

Influencing the Future of Sport and Exercise Medicine Education in the NHS

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PhD by Published Works

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Abstract

Introduction

This PhD by published works aims to influence and develop the future direction of medical education in the medical speciality of Sport and Exercise Medicine (SEM). SEM involves musculoskeletal medicine, exercise medicine and team care. This commentary aims to provide an introduction, link the various published outputs and place the work in context. The overall portfolio contains 20 items of which there are 17 published peer-reviewed papers, one book and two book chapters. Six original research papers and one textbook form the central outputs of the portfolio.

Methods

A mixed methods approach has been used across the central published peer-reviewed papers. The key papers are formed from two key methodologies, that of semi structured interviews and the Delphi consensus method. Qualitative research performed by semi structured interviews and analysed via thematic analysis forms three of the published outputs. Two published Delphi studies develop the findings of the previous qualitative research to form an undergraduate and postgraduate syllabus for SEM and gain consensus.

Findings

Stakeholders of SEM, highlight a lack of awareness of the speciality of SEM in the NHS. SEM clinicians and stakeholders highlighted that SEM in the NHS should focus on musculoskeletal medicine and concussion. Interviews with NHS doctors suggested a need to increase exercise medicine related education in both undergraduate and postgraduate education. An SEM undergraduate and postgraduate syllabus was developed and consensus gained via a modified Delphi method using an expert panel of 45 clinicians. The final undergraduate syllabus had 58 learning objectives grouped into 9 subthemes while the postgraduate MSc SEM syllabus had 133 learning objectives divided into 11 subthemes. Finally, the textbook Sport and Exercise Medicine: An Essential Guide was published by Routledge which mapped to the majority of the postgraduate learning objectives developed.

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PhD by Published Works: Portfolio and Commentary

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I hope this portfolio of work supports and influences the direction and future of medical education in our speciality of SEM,

Dr Dane Vishnubala

August 2023

Academic Declaration

I confirm that this work is original and that if any passage(s) or diagram(s) have been copied from academic papers, books, the internet, or any other sources these are clearly identified by the use of quotation marks and the reference(s) is fully cited. I certify that, other than where indicated, this is my own work and does not breach the regulations of HYMS, the University of Hull, or the University of York regarding plagiarism or academic conduct in examinations. I have read the HYMS Code of Practice on Academic Misconduct, and state that this piece of work is my own and does not contain any unacknowledged work from any other sources.

Dr Dane Vishnubala

August 2023

Abbreviations

Abbreviation	
AHP	Allied Health Professional
BASEM	British Association of Sport and Exercise Medicine
BJSM	British Journal of Sport and Exercise Medicine
BMC	Bio Med Central Journal
BMJ	British Medical Journal
CDM	Consensus Development Model
CMO	Chief Medical Officer
FSEM	Faculty of Sport and Exercise Medicine
HYMS	Hull York Medical School
MHHP	Moving Healthcare Professionals
MSc	Master of Science
MSK	Musculoskeletal
NHS	National Health Service
OHID	Office for Health Improvement and Disparities
PA	Physical Activity
PACC	Physical Activity Clinical Champion
PG	Postgraduate
PHE	Public Health England
RAM	RAND/UCLA Appropriateness Method
SEM	Sport and Exercise Medicine.
UEMS	European Union of Medical Specialists
UG	Undergraduate

1 Overview

This PhD by published works portfolio is based on over four years of research and includes publications that focus on influencing and developing the future direction of medical education in SEM. The full portfolio of published works can be found in the appendix. The portfolio is accompanied by this commentary that aims to meet the requirements set out by HYMS for the commentary (Table 1).

Hull York Medical School PhD by published works commentary requirements:

- 3.4. Along with a portfolio of published work, the candidate must also submit a commentary, not exceeding 10000 words, that:
- 3.4.1 Provides an introduction and places the work in context.
 - 3.4.2 Establishes the linking hypothesis or theme between the various topics covered by the published work.
 - 3.4.3 Gives emphasis, couched in a critical discussion, to significant findings and conclusions.
 - 3.4.4 Provides an indication of areas for further research development and exploration.
 - 3.4.5 Indicates in the case of work submitted under joint authorship, the contribution made by the candidate (signed statements from corresponding authors are required).

Table 1: HYMS Requirements for PhD by Published Works Commentary

The portfolio of research that has been submitted for consideration consists of 20 items. These include 17 published peer-reviewed papers, one book and two book chapters. Of the 17 journal outputs, nine are original research studies. The central outputs (or the golden thread) of the thesis including the two syllabus developments by Delphi as well as the wider portfolio aim to influence the future of Sport and Exercise Medicine education in the United Kingdom (UK). The central outputs are formed from six original research papers and one textbook.

Many of the papers have been published in a range of well-known and international peer-reviewed journals including BMC Medical Education, BMC Health Services Research, British Medical Journal (BMJ), British Journal of Sports Medicine (BJSM), and BMJ Open SEM amongst others. All outputs were published between 2019 and 2023.

Despite the potential growing need for the skills of SEM doctors as highlighted by the NHS long-term plan (Alderwick and Dixon, 2019) which highlights the need for preventative medicine, with an increasing burden of patients with long-term conditions, there is very little SEM in the medical undergraduate syllabus or awareness of the specialty at a university level (Pandya and Marino, 2018). Many postgraduate SEM-related jobs particularly in team care and MSK have an MSc in SEM as desirable or essential. However, there is currently no consensus on a syllabus for MSc in SEM (Kordi, Dennick and Scammell, 2005). (Kordi, Dennick and Scammell, 2005).

The NHS is struggling and needs to innovate to manage the needs of a growing, ageing population with increasing long term conditions and levels of inactivity (Alderwick and Dixon, 2019). SEM could play an important part (Jones and Weiler, 2016). Exploring the role a broad specialty such as SEM can play in the NHS (Figure C) has also not been investigated which is another research and knowledge gap. Understanding the NHS need of SEM will aid to develop learning outcomes that factor in the needs of the largest employers of doctors and lead to the development of a syllabus that is fit for purpose. The syllabus if implemented can then support the next generation of doctors and postgraduate SEM workforce to work in and support the NHS and have influence on our nation's health at a time of rising NHS pressures. In the next section, the research aims will be articulated further. Considering the above, the following aims and objectives have been set.

1.1 Research question and aims

Table 3: Shows the aims and key research questions

Overarching Aim:

To influence the future of SEM education in the UK

The key research questions that are answered by the core publications:

1. Are there educational gaps and solutions to promoting PA amongst doctors?
2. What do the NHS and key stakeholders need from SEM?
3. What should an Undergraduate SEM syllabus for medical students contain?
4. What should a Postgraduate MSc SEM syllabus for doctors contain?

Considering the aims and questions in Table 3 above, this PhD by published works aims to understand the challenges that SEM as a specialty faces, explore the educational needs of current and future SEM doctors, understand the needs of the NHS from SEM and develop an SEM undergraduate and postgraduate MSc SEM syllabus. The next section explores what this portfolio of work contributes to our current knowledge of SEM education.

1.2 Key contributions to knowledge

The NHS in England is made up of 42 integrated care systems (Sanderson et al., 2023), of which only 15 benefit from SEM expertise and input (FSEM, 2023a). There are only a few NHS jobs in SEM (Jones and Weiler, 2016) despite growing evidence to show the value SEM can offer (FSEM, 2023a). This portfolio of research has answered several unanswered questions and research/knowledge gaps. This thesis and its associated publications have helped to showcase what role SEM could play in the NHS (Vishnubala et al., 2020a), identify educational gaps and a need for SEM and PA Education (Vishnubala et al., 2022c; Kime et al., 2020), surveyed the British Association of Sport and Exercise Medicine (BASEM), the largest national sports medicine membership organisation in the world, to understand their view on undergraduate SEM education needs (Marino, Vishnubala and Fitzpatrick, 2023) and used the information garnered from all of these pieces of research to develop

undergraduate and postgraduate syllabi and gain consensus via a Delphi methodology. The developed SEM syllabi for an undergraduate SEM and an MSc SEM aimed at doctors achieved consensus via Delphi methodology. (Vishnubala et al., 2023a, 2022b). This is the first such published consensus to be carried out in the UK. The syllabi have also been implemented into a tangible output in the form of a SEM textbook published by Routledge (Eastwood and Vishnubala, 2023). It is the only SEM textbook to map to agreed UK standards and has already been adopted by several leading universities, including the University of Leeds.

The undergraduate SEM syllabus has been adopted by the Faculty of Sport and Exercise Medicine (FSEM), which is the national governing body for SEM in the UK as well as the BASEM, a leading organisation with one of the oldest and largest SEM memberships in the world. At the time of writing, It is currently being edited into a public-facing document with supporting information around implementation advice aimed at medical schools. This will enable the syllabus to be visible and allows institutions to implement it into their undergraduate curricula should they wish.

Overall, this collection of research has developed and gained consensus for a UK undergraduate and postgraduate MSc SEM syllabus factoring in the needs of stakeholders (Vishnubala et al., 2022b, 2023b). The next section will explore the relevant literature that grounds this portfolio of work and sets the scene further.

2 Relevant Literature

In this section, I will use the literature to introduce and discuss SEM as a specialty and the development of the medical specialty. This is not a literature review per se. I will then explore the literature pertaining to SEM around developing a syllabus and gaining a consensus. Finally, I will then explore the literature surrounding the promotion of PA by healthcare professionals.

2.1 SEM as a specialty and its development

The specialty of SEM was formally recognised by the GMC in 2005. Initially, it was given approval with the provision that exercise medicine was included due to its perceived importance in NHS settings (Cullen, 2009). Approval was gained around the time of the successful bid for the London Olympics. The specialty encompasses team care, MSK medicine and exercise medicine (Jones and Weiler, 2016). To become a specialist, doctors must undergo further training. The duration of time to get specialist recognition is 8-9 years post-medical school graduation (JRCBT, 2019). The route to specialist recognition is shown in Figure E and will be discussed in 3.2.

There are several key organisations involved in SEM education in the UK. FSEM, as well as the Joint Royal Colleges of Physicians Training Board (JRCPTB, 2021), oversee SEM specialist training in the UK. BASEM provides a broad range of education from undergraduates to early career professionals, those with an extended role, registrars, and specialists (consultants). FSEM also provides professional exams for those wishing to do SEM as an interest or in an extended role as well as those training to be specialists to enter the GMC register.

Regarding scale, there are approximately 180 consultant doctors (specialists) in SEM on the GMC specialist register (FSEM, 2023b; Jones and Weiler, 2016). There are now 19 NHS trusts employing SEM consultants (Jones and Weiler, 2016). The military, NHS and private sector all employ consultant doctors (physicians) in SEM. With the growing number of consultants, FSEM aims to make clear its strengths and possible contributions, particularly in an NHS setting which is reiterated and laid out in its latest strategy document FSEM strategy 2022-2025 (FSEM, 2022).

The need to create and implement SEM services into the NHS has been a key driver for FSEM. The FSEM workforce planning document (FSEM, 2023a) outlines a possible strategy with reasoning. There are several ways SEM could add value, this includes the use of a potential “one-stop shop” with integrated MSK pathways and services. SEM professionals in

MSK services are thought to reduce care variation, improve patient experience, be less likely to over-investigate, and likely to be cost-effective (FSEM, 2023a). Of the UK's 42 Integrated care systems (ICS), only 15 currently have any SEM input into their service offerings.

While significant progress has been made, specialist training numbers have dropped including the loss of training posts in Wales and Scotland (Jones and Weiler, 2016; Marino et al., 2023). Key challenges including increasing training numbers and increasing the number of NHS posts remain, as well as standard setting via professional exams required by doctors working towards specialist recognition in SEM. There are several factors to consider for this drop in training numbers, including a loss of momentum after the London 2012 Olympics, low numbers of NHS posts, and large numbers of SEM consultants practising predominantly within the private sector (Marino et al., 2023).

As specialist training in the UK is paid by taxpayers, specialist training is intended to assist and educate future NHS consultants. Consequently, recognising and comprehending where SEM belongs inside the NHS and how it might provide value as a specialty is key, and, accordingly, FSEM has outlined its stance and aims in its workforce planning document, including increasing the number of SEM consultants, the number of training posts and ensuring that SEM is involved and has an input in MSK commissioning (FSEM, 2023a). The roles and services where SEM might provide support and develop more SEM consultant positions are crucial in possibly expanding the number of trainees and enhancing patient care. The next section explores specialist training in SEM further.

2.2 Specialist training in SEM

Higher specialist training is the route taken by doctors in the UK to become registered specialists on the GMC register and subsequently to qualify or else become eligible for consultant positions (Harries et al., 2016). Figure E shows the specialist training pathway. Training will include rotations in general practice, emergency medicine, rheumatology, orthopaedics, public health, medical specialties, musculoskeletal medicine, paediatric musculoskeletal medicine, prehospital medicine, and elite sports medicine (JRCPTB, 2021).

During this period, doctors will cycle through a variety of positions to broaden their medical knowledge and experience as well as fulfil the curriculum requirements of specialist SEM training. In the UK, it might take between 8 and 9 years after medical school graduation to become a specialist in SEM, although in other countries the time required is much shorter (McLarnon and Heron, 2022; Jones and Weiler, 2016). This portfolio does not focus on specialist training, given the recent development of the UK specialist curriculum (JRCPTB, 2021). It is important to consider the specialist curriculum when considering what a syllabus for an MSc SEM for a doctor interested in an extended role needs to contain.

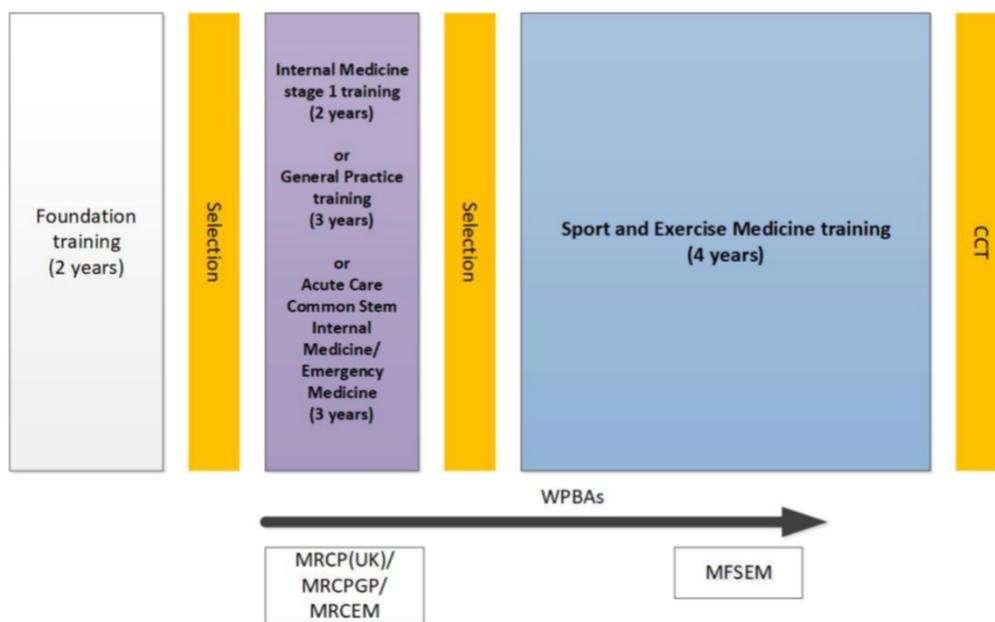


Figure E: Training Pathway to becoming an SEM Specialist.

Doctor With an Extended Role

Several nations recognise SEM as an independent specialty, while others recognise it as a subspecialty or a subject of interest (Neunhaeuserer et al., 2021; Pigozzi, 2009; Jenoura, 2016). A subspecialty requires the clinician to complete training in their initial specialties, such as general practice, rheumatology, or orthopaedics, and then subspecialise further. Given the varied terms used in each country to characterise training and define a specialist, this can be difficult to ascertain. In the UK, specialists are listed on the specialist register of

the GMC after undergoing the extensive training already outlined and passing the formal examinations described previously and administered by FSEM. Many physicians complete MSc in SEM or FSEM membership examinations and practise SEM in the capacity of a doctor with special interest. GPs in the UK refer to themselves as GPs with an extended role, formerly known as GPs with a special interest or GPSis (Gérvás et al. 2007; Thomas et al. 2020). In the UK, additional programmes are presently being developed, including the recently introduced diploma in MSK medicine, as well as an exercise medicine exam and a team medicine exam (FSEM, 2022). Diplomats are those who pass this professional knowledge examination and can join the faculty as diplomat members (Hazan, 2022).

It is possible to work privately, for the military, or the NHS, among other locations of work, in the field of SEM (Evans, 2016). This means that those who work in SEM have access to a vast array of possible positions. The preponderance of these positions usually requires an MSc in SEM or a postgraduate diploma in SEM. This is an important distinction to make when examining the literature, given the wide variety of roles, experience, qualifications and titles of a doctor working in the field of SEM. While a GMC curriculum exists for a specialist in SEM, those working with an extended role do not have a defined syllabus or curriculum. The MSc in SEM which is the most common prerequisite to work in an extended role at present, has no nationally agreed syllabus with higher education institutions all running their own syllabi (Kordi, Dennick and Scammell, 2005).

Development of SEM Syllabi

Recognising the challenges, opportunities, and requirements of the specialty is crucial when devising a syllabus. The development of syllabi forms an integral component of this thesis. What should an SEM syllabus for an undergraduate degree or a postgraduate MSc contain? SEM doctors can operate in a variety of settings and capacities (Kordi, Dennick and Scammell, 2005) which presents a challenge without a consistent syllabus. SEM practices and training are universally variable (Neunhaeuserer et al., 2021). There are no published articles on the development of the current UK specialist SEM curriculum. However, there are two papers exploring the development of an international specialist curriculum and one exploring an MSc SEM syllabus, although there is presently no literature available on an undergraduate syllabus. Below, I will explore the three identified papers further.

Paper 1: Defining the Sports Medicine Specialist in the UK: A Delphi Study (Thompson 2004)

The Delphi study had a sample size of 160 participants. The majority of participants in a UK-based Delphi study (Thompson, 2004) comprised of members of the BASEM agreed that orthopaedics, soft tissue medicine, and emergency medicine are essential components of SEM. Seventy-two percent of respondents deemed a functional knowledge of rehabilitation, particularly physiotherapy, to be essential. All other disciplines, including rheumatology, had a 16% agreement rate. This contradicts the current specialist curriculum in the UK which incorporates rheumatology and other topics not regarded essential in this Delphi. Notably, this Delphi was conducted prior to the official recognition of specialty in the UK and, consequently, all respondents were physicians with an interest in the topic rather than "specialists" per se. Anecdotally, at the time of the research, many physicians practising SEM would have been active within the private sector, as there was no GMC specialty recognition or official NHS work, which may have also distorted the results of this Delphi. Only 53% of individuals responded to the survey. The most recent GMC SEM specialist curriculum was updated in 2021 (JRCBT, 2019), although the mechanism by which this was accomplished was neither transparent nor made public or published.

Paper 2 Developing learning outcomes for an ideal MSc Course in Sports and Exercise Medicine (Kordi, Dennick and Scammell, 2005)

This was the only paper exploring an MSc Syllabus in SEM in the literature. The paper produced 29 learning outcomes. The methodology appears to use a survey format to rank agreement of the proposed learning outcomes. The survey was sent to 61 course graduates, 56 teachers, 32 students and 20 course directors. There is very little information about the demographics beyond this. It is unclear who was involved in the development of the draft syllabus. While the survey methodology of ranking agreement appears to align with a Delphi, there was only one round with no opportunity for comments or revisions. While the rigour of the methodology reduces the confidence in the outcomes, it is a useful starting point when looking to develop an MSc SEM syllabus.

Paper 3: International Delphi for a specialist SEM curriculum (Humphries, Jaques and Dijkstra, 2018; Humphries et al., 2021)

A two-part international Delphi for a specialist syllabus for SEM was published first in 2018 and then again in 2021. The syllabus was designed for use in developing nations that may not have the resources to develop a syllabus and where SEM may not be a specialty. The 11 domains developed are shown in Table 4. The curriculum comprises eleven domains and eighty general learning areas, with a separate paper outlining the specific learning areas for each of the general ones. The international syllabus in the SEM group (ISSEMG) contributed to the writing of the article. The group consisted of 17 specialists from 12 countries, whereas the second paper included 26 clinicians with a variety of specialisations drawn from 12 nations. This is the only consensus of a specialist syllabus in the published literature. The methodologies utilised were a modified version of the Delphi methodology, with a threshold of 80% for agreement. According to Keeney (Keeney, Hasson and McKenna, 2006), consensus should aim for a 75% agreement, although there are many factors to consider here. Depending on the round of the Delphi, response rates ranged from 60% to 100%. While a response rate of 60% is not optimal, a response rate of 80% represents an

appropriate target (Msibi et al., 2018). While Kilroy advised that we should ensure that response rates from the panel do not fall below 70% (Kilroy, 2006).

Delphi methodology has been widely used in curriculum development for some time. This is an opportunity to begin with a clean slate when using Delphi. As the expertise is anonymous, a Delphi approach prevents vocal individuals from dominating the consensus process, as may happen in a focus group (Jairath and Weinstein, 1994). The panel's knowledge as subject matter experts is more important than the panel's size (Akins, Tolson and Cole, 2005). The paper by Humphries (Humphries, Jaques and Dijkstra, 2018) indicates that 17 specialists were chosen for the final panel, but it is unclear how they were selected, what their credentials were, or what the inclusion/exclusion criteria were. Consequently, it is difficult to comment further. This presents a fascinating conundrum. The nature of what constitutes an expert has been the subject of considerable debate. However, for our purposes, an expert is regarded as a person with the necessary qualifications and experience in the subject matter being reviewed (Keeney, Hasson and McKenna, 2006) who, therefore, can offer insight. Statistical analyses of Delphi panel dimensions have revealed a wide range of panel size recommendations. A panel size greater than 30 does not enhance Delphi's quality (de Villiers, de Villiers and Kent, 2005).

Table 4: Humphries et al 2018 11 domains for the international SEM Specialist Syllabus

The 11 domains agreed upon from the first paper (Humphries, Jaques and Dijkstra, 2018) were:

1. PA and human health
2. Medical issues related to exercise
3. Injuries related to sports and exercise
4. Nutrition
5. Pharmacology
6. Antidoping
7. Sports team care and sports event medical management
8. PA in challenging environments

9. Specific groups undertaking sports and exercise
10. Intrinsic skills of an SEM physician
11. Extrinsic skills of an SEM physician

This is the only original research consensus on a specialist SEM syllabus available. However, the paper's lack of clarity on the recruitment process of the expert panel selection and lack of inclusion/exclusion criteria should be noted.

2.3 Gaining Consensus for a Syllabus

Gaining a consensus with regards to any curriculum or syllabus is important to ensure that experienced clinicians working in the field of SEM agree these are suitable, appropriate, and relevant learning outcomes. Consensus development methods (CDMs) can support complex decision-making by allowing a systematic approach to the synthesis of expert opinions (Humphrey-Murto et al., 2017). In a CDM, there are repetitive interactions with a particular “expert” group until a consensus is reached.

Several types of CDM are used:

- Nominal Group Technique (NGT)
- Delphi Technique (DT)
- Consensus Development Conference (CDC)
- RAND/UCLA Appropriateness Method (RAM)

Table 5 shows a summary of the different CDM models commonly used. As the method used in the portfolio is a Delphi, this is introduced next and discussed further in Section 4 of the methods.

Table 5: Overview of commonly used consensus development techniques

Consensus Development Method	Overview
Nominal Group Technique (NGT) (McMillan, King and Tully, 2016; Pope, 2000)	A face-to-face approach using small groups across four phases: silent generation, round robin, elucidation, and ranking.
Delphi Technique (DT) (Meskell et al., 2014)	Asynchronous, remote, anonymous approach in which expert participants provide opinions on items and rate/rank them. Multiple rounds occur depending on the design.
Consensus Development Conference (CDC) (Murphy et al., 1998; Arakawa and Bader, 2022)	Small group process with experts presenting evidence to the small group participants. Face-to-face with a chair facilitating the process. Participants then discuss, debate, and come to an agreement
RAND/UCLA Appropriateness Method (RAM) (Brook, 1994) (Raine et al., 2015)	A hybrid method that combines NGT and DT. 5 stage process, with a literature review to generate a list, expert panel rank agreement, then debate the issues and disagreements, following revisions a final round of anonymous ranking.

Delphi Technique (DT)

Since the 1950s, the DT has been widely utilised as a technique for achieving consensus (Meskell et al., 2014). Utilising a group of "expert" participants in an interactive, iterative process. Participants solely interact with the task and not with one another. Participants are required to rate their agreement and opinions/views on each item. The research team then compiles and revises any items that did not meet the predetermined agreement and repeats the procedure with the revised items. The entire procedure is anonymous and

asynchronous potentially enabling greater participation. While the participant's opinion is typically objective, participants cannot develop/discuss/debate the items further.

2.4 Promotion of PA by HCPs

PA or exercise medicine forms a key part of SEM as laid out by the current specialty curriculum (JRCBT, 2019) and FSEM. While it is given importance, where and how it fits into SEM and how SEM would conduct such a role, particularly in an NHS setting, is open to discussion.

At present FSEM's direction and that of the Office of Health Improvement and Disparities (OHID, formerly Public Health England) is around increasing the amount of PA carried out by the public to prevent long-term conditions. FSEM currently runs Moving Medicine (Brannan et al., 2019) which is a PA online resource to be used with patients to provide evidence-based advice on becoming physically active to prevent or manage a range of long term conditions (Brannan et al., 2019). The most recent UK Chief Medical Officer (CMO) states the importance of PA in the primary and secondary prevention of several long term conditions (Davies et al., 2019). The CMOs, Sport England and OHID/PHE have all identified HCPs as being integral to the promotion of PA to patients (Brannan et al., 2019). However, several studies suggest a lack of awareness and knowledge around PA amongst HCPs as well as highlighting other barriers such as time (Chatterjee et al., 2017; Lowe et al., 2017) and lack of centralised resources. There appears to be a gap in the literature around proposed solutions that help HCP promote and develop PA with their patients (Chatterjee et al., 2017).

With this in mind, OHID ran the Moving Health Care Professionals Programme (MHHP), which aims to increase awareness, knowledge, and confidence around PA among HCPs (Brannan et al., 2019). The programme commissioned online learning for HCPs via BMJ and eLearning for health and tried to influence the undergraduate and postgraduate curricula by running work groups and lobbying the medical school's council (MSC), GMC and individual

medical schools (Brannan et al., 2019). OHID also ran a unique peer-to-peer education model for 8 years called the PA Clinical Champions Programme (Brannan et al., 2019). The programme recruited a range of clinicians to act as PA clinical champions and deliver a standardised training session to HCPs. The programme had nearly 50+ champions. The programme has educated over 40 000 HCPs and has been further evaluated. The evaluation showed that there was an increase in knowledge of PA by HCPs, there was an increase in confidence around discussing PA with patients and, finally, HCPs post-training increased the number of conversations they had around PA (Sport England, 2021). Following the transition of PHE to the OHID, the programme has been put out for tender by Sport England to make it a sustainable programme. A collaborative bid led by the Advanced Wellbeing Research Centre (AWRC) of Sheffield Hallam University has been accepted and the programme will restart in September 2023 and will look to also develop a more sustainable model moving forward with a places-based focus.

3 Methods

Table 6: Shows the aims and key research questions.

Overarching Aim: To influence the future of SEM education in the NHS.
The key research questions that are answered by the core publications: <ol style="list-style-type: none">1. Are there educational gaps and solutions to promoting PA amongst doctors?2. What do the NHS and key stakeholders need from SEM?3. What should an Undergraduate SEM syllabus for medical students contain?4. What should a Postgraduate MSc SEM syllabus for doctors contain?

To achieve the aims and answer the questions highlighted in Table 6 a range of methods were considered. Research questions 1-2 have been grouped due to their similar methodology, as have 3-4.

3.1 Questions 1-2: Qualitative Research

The first two questions, as discussed in the relevant literature Section 3.4, have been explored, albeit predominantly via surveys. The surveys highlight some areas but given the limitations of surveys in allowing a thorough expansion and exploration of the comments made, a focus group or interview approach may aid in answering the question better. Due to the busy nature of the individuals involved from a practical viewpoint, as well as to avoid issues regarding bias and dominance, a semi-structured interview approach was taken. Question 2 would also be best served following a similar approach. There is no original research around this question, only editorials discussing the role of SEM in the NHS.

3.2 Semi-Structured Interviews

Through semi-structured interviews, a small number of participants can investigate an issue or question in depth. Four of the original research publications for the thesis are semi-structured interviews. Semi-structured interviews require a relational approach based on active involvement and inquiry (Braun and Clarke, 2006). In addition, it demands well-developed interviewing abilities. In lieu of a transactional question-and-answer structure, the approach should be iterative and evolve as the conversation develops. As with the great majority of qualitative research, the objective of these interviews is to attempt to comprehend the topic from the perspective of the participants; explore the relevance of people's perspectives; and investigate their lived experiences (Agostinone-Wilson, 2012). To properly respond to questions 1 and 2, it is vital to study and analyse personal experiences, attitudes, beliefs, perceptions, perceived barriers, and offered solutions. The semi-structured interviews used in this thesis were designed using a ten-step process shown in Table 7 (Braun and Clarke, 2006).

Table 7: Development approach for semi-structured interviews using Braun and Clarke as the framework.

Step	
1	Clarify and ensure clear purpose and scope
2	Identify the participants required. What are the inclusion and exclusion criteria?
3	Consider ethical issues
4.	Consider the logistics
5	Developing the interview guide
6	Establishing trust and rapport
7	Conducting the interview
8	Memo-ing and reflection
9	Data analysis
10	Trustworthiness of the data

Notably, the interview guide was created with an iterative approach involving several pilot interviews and stakeholder input. In qualitative research, it is challenging to identify the requisite number of participants and relevant amount of data. However, participant homogeneity, interview quality, and thematic saturation were all evaluated (Malterud, Siersma and Guassora, 2016) and considered.

3.3 Thematic evaluation

The idea that qualitative research is less rigorous is widespread (Braun and Clarke, 2006). According to several studies, qualitative researchers do not often specify their analytical methods (Attride-Stirling, 2001). Researchers offer an explanation and justification of their analysis methods (Braun and Clarke, 2006). Thematic analysis is a type of analysis in which data, in this instance semi-structured interview data, are examined to detect recurrent patterns. Following the selection of codes, themes are developed by employing the codes (Braun and Clarke, 2006). Inductive coding produces concepts based on given data (Thorne 2000). In contrast to deductive reasoning, inductive reasoning involves investigating or testing concepts. Due to the scarcity of previously published research, exploring PA and SEM, an inductive approach was utilised. The codes will then be examined and organised into themes and subthemes (Kiger and Varpio, 2020). To ensure the dependability of qualitative research, criteria comprising credibility, transferability, dependability, and confirmation should all be considered (Guba and Lincoln, 1989).

3.4 Questions 3-4: Syllabi development

To comprehend what should be included in the proposed syllabi, it is necessary to consult with knowledgeable, experienced professionals (Powell, 2003). Several techniques for achieving consensus have been highlighted. Due to the impracticality of gathering experts in person, face-to-face methods were ruled out. Face-to-face group work's potential for dominance and bias were also considered during decision-making. Therefore, while the hybrid approach of RAM had merits, an asynchronous, anonymous, and online approach utilising Delphi appears both plausible and practical. Delphi methods have been widely

utilised in curriculum and syllabus creation for some time (Meshkat et al., 2014). There is an opportunity to start from scratch with a Delphi (Fitch et al., 2008); however, given that a draft syllabus was developed by the research team and sent to the panel, this constitutes a modified Delphi. To prevent participant exhaustion and attrition, a two-stage approach was utilised. Consequently, this is a modified two-stage Delphi project, yet Delphi rounds could continue if a consensus is not reached (Green et al., 1999). Due to the anonymity of the expertise, a Delphi prevents vocal individuals from dominating the consensus process, as they would in a focus group (Jairath and Weinstein, 1994). It eliminates the inherent biases, such as conformity and dominance, that can arise in face-to-face group meetings (Nasa, Jain and Juneja, 2021). A flow chart showing the process of the modified Delphi is shown in Figure F.

9.4.1 Panel Identification for the Delphi Technique

It is believed that the panel's knowledge as subject matter experts is more crucial than its size (Akins, Tolson and Cole, 2005). The composition of a panel and the definition of an "expert" are contentious issues. Considering these considerations, an expert as a person who possesses the requisite skills and knowledge of the topic under evaluation, and who can therefore offer insight (Keeney, Hasson and McKenna, 2006). In terms of the number of panellists, analyses of Delphi panel sizes have revealed a wide range of values. In terms of panel size, a panel size of more than 30 is not believed to improve Delphi quality (de Villiers, de Villiers and Kent, 2005)

Recruitment and Access Negotiation for Panel Members

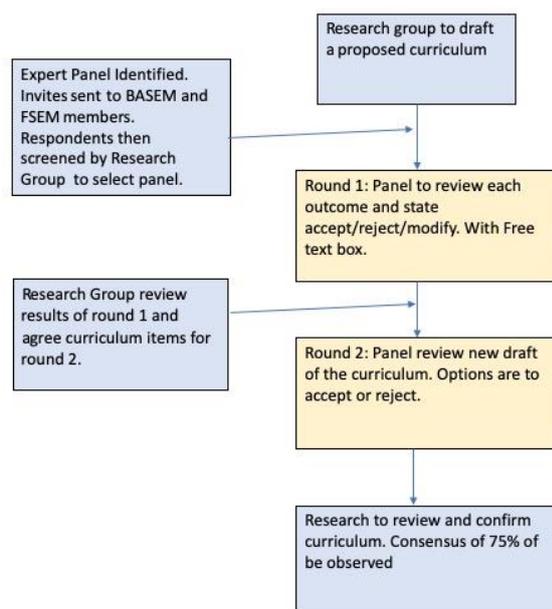
Panel members were approved by the research team and pilot group. Members of the panel will be "sourced" from the BASEM and the FSEM. Given that this is one of the smallest specialties in the UK, most experts on the GMC specialist register or doctors with a substantial interest tend to be members of one or both organisations.

Consensus and Response Rate

During Phase 1, panel members examined each curriculum item and will be allowed to accept, reject, or comment. Thereafter, they will be able to add an open comment.

The research team will then compile, evaluate, and create a new curriculum based on this data. To preserve academic rigour, it would be necessary to ensure that response rates from the panel do not fall below 70% (Kilroy, 2006). According to Keeney, 75% agreement is deemed to constitute a consensus (Keeney, Hasson and McKenna, 2006). It is important to note, however, that the greater the homogeneity of a group, the higher the percentage of agreement that may be required.

Figure F: Shows an overview of the modified Delphi methodology used in both undergraduate and postgraduate MSc SEM syllabus development.



3.5 Reflexive considerations from

This must be discussed in the first person, given that I will critically examine and acknowledge my own role as a researcher, my biases, assumptions, and possible influences that may impact my research. I will explore several domains that make up the reflexive considerations.

In my capacity as NHS England Training programme director for sports medicine in Yorkshire and having designed and led an MSc in SEM and taught on two others, I will have preconceived ideas of what a syllabus for undergraduate and postgraduate should contain. Given the broad research group I had for the Delphi and the large expert panel, this will have aided in mitigating that. As OHID's lead doctor for a national peer-to-peer PA education programme, I have developed a syllabus and later a curriculum around PA education of health care professionals as well as taught over 3000 HCPs. Therefore, again, I have several preconceived ideas about the role of education and the solutions required to increase PA advice provided by HCPs. Using a second coder to independently code and explore intercoder variability will have aided to some extent in managing potential biases I may have and the potential subjectivity that is inherent in analysing qualitative data. This should improve the robustness of the process and the validity and credibility of the output.

I had no specific relationship with any participant in the qualitative interviews and, for the Delphi, the participants were anonymised to avoid any biases when looking at the data given that the SEM community is relatively small.

3.6 Ethical considerations

All original research had university ethical approval. Given the nature of the research, the risk of harm, both physical and emotional, was extremely low. Delphi-related research was remotely done by the participant. The qualitative interviews have the possibility of causing participants emotional/psychological discomfort although, given the nature of this topic, this is extremely unlikely. No psychological or physical harm was caused to the knowledge of all involved in the research that form this thesis.

4 Results

The portfolio focuses on syllabus development at its centre, with several supporting research articles that aid in identifying the need and contributing to the construction of the first iteration of the curriculum prior to gaining consensus via an iterative process. The portfolio may be broken down into two themes. These consist of undergraduate education and postgraduate education. Table 8 below displays the seven selected publications that comprise the "golden thread" of the thesis. To maintain consistency, the numbering matches those in other tables. This section highlights and provides an overview of the results related to the key published papers.

Table 8: Key Publications that form the portfolio of published works.

Output Number	Type	Title of Publication (Reference)
1	Original Research	How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation (Kime et al., 2020)
4	Original	Integrating Sport and Exercise Medicine Clinics into the National Health Service: A Qualitative Study (Vishnubala et al., 2020a)
11	Original	Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi Study (Vishnubala et al., 2022a)
13	Original	UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study (Vishnubala et al., 2022c)
14	Edited Book	Sport and Exercise Medicine: An Essential Guide (Eastwood and Vishnubala, 2023)

15	Original	Educating the Next Generation in sport and exercise medicine: A cross Sectional Survey (Marino, Vishnubala and Fitzpatrick, 2023)
16	Original	Creating a Sport and Exercise Medicine Undergraduate syllabus for doctors: a Delphi Study (Vishnubala et al., 2023b)

4.1 Key Publications (Full Papers)

All seven key publications are available in full below.

Background

Diabetes and its consequences are a major problem for health systems around the world, reaching epidemic proportions over the last 30 years [1]. Worldwide, over 420 million people are currently living with diabetes [2]. Furthermore, the absolute global economic burden of diabetes was \$1.3 trillion in 2015 [3] and in 2016, around 1.6 million deaths were directly caused by diabetes [2]. Fortunately, diabetes and its consequences are - for the most part - manageable. Medication, regular screening, treatment for complications, improved physical activity (PA) levels and diet can all help to avoid, delay or manage diabetes [2]. Yet, much of the responsibility for facilitating the requisite behaviour change lies at the feet of healthcare professionals (HCPs) [4]. Although the evidence base surrounding theoretical frameworks and systems-based approaches to behaviour change point to the powerful impact of concurrently addressing underlying influences on behaviour [5–7], unhealthy practices are often socially reinforced [8, 9]. Therefore, effective, cost effective, sustainable and implementable strategies that can help alleviate pressure on HCPs and struggling health systems remain in short supply.

Contemporary national programmes for increasing PA focus on the promotion of PA, including for those people living with a long-term conditions, for example diabetes [10]. As part of national initiatives, such as Sport England's Local Physical Activity Delivery Pilots, HCPs are expected to have an important role supporting both in the local community and community agencies tasked with promoting PA [10, 11].

While HCPs appear confident prescribing medication, screening, treatment and diet interventions for patients living with diabetes, there is less confidence and consensus among HCPs regarding the promotion of PA [12]. This could be problematic as the UK Chief Medical Officers (CMO) PA guidelines 2019 update, 'developing options for future communication and surveillance', highlighted the importance of a broad group of HCPs in promoting PA [13] and the Royal College of General Practitioners (RCGP) have identified PA as a strategic priority [14]. Many complex and multifaceted barriers account for insufficient levels of activity [15]. For example, HCPs do not always know what to recommend to people living with diabetes when asked about incorporating PA into their lives [16]. Further, HCPs and patients have cited this lack of knowledge, combined with the fear of hypoglycaemia and a loss of glycaemic control as a primary reason for non-engagement [17]. This fear may, in some way, account for people with diabetes being among the least physically active in society [18] and why a high proportion of patients living with diabetes struggle to maintain a healthy weight [19].

Allaying these fears are important since a physically active lifestyle is critical for blood glucose management

and overall health in individuals with diabetes and prediabetes [20]. Adults with a high exercise capacity display reduced risk of coronary artery disease, myocardial ischaemia and stroke, regardless of their diabetes status [21]. In addition, compared to those individuals with type 1 who are inactive, their active counterparts have lower levels of retinopathy and microalbuminuria [22], an increased likelihood of reaching HbA1c, blood pressure and BMI targets [19] and decreased total daily insulin needs [23]. With this in mind and in line with current guidance, PA should be undertaken, recommended and prescribed to all individuals with a metabolic condition as part of diabetes management and overall health [24].

Adopting person-centred, behavioural approaches in this context may improve the chances of achieving the desired PA outcomes. These approaches indicate that regular positive experiences promote the motivation and capability to adopt a behaviour, whereas negative experiences can lower motivation and perceived capability [5, 25]. Highlighting the unique needs of adults with diabetes and the challenges they face around PA is likely to be of great importance. Previous research has highlighted the role that HCPs play in providing information and appraising social support in the form of education around diabetes and PA [15]. In addition, there is a growing need to improve knowledge around PA in relation to diabetes among HCPs [12, 16], alongside appropriate and individualised application of this, integrated within a programme that emphasises the importance of PA in diabetes management. Importantly, these ideas require a detailed understanding of the preparedness of HCPs for delivering guidance and support to participants, as well as a detailed appreciation of mediated approaches to PA promotion, developed for adults with diabetes. These approaches are expected to help to develop a better understanding of what works - or not, why and how. In doing so, bottom up, exploratory and iterative approaches have been recommended [26] and deployed with professional groups who have a responsibility for the provision of PA and public health [27]. This can help establish the basis for forming and refining intervention activities including those aimed at enhancing the preparedness of HCPs.

Therefore, the aim of the work was to conduct a formative evaluation of HCPs working in primary care and the community around the delivery of PA guidance for those with diabetes. The evaluation details information relating to the characteristics, decisions and behaviours of these HCPs, to inform and develop future education and training programmes for this group and, therefore, improve diabetes service provision in respect of PA. An important aspect of the study was to identify the challenges faced by HCPs and understand what worked less well and why, important criteria for the successful management of PA promotion interventions [28]. Here we describe this formative evaluation process and identify

those factors that need to be considered prior to designing a behavioural intervention aimed at HCPs.

Methods

Study overview

This exploratory research study adopted a sequential mixed method design. The quantitative survey element of the research was implemented first and the findings were used to inform the qualitative interviews. As this study was exploratory, a non-probability sample of experts practicing within the field of diabetes and physical activity were recruited. This type of approach has been used previously in PA research to provide more in-depth accounts from health and social care professionals [27]. This involved a two phase, multi-site approach to evaluate the delivery of PA guidance by HCPs - working in either primary care or the community - to patients living with diabetes (including type 1 diabetes, type 2 diabetes and pre-diabetes). HCPs working in secondary care were not involved in this study. The study took place in the Yorkshire region between February and July 2018. A purposive sampling strategy was used to recruit HCPs who saw patients with diabetes as part of their role. Inclusion and exclusion criteria were based on whether a HCP was qualified, which was determined by the Health Care Personnel Law and Legal Definition. This states that Health Care Personnel are persons who have special education on health care and who are directly related to provision of health care services. The inclusion criteria were HCPs who met this definition.

Participants were first approached through General Practice surgeries and the researchers' existing links with community organisations. An initial email was sent to HCPs inviting them to participate by the research team. Those that wanted to take part were given an information sheet and asked to provide written consent.

The first phase of this study utilised an online pilot survey with HCPs. It was designed to test assumptions around HCPs knowledge, levels of training and preparedness to deliver PA guidance to patients living with diabetes. The findings from this pilot phase were used to determine the most appropriate lines of questioning and issues to be unpicked during the semi-structured interviews in phase two. The second phase of the study was based on a phenomenological approach that focused on HCPs experiences [29]. This was the most appropriate theoretical framework for exploring HCPs understanding of PA and diabetes and their preparedness for delivering it to adults with diabetes. Phase 2 involved individual, semi-structured qualitative interviews with HCPs. The interviews provided an in-depth exploration, as recommended by Knight et al. [16], of HCPs experiences of delivering PA guidance to patients living with diabetes, giving them an opportunity to talk freely about their

experiences. This combined approach facilitated a more robust and informative investigation of the current situation.

Data collection

Online pilot survey

A small purposive sample of HCPs participated in the bespoke online pilot survey, hosted by Qualtrics [30]. The pilot included multiple choice and open text response questions on participants own engagement in PA, previous education, their work-based training and knowledge of PA and diabetes, and the practicalities of delivering PA guidance in an appointment setting. The pilot survey took approximately 15 min to complete.

Semi-structured interviews

Reflecting the importance of using iterative bottom up and exploratory approaches when understanding and investigating HCPs practices [26], individual semi-structured interviews were conducted face-to-face or by telephone. The research team facilitated the interviews, either individually or in pairs. Each interview lasted between 15 min and 1 h. They were arranged at a time to suit the participants and in the case of face-to-face interviews, were held either in the work place or the participants' homes. An interview schedule was developed to guide the questions, which was piloted beforehand with a small number of HCPs. A semi-structured, deductive and inductive approach guided the interviews, which meant that the questions were aligned to both the main themes arising from the survey and the issues that arose directly from the participants as the interview progressed. This strategy allowed the participants to talk freely and share their views and experiences in respect of PA and diabetes. The questions centred on how prepared HCPs felt to deliver PA to those with diabetes, including the support they received and the barriers they faced. The interview schedule is available as supplementary material. Interviews were conducted until no new themes emerged and, therefore, data saturation was achieved. They were recorded with the participants' consent and no participation incentives were offered. Appropriate University ethical and local research and governance approval were obtained.

Data analysis

Online pilot survey

Descriptive statistics were used to describe data from the online pilot survey. All analyses were undertaken using IBM SPSS Statistics v25. Due to the sample size ($N = 6$) in phase one, there is an increased risk of disclosing information about individuals. For example, there are many cells with small counts, under 5. Although the tables themselves do not reveal the identity of an individual, there is a risk that combining or linking

tables within this data set may result in a secondary disclosure. By adopting a policy of small number suppression, data cannot be reported from phase one. Nevertheless, data from the pilot study suggested that although many participants were physically active themselves, there were significant shortfalls in training and knowledge around PA promotion for people living with diabetes. As a result, confidence to deal with the practicalities of delivering PA guidance in an appointment setting appeared low.

Individual interviews

The interviews were transcribed, and qualitative data analysis was conducted using a thematic approach [31]. This process involved generating categories and coding data so that common themes and links could be identified, but at the same time ensuring the data remained a faithful representation of the participants' comments [32]. As a means of reducing interpretation bias and increasing trustworthiness, transcripts were analysed by more than one member of the research team, all experienced in conducting qualitative analysis. In addition, participants verified the themes arising from the analytic process as a means of establishing the credibility of the findings. The researchers were aware of their influence on the study and endeavoured to employ reflexivity throughout the study process, using techniques such as critical reflection, note-taking and an assessment of their individual impact on data interpretation. A potential conflict of interest and ethical consideration was that one of the authors knew several of the participants, which may have led to coercive practices being employed. However, all participants were given an information sheet and asked to sign a consent form. The voluntary nature of participation was emphasised. In reality, the fact that some participants knew one of the authors turned out to be a strength of the study, since the author in question enabled access to a 'hard-to-engage' group, who ordinarily may not have set aside the time to participate in the study. Indeed, we came across cases where participants asked if they could be interviewed by this colleague and in doing so, we responded to participants' needs and a trusting and safe relationship was established.

Results

A total of 6 HCPs (4 Females; 2 males) participated in phase 1, some of whom participated in phase 2. A total of 18 HCPs (11 females; 7 males), participated in Phase 2. Of these, 15 participants were General Practitioners (GPs) and 3 were nurses employed either in a General Practice surgery or in the community. We present the results using a series of themes and selected excerpts in the following section which follows an approach we have used previously in the published literature [15].

Individual interview results

Training/education for HCPs

One of the most striking aspects of the interviews was that all HCPs, except one, stated that they had received little or no pre-registration education in physical activity or exercise (PA/E), both as a mediator for a healthy lifestyle or for preventing and managing diabetes, as part of their undergraduate or post-graduate training. The little training that they had received around PA/E was generic, in terms of being "good for your health" rather than specific to diabetes. As one HCP commented,

"During medical training I received no physical activity training at all...So, if you then asked me specifically how much I should do or what I should be telling them [patients with diabetes], I'd probably just say, 'you should do more' and that would probably be about where my medical training ends on that front" (HCP 9).

The exception to this was one HCP, whose initial degree included information on PA/E and at-risk groups. Other than this, any training or education in PA/E and diabetes that HCPs had received was undertaken whilst in their current role as part of their continuous professional development (CPD). This was largely undertaken on an ad-hoc basis and by individuals who took the initiative and chose to complete self-directed learning, for example, e-learning modules on the British Medical Journal website or attendance at study days. However, unless HCPs had an interest in PA/E, it was not an area in which they would voluntarily seek training, as exemplified by these HCPs,

"It's (PA/E) not in a GP curriculum, it's not in GP training, it's not in undergraduate training. So, unless you've found someone enthusiastic or somewhere to go and you're interested in learning, it wouldn't be something you'd do" (HCP 9).

"Well, I guess when it comes to diabetes specifically, we know a lot about the disease, the physiology, and I guess the drug management, but when it comes to the physical activity side of stuff I can't think of a single time I ever had any kind of lecture or group session to do with that. I think physical activity in general is really poorly taught to doctors, and when I've had to learn stuff I've had to go and... It's all very self-directed. I have actively to go and seek that information out. I can't think of a single time either at medical school or during my... or my training when we covered those topics" (HCP 13).

For those HCPs who had completed CPD training on PA/E and diabetes, the focus was on type 2 diabetes,

rather than type 1 diabetes or pre-diabetes. The emphasis was on medication and diet, and not PA/E, as a way of managing diabetes, as highlighted by one participant,

“There was never anything that was like here’s how to manage diabetes, on the lifestyle measure, physical activity. It was much more on the lines of, ‘right, diabetes, you need to discuss diet, you need to start thinking about medication’” (HCP 11).

Worryingly, even for those who had previously worked in a diabetes-specific role, PA/E was not a recognised component of diabetes management,

“I did actually do a diabetes job for four months. I wouldn’t say exercise was really discussed and since then, exercise-wise, pretty much zero CPD-wise” (HCP 8).

Guidelines for PA and diabetes care

All the participants were unfamiliar with any guidelines relating to PA/E and diabetes and had no idea where to go to find out specific information. Some participants referred to the British Medical Journal (BMJ) or the National Institute for Clinical Excellence (NICE), largely because they chose to be proactive, but the information sought mainly related to the treatment of diabetes rather than PA/E:

“There isn’t one consistent guidance for diabetes...I wouldn’t know if there was an authority to follow in the UK. NICE has a little bit of guidance about it, but again, it’s fairly broad” (HCP 9).

Of greater concern was the fact that only a small number of participants were familiar with the generic PA/E recommendations according to the CMO guidelines. Of these a few could recite the number of minutes for moderate and high intensity exercise per week, but as one HCP stated, this was despite having read any guidelines,

“I think I’d probably just have an image of what I’d say in my head, but that’s not based on being up-to-date...that I’ve read in the last 5 years” (HCP 10).

In addition, those HCPs involved in delivering medical training commented on the fact that even new doctors were unaware of the current PA/E guidelines for the general population,

“I was giving a talk to F1s (Foundation doctors) and I showed them the Government guidelines and the Chief Medical Officer guidelines [for PA/E]. We asked the question, ‘have you seen this before?’ I think one

person put their hand up to say they’d seen it. It was a group of 30. No-one knew the guidelines” (HCP 9).

Given the lack of training and education or awareness of where to find information on PA/E and diabetes, some HCPs stated that they felt their day-to-day practice was compromised in respect of delivering PA/E guidance to their patients,

“I can’t speak for all doctors, but I have a feeling that the sentiment is shared, we kind of feel a bit out of our depth when it comes to physical activity in general, especially when it comes to physical activity and diabetes” (HCP 13).

Nevertheless, they provided advice to their patients, which was largely based on opinion rather than recommended guidelines or policy,

“I guess most of the guys I work with would say, ‘you should do more exercise’ or ‘you should eat better’. Everyone has an opinion, but it’s based on their opinions rather than necessarily formal training...so we give the advice that we think is best” (HCP 9).

Perceptions of practice for promoting PA with patients with diabetes

Even though most HCPs had not received any formal training in PA/E in general or as a means of managing diabetes, and furthermore, were unaware of current PA/E guidelines, HCPs believed that many of their peers were aware of the need for more people to adopt lifestyle recommendations. They referred to the importance of exercise, diet and losing weight as generic considerations for the population in general, but also, as a means of reducing the likelihood of developing pre-diabetes and type 2 diabetes. Some HCPs placed a greater significance on PA/E rather than medication as a more effective way of managing type 2 diabetes,

“I’m definitely a less is more doctor. If I can stop people’s medications, then I’m thrilled. But that’s why I sought it [PA/E] out, because there’s good evidence now that exercise and weight loss is probably at least as effective, if not more effective, than medication [for type 2]” (HCP 1).

A misconception as to what constitutes PA, as opposed to exercise, was prevalent amongst HCPs. When asked specifically about this issue, many believed there were a lot of mixed messages around PA, exercise and sedentary time, in terms of their meanings and recommendations for increasing activity. For those HCPs who

could differentiate PA from exercise, they made a distinction between the two when advising patients and were able to emphasise the importance of fitting activity into everyday life,

“I also try to say they don’t need to specifically go out and exercise, but if they put some music on at home and they do lots of house jobs in that day, they actually use quite a lot of energy... Try and look at what you’re doing in a day and see where you can build in activity. When you do it regularly it becomes behaviour” (HCP 2).

Some HCPs believed that the existing PA/E support which was currently available was aimed at structured, formal exercise and not every day PA, when, in fact, the reverse should be the case with HCPs encouraging people to be more physically active within their everyday environment.

HCPs current practice

It was clear that there was no ‘one size fits all’ approach regarding HCPs delivery of PA/E guidance to their patients, irrespective of whether a patient had diabetes. Each HCP tackled PA/E differently depending on their role. Amongst GPs there were some commonalities. For example, they referred to the lack of time and not being able to fit PA/E, alongside other priorities, into one consultation. Therefore, the bulk of the responsibility for PA/E guidance was left to the practice nurses, although many GPs thought nurses probably placed a greater emphasis on diet rather than PA/E. When asked, GPs were unclear about the exact nature of the advice proffered by the practice nurses,

“I wouldn’t be 100% certain about how much time or information they’re [patients] given about exercise” (HCP 11).

In fact, practice and community nurses stated that they did address PA/E with all their patients who had diabetes, regardless of the type. This was achieved through an individualised, person-centred approach, focusing on a patient’s diabetes in the context of their lifestyle,

“I look at the person holistically – look at their medication, look at their current physical activity and look at the overall gains of physical activity to mental health, but also the weight loss and the impact that that will have on their physical health in reducing their blood sugars and the stabilisation of their diabetes” (HCP 6).

HCPs in general reported that of the patients they saw with diabetes, the majority had type 2 or pre-diabetes.

Therefore, the emphasis was on weight loss or calorie counting through a combination of diet and PA/E. HCPs tried to give practical advice according to the individual and sought to ascertain: firstly, the level of PA/E that the individual was currently doing and secondly, determine whether the individual knew the recommended amount of PA/E that they should be doing. Finally, HCPs presented opportunities for being more active which were tailored to the individual’s lifestyle and, therefore, more likely to appeal to the individual,

“Then if we both thought they weren’t doing enough, or they’d like to do more to help their condition, I’d probably explore the type of things that they would be interested in doing, that they could sustain doing... rather than telling them what they should” (HCP 10).

Confidence in delivering PA/E advice to patients

Most HCPs felt reasonably confident in giving basic, generic PA/E advice to their patients. This consisted of exploring the activities that patients currently engaged in and encouraging patients to be more active in the context of their everyday lives. However, when asked about giving PA/E advice to those with diabetes, specifically type 2 diabetes, there was a divergence of opinion amongst HCPs. Some were reluctant to offer advice,

“On a 1-10 scale, with 10 being really confident, probably like 3-4. My advice to them would probably be really generic lifestyle and physical activity advice that I’d give to anyone. Specifically, how I’d tailor that to diabetes [type 2], I would not know how to” (HCP 13).

Others reported feeling confident that they could apply their knowledge, however limited, to pre-diabetes and type 2 diabetes, but unless they had received specific PA/E training in relation to type 1 diabetes, they lacked the confidence to deliver PA/E advice in this context,

“Someone who was pre-diabetic and overweight, I’d feel pretty confident. If there was someone who had poorly controlled type 1 who was on high doses of insulin, I’d feel quite nervous about giving too specific advice about how much physical activity they could safely do...I’d probably avoid the conversation altogether, to be honest” (HCP 10).

An important point raised by a few of the HCPs was the level of confidence that patients placed in their HCP. They felt that this was a significant factor in determining if a patient engaged in PA/E. Key to this was the perceived knowledge of HCPs around PA/E and the way information was delivered. Essentially, if HCPs seemed

confident and knew what they were talking about, this instilled confidence in their patients,

“If you can get that engagement with them, that’s the other big thing. I think a lot to do with that is if they’re confident with you, you’re giving good messages...and they’re comfortable with you” (HCP 17).

Signposting and access to supportive resources

Most HCPs had limited knowledge about appropriate community services and support for patients who wanted to be more active. This was the case regardless of whether their patients had diabetes. They cited insufficient time to research what was available, an inability to keep track of local services and not knowing who to contact as the main factors,

“I wouldn’t actually know what’s available because it changes all the time according to funding and stuff in the area” (HCP 3).

Even when HCPs were aware of a local service, most notably, Exercise on Prescription, the National Diabetes Prevention Programme or DESMOND (Diabetes Education and Self-Management for Ongoing and Newly Diagnosed), they were unclear about how to access information to pass onto their patients,

“I found that there wasn’t very much information out there and that made it difficult for me to refer people in. People need to know...they’re asking you what it’s about and you think, ‘there’s only so much I can tell you’” (HCP 5).

In terms of in-house referrals, HCPs tended to signpost patients to either the practice nurse, visiting dietitian or in the case of one practice, a gym/personal trainer service.

The consensus was that if everything was in one location, there was an increased likelihood that patients would engage,

“I would argue that it (physical activity promotion) would come better from being from your GPs surgery than it would from the local authority. For the average lay person on the street, I suspect if they’ve got a health issue they’re not going to go on the council website, they’re going to come to us. And then if we send them to someone else to do it, that’s a barrier, in something that’s already got 20 barriers to doing the exercise” (HCP 1).

Some practices offered free education sessions for those with pre-diabetes or newly diagnosed type 2 patients.

However, HCPs were unsure about the content of these sessions, whether PA/E was covered in the curriculum, and even whether they were effective,

“There’s no good scheme to refer them to. There’s a pre-diabetes education session, but it’s a one-off session and it’s theoretical. I don’t think it’s enough to make someone change” (HCP 9).

Future developments and improvements in PA and diabetes

All HCPs highlighted the need for a greater emphasis on PA/E, in medical school curriculums and as part of CPD, both generic and applied to specific conditions such as diabetes. In the patient consultation, HCPs thought that PA/E should be an integral component, rather than, at best, an add-on at the end. HCPs referred to the fact that currently, there is no requirement to discuss PA/E in a consultation because it is not linked to a target and, therefore, not incentivised,

“The only thing that drives me absolutely insane is the fact that the funding is completely the wrong way round. We’ve got QOF (quality and outcomes framework) targets for their HbA1c, their blood pressure, whether they’ve had their feet checked...and there’s no mention of exercise or weight loss. I would love the funding to be attached to sustained weight loss or sustained activity, or at least providing them with discussions about their activity. It would actually focus the problem on what’s actually underlying, rather than how they’re actually fixing it” (HCP 1).

When asked what HCPs needed to help them focus on PA/E in the consultation, they referred to concise information, i.e. a leaflet like the existing diet sheets, which was regarded as more convenient than having to look on a website,

“I’d probably say a one-page summary outline with reference to all the kind of key facts, with evidence supporting it, as to what we ought to be doing as clinicians for patients with diabetes, exercise and how to go about delivering that” (HCP 13).

Likewise, regarding patient education and PA/E, HCPs thought that information needed to be succinct with clear guidelines for the patient to follow. Also, tailored patient information was important. It was suggested that one way of achieving this was through an interactive patient hub or one-stop shop,

“Some sort of resource in that way in which you can click on to things and it takes you to something a bit

more specific for you and gives you more tailored advice, would be useful" (HCP 18).

Many HCPs stated that PA/E promotion should be part of the practice nurse role rather than GPs since practice nurses saw patients with diabetes on a more regular basis. In addition, HCPs felt they needed improved strategies for communicating PA/E guidance effectively,

"Just getting the information across. May be some tips on how to get that information across and how to approach it with those patients, because they're not always the most receptive to the information we try to give them" (HCP 12).

From an HCP perspective, time was often a constraint on whether they delivered any PA/E advice. HCPs stated that if they had up-to-date and readily available information on current PA/E recommendations and local services, they would be more likely to discuss PA/E in what was often a time-pressured consultation,

"For me it's how we can get experts to make sure the resources are up-to-date, in an easy to find place, that's marketed to the clinician and realistic to what we can do in practice" (HCP 9).

Discussion

HCPs represent an important ingredient in efforts to promote PA within the population [13, 31, 33], including those with long-term conditions and this is reflected by their prominence in key national policy and interventions [10–14]. In this respect, understanding the barriers and facilitators that HCPs face are important in developing effective and supportive strategies and interventions that enhance their preparedness for PA promotion.

With those thoughts in mind, this study identified both the strengths of HCPs and the challenges they face in their efforts to promote PA for patients with diabetes. In line with previous research [34], our study encountered a genuine commitment by HCPs to promote PA despite difficult and challenging circumstances impacting their day to day work such as time [35, 36], large caseloads and competing demands as reported in other studies [37]. It has also been reported that medical students and doctors who are physically active themselves are much more likely to counsel their patients on PA and increasing the activity levels of medics has been suggested as an ingredient of a possible strategy for PA promotion in patients [38]. In this study, a number of HCPs reported in the interview data that they were physically active themselves and so this commitment to encouraging PA in their patients may also reflect their personal interest in sport and PA.

The commitment to PA promotion, including to those patients with diabetes is important, given the pivotal role of HCPs in national strategies and programmes designed for promoting PA, including those focused on patients with long-term conditions [10, 13, 39]. Indeed, the RCGP [14] identify PA as a strategic priority, while the 2019 CMO Physical Activity Guidelines have identified HCPs as being important in implementing PA messages to a range of groups [13]. Going forward, for the first time, the UK PA guidelines will be accompanied by a planned and coordinated communication strategy to support the implementation of the revised PA guidelines. Communication has been notably absent in recent PA guidelines and was recommended in technical reports aimed at supporting the new guidelines [40]. This is a positive development given HCPs in this study expressed concern about the fragmentation of resources to support PA advocacy.

That said, it is important that HCPs feel efficacious and knowledgeable in promoting PA to patients, including possessing an understanding of patients' needs, motives and determinants, in addition to the current PA guidelines [34].

In the UK, multiple HCPs present with diverse levels of training and experience [41]. In this study we encountered instances where HCPs lacked knowledge on the recommended guidelines on PA, including PA and diabetes, as reported elsewhere [39, 42]. In these circumstances HCPs expressed understandable discomfort. A lack of knowledge around the PA guidelines has been identified for other conditions within the literature [43, 44], but also for diabetes. Indeed, Knight et al., [16] showed two thirds of HCPs were unfamiliar with the evidence-based guidance leaving them unable to offer basic advice on insulin action [41]. Furthermore, Cuthill and Shaw [38] have identified that clinicians' knowledge of the relevant UK recommendations was reported in several studies to be as low as 7–27%. In part, this reflects the level of training and support HCPs receive, including training on PA which is an important component of effective PA promotion [39]. However, only very exceptionally did we encounter HCPs who had received full undergraduate training in PA and its relationship with health. Indeed a lack of training on PA promotion has been reported as a challenge, with HCPs in this study highlighting a lack of knowledge and skills as a result of little or no reference to PA in their undergraduate curriculum, which is documented elsewhere [38, 39, 45–47]. Interestingly enough, financial incentives have been suggested as interventions to incite HCPs to promote PA [39], yet we did not encounter this response in our study.

Looking forward, research has identified that future medical students want to receive more training on PA [48] and reports indicate that this issue is now receiving greater attention in undergraduate medical school curricula [49], for

example, through Exercise Works! (<http://www.exercise-works.org/>). Yet this does little to solve the immediate training needs of HCPs currently in post, including those in our study, where other options are needed. Also, it is important to mention that having accurate knowledge of the dose of activity recommended for health benefits is not enough to translate into improved PA promotion for the population alone. Doctors and indeed all HCPs must be confident and competent in administering advocacy, promotion and counselling skills [38] and this is an important part of CPD strategies.

HCPs in this study reported that there were options to engage in CPD and indeed several participants identified professional bodies that offered CPD opportunities with accreditation and as part of nationally recognised programmes. This is a step in the right direction, but HCPs reported needing to be motivated to seek out these CPD opportunities, some of which they accessed through their own volition. With those thoughts in mind, the RCGP are collaborating with Public Health England on the GP Clinical Champion Programme for PA [50, 51]. This involves recruiting HCPs such as GPs, nurses and other allied HCPs to a 'championing' and 'advocacy' role for PA, where the incumbents establish and build new local networks to promote the case for PA promotion with fellow HCPs through training and education opportunities [52].

Given the importance of competence and confidence in PA advocacy [38], for those HCPs who expressed a lack of confidence in their ability to disseminate information and advice, the Clinical Champion Programme is a positive development, but a more developmental approach, such as mentoring or peer-led training, might also be valuable in refining the skills and competencies for PA advocacy. For example, a Sport and Exercise Medicine pilot is underway at Oxfordshire University Hospital Trust. The programme adopts a peer-led approach to training HCPs in PA across a variety of clinical pathways and an Active Hospital toolkit is also in development (<https://www.sportengland.org/our-work/health-and-inactivity/moving-healthcare-professionals/>).

A further component of PA promotion by HCPs is an awareness of PA opportunities. In this study, HCPs referred to a lack of awareness of local services and options for referring patients into local PA programmes operating in the community [53]. This is arguably exacerbated by major reform of public health both locally and nationally which in turn has implications for PA promotion. Nationally there has been a reduction in funding for local authorities for public health operation. The UK Comprehensive Spending Review reports that spending will fall by at least £600 million in real terms by 2020/21, an annual reduction of 3.9% [54, 55], resulting in funding for PA opportunities being scaled back in

some areas [56]. The current economic climate may mean that the presence of PA opportunities such as Exercise Referral Schemes (ERS), which for a long time have been an important and readily available instrument in the PA armoury [38, 53] will be deemed resource intensive and may no longer be available. Already, this has meant that in some instances the commissioning process has led to a scaling back or restructuring of ERS in some local areas. Indeed, in one of the local contexts where this study took place, the local ERS had been restructured [57]. In some cases, this has reduced the number and type of options open for HCPs to refer patients to PA services. Changes in local PA provision may place further demands on HCPs to seek out the information on PA for patients from non-centralised sources, in turn contributing to time pressures faced by HCPs in their daily work and reported elsewhere [34]. Indeed, doctors report feeling insufficiently equipped to provide support or information to their patients [39]. In this study, online web-based sources of information on PA support and services were sometimes referred to as an easier option in providing information to patients, but knowing where to seek information was not always easy in practice, with information on PA located in multiple locations placing further time demands on already busy HCPs to seek out these resources. It remains to be seen if the updated 2019 PA guidelines [13], which is not only by a communication strategy, but also by a series of infographics available in centralised locations, helps address this challenge and would be a worthy focus of future investigations.

To support HCPs attempts to promote PA and in response to the pressures faced by HCPs, Moving Medicine (MM) was launched in 2018. MM is an interactive, evidence-based, internet tool to support brief advice in PA across a range of diseases and conditions [58]. Importantly, it houses information on PA in a central location. The intervention includes a series of modules linked to a range of conditions (including type 2 diabetes) in which PA can have a positive impact. It offers HCPs several strategies: time bound consultations, promotional materials and resources to assist patients through the process of being more physically active, as well as resources for patients that can be distributed. This is another step in the right direction and evaluation of this programme. However, given the responses of HCPs in this study, the evaluation should not only include impact outcomes on PA levels, but also process outcomes on the use and usability of resources [26, 59]. In particular, the extent to which MM helps HCPs overcome some of the commonly reported barriers in this study, such as confidence, competence time, knowledge and accessibility. Formative evaluative approaches like the one deployed in this study are likely to be valuable in this respect.

Limitations and strengths

This study has several limitations and strengths. Limitations include a lack of representation from nurses who take on an important role in PA promotion [52, 60] and form an essential component in the dissemination of the updated UK CMO PA guidelines [13]. Many of the participants in this study thought PA was important. Efforts to promote PA for long term conditions are likely to involve a critical mass of HCPs including advocates and non-advocates. In that respect, it would have been insightful to have engaged those HCPs who felt PA was not important to better understand their reasons for this. This is also important in developing interventions that facilitate awareness, engagement and preparedness for PA promotion.

In thinking about how such activities are deployed, the authors encountered reluctance from some GPs to speak with outsiders or researchers from beyond their own professional circles. The strengths included an approach which identified a lack of presumed knowledge of the guidelines around PA and diabetes and an understandable anxiety amongst participants about this. This in part may have contributed to some of the difficulties when recruiting HCPs for this study, especially GPs. In overcoming this challenge, a further strength was the training of co-author and GP as a researcher who was involved in data collection. This helped address some of the preconceived misgivings about speaking with outsiders [61] preferring to speak with researchers who were both known and trusted and where a previous relationship existed. Furthermore, given the time pressures that busy HCPs faced in participating in this study, when they would otherwise be doing important tasks such as writing up patient notes and arranging referrals, the team adopted a flexible and accommodating approach around their availability. Equally important, this study provides some valuable insights into how to conduct research with this group and in this context.

Conclusions

This evaluation presents new insights into the preparedness of HCPs for delivering PA guidance to adults with diabetes and also valuable information for how to undertake research in this setting and these groups. Using a sequential mixed method, two-phase approach, we have identified the factors underpinning the decision-making processes and behaviours of HCPs, as well as the challenges they face, when promoting PA to the diabetes community. Importantly, we have provided an opportunity for HCPs to tell their story through insightful accounts and through a trusted source. Given the importance of PA within the strategic and policy context for PA, rich information derived from the day-to-day, working HCP is integral to shaping future practices going forward. With those thoughts in mind, we provide the following recommendations.

Recommendations

- Undergraduate education focused on PA and health conditions, including type 1 diabetes, type 2 diabetes and pre-diabetes.
- CPD opportunities for PA training and diabetes.
- Mentoring of HCPs who are new to the role or who just lack confidence in their ability to disseminate advice on PA to those with diabetes.
- Accessible, central database of current local PA providers.
- Tailored resources (web-based and printed) for HCPs and patients with diabetes.
- Consistent, joined-up approach between primary, secondary and community services regarding PA promotion for those with diabetes.
- PA services / programmes tailored specifically to patients with diabetes that are affordable.
- Continued and on-going dialogue with HCPs about their needs when promoting PA.
- Adopting a qualitative approach in investigating the barriers and facilitators that HCP face include non-supporters when developing interventions that help facilitate their engagement and involvement.

Abbreviations

BMI: Body Mass Index; BMJ: British Medical Journal; CMO: Chief Medical Officers; CPD: Continuous Professional Development; DESMOND: Diabetes Education and Self-Management for Ongoing and Newly Diagnosed; ERS: Exercise Referral Schemes; GP(s): General Practitioner(s); HCPs: Healthcare Professionals; MM: Moving Medicine; NICE: National Institute for Clinical Excellence; PA: Physical Activity; PA/E: Physical Activity or Exercise; RCGP: Royal College of General Practitioners

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Authors' contributions

All authors - NK, AP, SZ and DV - made substantial contributions to the conception, design, analysis and interpretation of the data. All authors were involved in writing the manuscript and all authors have read and approved the final version of the manuscript. All authors have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Availability of data and materials

The data generated and analysed during the current study are not publicly available due to the risk of individual privacy being compromised, but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The Research Ethics Committee at Leeds Beckett University granted ethical approval for this research (Reference Number 49891). Informed consent to participate was obtained in writing from all the participants involved.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Output 4: Integrating SEM Clinics into the NHS: A Qualitative Study.

Integrating sport and exercise medicine clinics into the National Health Service: a qualitative study

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ABSTRACT

Objectives To explore the services National Health Service (NHS)-based sport and exercise medicine (SEM) clinics can offer, and the barriers to creating and integrating SEM services into the NHS.

Methods Semi-structured interviews were undertaken to collect data from identified 'stakeholders'. Stakeholders were identified as individuals who had experience and knowledge of the speciality of SEM and the NHS. An inductive thematic analysis approach was taken to analyse the data.

Results N=15 stakeholder interviews. The management of musculoskeletal (MSK) injuries (both acute and chronic) and concussion were highlighted as the two key services that SEM clinics can offer that would most benefit the NHS. MSK ultrasound was also mentioned by all stakeholders as a critical service that SEM clinics should provide. While exercise medicine is an integral part of SEM, SEM clinics should perhaps not have a heavy exercise medicine focus. The key barriers to setting up SEM clinics were stated to be convincing NHS management, conflict with other specialities and a lack of awareness of the speciality.

Conclusion The management of acute MSK injuries and concussion should be the cornerstone of SEM services, ideally with the ability to provide MSK ultrasound. Education of others on the speciality of SEM, confirming consistent 'unique selling points' of SEM clinics and promoting how SEM can add value to the NHS is vital. If the successful integration of SEM into the NHS is not widely achieved, we risk the NHS not receiving all the benefits that SEM can provide to the healthcare system.

INTRODUCTION

Sport and exercise medicine (SEM) was established as an independent medical speciality in the UK in 2005 as an important aspect of the London 2012 Olympic Games health legacy commitment.^{1,2} There are many facets to the speciality, which is reflected in the breadth of the training programme (figure 1).^{3,4}

Decline of SEM in the NHS?

There are now over 147 SEM doctors on the General Medical Council Specialist Register, and every year approximately nine new specialist trainees begin training in the UK.^{5,6} In

Summary box

What are the new findings?

- ▶ Providing expert care of MSK injuries and of concussion are deemed the two key services that SEM clinics can provide for NHS.
- ▶ While exercise medicine is an essential part of the SEM speciality, it should perhaps not be a focus of SEM clinics.
- ▶ Convincing management, resistance from other specialities and lack of knowledge of the speciality were listed as key barriers to integrating SEM into the NHS.
- ▶ Educating about SEM clinics is vital to its success. We need more formal clarification of the 'unique selling point' of SEM clinics, and this advertised more widely.

How it might help clinical practice in the future?

- ▶ The findings of this study could be used to influence the SEM registrar curriculum to include information on setting up SEM clinics in order to empower newly qualified SEM consultants to feel more comfortable setting up SEM services.
- ▶ Better definition on how SEM can be integrated into the NHS could result in more successful SEM NHS services and increased funding into SEM, allowing the healthcare system to benefit more from the services SEM can offer.

recent years, there has been a decline in growth of the speciality, highlighted by a loss of SEM training posts in Scotland and Wales.^{7,8} This drop can be attributed to several factors such as the loss of momentum following the London 2012 Olympic games (a similar loss of momentum has been observed after previous olympic events).⁹ Perhaps due to the low number of National Health Service (NHS) SEM posts, the majority of SEM trainees work in the private sector once they become consultants, and, anecdotally, some no longer work within NHS settings at all despite the fact that many view it as a desirable work setting.¹⁰

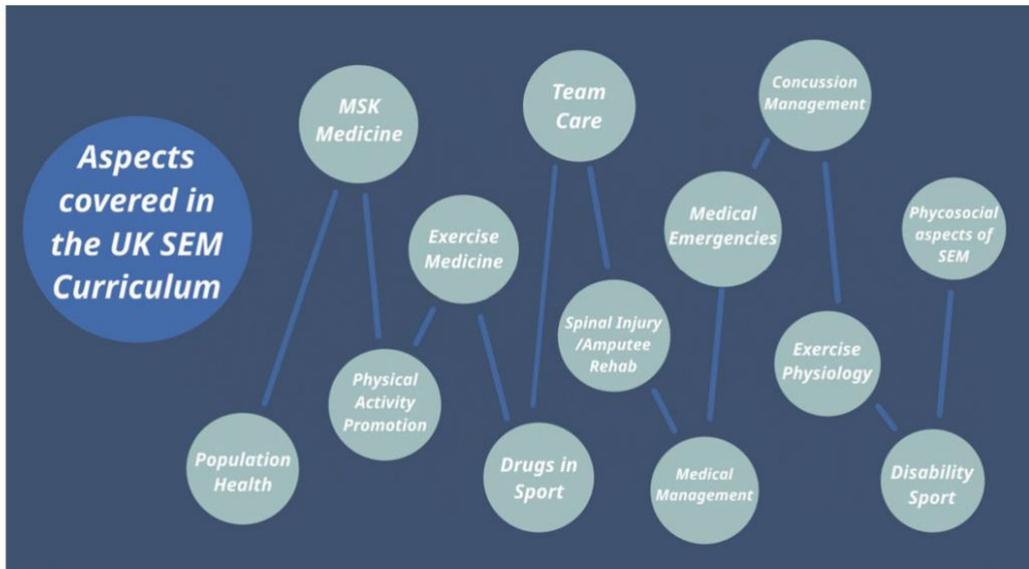


Figure 1 Key aspects involved in speciality training curriculum for SEM in the UK.⁴ MSK, musculoskeletal; SEM, Sport and Exercise Medicine.

Current relationship between SEM and the NHS

The Faculty of Sport and Exercise Medicine (FSEM) promotes SEM as a cost-effective approach to the prevention and management of illness and injury and is calling for an increase in SEM consultants in the NHS.¹¹ In support of this, one study found that 93% of the clinicians surveyed felt that there was a role for SEM in the NHS.¹² Given the training and expertise of SEM consultants, they may be considered well placed to aid the NHS in dealing with high levels of physical inactivity, and the burden placed on the system by musculoskeletal (MSK) issues.¹¹ Current NHS SEM services have been shown to reduce surgical interventions, reduce the number of scans requested and improve patient satisfaction, and can therefore be beneficial to the NHS.¹³

To establish a mutually beneficial relationship, more clarity is needed over the role of SEM in the NHS. The need to better define how SEM fits into the NHS has been raised for many years.^{5 7 14} Though several case studies highlight examples of integration across the UK, more research is needed to explore how SEM can be better integrated into the NHS.¹⁵ As such, this study aims to explore what individuals working in SEM think about what services an NHS-based SEM clinic could provide that would be of most value, and the barriers to creating and integrating such a service within the NHS.

METHODS

A qualitative approach using semi-structured interviews was used in this study. Research ethics approval was

granted from the Faculty of Medicine and Health Sciences Research Ethics Committee, University of Nottingham (reference: 212-1802; 12 February 2018).

Participants and recruitment

Stakeholder groups were defined based on identifying individuals with experience and knowledge of the speciality of SEM, and of working in the NHS. Participants were recruited (February–April 2018) from these stakeholder groups subject to the inclusion criteria (table 1) using purposive sampling by email.¹⁵

Data collection

The interview schedule is provided in figure 2. Each participant was given a unique anonymised code. These data were recorded in a key file with the participant speciality (ie, the stakeholder group interviewees' belong to). No other personal data were recorded. All interviews were conducted by the lead author and digitally audio

Table 1 Inclusion criteria for the study

1. Belong to a stakeholder group (as per table 2)
2. Have actively worked in SEM, including: SEM clinics, elite sport, public health, with more than 3 years experience working in SEM or working with SEM practitioners
3. Have had more than 5 years experience working in the NHS

NHS, National Health Service; SEM, sport and exercise medicine.

Interview Guide

1. Are you aware of the speciality of Sport and Exercise Medicine?
 2. How do you feel SEM could best be incorporated into the NHS?
 3. What key services should SEM clinics be offering that would provide most benefit to the NHS?
 4. In your opinion, what are the most common conditions SEM clinics should be seeing?
 5. What would you feel are the barriers to setting up SEM clinics in your:
 - a) Trust?
 - b) Department?
- Specifically for SEM Consultants and Registrars:
6. Do you feel prepared to set up an SEM service?
 - 7a. If not, what would you want to learn and how?
 - 7b. If you have, what are the most important learning points you would want others to know before setting one up?
- Final question, asked to all participants:
8. Do you have any other comments?

Figure 2 Interview guide used for every interview. SEM, sport and exercise medicine.

recorded. All recordings were transcribed verbatim. Any identifiable information discussed during the interviews were redacted from the transcripts. Interviews continued until data saturation was reached.^{16 17}

Data analysis

An inductive thematic analysis approach was taken to analyse the interview transcripts.¹⁸ In terms of epistemology, a realist approach was adopted as the research team believed there was likely to be a single truth in answer of the objectives, in keeping with the realist paradigm.¹⁹ Braun and Clarke's six-step process was followed and used to extract meaning and concepts from the data in order to identify patterns, and ultimately generate themes, which were managed using Trello software (version 3.40).^{20 21} To ensure reliability, two members of the research team started the coding process by reading, five (33%) randomly selected interview transcripts separately and discussed their coding decisions together, working through differences of opinion until a consensus was made. A reflective journal was kept to determine the extent to which thoughts and observations were data-driven and without researcher influence, in order to manage unconscious bias. Once all interviews had been coded and themes had been finalised, five randomly selected transcripts were given to the same reviewers to code to check whether extracts represented the themes appropriately. There was a 79% similarity. A result of over 70% has previously been deemed acceptable.²²

RESULTS

Demographic information

Seven stakeholder groups were identified (table 2). Sixteen individuals were invited to participate in the study, and 15 participated (93%) covering all stakeholder groups. The interviews lasted 23 min 10 s on average, ranging from 14 min 38 s to 31 min 03 s. The stakeholders included 4 female and 11 males with an average age of 41 (range 34–47) years. They were all working in the UK.

Interview results from consultants and teaching staff

Five themes and 15 subthemes were identified from the transcripts (table 3).

Table 2 The seven stakeholder groups and number of participants per group

Stakeholder group	Participants (n)
1. Accident and emergency doctors with an SEM interest	2
2. SEM registrars	2
3. General practitioners with extended role in MSK	1
4. MSK radiologists	2
5. Orthopaedic surgeons	2
6. Physiotherapists	2
7. SEM consultants	4

MSK, musculoskeletal; SEM, sport and exercise medicine.

Table 3 Themes and subthemes

Refined themes	Subthemes
1. Roles believed to be key to being an SEM clinician	1(a) Demonstrate clinical leadership (7) 1(b) Expert in MSK medicine (15) 1(c) Perform MSK ultrasound (15) 1(d) Provide physical activity (PA) education (10)
2. Services SEM clinics can offer that would provide the most value to the NHS	2(a) Management of MSK injuries (acute and chronic) (15) 2(b) Management of concussion (11)
3. Sources that SEM clinics receive referrals from (not included in full as deemed not relevant to study objective)	3(a) A&E (8) 3(b) GP (14) 3(c) Physiotherapists (13) 3(d) Orthopaedics (10)
4. Clinicians' recognise there are common barriers to setting up an SEM clinic	4(a) Resistance from management (8) 4(b) Conflict with other specialities (9) 4(c) Lack of awareness of the speciality (15)
5. Learning points for setting up SEM clinics (from Q7b only asked to SEM consultants and registrars (n=6))	5(a) Increasing awareness of SEM (6) 5(b) Meeting with the 'right' influencers (4)

In brackets is the number of participants that mentioned the sub-theme.

A&E, accident and emergency; GP, General practitioner; MSK, musculoskeletal; NHS, National Health Service; SEM, sport and exercise medicine.

1. Roles believed to be key to being an SEM clinician

1(a) Demonstrate clinical leadership

Clinical leadership was brought up in the context of incorporating MSK services into the NHS, either through Clinical Commissioning Groups (CCGs) or by showing leadership.

The work could be within CCGs looking at transforming outdated systems and medical management into streamlining conservative treatment of MSK issues. Participant 8.

SEM doctors should be able to show medical leadership within MSK medicine' (participant 5).

1(b) Experts in MSK medicine

MSK medicine was identified by all participants as a critical service that should be provided by SEM clinics in order to add value to the NHS.

MSK medicine is a vital part of SEM clinics, providing knowledge of MSK injuries and the skill to assess, diagnose and treat. Participant 9

1(c) Perform MSK ultrasound

All participants also identified MSK ultrasound as a service, SEM clinics should offer.

We do diagnostic ultrasound, it saves the patient having to go through a radiology department. Participant 13

The ability of SEM clinicians to manage MSK issues and be able to also use ultrasound to aid with diagnosis and treatment (via ultrasound-guided injections) was seen as valuable by nine participants, with one participant describing an SEM clinic as a 'one-stop shop' (participant 7).

1(d) Provide physical activity (PA) education

Various participants maintained that SEM clinicians should be involved in providing and promoting education regarding PA.

The advice regarding PA, I think there's a massive need for this going forward. Participant 11.

However, the best way for SEM clinicians to promote PA was unclear.

I think there are different ways of promoting PA—do you need a separate clinic? I'm still myself trying to work out how it will work as a job role for a SEM doctor. Participant 9

In regard to how best exercise medicine should be promoted, several participants mentioned it should be done as part of wide-spread public health initiatives and that large organisations are already taking lead on this.

There's a definite role for exercise medicine in public health. Participant 6.

The Faculty [FSEM] have taken on the role of educating on PA. Participant 8

2. Services SEM clinics can offer that would provide the most value to the NHS

The management of non-surgical MSK injuries (both acute and chronic) and concussion were highlighted as

the two key areas in which SEM could add the most value to the NHS.

2(a) Management of MSK injuries (acute and chronic)

Regarding the management of MSK injuries, one participant highlighted the challenges of managing acute MSK issues in accident and emergency (A&E) settings owing to time pressures.

It is very difficult to fully assess MSK injuries' and that it was a good idea to 'have a clinic to follow that up because people have got more dedicated time. Participant 14

2(b) Management of concussion

Concussion was flagged up by over half of the participants as an opportunity to incorporate SEM into the NHS. Many highlighted the poor knowledge around concussion management and that concussion clinics 'could be an extra service that an SEM Consultant would be well trained to deliver' (participant 6).

In the next 10 years, we'll see more NHS Concussion Clinics. Participant 8

4. Clinicians' recognise there are common barriers to setting up an SEM clinic

4(a) Resistance from management

When asked, over half of the participants posited that managers were one of the biggest barriers to integrating SEM services into the NHS. It was felt that managers are under increasing financial strain and they

would have thought sports would have to be rationed for more serious medical conditions. Participant 13

The majority of participants reiterated the idea that it can be 'difficult to innovate' (participant 3) within hospital settings and getting managerial approval for creating change in hospitals can be difficult.

A lot of the NHS is resistant to change and because SEM is still quite new, there are already a number of established pathways. Participant 15

4(b) Conflict with other specialities

Several participants commented on the concept of SEM being perceived as encroaching onto other specialities and 'pinching work', which may result in other specialities being 'resistant to us' (participant 11).

For example, with ultrasound, we may be taking away from interventional radiology. Participant 12

Radiology and orthopaedics were singled out as the two specialities most likely to be affected by this issue.

People are worried about their own specialty so that would be orthopaedic surgeons, physios, radiologists who don't want to be de-skilled or lose the areas of interest that they have themselves. Participant 1.

4(c) Lack of awareness of the speciality

The lack of awareness of the SEM speciality was commented on by several participants as a barrier to integrating it into the NHS.

I think it's lack of familiarity because people won't know what you can do and what you can offer.'
Participant 4

Most health professionals are 'unaware of the speciality (participant 10).

SEM does not have 'an identity as to where they sit (participant 3).

It was mentioned that if potential sources of referrals to SEM clinics have a lack of awareness of the speciality will result in a lack of engagement with the SEM service.

Potential sources of referrals 'don't really know what they should be referring' (participant 15).

5. Leaning points for setting up SEM clinics

5(a) Increasing awareness of SEM

Participants provided solutions for many of the identified barriers which included education of a range of stakeholders and referring professionals.

few people know SEM services exist and even less know what sort of things and patients should be referred to them. Participant 9

5(b) Meeting with the 'right' influencers

In addition, when setting up a service, advice from one of the participants included meeting the medical director to ensure the issue is being discussed with the right influencers.

it was a big learning experience for me... if I was to do it again I would want the big influential people on board from the get go. Participant 1

DISCUSSION

This research has provided three key findings. First, the key services that SEM clinics can offer the NHS are in the management of MSK injuries and concussion. Second, the main barriers to setting up a SEM clinic are getting managerial agreement, conflict with other specialities and a lack of awareness of the speciality. Third, the main perceived solution to reducing the impact of the identified barriers is to improve education among the medical profession about the speciality of SEM.

Defining a place for SEM in the NHS

The management of MSK injuries and concussion were highlighted as the two key areas in which SEM services can provide useful services to the NHS. Regarding MSK injuries, this includes both acute injuries usually presenting via A&E, and chronic injuries usually presenting via general practice. The benefit of utilising MSK ultrasound and injection therapies in the management of MSK injuries was also identified by several stakeholders as a key service

that SEM clinics can provide. MSK consultations are thought to account for nearly 30% of all general practice consultations with nearly 82% not requiring surgery.^{23 24} These patients will therefore typically re-present in general practice recurrently which is an inefficient use of NHS resources.¹⁴ SEM consultants play a key role here in non-surgical management, enabling cost-saving and improved pathways for patients.¹³ Regarding the presentation of acute injuries, A&E departments are notoriously time pressured and overworked.^{25 26} Fundamentally, A&E does not have enough time to assess acute injuries thoroughly, and the acute swelling post injury means A&E potentially is not the ideal setting to assess certain injuries. Given that 7.7% of A&E attendances are directly related to playing sport, SEM clinics may result in reduced workload for overstretched A&E services without the need to outsource to private care.²⁷

Concussion is well covered on a SEM syllabus and the management of concussion was also highlighted as a key service that SEM clinics could provide.⁴ Concussion is also a common presentation, and given the majority of GPs and A&E doctors do not feel confident in how to manage it, this is an area that SEM clinics could help relieve pressure from overloaded departments.²⁸⁻³¹

SEM, exercise medicine and the NHS

Physical inactivity costs the UK economy over £7.4 billion a year.³² To begin to address this, FSEM recently launched 'Moving Medicine', a website designed to support healthcare professionals integrate PA advice into clinical practice.³³ For the day-to-day clinical work of a SEM doctor, it is unclear exactly what an exercise medicine service within the NHS could, or should, look like, and whether SEM clinics should facilitate exercise medicine. The value of exercise medicine is not being debated, rather the question is regarding the most effective method and setting for delivering it.³⁴ While it is always essential to provide brief PA advice where appropriate as per NICE guidance, the findings of this study suggest SEM clinics may not be the most effective setting for having a heavy exercise medicine focus.³⁵ SEM clinicians of course have a responsibility to promote, integrate and facilitate exercise as medicine within society and the healthcare system. However, exercise medicine may be best dealt with through public health initiatives to promote both individual and population-level change rather than through individual-level behaviour change promoted through SEM clinics, an idea that has been highlighted previously.³⁶

Key barriers to integrating SEM into the NHS

The need for SEM to build collaborative relationships with other specialities was highlighted in this study and has been emphasised previously.^{34 37} Caution should be applied to not cross the boundaries of other specialities, but instead take a cooperative approach and explain how SEM can add value. Another major barrier appeared to be awareness of the speciality among other medical professionals. If the



knowledge of the speciality is poor, it is hard to cultivate a reputation, resulting in SEM clinics not receiving referrals that should have been sent to the service.

What are the next steps?

The findings of this study have highlighted a key solution to better incorporating SEM into the NHS is to improve education about SEM among the medical profession, a finding supported by previous studies.^{12 38} It is unsurprising that other professions have a lack of knowledge about the SEM speciality, particularly in relation to how it works as a speciality within the NHS, when the speciality itself appears to not have clear definitions over its place in healthcare. SEM urgently needs to confirm its identity within the NHS.

Despite the barriers mentioned in this study, several SEM services are already in place.¹³ It is important to ensure that the value of SEM clinics is observed and documented to ensure they continue to be funded by the NHS. Otherwise, we risk the NHS not benefitting from the services that SEM clinics can offer.

Strengths and limitations

This study had several strengths including a high inter-rater reliability to ensure trustworthiness of coding, achieving data saturation (despite a limited number of interviews conducted) and utilising a qualitative design to uncover insightful data. As ever, there were limitations such as the potential influence of the interviewer on data collection and analysis. A reflective journal was kept to minimise this. Interview participants were selected depending on them being viewed as a stakeholder by the research team and was therefore open to selection bias. It may have been beneficial to get the views of other SEM-related specialities such as podiatrist, chiropractors and osteopaths. In addition, opinions could be explored from individuals that work outside of the NHS, policymakers or government figures. It would have also been of benefit to interview patients that had attended SEM clinics to explore what they thought of the services they had received. Future studies could consider seeking opinions from a broader range of stakeholders.

CONCLUSION

This study has provided data that supports the management of MSK injuries and concussion as the two key areas in which SEM clinics can offer valuable services to the NHS. The management of these two areas should be targeted as the 'unique selling point' of SEM clinics, ideally with the ability to provide MSK ultrasound and injection therapies. These clinicians felt that it is more important for SEM clinics to prioritise these services over exercise medicine, which, while highly important for SEM and public health, should be dealt with at a public health, population-based level rather than have a heavy focus in SEM clinics. The perceived barriers to SEM clinics being created were lack of

knowledge regarding the speciality from potential referral sources, potential conflict with other specialities, and gaining support from management. This preliminary research can be used to guide further studies exploring how best to integrate SEM into the NHS. If the successful integration of SEM into the NHS is not widely achieved, we risk the NHS not receiving all the benefits that SEM can provide.

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Contributors All authors contributed to the final paper. DV, MKP and KE were involved in developing the concept and design. DV carried out all data collection. Analysis of the data was completed by DV and KM. Write-up was contributed to by all authors and further guidance and advice provided by SG, KE, AP, PB and CF.

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Patient involvement Given the nature of the study, no patient involvement was required.

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Output 11: Creating a SEM MSc Syllabus for Doctors: A Delphi Study.

Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi study

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ABSTRACT

Objective Sport and Exercise Medicine (SEM) Masters curricula vary. This Delphi study is aimed to create a consensus curriculum for doctors undertaking SEM Masters courses.

Methods A modified Delphi survey was used. An expert panel was established of individuals deemed to have adequate knowledge of the field. The research group developed the initial draft of the curriculum by collating and reviewing previously published UK-based postgraduate SEM-related curricula. There were two phases. In phase 1 the expert group either accepted, rejected or modified each learning objective (LO). During phase 2 the expert group were asked to accept or reject each LO that did not get accepted outright previously. The research group analysed the levels of agreements and the comments given by the expert panel after each phase.

Results The expert panel consisted of 45 individuals, with 35 completing phase 2 (78% retention rate). Of the 136 LOs initially collated: 71 (52%) were accepted outright, 60 (44%) were altered in some way and reincluded in phase 2, and 5 (4%) were removed after phase 1. The research group added 2 (1%) new LOs on reflection over comments made by the expert panel. The final curriculum contained 133 LOs, divided into 11 subthemes.

Conclusions The findings will better inform educators when developing SEM Masters curricula and inform students what they should look for when considering an SEM Masters. This consensus curriculum is an important step in standardising postgraduate SEM education.

INTRODUCTION

Sports and Exercise Medicine (SEM) became established as a specialty in 2005 in the UK and this has driven increasing demand for education on its core components.¹ SEM postgraduate education varies throughout the world. Some countries offer postgraduate courses in SEM, such as Masters of Science or Postgraduate Diplomas.² Within the UK, there is currently no consensus on what learning objectives (LOs) should be included within both SEM Masters and Diploma courses. Consequently, students undertaking postgraduate SEM qualifications at different

key messages

What are the new findings

- This Delphi study has produced an up-to-date consensus on what skills and knowledge are expected of an individual with a Masters in Sport and Exercise Medicine (SEM) in the UK.
- Practical skills such as ultrasound, joint and soft tissue injections and compartment pressure testing were deemed too specialised to be included in SEM Masters curricula.
- How to develop and deliver exercise medicine services and musculoskeletal services were also deemed inappropriate to include on SEM Masters curricula.

What is already known

- An important aspect in the ongoing evolution of SEM is ensuring adequate SEM skills and knowledge in individuals working as SEM clinicians.
- There is currently no standardisation of SEM Masters courses in the UK.

universities will develop different skills, leading to less standardisation of clinicians employed in SEM posts.

Increased integration of SEM into the National Health Service (NHS) could provide significant benefits.³ An important aspect for the evolution of SEM in the UK is ensuring the development of SEM curriculum for every level of training. Many SEM jobs in the UK require having an SEM Masters in their eligibility criteria. However, there is limited previous research looking into what a Masters course in SEM should include. A study in 2005 in the UK developed LOs for an ideal SEM Masters course, although how the findings influenced or were implemented into curricula is unknown.² This Delphi study aims to develop an up-to-date consensus on what skills and knowledge are expected of an individual with a Masters in SEM in the UK. This will aid in creating a unified and standardised SEM Masters education by universities

throughout the UK. It will also ensure students can appreciate whether their SEM Masters education has provided the necessary skills and objectives to work as a competent SEM clinician.

This study has focused specifically on what LOs doctors undertaking an SEM Masters should hope to achieve. It should be noted that other healthcare professionals also undertake Masters degrees in SEM, and the LOs for these groups are likely to be different due to their role within the multidisciplinary team.

METHODS

Study design

A modified Delphi survey was used to seek consensus on a postgraduate SEM Masters curriculum for doctors. Expert contributions to the study remained anonymous to the research group, in keeping with the principles of Delphi methodology.⁴

Establishing the research group

The research group included the authors DV, KRM, PB, CN, AP and GF. The research group were selected due to their experience in medical education. DV, CN and AP have experience in the exercise medicine sector. DV and CN have experience in delivering SEM education. DV and KRM have undertaken a Masters in SEM. GF and PB have experience in Delphi methodology. DV and KRM have experience in the education of early career SEM professionals through British Association of Sport and Exercise Medicine (BASEM) and roles within UK Universities. Content decisions were finalised by the research group.

Expert Delphi panel

Experts are defined as individuals with knowledge and experience. For this study, they must have adequate knowledge in postgraduate SEM education.^{5,6} Invitations to express interest in being on the expert panel were emailed to all members of the BASEM and the Faculty of Sport and Exercise Medicine (FSEM) via their mailing lists. In addition, members of the research group shared invitations to submit interest in being on the expert panel via social media.

In their expressions of interest individuals were asked demographic information and questions selected by the research panel to determine eligibility. The following eligibility criteria were used:

- ▶ Doctors that have completed their Foundation Training.
- ▶ Hold a higher qualification in SEM: specifically either an SEM Masters degree or diploma. Alternatively, they could have membership or fellowship of the FSEM (MFSEM/FFSEM)
- ▶ Have been a doctor for more than 5 years
- ▶ Working in the UK at the time of the study.

The research group reviewed the responses and removed those that did not match the eligibility criteria. Regarding the size of the expert panel, a panel size of

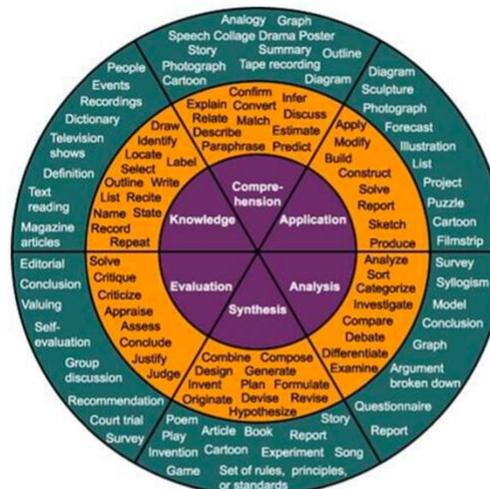


Figure 1 Bloom's taxonomy wheel. Level 1 is knowledge, level 6 is evaluation. Image used within rules of license (creative commons attribution—sharealike license). Taken from: <https://www.wyliio.com/credits/flickr/4100721032#>.

more than 30 is not considered to improve the quality of the study.^{4,7}

Development of the initial curriculum

The research group developed the initial curriculum draft by collating and combining previously published LOs from UK-based SEM specialty training curriculums and a previous paper exploring the LOs required for an ideal SEM Masters curriculum published in 2006.^{2,8,9} This approach was used to ensure no potential relevant LOs were omitted. The LOs taken from the pre-existing curricula were grouped into suitable themes by the research group using themes previously published. All LOs were reviewed by the research group and edited, if needed, using Bloom's taxonomy wheel (figure 1) to make them suitable for postgraduate level.¹⁰

Procedure

The initial survey to express interest in joining the expert panel was made using Google Forms (Google). Demographic information was obtained through this form. For the Delphi itself, electronic surveys were created using Qualtrics software and a link to it was emailed to all eligible members of the expert panel.¹¹ The participant information sheet was attached to the email, along with contact details of the research group. Consent was gained via a mandatory question given before starting the Delphi. The instructions clearly stated that experts should consider the curriculum to be relevant for doctors undertaking a Masters in SEM, not considering other professions that may also undertake a Masters in SEM.

Engagement from the expert panel is crucial for any Delphi study and the aim was for the response rate to not fall below 70%.¹² Experts were given 12 days to complete each phase of the Delphi. Non-responders after 8 and 10 days received a system-generated reminder. Text reminders were also sent to the expert panel if no response had been received on day 11. Only experts that completed phase 1 of the Delphi were invited to participate in phase 2. The data were collected between October and November 2020.

Phase 1: review of the draft curriculum

During phase 1, panel members reviewed the curriculum and were asked to accept, reject or modify each item. Participants were given the option of providing an anonymous comment after each decision. The percentages of agreement for each LO were calculated and, along with all comments, were read through and discussed by the research group. The response to each LO was discussed regardless of the level of agreement from the expert panel. After the collected data were reviewed, the research group agreed to either accept, reject or alter each LO to create a second version of the proposed curriculum. LOs with levels of agreement above 75% with no comments were accepted. The research group reviewed all comments on LOs that had been accepted and the LOs were amended accordingly and included in phase 2. LOs with levels of agreement below 75% without comments were rejected. For those with comments, these were reviewed by the research group, and where it was felt appropriate a modified LO was added for further review in phase 2.

Phase 2: second review of proposed curriculum (accept or reject)

A link to the second version of the curriculum was sent to all expert panel members that completed phase 1. For this phase, they were only provided with the option to accept or reject each LO. As reported by Keeney *et al*, a consensus was defined by 75% agreement.¹⁵ Previous literature reports varied levels appropriate for consensus, ranging from 70% to 100%.⁶ There was an optional open comments box at the end of each theme for further comments. The LOs accepted outright after phase 1 and did not require further input were included for reference. Again, the percentage of agreement was calculated, the research group reviewed all comments and a consensus was reached to either accept or reject each LO. Phase 2 would be repeated until a final consensus on the syllabus was reached.

RESULTS

The initial proposed curriculum

There were 136 LOs collated from prior SEM syllabi. The research group divided these across 11 distinct themes.

The expert panel

Of the 94 people interested in being on the expert panel, 48% (45/94) met the eligibility criteria. The reasons for non-eligibility included having worked as a doctor for less than 5 years (n=19), not holding an SEM Masters/Diploma/FFSEM/MFSEM (n=17) and not being based in the UK

Table 1 The reasons for alterations to LOs after phase 1

Reasons for alteration	Number of learning objectives (LOs) altered
Spelling and grammar (including re-wording)	44 (32%)
Alteration to Bloom taxonomy level	34 (25%)
Objective made more specific	10 (7%)
Objective made more broad	2 (1%)

The percentage of LOs altered for each reason is also provided.

(n=13). The expert panel consisted of 20 SEM consultants, 4 orthopaedic consultants, 1 rheumatology consultant, 17 general practitioners, 11 SEM registrars and 14 doctors that did not specify their training or job role but did confirm that they had been a doctor for more than 5 years. All the 14 doctors that did not specify their training/job role had completed a SEM MSc or Diploma and 57% had been a doctor for 13 years or more. Twenty-one individuals on the expert panel (47%) had experience teaching SEM Masters and Diploma courses.

Phase 1

In phase 1 of the study there was a 100% (45/45) response rate from the expert panel. Fifty-two per cent (71/136) of the LOs were accepted without the need for alteration, and 44% (60/136) were altered. The reasons for alterations are given in [table 1](#). Thirty LOs were altered for more than one reason. Regarding the alterations made to the Bloom taxonomy level, 44% (n=15) were moved to a higher taxonomy level, 41% (n=14) were moved to a lower taxonomy level and for the final 15% (n=5) the wording was altered but the LO was kept within the same taxonomy level.

Five LOs (4%) were rejected and all were removed due to being deemed too high level for postgraduate SEM Masters. The objectives removed for being too high level are given in [table 2](#), alongside comments given by the expert panel that contributed to the research group deciding on their removal. The first two LOs listed in [table 2](#) regarding developing, leading and delivering exercise medicine services and MSK services received an agreement of 78% and 80%, respectively. Despite being above the approval threshold, the research group discussed these objectives at length, taking on board comments given by the expert panel, and determined these LOs were too high a level for a Masters level.

On reviewing the comments given by the expert panel, the research team added the following two LOs to the proposed curriculum:

1. Discuss a range of common ethical issues in a team sport environment (added to 'sports team and event management' subtheme)
2. Recognise the key medico-legal requirements and considerations in team medicine (added to 'sports team and event management' subtheme).

Table 2 The LOs removed after phase 1 and comments given by the expert panel which contributed to justifying the removal of the LO

Learning objective (LO) removed	Expert panel quotes supporting the removal
1. Develop, lead and deliver both paediatric and adult exercise medicine services	<i>Be able to contribute to the delivery of - Reduce the taxonomy order (Participant 41)</i>
2. Develop, lead and deliver both paediatric and adult musculoskeletal services	<i>Demonstrate awareness of - Not all MSc courses offer the chance for delivery (Participant 39)</i>
3. Perform a targeted ultrasound examination of a peripheral musculoskeletal problem	<i>Does not need to be part of SEM MSc - needs to be a separate course (participant 21) Reject as this is an additional skill that isn't going to be taught as part of MSc (participant 30)</i>
4. Inject a variety of joints and soft tissues with radiological guidance	<i>Does not need to be part of SEM MSc - needs to be a separate course (participant 21) I don't feel this is mandatory for MSc level (participant 42)</i>
5. Perform compartment pressure testing	<i>Not sure this is an essential component- would be done in Secondary Care (participant 33) Reject as advanced skill? beyond this level - know how it is done (participant 28)</i>

SEM, Sport and Exercise Medicine.

These were both added due to comments made by members of the expert panel at the end of the survey when asked if they had any final thoughts. The first was added due to a participant stating: 'I would also add a section on Ethics and how this may impact the SEM physician' (participant 31). The second was added due to a member of the expert panel stating: 'Medico-legal issues in sports' (participant 18). On discussing these within the research group the value of both comments were noted, and it was therefore deemed important to add related LOs.

Phase 2

Of the 45 that completed phase 1, 78% (35/45) of these individuals also completed phase 2. All LOs (100%) were accepted in phase 2 of the study, with all objectives achieving over 85% agreement. No alterations were made to any LOs. Therefore, no further phases were required. The final curriculum consisted of 11 subthemes (outlined in table 3) and 133 LOs. The full version of the final curriculum can be found in the online supplemental information.

DISCUSSION

Summary of findings

An expert panel of 45 (100% of those eligible) completed phase 1 of this modified Delphi study, with 35 also completing phase 2 (78% retention rate). One hundred and thirty-six LOs were reviewed, with five removed during phase 1 after being deemed too high level for an SEM Masters degree. Two additional LOs were added, resulting in a final curriculum of 133 LOs, all of which were accepted by the expert panel during phase 2.

The importance of a standardised SEM Masters curriculum for doctors

Obtaining a high-quality and relevant education in SEM should be a critical goal for all physicians working in SEM.¹⁴ Although there is no specific data on this, anecdotally, the research group is aware that a large proportion of doctors working in the field of Sport and Exercise Medicine are not SEM consultants or on SEM specialty training programmes. For this group, their SEM knowledge and experience will be heavily influenced through the completion of an SEM Masters. It is reasonable to assume physicians will want their SEM Masters to be as relevant as possible to being an SEM physician, particularly given the cost and time-commitment of undertaking a Masters degree.

Table 3 The finalised subthemes and number of learning objectives within each subtheme

Subtheme	Number of objectives in subtheme
1. Physical activity and human health	13
2. Medical issues related to exercise	16
3. Injuries related to SEM	22
4. Basic science in SEM	18
5. Clinical pharmacology	6
6. Antidoping	4
7. Sports team and event management	28
8. Physical activity in challenging environments	1
9. Specific groups in SEM	11
10. Intrinsic skills of an SEM clinician	3
11. Extrinsic skills of an SEM clinician	11
Total	133

As a relatively new specialty SEM is continuing to find its place within the UK healthcare system; many fellow healthcare professionals have limited knowledge of the specialty and the skills SEM physicians possess.^{15,16} As a specialty we need to demonstrate we can stand alongside conventional specialties by being prepared to methodically examine our practice, ensure physicians practising within SEM are sufficiently capable and ensure they are working at a high level consistent throughout the UK.¹⁷ It is becoming increasingly common for SEM posts to include having an SEM Masters in their desirable or essential job criteria. The need to standardise SEM Masters curricula is therefore becoming increasingly important. It will be beneficial to the professionalism of the specialty to ensure individuals working in SEM posts that require an SEM Masters possess similar, consistent skills and knowledge.

Aspects too specialist for SEM Masters level

The expert panel rejected the practical LOs around performing ultrasound, joint and soft tissue injections and compartment pressure testing, with comments implying that they are too high level for SEM Masters courses. Ultrasound imaging is increasingly used in SEM to diagnose and monitor injuries; diagnostic ultrasound has previously been described as the 'sports physicians stethoscope'.¹⁸ A 2017 International Consensus statement outlining a generic syllabus for SEM specialty training includes an 'advanced skill' of 'targeted ultrasound examination of a peripheral musculoskeletal problem'.⁹ How best to provide ultrasound training to SEM clinicians, or a consensus decision as to whether it is needed, remains a controversial issue.¹⁸ The research group anecdotally acknowledges that many SEM clinicians choose to self-fund ultrasound training courses and equipment. The findings of this study indicate that ultrasound training should not be included in SEM Masters' teaching.

LOs focused on developing and delivering exercise medicine services and musculoskeletal services were also not deemed appropriate to include in this curriculum, with several expert panel members commenting on issues with SEM Masters including these LOs. The research group discussed these objectives at length and deemed that these objectives would be more suitable for SEM consultant level or specialist SEM trainees. FSEM have created resources to aid SEM doctors in setting up SEM clinics and services, such as 'Sport and Exercise Medicine: A Fresh Approach in Practice' published in 2014.¹⁹ Interestingly, the 2017 International Consensus syllabus for SEM specialist training does not include learning how to set up an SEM service, nor does the most recent UK SEM specialist training programme curriculum.^{8,9} With increasing interest in how SEM can best be integrated into the NHS given the benefits SEM services can provide, it would be of great interest for further research be done to determine how the SEM specialty can most effectively increase the number of SEM services offered in the UK.³

Catering to all SEM Masters students

Doctors at any stage in training can undertake a Masters in SEM, and doctors at different stages in training may require different outcomes from a Masters course. It is also important to acknowledge that other healthcare professionals undertake an SEM Masters degree, such as physiotherapists, osteopaths and sports therapists. While there will be overlap, the outcomes these professionals wish to achieve from an SEM Masters are likely to be different to the LOs for doctors. Future research may consider exploring an appropriate SEM Masters curriculum for other healthcare professionals; it would be interesting to compare and contrast these with this curriculum.

Strengths

A modified Delphi was conducted thoroughly, following the appropriate methodology.⁴ The expert panel consisted of highly qualified individuals from relevant professional backgrounds. A high level of engagement and response rate was achieved. Many, often detailed, comments were received from expert panel members to justify responses. The research group contains individuals with a wide range in level of training. A high level of acceptance was achieved for each of the LOs included in the final curriculum. As no repeats to phase 1 or phase 2 were required, there were only two rounds of the Delphi before the finalised curriculum being created. Less than three rounds are recommended to reduce participation fatigue.^{13,20,21}

Limitations

Although demographic data was removed, due to the nature of the questions asked to deem eligibility criteria, the research group may have been able to deduce who expert panel members were, resulting in bias. In addition, despite Masters degrees being primarily academic degrees, the only mention of research in the final proposed curriculum is in one LO listing research as a skill commonly used in practice by SEM physicians that the learner should be able to demonstrate. This is likely due to vocational-based curriculums being used to create the initial proposed list of LOs developed by the research group. It may be appropriate for educators creating curricula for SEM Masters to consider including additional research-related LOs. Given the nature of a Delphi study, the study is limited by the research group members and expert panel. The study methodology is by design opinion-based and open to researcher and participant bias. In addition, it would have been beneficial to know the specific training/job role of the 14 doctors on the expert panel that did not provide this information. However, all of these doctors had an MSc or Diploma in SEM and had all been a doctor for 5 years or more, with the majority having been a doctor for over 10 years.

CONCLUSION

The findings of this study will better inform educators involved in developing SEM Masters curricula, and inform students as to what they should look for when considering undertaking a Masters in SEM. This consensus curriculum is an important step in the standardisation of postgraduate SEM education. The next step will be to ascertain views of the finalised consensus curriculum from individuals involved in delivering, teaching and examining SEM masters content in the UK.

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Contributors DV conceived the idea of creating a piece of work on this topic. DV, AI and KRM were involved in data collection. DV, KRM, PB, CN, AP and GF sat on the research group and analysed the data. All authors contributed to the critical revision and approval of the final editorial. DV is the guarantor of this study.

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Patient consent for publication Not applicable.

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Provenance and peer review Not commissioned; externally peer reviewed.

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Syllabus for doctors on Postgraduate SEM Masters courses

1. Physical Activity and Human Health	
	Demonstrate an understanding of the role of physical activity in the prevention and treatment of common long-term health conditions
	Advise on and promote population health through physical activity
	Make use of physical activity guidelines and recommendations in practice
	Analyse current UK screening programmes to promote health
	Analyse key national and international physical activity resources available to patients and clinicians
	Discuss how to overcome the following barriers to physical activity: environmental, social, physical, cultural, religious and psychological
	Demonstrate the ability to prescribe physical activity in healthy individuals and also individuals with disease
	Critically apply physical activity guidelines in both the prevention and management of chronic disease
	Design a physical activity programme for a variety of special populations (e.g. older adults, pregnancy, disability, children)
	Analyse and overcome factors that may impact physical activity prescribing
	Recognise the importance of communicating the physical activity message beyond the individual
	Demonstrate an understanding of public health policy development and implementation in relation to physical activity and health
	Understand and promote integrated sport and physical activity opportunities for school aged children and adolescents in order to promote a lifelong relationship with physical activity
2. Medical Issues Related to Exercise	
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Neurological conditions
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Respiratory conditions including: Asthma - Chronic Obstructive Pulmonary Disease - Exercise Induced Laryngeal Obstruction - Exercise Induced Bronchospasm
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common infectious diseases
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Cardiovascular conditions including: HOCM and other cardiomyopathies – Structural abnormalities – Arrhythmias – Valvular disease – Hypercholesterolaemia – Hypertension – Ischaemic heart disease - Heart failure - Inherited channelopathies - Congenital disease
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common gastrointestinal conditions

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Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common renal and urogenital conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Metabolic conditions including: Diabetes – Thyroid disease – Obesity
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common ENT conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common immunological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common haematological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common dermatological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Rheumatological conditions including: Inflammatory and seronegative arthritis, Osteoarthritis, Fibromyalgia and chronic pain, Connective tissue disorders, Hypermobility syndromes, Osteoporosis
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Psychological and mental health conditions including: Eating and body perception disorders in the developing athlete - Anxiety - Depression – Stress - Trauma
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Adult musculoskeletal conditions including: Acute pain - Acute musculoskeletal conditions - Chronic pain - Chronic musculoskeletal conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Paediatric musculoskeletal conditions including: Fractures - Ligamentous injuries and complications - Apophyseal injuries -

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	Overuse injuries - Growth plate stress - Osteochondritis dissecans - Snapping hip - Shoulder instability - Patella instability - SUFE - Perthes - Scoliosis - Talipes - Flexible pes planus - Chest wall deformities - Timings of growth plate closure
	Demonstrate the ability to deliver age appropriate injury rehabilitation programmes illustrating understanding of the biomechanical principles underpinning the individuals' chosen activity
3. Injuries Related to SEM	
	Apply the principles of prevention, diagnosis, and treatment of injuries related to sports and physical activity
	Analyse management plans for optimal treatment of patients across the spectrum of musculoskeletal problems in accordance with latest guidelines and best practice, and involving other allied health professionals where appropriate
	Apply knowledge of the pathophysiology of tissue injury and subsequent clinical symptoms and presentations of musculoskeletal disease to the management and rehabilitations of a range of common presentations
	Analyse the evidence-based management of common head and neck injuries
	Analyse the evidence-based management of common upper limb injuries
	Analyse the evidence-based management of common trunk, abdominal and thoracic spinal injuries
	Analyse the evidence-based management of common lumbar spine and pelvic injuries
	Analyse the evidence-based management of common lower limb injuries including: Tendinopathies - Ligament injuries - Avulsion injuries - Dislocation - Fracture management Other common soft tissue injuries
	Recognise red flags which may indicate malignancy or infection
	Interpret the findings of radiological and other relevant investigations to determine differential diagnoses
	Apply the principles of biomechanics to different sporting and physical activities and in the context of injury
	Recognise the role of physical activity in rehabilitation
	Devise a rehabilitation programme in relation to common sports injuries
	Analyse the role of surgery in the management of common sports injuries
	Analyse rehabilitation progression and return to activity factors when managing common musculoskeletal conditions
	Be able to interpret human movement analysis - basic kinematics and kinetics
	Explain the role of biomechanical analysis of sport specific techniques in the management of sports related injuries
	Analyse the effects of variations in biomechanics and the influence of posture on common musculoskeletal presentations
	Analyse the role of orthotics in the management of common sports injuries
	Recognise the role of splinting, bracing and taping techniques
	Apply an understanding of level 3 safeguarding knowledge to a range of hypothetical or retrospective cases
	Discuss the relevance of common radiological investigations including the suitability of each modality for a range of contexts
4. Basic Science in SEM	
	Analyse the principles of exercise physiology including: types of physical activity, effects of physical activity and maximising adaptations to sport and physical activity

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Discuss the principles of body morphology in the context of sport and physical activity
Apply the key principles of sports psychology to sport and physical activity
Analyse the impact of common diseases and medications on normal exercise physiology
Describe clinically relevant regional anatomy including normal variations
Describe the anatomy of joints and musculo-tendinous units
Describe the characteristics of bone, tendon, ligament, articular cartilage and muscle
Apply anatomical knowledge to history taking, physical examination and imaging
Describe cellular metabolism and biomechanical pathways of energy production
Apply the principles of strength and conditioning to formulate a basic plan
Undertake appropriate assessments of fitness
Discuss energy release from various sources including fats, carbohydrates, proteins
Discuss physiological responses and adaptations to exercise
Discuss the role of genetics in sport and physical activity
Discuss the role of macro and micronutrients
Discuss the key principles of hydration in sport and physical activity
Discuss the benefits and risks of nutritional supplements in sport and physical activity
Discuss the effects of alcohol on performance
5. Clinical Pharmacology
Discuss the issues of medication abuse in elite athletes
Discuss the influence of medications used in the treatment of disease on physical activity capacity
Discuss medication and exercise interactions which may cause or worsen disease
Prescribe safely by considering, contraindications, side effects, drug interactions and dosage of commonly used drugs in sport and physical activity
Discuss the regulations regarding travelling with medicines
Discuss the governance of medicine storage and management systems
6. Antidoping
Apply knowledge of the WADA prohibited list in both practice and hypothetical scenarios
Understand the WADA therapeutic use exemption process
Detail the consequences of doping: health risks, sanctions and responsibilities
Recognise suitable resources and tools to support athletes and clinicians regarding medications and anti-doping
7. Sports Team and Event Management
Describe the roles of the SEM physician in the team environment
Describe the features of good team dynamics
Describe the role of the main organisations of sport, sports medicine and health promotion at a national and international level
Discuss the relevant medical codes on the ethical treatment of athletes (e.g. Olympic code, FSEM code)
Analyse the components and processes of pre-participation screening for athletes and event participants
Discuss the key components of preseason and pre event medical organisation
Analyse the recognition and management of disordered eating and RED-S

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Discuss the equipment, medical supplies and facilities required for team and event care
Perform risk assessments of training and competition venues
Discuss common match and event day medical issues
Demonstrate the on-field assessment and management of sports injuries and medical conditions
Discuss the psychological aspects of motivation, arousal and performance
Discuss a range of common ethical issues in a team sport environment
Recognise the key medicolegal requirements and considerations in team medicine
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Cardiorespiratory arrest
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Sudden death in sport, both cardiac and traumatic causes
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Concussion and head injury
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Acute musculoskeletal and soft tissue injuries
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Basic management of fracture and dislocations
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
The acutely unwell patient
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Eye and ENT emergencies
Apply the principles of pre-hospital care to a range of common sport and physical activity emergencies
Demonstrate simple skin closure and suturing and have an awareness of the indications for each
Demonstrate basic airway management and deliver effective resuscitation
Demonstrate defibrillation and cardiorespiratory resuscitation
Advise on screening programmes to detect those at risk of sudden death in sport

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	Discuss the findings of any abnormalities raised during screening with athletes, family members and carers
	Demonstrate prompt assessment of the acutely deteriorating patient, including those who are shocked or unconscious, and deliver appropriate, evidence-based care
8. Physical Activity in Challenging Environments	
	Be able to manage common issues in SEM relating to physical activity in extreme environments including: cold environments, hot environments and altitude (
9. Specific Groups in SEM	
	Be able to manage issues in SEM relating to specific groups of athletes in sport including: paediatric, female, ageing, adventure sports and athletes with a disability
	Apply the effects of the ageing process when providing physical activity advice
	Apply knowledge of the physiological changes during and after pregnancy when providing physical activity advice to pregnant and post-partum individuals
	Demonstrate the ability to advise women on undertaking safe exercise throughout the lifespan including advising on energy balance, bone health and hormonal influences
	Discuss the management of common issues affecting disabled athletes and exercisers in relation to sports and physical activity
	Discuss physical problems experienced by amputees and wheelchair users with everyday living and with respect to sport
	Discuss contraception options in athletes
	Demonstrates an awareness of the unique needs of patients with disabilities, the barriers faced in participating in physical exercise and the ability to advise those with disabilities how to undertake safe exercise
	Understanding the social, psychological religious and cultural factors that influence physical activity participation and demonstrate initiatives to overcome these
	Demonstrates knowledge of the anatomical, physiological, psychosocial, sexual and educational development of children and adolescents in the management of musculoskeletal conditions
	Demonstrates knowledge of the aspects that enhance care during the transition and transfer between paediatric and adult services across healthcare
10. Intrinsic Skills of a SEM Clinician	
	Demonstrate the following skills commonly used in practice by SEM physicians: Communication - Collaboration - Leadership and management - Health advocacy - Safety - Research - Teaching - Learning - Professionalism -Consideration of ethics, cultural religious and LGBTQ awareness
	Demonstrate the ability to work within a multidisciplinary team
	Demonstrate the need to coordinate care across multiple agencies to address physical, psychological and social needs in community, secondary care, recreational and elite sporting environments
11. Extrinsic Skills of a SEM Clinician	
	Perform a comprehensive examination of the musculoskeletal and neurological systems and interpret the findings sufficiently to develop a clinically reasoned diagnosis and management plan
	Perform a sport-specific medical and musculoskeletal screening examination

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Provide safe and effective immediate medical care for on-field injuries and medical events
Perform concussion screening examinations, baseline and postinjury, and interpret the results
Recognise the indications of a range of radiological and other investigations relating to sport and physical activity
Analyse ECG findings in an athlete and recognise the indications for onward referral
Discuss the indications, benefits and risks of a variety of common joint and soft tissue injections
Have an understanding of the role of a range of commonly used protective braces
Recognise the indications for taping joints, tendons and muscles and its role in injury prevention and treatment
Interpret simple video analysis of a variety of sporting skills including running gait
Analyse the indications for and findings of resting and exercise lung function tests

UK Doctors Delivering PA Advice: What are the challenges and possible solutions? A Qualitative Study.



Article

UK Doctors Delivering Physical Activity Advice: What Are the Challenges and Possible Solutions? A Qualitative Study

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Abstract: Despite strategies to enable Health Care Professionals (HCPs) to give physical activity (PA) advice to patients, this appears to be rarely done in consultations. The aims of the present study were to gain an understanding of doctors' awareness of current PA guidelines and to explore their opinions on barriers and solutions. A qualitative approach using semi-structured interviews was adopted. This study included 15 doctors currently working in the UK's National Health Service (NHS). A thematic analysis approach was used to analyse the transcripts. Four themes and twelve sub-themes were deciphered. Intrinsic factors limiting the delivery of PA advice included a lack of knowledge of PA guidelines and PA being an afterthought. Barriers to delivering PA guidance included a lack of PA education, time pressures, and patient engagement. Solutions included staff training, incorporating PA into undergraduate training, and encouraging staff to be physically active. Methods to optimise PA guidance included individualised PA advice, local exercise services and schemes, utilising online and visual resources, and motivational interviewing. This study provides an updated insight into doctors' opinions on barriers and solutions to discussing PA with patients. It is clear that further work is needed to ensure greater awareness of PA guidelines amongst clinicians.

Keywords: physical activity; adults; medical education

1. Introduction

Despite significant evidence that physical activity (PA) has numerous benefits on physical and mental health and well-being, levels of physical inactivity are increasing [1,2]. In the United Kingdom (UK), the Chief Medical Officer (CMO) recommends that adults aged 19–64 years should complete at least 150 min of moderate activity, or 75 min of vigorous activity, each week, as well as muscle-strengthening activities at least twice per week [3]. Despite the well-documented benefits of PA, most adults globally fail to reach these recommendations [2]. According to the most recent Active Lives Adult Survey, between November 2020 and 2021 in the UK, 61% of adults were receiving at least 150 min of PA per week, with 27% classed as inactive, meaning they engaged in less than 30 min of moderate PA per week [4]. In recent years, physical inactivity and sedentary behaviour have been under increased focus as they have been found to be independent risk factors for mortality and non-communicable diseases [5,6]. With the COVID-19 pandemic and subsequent lockdowns, researchers have found that PA levels in the UK have decreased

further, associated with reduced physical function and increased mental ill-health [7,8]. It is, therefore, of increasing importance to optimise strategies to increase engagement with PA.

The UK CMO highlighted the importance of healthcare professionals (HCPs) in promoting PA to patients in their updated guidance released in 2019 [3]. There have been schemes to engage HCPs in discussing PA with patients, such as Make Every Contact Count (MECC), which aims to improve confident discussions of PA with patients through HCP training [9]. Despite this, a recent study of 839 UK-based GPs found that only 36% were “somewhat familiar” with the PA guidelines [10].

The aims of the present study were to gain an updated, in-depth understanding of doctors’ awareness of current PA guidelines and explore their opinions of any potential barriers and solutions for doctors engaging in PA discussions with their patients.

2. Materials and Methods

2.1. Design

A qualitative approach was taken, utilising semi-structured interviews [11]. Ethics approval was given by the Faculty of Biological Sciences at the University of Leeds (27 July 2020/BIOSCI 19-039).

2.2. Participants and Procedures

The inclusion criteria for this study included UK-based doctors currently working in the National Health Service (NHS), including doctors working in hospitals and primary care. Participants were excluded from the study if their medical degree was not from a UK University or if they were currently not practising medicine. The participant recruitment process for this study involved advertising through a range of channels, including social media (Twitter and LinkedIn) and by word of mouth. Recruitment was aimed at clinicians who are patient-facing but working across primary and secondary care. This was intentionally broad to reflect the opinions of all those participants who would normally be expected to provide PA guidance. Guidance on PA concerns almost all clinicians working within healthcare. Participants that expressed interest in these channels were sent a copy of the participant information sheet and consent forms, which were signed electronically and returned. Participants were contacted to arrange an interview either in person or online via Zoom. At the start of each interview, participants confirmed they had read the participant information sheet and gave verbal consent to be included in the study. Recruitment and interviews continued until data saturation was reached; this is the point at which no new emerging themes were identified [12].

2.3. Data Collection

Data were collected using semi-structured interviews to gather in-depth and informative responses [13]. This interview method was chosen as the research design as it enabled the interviewer to clarify statements and enquire about further information [11]. The interview guide contained 20 questions and is provided in the Appendix A. The questions promoted open dialogue between the interviewer and participant to elicit maximal information [13], and probing was used when appropriate if initial responses were limited [14]. The last question of the interview enquired whether the participants had any other comments to make to allow for new information and ideas [15]. Several questions were specifically included in the interview to gain an understanding of the participant’s awareness of PA guidelines, including asking if they meet the current UK guidelines for PA themselves, awareness of the PA guidelines, awareness of the CMO PA guidance and awareness of the Moving Medicine resource, an online PA resource for HCPs (<https://movingmedicine.ac.uk/>).

DV, AI, RB, and SW were all involved in data collection. DV provided training to AI, RB, and SW and observed one interview per interviewer to ensure consistency. Interviews were conducted via Zoom between March 2021 and May 2021; only audio was recorded for all interviews. Any identifiable information on the recordings was removed. It was made

clear that data would remain anonymous and confidential, and participation was entirely optional. Participants were informed that they could withdraw from the interview at any stage. Unique codes were used throughout the study to preserve participants' identities. Recordings were transcribed verbatim.

2.4. Data Analysis

Thematic analysis was used to analyse the transcripts [16], which enables a rich and detailed account of the data to be obtained [17]. The six-step process is used to extract meaning and concepts from data to identify patterns and ultimately generate themes [18]. Refinements to the themes and subthemes continued until nothing substantial was added. A recursive process was used in the analysis, moving back and forth between transcripts and themes as needed [16]. Themes were reviewed regularly until there was a distinct and coherent meaning for each. Transcripts were analysed by KM and DV separately. A reflective journal was utilised to evidence the extent to which thoughts and observations were data-driven and without researcher influence, in turn reducing the likelihood of researcher bias. Together, themes and sub-themes were discussed and agreed upon. NVIVO 11 software was utilised to manage extracts from the interviews and illustrate themes. Example quotes from transcripts were presented in tables for each theme and sub-theme. Signs of data saturation were first seen at 10 participants, and no new themes were identified following participants 12 to 15, signifying complete data saturation and that enough information was gained to ensure repeatability [19]. Microsoft Excel was used to collate and summarise qualitative data, which included demographic information of participants (years of experience, current primary healthcare setting, job role and location of work), and frequencies and proportions of responses to questions asked about participant understanding and awareness of PA guidelines.

3. Results

3.1. Participant Characteristics

Fifteen participants expressed interest in participating in the study. As all were eligible, a total of 15 participants were included in the study. Interviews varied in length between 20 min and 45 min, with an average of 29 min. Data saturation was reached at participant 15; at this point, no more emerging themes or new responses were found. Due to data saturation being reached, no further participants were recruited.

Participant characteristics can be found in Table 1 below. The majority of participants (73%) had 6–10 years of experience working as a doctor. The job role of participants varied widely across different specialities, from foundation year 1 doctors to qualified General Practitioners and one Sport and Exercise Medicine Consultant. The majority of participants were located in either northwest England (60%) or Yorkshire and Humber (27%). While the majority of participants were physically active and meeting the CMO PA guidelines (80%), only 27% of participants were aware of the CMO PA Guidelines, and only 33% were aware of Moving Medicine as a resource.

Table 1. Participant characteristics.

Characteristic	Category	N (%)
Years of experience	0–5	3 (20%)
	6–10	11 (73%)
	15+	1 (7%)
Current primary healthcare setting	Inpatients	4 (27%)
	Outpatients	2 (13%)
	Inpatients and outpatients	2 (13%)
	Primary Care	6 (40%)
	Academic or leadership role	1 (7%)

Table 1. Cont.

Characteristic	Category	N (%)
Job role	Foundation Year 1	3 (20%)
	Medical Registrar	1 (7%)
	Psychiatry Registrar	1 (7%)
	Paediatric registrar	1 (7%)
	General Practitioner registrar	3 (20%)
	Qualified General Practitioner	3 (20%)
	SEM registrar	2 (13%)
	SEM Consultant	1 (7%)
UK region	West Midlands	0
	East Midlands	1 (7%)
	Yorkshire and Humber	4 (27%)
Meeting CMO's PA guidelines for aerobic exercise	Northwest	9 (60%)
	London	1 (7%)
Meeting CMO's PA guidelines for aerobic exercise	Yes	12 (80%)
	No	3 (20%)
Aware of CMO's PA guidelines	Yes	4 (27%)
	No	11 (73%)
Aware of Moving Medicine	Yes	5 (33%)
	No	9 (67%)

CMO, Chief Medical Officer; N, number; PA, physical activity; SEM, sport and exercise medicine; UK, United Kingdom.

3.2. Themes and Sub-Themes

A total of 122 codes were generated from the 15 transcripts. Connections between these codes were found to coalesce into 4 themes and 12 sub-themes, summarised in Table 2. Themes and subthemes are listed in order of when they were deciphered from the data; the order does not signify importance. Next to the participant quote is the assigned identification number for the participant in brackets.

Table 2. Themes and sub-themes.

Theme	Sub-Themes
Intrinsic factors limiting delivery of PA advice	Lack of knowledge of PA guidelines PA is often an afterthought
Barriers to delivering PA guidance	Lack of PA education Time pressures Patient engagement
Solutions to increase staff awareness and successful implementation of PA guidelines	Staff training Incorporating PA into undergraduate training Encouraging staff to be active themselves
Methods to optimise PA advice	Individualised PA advice Local exercise services and schemes Utilising online & visual resources

3.3. Theme 1—Intrinsic Factors Limiting Delivery of PA Advice

3.3.1. Lack of Knowledge of PA Guidelines

A lack of knowledge and awareness of the PA guidelines was mentioned in the majority of interviews. There was a broad lack of awareness of PA guidelines amongst the interviewees. Similar comments were made by several interviewees when asked about their knowledge of PA, with one stating: 'I wouldn't say I [I am] confident to be honest' (2) and another commenting: 'I think I've looked at them many years ago, but they don't come to mind particularly often' (6). Going a step beyond the knowledge of PA guidelines to giving advice and prescribing exercise, one interviewee stated: 'I feel confident in prescribing medication. I feel less confident in giving exercise advice' (15).

3.3.2. PA Is Often an Afterthought

Many interviewees emphasised that PA is often not a top priority for medical professionals during consultations, with one interviewee stating: 'It's tricky because it's often not the top thing that you talk about' (11). Several interviewees asserted that it would be advantageous to incorporate PA into the taught consultation structure: 'If it becomes part of our natural history taking and we're looking at them as a whole ... you could then capture a lot of factors that can then change in the future' (14).

3.4. Theme 2—Barriers to Delivering PA Guidance

3.4.1. Lack of PA Education

A lack of PA education during undergraduate and postgraduate training was highlighted during the interviews. One interviewee stated when asked if they had received any PA education: 'Nothing formal from my recollection' (9), and another stated 'I wouldn't say I received formal education with regards to delivering physical activity advice. It's been a more informal and implicit kind of education mostly during my time on placement during medical school' (1). Another interviewee added to this: 'a lot of it does stem from the neglect from medical school regarding physical activity teaching' (3).

3.4.2. Time Pressures

Time constraints were mentioned in most interviews and by all those working in primary care settings. Regarding giving PA advice in practice, one interviewee said: 'with their time constraints of a GP 10 min consultations you're less likely to achieve it' (5). Another added a similar comment: 'I know GPs are hard-pressed; they've got so much pressure to deal with so many issues coming in within 10 min. That is just not possible to give effective PA advice that patients can take in and understand' (2). However, several interviewees did express altering views, with one interviewee stating: 'it doesn't take that much time to add [physical activity] into what you're speaking about' (4).

3.4.3. Patient Engagement

It was mentioned in multiple interviews that the patients themselves, understandably, play a large role in whether PA advice will be successful in creating behavioural change. One interviewee explained: 'It's very patient-dependent. He wants to lose weight and he's keen to get [PA advice] it's easier to talk to them' (12). Self-motivation was highlighted as an important factor, with the same interviewee stating: 'it's more like empowering them to do it themselves as well' (12). Another added: 'If they're not ready to engage, there's no point in me saying "you should run half an hour, five times a week" because they're just going to go on deaf ears and I'm going to lose that rapport with them' (15).

3.5. Theme 3—Solutions to Increasing Staff Awareness and Successful Implementation of PA Guidelines

3.5.1. Staff Training

Increased education and teaching of PA for medical staff was a common theme throughout the transcripts. One interviewee stated: 'I think a baseline would be useful for us all because it's so beneficial and pretty much for every single patient, especially with chronic disease' (8). Regarding staff training, the importance of including up-to-date research and statistics in PA education was mentioned by interviewees, with one stating: 'have those comparison tables, comparison charts that show statistics even if the number needed to treat' (4). Another interviewee commented: 'obviously evidence-based medicine is such an important part of delivering safe and high-quality patient care' (1), and another added: 'if you empower them, give them the knowledge that it is not just 'oh it might be useful' but actually clinically it's been shown the evidence is there and the evidence is strong' (5).

3.5.2. Incorporating PA into Undergraduate Training

Incorporating more PA into undergraduate curricula was mentioned by many interviewees as a method of increasing knowledge among medical professionals. One interviewee stated: 'I think that's really important to do, yes 100%' (12). Another interviewee commented: 'it needs to be better integrated within medical school and linking it in towards the earlier years of your career as well because that's where you start developing your practice in action' (1).

3.5.3. Encouraging Staff to Be Active Themselves

The concept of encouraging staff to be physically active was mentioned by several interviewees, with one commenting: 'I suppose if you're more active yourself, it's probably easier to give tailored advice to people who live in the same city as you' (4). Another interviewee stated: 'it's a case of practice what you preach' (5).

3.6. Theme 4—Methods to Optimise PA Advice

3.6.1. Individualised PA Advice

Ensuring that PA advice is targeted individually was mentioned numerous times throughout the interviews, highlighting that it is beneficial to have a good knowledge and understanding of the person you are pitching the PA advice to. One interviewee stated: 'you have to know your patient and know how best to pitch the idea to them' (12). Another stated: 'I think finding out what they're interested in, some people prefer different forms of exercise' (14), and they added 'if you can work it into their daily routine, walk to school rather than drive to school sort of things can really make a difference in terms of like the whole family exercise' (14). Motivational interviewing was highlighted as an important aspect of optimising PA advice. One interviewee stated: 'I think having that motivational interviewing approach to the consultation has helped, I think bearing in mind physical activity when talking about different chronic or acute health conditions has helped, again, patient-led' (7). Another interviewee commented on how they have personally found motivational interviewing to be effective: 'I usually use now some motivational interviewing approach, starting with assessing via open questions, what they do at the moment, what they know about the possible benefits of exercise, whether they've contemplated—where they are on the state of change sequence from that point of view' (10).

3.6.2. Local Exercise Services and Schemes

Local exercise services, such as referring to an exercise programme, and schemes such as the couch-to-5k, were highlighted by several interviewees as useful methods to encourage patients to increase their PA levels. One interviewee said: 'people seem to really like that flexibility around it' (15). Another interviewee gave a specific example: 'one of them is a local football team and they've set up half-term fitness regimes and places that kids can go and learn about diet and exercise, so I have referred to them a couple of times' (14).

3.6.3. Utilising Online and Visual Resources

The use of visual and online resources was highlighted, with one interviewee stating: 'I like to give outpatient leaflets, especially if they've got an arthritic issue, for example, that has exercises on there that they can use' (15), and adding to this 'in recent time, you can text people with the website, so I'll text them with the website for the NHS and their guidance about a healthy lifestyle' (15). Another interviewee stated: 'I know there are resources online, where they have information for each chronic condition... I know there is specific kind of guidance of how to go about giving physical activity education to patients in those areas' (1).

Moving Medicine (an online PA resource for HCPs) was mentioned specifically by several of the interviewees, with one stating about the moving medicine website: 'I just have a flick-through on the conditions and then I can either print it out or just made a note on it and then relay that information to the patients' (1). However, only 33% (5/15) of

participants were aware of this resource, and no participants described using it regularly. Reasons for this were described as due to setting and lack of time or familiarity. In contrast, a few interviewees commented on the difficulties of finding the appropriate online or visual resources, with one stating: 'obviously there are some available but finding the right ones is usually quite tricky' (3). Only four participants (27%) were familiar with the UK CMO PA guidelines, and participants from either those aware or not aware felt that resources needed more promotion, as most HCPs would not be aware of them.

4. Discussion

The aims of this study were to explore the understanding of doctors in the UK of the PA guidelines and barriers and solutions to engaging in discussions on PA with patients. Thoughts and opinions were obtained from doctors in England in a variety of different specialties and at a variety of stages in training. This study found that some issues related to delivering PA advice include a lack of knowledge of the PA guidelines, a lack of priority for giving PA advice, time pressures, and patient engagement. Solutions given included staff training on PA, incorporating PA into the undergraduate curriculum, encouraging staff themselves to be active, providing individualised advice, utilising local exercise services and online or visual resources, and using motivational interviewing to facilitate the advice being given.

4.1. Improving Knowledge, Confidence, and the Priority Given to Providing PA Advice

Improving inactivity levels in society is a complex and multifactorial issue, demonstrated well by the fact that limited solutions have been developed to combat the rise in physical inactivity despite extensive evidence of the benefits of being active for health and quality of life. The findings of this study are in line with previous papers highlighting the lack of knowledge and confidence of HCPs in giving PA to patients [10,20–22]. Indeed, 10% of junior doctors felt they had been adequately trained in PA [23]. Improving this could lead to PA being discussed during more consultations. Indeed, improved training and education for doctors were highlighted as solutions from the findings of this research.

This study found that PA being an afterthought and not a priority is a reason why it may not be mentioned during consultations. A similar finding of lack of priority to PA advice during consultations was found amongst physiotherapists [22]. Interestingly, one study found that 98.9% of GPs believe that PA is important for health [10]. Therefore, while the benefits are well acknowledged by doctors, it continues to not be thought of as a priority during consultations. Potentially, this is due to PA not being highlighted throughout training as an important aspect to consider. It has been suggested that PA levels be considered a vital sign [24] and, given the wide-ranging impacts of PA on health, it would be prudent for discussion regarding PA to be taught at an early stage of medical training when students are developing and consolidating consultation skills and evaluating vital signs. This may help PA discussions become a natural part of consultations for doctors of the future. The findings of this study, therefore, support previous calls for PA to be better embedded into the training of medical staff and into undergraduate curricula [25,26]. Currently, in the UK, the medical curriculum, which is published by the General Medical Council and forms the framework for all UK medical schools, gives little priority to PA. In fact, there is only one outcome related to PA, and that is within the context of weight loss only [27]. Including PA in curricula at an early stage and throughout training may increase the priority given to discussing PA during consultations. The Office of Health Improvement and Disparities (OHID) currently runs the moving HCPs programme, which is a whole system educational approach to embedding PA into clinical practice [28].

4.2. Encouraging a More Physically Active Workforce

Encouraging doctors to be active as a way of encouraging the promotion of PA to patients is an interesting concept and finding of this study. However, this is not a novel concept, with a range of global research suggesting that doctors who are active are more

likely to give physical activity advice to their patients [29–31]. A study performed in Glasgow in 2019 found that 63.9% of 332 doctors met the recommended volume of aerobic activity, while only 23.5% achieved the recommended account of muscle-strengthening activities [21]. They concluded that their results indicated doctors are as active as the UK general public. Another recent study found that 58% of 245 UK doctors met the PA guidelines, again concluding no significant difference from levels in the general population [31]. Clearly, encouraging medical staff to be active is valuable in promoting health among the staff themselves and the individual benefits they will gain from this and in ensuring a healthy workforce. Previously there have been calls for the NHS to better encourage, support, and facilitate staff to engage in PA [31]. The moral debate of whether doctors need to, or should be, role models for patients regarding health behaviours [32] is beyond the scope of this article. However, the findings of this study support the concept that promoting PA among HCPs might result in PA being discussed more often with patients [33].

4.3. Utilising Resources

Time pressures are an issue throughout healthcare and have been highlighted numerous times throughout the literature as a reason why PA is not discussed with patients by HCPs [20,25,34,35]. This is supported by the findings of this study. A solution to this may be optimising the way in which PA can be delivered. Referring to local supported exercise services was highlighted during the interviews.

Utilising online and visual aids to promote PA to patients was also highlighted as a potential solution. Signposting to useful resources may also aid with the issue of having limited time during consultations. In addition, this study found that ensuring PA guidance is individualised is beneficial in optimising the PA advice given. With regard to online and visual aids, the importance of ensuring that they are specific for individual patients has been noted in recent years, with resources such as the CMO's PA guidance and Moving Medicine (an online aid for providing PA advice to patients) having targeted advice for specific population groups such as age groups and different chronic health conditions [36]. It should be kept in mind that resources that are online may perpetuate inequalities, as patients without the socioeconomic capacity to purchase technology or digital literacy may not be able to easily access these resources.

4.4. Limitations and Strengths

There is a risk of participant bias, as those who are more interested in PA may have been more likely to volunteer. However, based on the backgrounds of the doctors interviewed, the research team remained confident that the majority of participants were doctors without a specific PA interest or expertise. Most participants were based in Yorkshire and Humber and northwest England, and it would have been advantageous to gain a broader view from doctors based in other locations in the UK. There is potential for researcher bias and the reliability of interpretations of the interview data, although Braun and Clarke's six steps were used to reduce this. The data were also analysed independently by DV and KM, and the themes were discussed to reduce the potential for bias. Strengths of this research included in-depth qualitative accounts from doctors about the issues and challenges they faced when promoting PA, as well as possible areas that could be improved to help promote PA. The involvement of this group in shaping interventions is essential, given that HCPs have been identified as being key for promoting PA [3,25].

It should be acknowledged that this project specifically focused on PA guidelines for healthy adults. Alternative guidelines are recommended for specific population groups such as pregnant women, older adults, and those with chronic health conditions. It would be beneficial for future research to explore HCPs' thoughts and opinions on delivering PA advice for specific groups. It should also be noted that longer durations of higher intensity activity can actually be detrimental to certain health conditions such as chronic fatigue syndrome and long COVID-19 [37].

5. Conclusions

This paper provides an updated insight into doctors' views and opinions on barriers and solutions to discussing PA with patients. It is clear that further work needs to be done to ensure greater awareness of PA guidelines amongst clinicians so that they, in turn, can best advise their patients, improve the health of the nation, and reduce morbidity and mortality. Barriers to delivering PA advice included lack of PA education, time pressures, patient engagement, and limited staff training. Incorporating PA education in undergraduate training was highlighted as a possible solution, as was increasing awareness of resources to support clinicians. Increasing PA advice given to patients requires a multifaceted approach, including increasing education of HCPs, raising awareness of patient resources and awareness of local services, as well as wider healthcare system-wise change.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available to avoid the potential identification of interviewees based on comments made.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study.

INTERVIEW GUIDE

[Thank the participant for attending the interview.]

[Participant to have read the PIS and consent form and returned a completed copy of the consent to the researcher prior to the interview.]

[Researcher and participant to introduce themselves. Researcher to introduce the evaluation and the purpose of the interview.]

[Reiterate that the information participants provide will be anonymised and confidential. Check that the participant is comfortable with the interview being recorded.]

In this interview, I am interested in hearing about your experiences of delivering physical activity guidance to a patient and your opinion as a clinician on the barriers, challenges, and solutions to improving health care professionals given PA advice and views on current interventions/developments.

Please be assured that you will remain anonymous, and the research team will not share your comments with anyone else, so be as honest as you can. If there are any questions that you would prefer not to answer, you do not have to answer them. If at any point you do not understand what I am asking or need some clarification, please feel free to ask as we go along. You will be given an opportunity to say anything that we have not covered at the end of the interview

Do you have any questions about the interview before we begin?

Demographics

State your role, experience, and current location of work (primary or secondary care).

What is your speciality/discipline?

How many years of post-graduation experience do you have?

Which statement best describes your own PA:

1. Currently meeting the CMO PA guidelines of 150 min moderate/75 min vigorous or combination of both;
2. Currently doing some PA 30 min moderate physical activity (MPA), but not meeting CMO PA guidelines of 150 min moderate/75 min vigorous or combination of both;
3. Currently doing less than 30 min MPA.

Tell me about the education and training that you have received in relation to Physical Activity (PA):

Did it take.

Development;

How much time?

Knowledge of PA guidelines

[Feelings/confidence around delivering CMO PA guidance.]

[Why? Confidence? is it their role?]

If someone is diagnosed with a chronic disease that can be improved by PA, what do you currently do in terms of delivering PA guidance?

[Explore who delivers guidance, whether part of standard procedure or ad hoc, whether the content of guidance is general advice or adheres to guidelines;

Why this approach;

What they think of this approach;

What individuals/practices could do differently;

What works well and why?

What needs to change for this to happen;

Signposting, etc.]

What do you do differently for those who have a chronic disease and those who do not in terms of delivering PA guidance?

Given an Example.

What works well and why?

What works less well?

What would be your 'top tip' for promoting PA to your patients with chronic disease and those without?

[Explore what they do well and would share with their fellow colleagues as something that is exemplar practice.]

What would help you deliver the CMO PA guidelines to your patients?

Prompts here, time, resources, partnerships with providers, better training, other people I could refer to in-house, policy commitment for PA promotion.

What, in your opinion, are the challenges and barriers that prevent IICPs from giving physical activity advice?

Prompts here: Consider intrinsic and extrinsic

How do you engage or recruit hard-to-engage HCPs who are less enthusiastic or even anti-PA?

What works, why and how?

What works less well and why?

Should we not bother recruiting those HCPs who are less enthusiastic, yes or no and why?

Education

What IICP education do you feel is most effective at enabling IICPs to promote the guidelines?

Prompts:

The 2019 guidelines;

Infographics;

PA training;

Mentoring;

What works well and why?

How can we embed more physical activity into undergraduate and postgraduate curriculums?

Consider delivery type/method, scalability, assessment.
 What are the solutions to increase HCP physical activity advice?
 Consider policy, motivating practices, clinicians.
 Resources and Interventions;
 2019 Guidelines.
 Do you think the 2019 update has been helpful or not?
 Why is this?
 Have you seen the CMO PA infographics? If so, which ones?
 If yes—how do you use it?
 What else would you like to see in the guidelines?
 Prompts: 24 h message, inclusion of guidelines on sleep and PA, specific diseases,
 other groups?
 What other actions or resources should accompany the implementation of the CMO
 PA guidelines?
 Prompts: CMO PA Guidelines, communication strategy;
 A campaign with TV, radio, social media advertising;
 Better resourcing to support the campaign;
 Inclusion of communication experts on different platforms;
 Coordinated approach with other health issues.
 How do you feel about mandatory induction? Y/N? Timescale?
 Do you use any other PA-related guidelines?
 Yes/No? Why?
 Have some prompts.
 Moving Medicine:
 Do you know about MM?
 MM is an online suite of resources that provide time-specific consultations for HCP
 across 11 conditions.
 Do you currently use moving medicine resources?
 If you do use it, how do you use it?
 If you do not use it, why not?
 What works well and why?
 What does not work well and why?
 Content, coverage, access, style?
 In your opinion, what could be improved about moving medicine to make it more fit
 for your purpose as a clinician?
 Can you give an example of where you have done this?
 Is there anything else that you would like to add about delivering PA before we finish
 or anything you have not said?
 [Thank the participant and remind them of the contact details on the PIS should they
 have any questions, want to request a lay summary, etc.]

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Output 15: Educating the next generation in SEM: A cross-sectional survey



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Research

Educating the next generation in sport and exercise medicine: A cross sectional survey

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Abstract

Background: Sport and Exercise Medicine (SEM) is a relatively new specialty, and it is not well incorporated into undergraduate medical education. Previous studies have highlighted that medical students would benefit from increased teaching on SEM, and that students would like more SEM teaching. The aim of this project is to establish which SEM-related topics are deemed to be most important to incorporate into undergraduate medical education and confirm whether medical students would benefit from increased SEM exposure.

Methods: An online survey was distributed to all members of the British Association of Sport and Exercise Medicine (BASEM) via email, and it was shared on Twitter via BASEM and the research team.

Results: A total of 126 responses were analysed. The majority of respondents works in SEM, or were interested in pursuing a career in SEM. Musculoskeletal (MSK) examination skills, exercise to prevent and manage disease, and MSK injuries and conditions were deemed to be the most important SEM-related topics to teach medical students. Use of social media and pitch side case were deemed the least important. Respondents thought medical students do not receive enough SEM teaching at medical school and could benefit from increased SEM exposure.

Conclusion: This study supports the opinion that medical students would benefit from increased SEM exposure. This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. In response to this survey a Delphi study is being conducted in the UK to establish a consensus undergraduate SEM curriculum for medical students.

Keywords: Shoulder arthroscopy; glycine effect; electrolytes imbalance; complications; fluid overload.

17 (12) 2022

Output 15: Educating the next generation in SEM: A Cross-Sectional Survey

INTRODUCTION

Sports and Exercise Medicine (SEM) is a recognised specialty with its own higher specialist training programme and increasing numbers of SEM departments are becoming established in the National Health Service (NHS) [1]. In keeping with this increased opportunity for SEM in postgraduate training, there is increasing need to develop interest and knowledge among junior clinicians and students [2]. For students and junior clinicians interested in SEM there are limited options available to learn more about the specialty, with few resources aimed at this level of training [3]. There have been a number of research papers and editorials published in recent years calling for an increase in SEM in the undergraduate medical curriculum [3–8]. However, none report novel data to directly support their conclusions.

The primary objective of this study is to establish which SEM-related topics are deemed most important to be taught as part of undergraduate medical education in the United Kingdom (UK). Secondary objectives include determining how often SEM is taught at medical school and understanding thoughts on whether students would benefit from more SEM teaching.

METHODS

An online survey was created using Google Forms (Google Inc. USA). All members of the British Association of Sport and Exercise Medicine (BASEM) were emailed a link to the survey in June 2018. Participants responded over a three-month period. The survey was also shared via BASEM's twitter account and by the twitter accounts of the research team (KM and DF). Informed written consent was obtained via a compulsory question at the start of the questionnaire. This was an internal organization survey conducted with permission from said organization. Due to this, and no identifiable information being collected, ethical approval was not sought. This is in line with the Declaration of Helsinki on 'Ethical Principles for Medical Research Involving Human Subjects' created by The World Medical Association, Inc. [9–11].

Participants were eligible to complete the survey if they

were UK medical students or qualified doctors. The questionnaire aimed to explore several elements of SEM teaching to undergraduate level and is given in Appendix 1. Where appropriate, data were divided into 2 subgroups of juniors (medical students and pre-registrar doctors), and seniors (Consultants, General Practitioners and Registrars) for comparison between groups. In addition, where appropriate seniors were separated into those that worked or trained in SEM or not to establish differences of opinion. Statistical analysis was performed using Microsoft Excel. Where median values are given, they are reported as median and inter-quartile range. Where appropriate, data were assessed for normality using Shapiro-Wilcox and the Mann-Whitney U test was used to determine differences between groups. Statistical significance was set at $p < 0.05$.

RESULTS

The survey received 136 responses. Eight participants were not eligible due to not being a doctor or medical student. Incomplete surveys ($n = 2$) were removed, leaving 126 responses. Consultants made up 34% of participants, 25% were General Practitioners, 10% were registrars, 13% were pre-registrar level doctors, and 19% were medical students.

72% of senior clinicians were working or training in SEM. 69% of juniors were interested in pursuing a career in SEM. 66% of all respondents had an additional degree in SEM.

IMPORTANCE OF SEM RELATED TOPICS

Participants were asked to rank how important it is that various SEM-related topics are included in undergraduate medical education. There were statistical differences between responses from juniors compared with seniors for the topics of nutrition, exercise physiology, working as a team doctor, and pitch side care. In each case, juniors deemed them to be more important than seniors. The results are given in Table 1

Table.1 Participants were asked to rank how important it is that each topic is included in undergraduate education. 1 = not important at all, 10 = very important. P value given for comparing responses from juniors, with responses from seniors. Statistically significant p values are in bold.

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AND RELATED RESEARCH

Topic	Median (IQR)	Median (IQR) for juniors	Median (IQR) for seniors	P value
Musculoskeletal Examination Skills	10 (10 - 9)	10 (10 - 9)	10 (10 - 9)	0.934
Exercise to prevent and manage disease	10 (10-9)	10 (10 - 9)	10 (10 - 9)	0.465
MSK injuries and conditions	9 (10 - 8)	8 (10 - 8)	9 (10 - 8)	0.516
Nutrition's	8 (9 - 6)	8 (10 - 6)	7 (9 - 6)	0.024
Rehabilitation	8 (9 - 6)	8 (9 - 6)	7 (9 - 6)	0.126
Exercise Physiology	7 (8 - 6)	8 (9 - 6)	7 (8 - 5)	0.005
SEM in specialist groups (eg disability, women, older athletes, children's)	7 (8 - 5)	7 (8 - 5)	7 (8 - 5)	0.151
Biomechanics	6 (8 - 5)	7 (8 - 4)	6 (8 - 5)	0.624
Drugs in sport	5 (7 - 4)	6 (8 - 4)	5 (7 - 3)	0.346
Sport Psychology	5 (7 - 3)	6 (8 - 4)	5 (6 - 3)	0.065
Working as a team doctor	5 (7 - 2)	6 (8 - 3)	4 (6 - 2)	0.004
Sports Ethics and law	5 (6 - 3)	5 (7 - 3)	5 (6 - 2)	0.338
Pitch side care	5 (6-2.25)	5.5 (8 - 3)	5 (6 - 2)	0.016
Use of social Media	5 (6 - 2)	5 (6 - 2)	4.5 (6 - 1)	0.181

THOUGHTS ON AMOUNT OF SEM TEACHING

All juniors were asked how often they had been exposed to SEM during medical school. The majority had either never been exposed to SEM during medical school (60%) or had been exposed to it 1-2 times a year (37%). The remaining 3% were exposed to SEM 1-2 times a month (Figure 1).

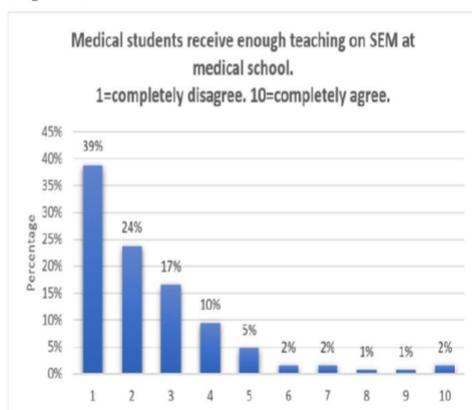


Fig.1 Responses when participants were asked if they agree or disagree with the statement 'Medical students receive enough teaching on SEM at medical school' 17(12) 2022

In this figure the results given when participants were asked whether medical students receive enough teaching on SEM. The median score for seniors was 2(3 - 1) and for juniors was 1(2 - 1). There was a statistically significant difference between the two groups (p = 0.004). There was no statistically significant difference between those seniors working or training in SEM and those that are not (p > 0.05) (Figure 2).

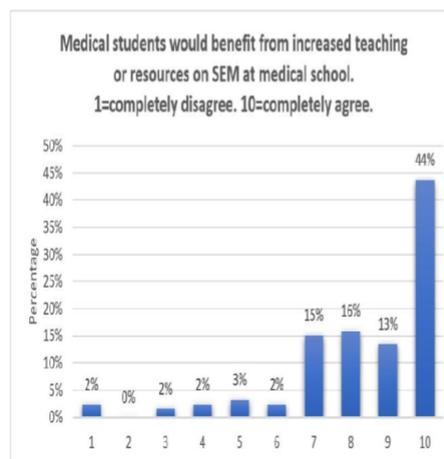


Fig 2. Responses when participants were asked if they agree or disagree with the statement 'Medical students would benefit from increased teaching or resources on SEM at medical school'

Figure 2 shows that participants think students would benefit from increased teaching or resources on SEM at medical school. There was no statistically significant difference in opinion between juniors and seniors (p = 0.908). Senior clinicians thought it was important for all medical students to have increased teaching or resources on SEM (median of 9 (7-10)), as well as those specific medical students interested in pursuing SEM (median of 10 (8-10)). There was a statistically significant difference between those seniors working or training in SEM and those that are not, with those working in SEM believing more strongly that medical students would benefit from increased SEM teaching or resources. The median for SEM professionals was 9(10 - 8) and the median for non-SEM professionals was 8(10 - 7) (p = 0.005).

DISCUSSION

THE MOST RELEVANT SEM RELATED TOPICS

The key findings of this study are that MSK examination THE JOURNAL OF ORTHOPAEDICS TRAUMA SURGERY AND RELATED RESEARCH

skills, exercise to prevent and manage disease, and MSK injuries and conditions are deemed to be the most important SEM-related topics to teach to undergraduates. Social media use and pitch side care were deemed the least important. This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. The findings of this study are important because they will determine how best we move forward in terms of the education we provide to undergraduate level. The majority of research thus far around incorporating SEM into medical curricula has been focused on exercise medicine [12]. Aside from exercise medicine, as far as the research team is aware, there are no SEM-focused resources aimed at the level of medical students. In addition, there is no SEM syllabus for medical students and new clinicians outlining what SEM they should know for their level in training.

BEING AN SEM DOCTOR- MORE THAN BEING PITCHSIDE

The difference of opinion between juniors and senior clinicians in the topics of working as a team doctor and pitch side care is of particular interest. It is a controversial topic within the SEM community that SEM doctors only work with elite athletes and sports teams, and the importance of highlighting that SEM is much broader than this has been highlighted previously [13]. Anecdotally, the authors acknowledge that the MSK medicine and exercise medicine aspects of SEM are often over-looked by those with limited experience of the specialty. Arguably these are the aspects of SEM that can best be utilized in a number of different specialties throughout the NHS. It may therefore be valuable for students and new clinicians to have some knowledge of SEM that will be valuable in a variety of different clinical settings.

THE BENEFITS OF MORE SEM EDUCATION

The survey findings suggest that students and clinicians of all grades are of the opinion that medical students would benefit from having more exposure to SEM during medical school, an opinion expressed previously [14–16]. However, there is limited data supporting this theory, which is an important finding of this study. In addition, this study found that seniors believe increased

SEM teaching would be beneficial for all students, not just those interested in pursuing a career in SEM. There are potentially several reasons for this. Firstly, the lack of exposure to SEM results in a lack of awareness of what is involved in SEM, including its place in health service provision [17]. A lack of awareness of the specialty of SEM has been demonstrated among the medical profession [18, 19]. This may mean that SEM NHS services are not being utilized due to lack of awareness of these services existing, resulting in patients not benefitting from referrals to SEM departments.

Secondly, inactivity is a significant risk factor for disability and death and to combat this as a society promoting physical activity as a form of medicine is of paramount importance [20]. If we are encouraging more people to be active, it follows that more people will suffer from sports-related injuries. We need our doctors of the future to be prepared and confident to deal with the MSK injuries that will potentially increase as a result of this. Furthermore, aspects of the SEM curriculum are applicable in many parts of medicine [21]. For example, both exercise and musculoskeletal medicine are relevant in General Practice, whilst exercise physiology is important in Anesthetics.

STRENGTH AND LIMITATIONS

This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. Views were collated from individuals in a variety of stages in their career in order to compare differences between sub-groups.

A limitation of this study is that most participants have an existing interest in SEM. The majority of participants were working in, or interested in working in, SEM and therefore are potentially biased towards feeling more SEM exposure would be of benefit. Further research should aim to gain opinions of non-SEM doctors, and students and juniors not interested in pursuing SEM, to establish how applicable SEM skills and knowledge is to the wider medical profession. Furthermore, as the survey was shared on social media, a response rate cannot be calculated.

CONCLUSION

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AND RELATED RESEARCH

This study has found that MSK examination skills, exercise to prevent and manage disease, and MSK injuries and conditions were deemed the most important SEM-related topics to include in medical student education. Use of social media, pitchside case, sports ethics and law, and working as a team doctor were deemed the least important SEM-related topics for undergraduate education. Respondents thought medical students do not receive enough SEM teaching at medical school and could benefit from increased SEM teaching/resources, which supports previous research findings. In response to the findings of this survey, a Delphi study is being undertaken to further clarify an SEM undergraduate syllabus. In addition, educational SEM & musculoskeletal resources have been created specifically aimed for the level of medical students and junior clinicians.

DECLARATIONS

Ethics approval and consent to participate: This was an internal organisation survey conducted with permission

from said organisation. Due to this, and no identifiable information being collected, ethical approval was not sought. This is in line with the Declaration of Helsinki on 'Ethical Principles for Medical Research Involving Human Subjects' created by The World Medical Association, Inc. Informed written consent was obtained via a compulsory question at the start of the questionnaire, and all participants were over the age of 18. All methods were carried out in accordance with relevant guidelines and regulations.

ABBREVIATION

KM and DF conceived the design of the study, contributed to the collection of the data, KM, DV and DF performed statistical analysis of the data. All authors (KM, DF and DV) contributed to the manuscript writing and approved the final version applicable

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RESEARCH

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Creating a sport and exercise medicine undergraduate syllabus: a delphi study



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Abstract

Background Sport and Exercise Medicine (SEM) is a growing speciality in the United Kingdom (UK). This growth has not been replicated in SEM teaching at an undergraduate level and SEM-related topics in schools of medicine in the UK are under-represented. As SEM continues to develop as a speciality it is important to consider how it is embedded at all levels of training. The aim of this project was to establish a consensus on SEM-related skills and knowledge relevant for undergraduate medical students in the UK, ultimately creating a curriculum of learning objectives (LOs).

Methods A modified Delphi survey was utilised to seek consensus on LOs suitable for incorporation into UK medical school curricula. An expert panel with adequate knowledge in the field was recruited. The initial curriculum was created by the research team using already established postgraduate SEM curricula. All learning objectives were sent to the expert panel for opinions in phases. Levels of agreement and comments made by the expert panel were reviewed after each phase until a consensus on each learning objective was made.

Results The expert panel was made up of 45 individuals, with 35 also completing phase 2 (78% retention rate). The initial curriculum contained 58 learning objectives separated into 9 themes. In phase 1 31% (18/58) were accepted outright, 48% (28/58) were altered and 19% (11/58) were rejected. Two additional learning objectives were added. Of the 49 LOs included in phase 2, 98% (48/49) were accepted. The final curriculum was made up of 9 sub-themes and 48 LOs.

Conclusion Sport and Exercise Medicine is a broad ranging and rapidly growing speciality. It is important to establish SEM education in all levels of medical education, including undergraduate level. This is the first published version of a Delphi SEM curriculum for undergraduate medical teaching.

Keywords Medical education, Sport and exercise medicine, Undergraduate

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Output 16: Creating a SEM Undergraduate syllabus: A Delphi Study

Background

Sport and Exercise Medicine (SEM) is a growing medical speciality in the United Kingdom (UK) and worldwide. SEM is a medical speciality that includes team medicine, exercise medicine and musculoskeletal medicine. SEM could be an important medical speciality to improving the health status and quality of life of patients by both increasing and maintaining physical activity levels. Physical inactivity is a leading cause of disease burden and an important modifiable risk factor alongside smoking. [1] The past few years have seen position statements, the creation of multiple postgraduate SEM courses, and an international Delphi study to create a curriculum for SEM practitioners. [1–3] However, this growth has not been replicated in SEM teaching at an undergraduate level, and SEM-related topics in schools of medicine in the UK are under-represented. [4–6] The General Medical Council's "Outcomes for Graduates" and Health Education England's "Future Doctors" reference the growing need for doctors to be skilled in providing tailored exercise medicine advice to patients, and in demonstrating core musculoskeletal skills. [7,8] Most medical specialties currently have a syllabus to which they expect medical students to achieve outcomes by the end of their undergraduate career.

Worldwide, the integration of sport and exercise medicine teaching into undergraduate curricula is also an issue. In the USA, Asif et al. (2022) conducted a Delphi study for an exercise medicine core curriculum because medical trainees in the USA were found to receive relatively few hours of teaching [9]. This global training issue also affects the Middle East and Europe. [10,11]

As SEM continues to develop as a speciality it is important to consider how it is embedded at all levels of training. In the UK, it is common practice by the majority of royal colleges to produce an undergraduate curriculum. Creating and encouraging the use of that curriculum by medical schools could be useful to ensuring exposure and interest to the speciality. SEM is a relatively young speciality, having been formally established in 2005, and no equivalent undergraduate curriculum has been established to date. [12] With this in mind, the aim of this project was to establish a consensus on SEM-related skills and knowledge relevant for undergraduate medical students in the UK, ultimately creating a curriculum of learning objectives (LOs). This will act as a guide for the teaching of SEM at undergraduate level and standardise undergraduate SEM teaching throughout the UK. The majority of medical schools do not follow, nor need to follow published royal college undergraduate curriculums, their priority it to ensure they meet GMC outcomes for graduates. Specific learning outcomes are usually created by the medical school and for the majority of specialties this is entirely appropriate given they

are large specialties found in all areas. SEM however, is a small speciality with only 173 Consultant doctors on the GMC specialist register based in a narrow range of locations and with currently a limited but growing NHS presence. [13] It is therefore unlikely that all medical schools have access to Sport and Exercise Medicine Clinicians. It is hoped this consensus of LOs will encourage medical schools to increase the amount of SEM teaching incorporated into medical school curricula.

Methods

Study Design

A modified Delphi survey was utilised to seek consensus on LOs suitable for incorporation into UK medical school curricula. The original delphi method was developed by Dalkey and Helmer and is an iterative process designed to determine consensus through exposing the expert panel to multiple iterations of data, in this case learning outcomes. [14,15] There are a variety of observed ways of delivering a delphi however its overall distinct features including the use of an expert panel and a round based, iterative approach. Delphi methodology is used extensively in curriculum development. [16] This delphi was defined as modified and therefore variant methodology due to the creation of the draft curriculum by the research group rather than the use of the expert group to create the original curriculum. [15] This methodology was used to avoid multiple rounds and therefore the risk of poor response rates with progressive rounds. [17] This study involved the creation of the original draft curriculum by the research team, which was put through 2 rounds of review by the expert panel before being finalised by the research team. In keeping with the principles of Delphi methodology, contributions given by the expert panel were kept anonymous to the research group throughout the process. [18] The methodology used in this study was also used for a Delphi study conducted by members of the research team for postgraduate SEM curricula, the same expert panel was utilised for both studies. [19].

Establishing the research group

The research group was made up of DV, AI, KM, TP, DS, AP, CN, PB and GF. This group was formed to incorporate individuals with experience in a wide variety of related topics including medical education, delivering SEM education, experience undertaking and/or teaching on undergraduate medical degrees, SEM Masters courses and Delphi methodology. In addition, individuals were included due to their experience with the Undergraduate Sport and Exercise Medicine Society (USEMS) and their interest in the speciality of SEM. USEMS is a UK based, non-profit society aimed at promoting the speciality of SEM for undergraduates. [20] All decisions regarding

content were finalised by the research group such as reviewing and amending learning outcomes based on comments from the expert panel following the first round.

Expert Delphi Panel

Individuals suitable for joining the expert panels are defined as individuals with knowledge and experience in the subject area. [21,22] All members of the British Association of Sport and Exercise Medicine (BASEM) and the Faculty of Sport and Exercise Medicine (FSEM) were emailed invitations to express interest in joining this expert panel. Invitations to submit interest were also shared on Twitter by the research group.

Individuals expressing interest in joining the expert panel were asked demographic information and questions selected by the research panel to determine eligibility. The eligibility criteria were selected to ensure the expert panel was made up of individuals with adequate knowledge in the field of SEM. It was not determined whether the participants had prior experience of writing LOs.

The eligibility criteria used consisted of:

- *Doctors that have completed their Foundation Training.*
- *Achieved a higher qualification in SEM: specifically, either a SEM masters degree/diploma, or membership/fellowship of the FSEM (MFSEM/FFSEM).*
- *Graduated more than 5 years prior to the start of the study.*
- *Working in the United Kingdom at the time of the study.*

Individuals that did not meet the eligibility criteria were removed by the research group. A panel size of at least 30 was aimed for as the quality of a Delphi study has

previously not been found to be improved by a panel size greater than 30. [18,23]

Development of the initial curriculum

A documentary analysis was performed and LOs included in previously published UK-based SEM specialty training and SEM Masters curricula were combined by the research group. Each learning outcome was then discussed by the research group at a meeting. Learning outcomes that were duplicated or deemed inappropriate for an undergraduate medical student were either removed or amended based on research group consensus. Following the research group review and consensus an initial draft of the curriculum was created. [2,23,24,25] The LOs in these curricula were grouped into relevant themes as determined by the research group. All LOs were reviewed by the research group before being amended or removed if required. Bloom's taxonomy was used to establish an appropriate level for undergraduate medical students as agreed by the research group (Fig. 1). [26] Reducing the Bloom's taxonomy level was the main reason for amending a learning outcome at the draft curriculum phase by the research group. The Bloom's taxonomy levels used are given in Fig. 1.

Procedure

Google Forms (Google Inc. USA) was used to create the initial survey for those wishing to express interest in joining the expert group, and demographic information was collected via this form. Qualtrics software was used to create the electronic surveys for the Delphi. [27] This survey was emailed to all individuals deemed eligible to join the expert panel. Participant information sheets were emailed to all eligible individuals. Written informed consent to participation was gained by all members of the expert panel via a mandatory question asked at the start of the survey. The survey instructions stated clearly that experts should consider the relevance of individual LOs for medical student level when answering the survey.

Data were collected from October 2020 to November 2020. Members of the expert panel were given 12 days to respond to each phase of the Delphi. A system-generated email was sent after day 8 and day 10 to non-responders to act as reminders. In addition, members received a text message if no response had been received by day 10. The research group aimed for the response rate to not fall below 70% as expert panel engagement is vital for Delphi studies. [28].

Phase 1: First review of learning objectives.

Members of the expert panel were asked to either accept, reject or modify each LO in the proposed curriculum. To ensure standardisation of approach, the expert panel were asked to focus not only on the content or topic conveyed in the learning outcome but also on the level of

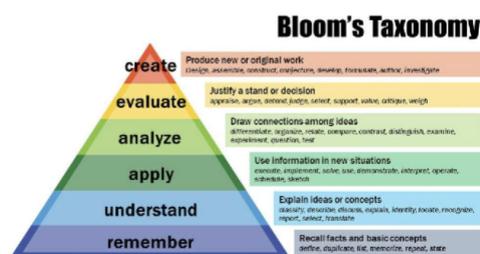


Fig. 1 Bloom's taxonomy. Level 1 is knowledge to level 6 which is creation. Image used within rules of license (creative commons attribution-sharealike license). Taken from: https://commons.wikimedia.org/wiki/File:Bloom%27s_Revised_Taxonomy.jpg

Table 1 Alterations. The reasons for alterations to learning objectives after phase 1. Eleven LOs (19%) were rejected and removed due to either lack of relevance to undergraduate level (n = 7) or overlap with other LOs in the curriculum (n = 4). The objectives removed for being too high level, and examples of quotes from the expert panel supporting their removal, are given in Table 2. The objectives removed due to overlap are given in Table 3 alongside the remaining LOs that they overlapped with

Reasons for alteration	Number of learning objectives altered
Spelling and grammar (including re-wording)	14
Alteration to Bloom taxonomy level	8
Objective made more specific	15

Bloom's taxonomy used. An explanation of Blooms taxonomy as well as links to further resources were provided to the expert panel. A consensus of opinion was defined by 75% agreement, as reported previously by Keeney et al. [18] Ranges from 70 to 100% have been reported in previous literature as appropriate for consensus. [19,29] Participants had the option of providing anonymous comments after reviewing each LO. For each LO the percentage of agreement was calculated and any anonymous comments regarding that LO were reviewed by the research group. All comments for all LOs were reviewed regardless of the level of agreement. The research group then accepted, rejected or altered each LO depending on the responses given to create a second draft of the curriculum. If a level of agreement of 75% or above was received with no comments given, the LO was accepted outright with no further need for review. If comments were given, the research group discussed the comments and, if appropriate, amended the LO and included it in the second draft of the curriculum for further review. If the level of agreement was below 75% and no comments were given, the LO was rejected. If comments were given, the research group reviewed the comments and, when appropriate, amended the LOs and included them again in the second draft of the curriculum for further review.

Phase 2: Second Review of learning objectives.

The second draft of the curriculum, based on responses given in phase 1, was sent via email only to members of the expert panel that had completed phase 1. In phase 2 members of the expert panel were asked to either accept or reject each LO and again there was the option to provide anonymous comments this time after review of each theme rather than each LO. The LOs accepted outright in phase 1 did not require a response but were included for reference. Again, percentages of agreements and comments were reviewed by the research team and decisions were made to accept or reject each LO. A level of agreement of 75% of above was again utilised. Phase 2 would be repeated until a final consensus on each LO was reached.

Results

The initial proposed curriculum

There were 58 LOs collated from prior SEM syllabi. These were grouped into 9 core themes by the research group.

Table 2 Removed LOs The LOs removed after phase 1 and the comments given by the expert panel that were reviewed by the research group and justify the removal

Learning objective (LO) removed	Expert panel quotes supporting removal
Outline neurological issues in relation to exercise	<i>There is a limited time within which an understanding of all these issues isn't able to be achieved and is covered in the wider curriculum (Participant 21)</i>
Outline renal and urogenital issues in relation to exercise	<i>Not sure how this could tie in to an UG syllabus (Participant 37)</i>
Outline ENT issues in relation to exercise	<i>ENT is too niche (Participant 16)</i>
Outline basic biomechanics in relation to different sporting and exercise activities and in the context of injury	<i>Huge area - think unnecessary when need to cover the basics in medicine (Participant 21)</i>
Outline the role of WADA and UKAD	<i>Not sure this necessarily needs to be in curriculum at UG level as PG level (Participant 43)</i>
Describe the on-field and emergency assessment and management of sports injuries and medical conditions	<i>Pre-hospital care generally not taught at UG level (Participant 37)</i>
Discuss the following in relation to SEM: eye and ENT emergencies	<i>Relatively small topic and could be integrated with other topics (Participant 16)</i>

The Expert Panel

Of the 94 people who expressed interest in being on the expert panel, 48% (45/94) met the eligibility criteria. The reasons for non-eligibility included having worked as a doctor for less than 5 years (n = 19), not holding a SEM MSc/Postgraduate Diploma/FFSEM/MFSEM (n = 17) and not being based in the UK (n = 13). The expert panel was made up of 20 SEM consultants, 4 orthopaedic consultants, 1 rheumatology consultant, 17 GPs, 11 SEM registrars and 14 doctors that did not specify their training or job role but did confirm that they had been a doctor for more than 5 years. Thirty-eight individuals (82%) stated they had experience of teaching medical students.

Phase 1

In phase 1 of the study there was a 100% (45/45) response rate from the expert panel. 31% (18/58) of LOs were accepted without need for alteration and 48% (28/58) were altered in some way. The reasons for alterations are given in Table 1. Nine LOs were altered for more than one reason. Regarding the 8 alterations made to the

Table 3 Overlapping LOs. The LOs removed after phase 1 due to overlap with other learning objectives are given on the left. The related learning objective(s) that remained are on the right

Learning objective removed	Remaining learning objective(s) justifying removal
Describe general pathology of the musculoskeletal system.	Relate musculoskeletal anatomical knowledge to common conditions and presentations. Outline the principles of tissue injury and repair in the musculoskeletal system.
Describe the findings of common radiological investigations.	Recognise the indications for common radiological investigations.
Describe the findings of radiological and other relevant investigations.	Recognise the indications for common radiological investigations.
Discuss the following in relation to SEM: Cardiorespiratory arrest.	Recognise the role of pre-hospital care in sport and physical activity. Demonstrate basic life support in a simulated environment.

Bloom's taxonomy level, 6 (75%) were kept at the level but alterations were made to utilise a more appropriate

word from the same taxonomy level, and 2 (25%) were moved up one level.

After review and discussion by the research group 2 additional learning objectives were added: 'Outline the pharmacological management of acute pain in musculoskeletal conditions in sport and physical activity' and 'Identify common adult musculoskeletal conditions'. This was due to it being noted that chronic pain was mentioned in other learning objectives, but the management of acute pain was not covered by any learning objectives and there being no learning objectives specifically including adult musculoskeletal conditions. With the removal of 11 learning objectives and 2 learning objectives added, a total of 49 learning objectives were included in the curriculum for phase 2.

Phase 2

Of the 45 members of the expert panel that completed phase 1, 78% (35/45) also completed phase 2. 98% (48/49) of LOs were accepted in phase 2 of the study, with these objectives achieving over 75% acceptance. Table 4 gives the level of acceptance for each LO following phase 2. The LO that did not reach 75% agreement was 'Outline haematological changes and responses to physical activity'

		Theme								
		1	2	3	4	5	6	7	8	9
Learning Objective	a		100%	94%	97%			86%	94%	92%
	b	100%	100%		81%	94%			94%	
	c	100%	78%		97%			97%	89%	
	d	94%	97%		100%			89%		
	e		89%					97%		
	f		72%					100%		
	g		86%					94%		
	h		97%	97%				89%		
	i		94%							
	j		97%							
	k									

Table 4 Levels of acceptance. The percentage (%) level of acceptance for each learning objective after phase 2. Greyed out boxes indicate the learning objective was accepted outright in phase 1. The black box indicates that the learning objective that did not meet the acceptance criteria

(LO 2f in Table 3). Ten LOs needed to be altered but, as these were all minor grammar and spelling changes, it was felt that there was no need for any further phases. The final curriculum was made up of 9 sub-themes and 48 LOs. Table 5 shows the finalised sub-themes and number of objectives in each sub-theme. The full version of the agreed curriculum can be found in the [supplementary material](#). In the final curriculum, 54% (26/48) of the LOs were in level 1 (knowledge) of Bloom's taxonomy, 42% (20/48) were in level 2 and the remaining 4% (2/48) were in level 3.

The finalised curriculum can be found in the [supplementary material](#).

Discussion

This study has utilised Delphi methodology to create an SEM curriculum for undergraduate medical education. The Delphi panel consisted of a broad range of practitioners, with the majority having experience of teaching undergraduate medical student. The final curriculum was made up of 48 LOs.

Physical activity LOs in the proposed curriculum

The initial proposed curriculum contained 11 objectives relating to medical issues related to exercise, of which 10 were accepted by the expert panel. The one LO that was not accepted related to knowledge of haematological changes in response to exercise (72% acceptance). This was deemed too specific and not at the right level for undergraduate learners. Four LOs were also included in the separate category of physical activity and human health, covering LOs related to physical activity guidelines, common barriers to physical activity and recognising useful physical activity resources. Physical activity reduces the incidence of non-communicable disease (NCDs) such as diabetes mellitus, ischaemic heart disease, several cancer types, and has therapeutic effects in multiple conditions such as musculoskeletal pain,

risk of falls and chronic obstructive pulmonary disease (COPD). [30] Despite this, clinicians are often not confident in advising and prescribing exercise interventions. [31] Multiple barriers were found such as fear of exacerbating the condition, insufficient knowledge on which types of exercise are the most beneficial for their patient group, and contraindications. Recent evidence also suggests that medical students themselves appreciate that physical activity is important in preventing disease, but they do not feel confident in physical activity guidelines and would like more teaching on this topic. [11,32,33] There has been a push to better incorporate exercise medicine into undergraduate healthcare curricula, and research into how best to do this. [4,32,34] The findings of this study support the embedding of exercise medicine into undergraduate medical curricula and highlights key LOs that should be covered.

Global application

8 out of the 9 subthemes in the present study were also included in the medical specialty syllabus designed by the international syllabus in Sport and Exercise medicine Group (ISSEMG) [2]. This consensus included a total of 11 subthemes. The differences are likely explained by the undergraduate focus in this study. The USA and Middle Eastern studies also included many overlapping undergraduate themes including physical activity and human health, antidoping and specific groups in SEM. [9,10]

Ensuring suitability for undergraduate level

Of interest, many LOs were rejected in the first phase of the study due to being topics deemed too SEM-specific for undergraduate curricula, with comments made that they were more appropriate for postgraduate level. In addition, the vast majority of LOs accepted in the final curriculum were in either levels 1 or 2 of Bloom's taxonomy. This suggests that lower levels of Blooms taxonomy appear to be more appropriate for undergraduate level in sport and exercise medicine curricula.

Overlap between other specialties

SEM-related topics extend into numerous specialties already well established in the undergraduate medical curricula such as: orthopaedics, rheumatology, and public health. Many of the LOs included in the finalised curriculum produced by this study are likely already covered in medical curricula. For example, many of the 10 LOs in the injuries related to SEM category such as 'outline common upper limb injuries' and 'recognise the indications for common radiological investigations' are likely to overlap with orthopaedic and musculoskeletal modules already incorporated into medical school education. Similarly, the LOs in the intrinsic skills of an SEM physicians including demonstrating skills such as communication,

Table 5 Finalised curriculum subthemes. The finalised subthemes and number of objectives in each sub-theme

Sub-Theme	Number of objectives in sub-theme
1. Physical Activity and Human Health	4
2. Medical Issues Related to Exercise	10
3. Injuries Related to SEM	10
4. Basic Science in SEM	7
5. Clinical Pharmacology	2
6. Antidoping	1
7. Sport Team and Event Management	9
8. Specific Groups in SEM	3
9. Intrinsic Skills of a SEM Physician	2
Total	48

collaboration and describing the importance of a multi-disciplinary team approach are already covered in medical curriculum.

Implementation into established undergraduate medical curricula

Whilst this study attempts to map the components of SEM onto a curriculum, actually placing these onto existing curricula remains challenging. The General Medical Council (GMC), who set the core curriculum objectives for medical students to learn during their training, mention SEM-related topics in a number of LOs in "Outcomes for Graduates". [7] However, medical schools have relative autonomy on the timing and level of depth required for its graduates. Previous reviews of United Kingdom (UK) medical schools have suggested that a proportion of medical schools have not been able to demonstrate evidence of exercise medicine teaching across the core curricula. [5].

While the overlap with other specialties will make embedding this suggested curriculum easier, it is appreciated that there are barriers due to limited space in already crowded medical curricula. Following this study, suggested next steps are to discuss this curriculum with individuals involved in creating, implementing and teaching undergraduate medical curricula to identify feasibility and practical steps for adoption.

Strengths and Limitations

Our panel consisted of qualified and experienced professionals from relevant backgrounds. The majority of our panel were senior clinicians. In addition, between reviews there was a high response rate, representing a good internal validity. The retention rate between Phase 1 and Phase 2 was above 75%, which improves the reliability of the study. One main limitation was that, due to SEM being a relatively small, albeit growing, speciality, the vast majority of our panel were highly interested in SEM, thereby introducing potential selection bias.

Conclusion

Sport and Exercise Medicine is a broad ranging and rapidly growing speciality, with significant importance in tackling the burden against NCDs. It is important to establish SEM education in all levels of medical education, including undergraduate level. To our knowledge, this is the first published version of a Delphi SEM curriculum for undergraduate medical teaching. Future work should explore the opinions of individuals working in medical education, and those whose primary focus is not in SEM, to discuss opinions and how it could be best implemented into medical school curricula. In addition, it would be advantageous to compare this curriculum

with undergraduate SEM curriculums used in other countries around the world.

List of Abbreviations

SEM	Sports and Exercise Medicine
UK	United Kingdom
LOs	Learning objectives
USEMS	Undergraduate Sport and Exercise Medicine Society
BASEM	British Association of Sport and Exercise Medicine
FSEM	Faculty of Sport and Exercise Medicine
MFSEM	Membership of the FSEM
FFSEM	Fellowship of the FSEM

Supplementary Information

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Supplementary Material 1

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Authors' contributions

DV conceived the idea of creating a piece of work on this topic. DV, AI, and KM were involved in data collection. DV, AI, KM, TP, DS, AP, CN, PB, GF sat on the research group and analysed the data. All authors contributed to the critical revision and approval of the final editorial.

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Data Availability

The data for this study is stored on Hull York Medical School servers and is not publicly available. Data can be made available upon reasonable request to the corresponding author.

Declarations

Competing interests

The authors have no competing interests to declare.

Ethics approval and consent to participate

Ethics approval was granted by the Hull York Medical School ethics committee board. Ethics ID number: 17/08. Informed written consent to participation was gained by all members of the expert panel. The study was carried out according to the Helsinki Declaration.

Consent for publication

Not applicable.

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Undergraduate Education Overview

The research portfolio begins with paper 15, which explores the perspectives of BASEM members. The survey examined what was being taught at the UG level, as well as what topics members felt was crucial to include in a SEM UG curriculum. In 2018, the first collection of data was undertaken. The results were utilised to aid the research team in creating the initial undergraduate curriculum for the modified Delphi study, paper 16 (Vishnubala et al., 2023a) in conjunction with the findings of papers 1 and 4.

Postgraduate Education Overview

The postgraduate focus culminates with the publication of output 11: PG SEM MSc syllabus (Vishnubala et al., 2022a) that gained consensus via Delphi methodology. The emphasised concepts and material from outputs 4 and 13 served as a vital resource for the development of the preliminary draft syllabus for the PG MSc Delphi. Output 4 explores the NHS's needs for SEM through stakeholder engagement, and output 13 highlighted educational needs were both key to developing the original draft syllabus for the Delphi. BMJ Open SEM published the paper outlining the Delphi process that was utilised to obtain a consensus on an MSc SEM curriculum. The final syllabus also formed the framework for output 14 which is the SEM textbook published by Routledge.

In the following section, the key papers and their findings are discussed and their implications for the overall aims:

4.2 How prepared are healthcare personnel to provide PA advice to individuals with diabetes? A formative assessment

Output 1 (Kime et al., 2020) is a qualitative piece of research investigating the preparation of primary care health care practitioners to provide PA counselling to people with diabetes. A survey followed by 18 semi-structured interviews comprised the second phase of this

sequential mixed-methods two-phase design. The investigation was published in the BMC. The paper noted that, among the 18 primary care healthcare professionals interviewed, there was a clear recognition of the importance of physical activity; however, participants were generally unaware of the CMO PA guidelines and lacked formal training. This was of particular interest to the broader scope of the doctoral work. In addition, they had a limited understanding of the community's physical activity-related services. This was essential knowledge and highlighted the need and significance of developing an SEM syllabus that could be implemented in both UG and PG environments.

It highlighted the need to investigate the knowledge of healthcare professionals, as well as the solutions and barriers to promoting PA in the NHS. Both physicians and physiotherapists were subsequently the subjects of two additional qualitative research studies (Vishnubala et al., 2022c; Stead et al., 2023). Kime's study also highlighted the need to strengthen PA education for undergraduates and postgraduates. As such, it was a crucial piece of research that led to the development of the Delphi studies (Vishnubala et al., 2023b; 2022a), which form the core of this portfolio and will be discussed in greater detail later.

4.3 A Qualitative Study on the Integration of SEM Clinics into the National Health Service

Output 4 (Vishnubala et al., 2020a) investigates what input the NHS wants from a SEM service and SEM physicians using a qualitative technique consisting of semi-structured interviews.

The report highlighted several significant findings. One suggestion was to improve SEM education and recognition of the specialty.

This proposal was an additional crucial element in the construction of a Delphi-based undergraduate programme in SEM for medical students (Vishnubala et al., 2023b). Another noteworthy conclusion indicated that musculoskeletal (MSK) and concussion services should be prioritised by SEM in the NHS. These findings were crucial to the creation of the first iteration of the postgraduate MSc SEM syllabus prior to consensus by Delphi methodology

(Vishnubala et al., 2022b). Recognising what key stakeholders feel is the role of SEM in the NHS is another key component in developing syllabi.

4.4 Creating a SEM Masters curriculum for physicians: a Delphi Study

The fourth output synthesises many of the data from the preceding articles, which helped construct a Delphi research (Vishnubala et al., 2022b) to produce a consensus of learning objectives for an MSc in SEM. Using a modified Delphi procedure with two rounds of expert panel review and input, a consensus was established. The expert panel was comprised of 45 individuals. Of the initial 136 learning outcomes, 44% were modified after round 1, and 4% were eliminated post-round 1, and 2 learning outcomes were added. The final 133 learning outcomes were divided into 11 domains as shown in Table 9.

Table 9: Agreed subthemes and number of learning objectives for the MSc SEM Syllabus

Sub-theme	Number of Learning Objectives in the Sub-Theme
1. PA and Human health	13
2. Medical Issues related to exercise	16
3. Injuries related to SEM	22
4. Basic Science in SEM	18
5. Clinical Pharmacology	6
6. Antidoping	4
7. Sports Team and Event Management	28
8. PA in Challenging Environments	1
9. Specific Groups in SEM	11
10. Intrinsic Skills of an SEM Clinician	3
11. Extrinsic Skills of an SEM Clinician	11
Total	133

4.5 Developing a SEM Undergraduate Curriculum for Physicians: A Delphi Study

A second Delphi to develop a consensus for what a UG syllabus in SEM should comprise was performed (Vishnubala et al., 2023b). Based on suggestions from prior studies (outputs 1, 4, 15), which indicated that solutions required both undergraduate and graduate education, this research was done. The technique followed the same methodology as the postgraduate Delphi output 11 research published in BMJ Open SEM. This is the first-ever consensus on a Sport and exercise E-Medicine undergraduate curriculum and the only undergraduate SEM curriculum ever published. The expert panel was made up of 45 participants with a retention rate of 78% by round 2. Of the original 58 learning objectives, 31% were accepted, 48% were modified, and 19% rejected. Some 48 learning outcomes were finally accepted, constituting 9 subthemes.

There has been a movement to better include exercise medicine in undergraduate healthcare courses, as well as a study into how this might be accomplished (Carter-Roberts et al., 2021; Pugh et al., 2020).

Recent data reveals that medical students themselves recognise the importance of physical exercise in illness prevention, but they lack confidence in PA standards and would want further instruction on this issue (Radenkovic et al., 2019; Carrard et al., 2019). The findings of this study support the incorporation of exercise medicine into the undergraduate medical curriculum and identify essential topics that should be addressed. Table 10 shows the agreed subthemes and the number of learning outcomes.

Table 10: Agreed subthemes and number of learning objectives for the undergraduate SEM Syllabus.

Sub-theme	Number of Learning Objectives in the Sub-Theme
1. PA and Human health	4
2. Medical Issues related to exercise	10
3. Injuries related to SEM	10
4. Basic Science in SEM	7
5. Clinical Pharmacology	2
6. Antidoping	1
7. Sports Team and Event Management	9
8. Specific Groups in SEM	3
9. Intrinsic Skills of an SEM Clinician	2
Total	48

4.6 What are the challenges and potential solutions for UK physicians providing PA advice?

This output (Vishnubala et al., 2022c) examines the challenges and solutions physicians face when providing PA advice in an NHS setting, following the identification of this issue in our second paper (Vishnubala et al., 2020a). The data were analysed using inductive thematic analysis and semi-structured interviews. Current PA education for physicians, according to the research, is limited, but there are opportunities to increase and enhance PA education. In addition, the paper identifies and discusses additional important obstacles and solutions for increasing PA advice in the NHS. Several government agencies, including the Department of Health and OHID, as well as lottery-funded Sport England, are working on a few initiatives and campaigns to promote PA knowledge and advice among patients and HCPs. The results provide solutions and identify critical obstacles to surmount. As primary author, I was

responsible for all aspects of this paper, including conceptualisations, data acquisition, analysis, and writing.

This paper has a unique contribution in that it is the only paper to examine this issue through the lens of the NHS Clinician using a methodology other than a survey, allowing for a deeper understanding. A similar methodology was used to pose the same questions to NHS physiotherapists (Stead et al., 2023a)

From the 15 semi-structured interviews, a total of 122 codes were produced which were distilled into four themes and twelve subthemes (Table 11). Exploring the education elements of physical activity advice by healthcare professionals in NHS settings of relevance the subthemes included challenges such as a lack of awareness of guidelines, PA as an afterthought (culture), a lack of PA education, and solutions centred on adding PA to UG and PG staff training were all proposed. The findings highlight the need to develop a syllabus that addresses some of the difficulties mentioned. As PA is a key part of SEM, and not routinely covered in medical school curricula, unlike musculoskeletal medicine for example, this was a useful addition to drive the development of the UG and PG syllabi development.

Table 11: Shows the themes and subthemes generated.

Theme	Sub-Theme
Intrinsic factors limiting delivery of PA advice	Lack of knowledge of PA guidelines PA is often an afterthought
Barriers to delivering PA Guidance	Lack of PA Education Time Pressures Patient Engagement
Solution to increase staff awareness of successful implementation of PA guidelines	Staff Training Incorporating PA into undergraduate training Encouraging staff to be active themselves
Methods to optimise PA Advice	Individualised PA Advice Local exercise services and schemes Utilising online and visual resources

4.7 Education of the Next Generation in SEM: A Cross-Sectional Survey) is the fifteenth deliverable

The final output (Marino, Vishnubala and Fitzpatrick, 2023) is a survey of the membership of the ASEM to study a variety of issues, including what the members thought to be vital undergraduate education topics. The paper was published in 2023, although the initial data collection took place in 2018.

In addition to stressing the need for additional SEM education at the undergraduate level, this research analyses those topics which respondents felt were important for inclusion in a curriculum at that level. This was yet another important piece of research that contributed to the development of the original undergraduate Delphi syllabus. The survey had 126 eligible participants. Findings included most participants saying they were not exposed to SEM in medical school as well as participants ranking the importance of topics with a disparity between seniors and early carer doctors around the topics of nutrition, exercise physiology, team care, and pitch-side care, which senior doctors felt were less important to an UG. However again this data was highly influential in creating the first iteration of the SEM UG syllabus.

4.8 Printed textbooks

Two book chapters and one edited book which includes a total of three co-written chapters form the first output in this area is a book chapter titled Clinical Sports Medicine (I am a co-author of a chapter on motivational interviewing by Brukner and Khan; Friedman and Vishnubala, 2019)Friedman and Vishnubala, 2019). The importance of behavioural change was highlighted in the range of the published works (Vishnubala and Pringle, 2021; Vishnubala et al., 2020b; Kime et al., 2020; Vishnubala et al., 2022c).(Vishnubala and Pringle, 2021; Vishnubala et al., 2020b; Kime et al., 2020; Vishnubala et al., 2022c).

The chapter on Type 2 diabetes and exercise prescription (Henson, Anyiam and Vishnubala, 2022) published by Routledge in the book *The Management of PA for Referred Medical Conditions*; covered areas highlighted in outputs 1 and 13 and aim to provide a tangible resource to improve an HCP confidence and expertise surrounding exercise prescription in diabetes. **Error! Reference source not found.** illustrates the covers for each of the three books.

SEM: A Essential Guide by Eastwood and Vishnubala

This book, *Sport and Exercise Medicine: An Essential Guide*, was published on March 30th, 2023 by Routledge (Eastwood and Vishnubala, 2023). It maps to most of the postgraduate SEM curricula (Vishnubala et al., 2022b) and covers important components of the Delphi MSc curriculum paper. This is the first textbook that was exclusively created for postgraduate SEM MSc degrees. Of note, DV co-authored three chapters on Public Health, PA, and Radiology.

5 Discussion

The discussion has been separated into undergraduate and postgraduate SEM curriculum development.

Output 1 (Kime et al., 2020) identified the importance of HCPs wanting to feel more confident around PA promotion as well as highlighting the need to know the CMO PA guidelines that were already known (Westland et al. 2018) Chatterjee?. There is also a need

for medical students to gain more education about PA (Gates et al., 2019) which while known was reinforced as a solution in the paper. Exercise Medicine/PA forms part of SEM and is reflected in its inclusions in the undergraduate SEM syllabus produced.

Developing further on output 1 (Kime et al., 2020), 90% of early career doctors feel they have not been appropriately trained in PA (Osborne et al., 2017a). Improving and increasing education could aid in PA being discussed more in consultations. Our research suggests the need to improve training and education in the PA space with calls by many of the participants to embed further in UG and PG education (Kime et al., 2020; Pandya and Marino, 2018). The outcomes for graduates (GMC, 2018) published by the GMC provide a framework that is used by all medical schools to form their curriculum (Sharma, Murphy and Doody, 2019). There is only one outcome that is related to PA and, unfortunately, this is around weight loss, for which the current evidence supports nutrition over PA.

MSK examination skills, exercise to prevent and manage disease, and MSK injuries and disorders are the most significant SEM-related subjects to teach students, according to the findings of output 15 (Marino, Vishnubala and Fitzpatrick, 2023). Social media usage and pitch-side maintenance were found to be the least significant. This study is the first to identify SEM-related topics that would be important to teach medical students. Until this point, the majority of research on the introduction of SEM into medical curricula has concentrated on exercise medicine (West and Griffin, 2017). In addition, numerous components of the SEM curriculum are transferrable to other medical specialties (Davies et al., 2019). First, a lack of exposure to SEM leads to a lack of knowledge of what SEM comprises, especially its function in the delivery of healthcare (O'Halloran et al., 2009; Osborne et al., 2017b) It has been discovered that the medical community is lacking in SEM expertise and its awareness (Vishnubala et al., 2020a). Exposure to SEM in undergraduate education could increase awareness of the speciality and therefore its development and role in the NHS. At present several NHS challenges could be supported by SEM but potentially, due to a lack of awareness of the speciality, it is potentially being underutilised

Having a recognised undergraduate SEM syllabus could aid with further recognition of the specialty by future doctors, although the challenge still lies in its implementation. However, should a medical school wish to increase their SEM exposure, this provides a framework to support them. It is important to note, that there is no evidence to support the increase in uptake of a medical subject in the undergraduate curriculum if the relevant medical faculty/college publishes an undergraduate syllabus. It is worth arguing however that there is nothing to refute it either. Raising awareness of SEM further in the undergraduate space, either by encouraging medical schools to take up the syllabus or influencing the GMCs outcomes for graduates, are all potential next steps. In a crowded medical school curriculum herein lies the challenge. Exploring and trialling implementation strategies would be an appropriate next step. This may include developing resources, toolkits and materials that allow a medical school to “pick it up” and deliver the education.

Postgraduate

The paper exploring what NHS SEM services could look like with key stakeholders highlights the importance of musculoskeletal medicine and concussion as the most important services. It was felt that while exercise medicine was important that it would probably not form the main part of an SEM clinic. This however conflicts to some extent with the FSEM position however they still note MSK being the priority (FSEM, 2023a). There was an acknowledgement that many stakeholders in the NHS and allied specialties were not aware of SEM, and this could be addressed arguably by an undergraduate syllabus which is likely to give all medical students SEM exposure rather than at a postgraduate level which would focus only on those already interested. The ability to one-stop shop where MSK ultrasound and injections were also provided was seen as attractive. The recognition of stakeholder needs and thoughts on what an NHS service could look like is important to consider the knowledge and skills required for a qualification such as an MSc in SEM that a doctor may take to work in an extended role.

The MSc consensus highlights the challenges of deciding what should be in an MSc when the individual joining such a programme may vary in their experience and knowledge. The MSc practical learning outcomes for ultrasonography, joint and soft tissue injections, and

compartment pressure testing were deemed too advanced for SEM Masters programmes by the expert council. The study team however observes anecdotally that many SEM doctors pay for their own ultrasound equipment and training courses. The findings of this study indicate that master's degree programmes in SEM should not incorporate ultrasound training. Stakeholders in NHS settings believed that ultrasonography was a vital aspect of the service although, nevertheless, SEM physicians' opinions on what the MSc should comprise may reflect perhaps their prejudices towards when the MSc should be completed in training and what it aims to accomplish. It is hoped that many existing programmes may adopt or integrate the consensus syllabus into their curriculum. However, given the large changes programmes may have to undergo to implement this, this may prove challenging. The next step may be to explore a documentary analysis and explore the MSc SEM syllabi at all UK institutions and compare this to our findings to explore differences and similarities in the scale of change being asked of various institutions. Having a MSc that uses the same syllabus may give employers confidence, as the variation at present for something that can be essential or desirable on job applications is large.

The Developed Syllabi

Extant undergraduate SEM syllabi are aimed at medical schools, while the MSc in SEM may be offered by a range of UK institutions that run an MSc in SEM courses. Of the learning outcomes identified, a commonality arose between the UG and PG in terms of themes. However, the number of LOs, the breadth of topics, and the level of Bloom's taxonomy as would be expected varies (see Table 12 for comparison). Bloom's taxonomy (see Figure H) is used to write learning outcomes and to differentiate lower-order outcomes requiring less cognitive processing from those that require higher levels (Adams, 2015). Most discussions and changes to learning outcomes revolved around the level of taxonomy required. The undergraduate level could thus be seen as the foundational syllabus to the postgraduate course which is possibly intended for more established clinicians. However, there are overlaps, given that many MSc courses in SEM admit intercalated medical students between

years 3 and 4 and clinicians undertaking an MSc in SEM, as doctors can vary from immediately post-graduation to experienced senior clinicians.

Table 12: Comparison of subthemes and number of learning outcomes.

Sub-theme	MSc SEM: No. of Learning Objectives in the Sub-theme	Undergraduate SEM No. of Learning Objectives in the Sub- Theme
1. PA and Human Health	13	4
2. Medical Issues related to exercise	16	10
3. Injuries related to SEM	22	10
4. Basic Science in SEM	18	7
5. Clinical Pharmacology	6	2
6. Antidoping	4	1
7. Sports Team and Event Management	28	9
8. PA in Challenging Environments	1	
9. Specific Groups in SEM	11	3
10. Intrinsic Skills of an SEM Clinician	3	2
11. Extrinsic Skills of an SEM Clinician	11	
Total	133	48

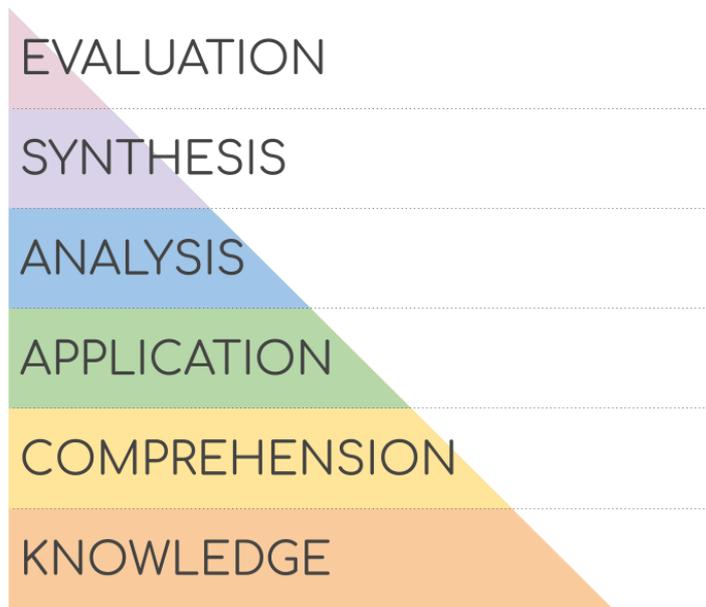


Figure H: Bloom's Taxonomy.

Strengths and Limitations

Strengths and limitations are discussed for each publication. It is worth noting that all research carried out was UK based and on UK participants. Of note, given the small SEM community, even after anonymising the expert panel, it was possible to identify some participants based on their free text comments which could have introduced some bias. In comparison to the literature reviewed, clear inclusion and exclusion criteria for the expert panel were implemented, and both Delphi papers had high response rates and consensus levels, as outlined previously. Given the same expert panel was used for both the undergraduate and postgraduate Delphi, there is concern around possible survey fatigue and its potential impact on the final syllabi.

Strengths and Limitations: A Personal Critical Reflection

My stance and approach toward several frequently employed qualitative methods, including some of those utilised in the published papers, have evolved over the past five years because of my personal development and accumulation of experience in qualitative

research. Due to what feels a drive to ensure qualitative research is as 'trustworthy' as quantitative research—which is erroneously perceived as more rigorous by many, qualitative researchers have continued to rely on post-positivist theories, including grounded theory. Guba and Lincoln's criterion although criticised is widely recognised as a framework for enhancing the rigour of qualitative research (Nowell et al., 2017).

Guba and Lincoln's Criteria

Guba and Lincoln (Guba and Lincoln, 1989) established a set of criteria that they referred to increase the "rigour" or "trustworthiness." The trustworthiness criteria encompassed the following quantitative terms: confirmability (objectivity), credibility (internal validity), transferability (external validity), and dependability (reliability). The categories provide a practical foundation for initiating a discourse on the development of my own personal qualitative development. Nevertheless, the criteria have faced criticism due to their ambiguity regarding the attainment of trustworthiness and the inconsistent degree of implementation and interpretation of the criteria (Forero et al., 2018). According to Rezaiye (Rezaiye, Radfar and Hemmati MaslakPak, 2021) the lack of consistency in implementing the criteria undermines their reproducibility and transparency. It is important to note, however, that regarding qualitative research in the same way that one might approach quantitative research by a positivistic approach to its criteria and aligning them with the former may not be the best approach (Varpio et al., 2017). Once more, researchers who examine qualitative research from the perspective of quantitative research have expressed concerns regarding the generalisability or transferability of qualitative findings beyond specific contexts (Tuckett, 2005). I will discuss the various methods for enhancing rigour that have caused the greatest shift in my position.

Credibility

Credibility investigates validity or internal dependability. Numerous strategies are considered in order to guarantee credibility. This entails prolonged engagements, member checking, persistent observation, and triangulation, among other techniques. Credibility is arguably wrongly predicated on the positivistic or objectivist position that it is possible to discover a single truth or fact (Varpio et al., 2017). Several strategies have been proposed to enhance credibility (Guba and Lincoln, 1989), including spending more time in the setting collecting data, which may result in greater trust and intimacy, and 'richer' data. The interviews with health care professionals regarding physical activity lasted, on average, thirty minutes. The quantitative approach of selecting large samples and removing researcher bias around participants is contrasted with qualitative approaches to recruitment and sampling, such as purposeful sampling. I was able to select participants who possess the requisite expertise and experience in the field of interest. Furthermore, the possibility of a professional relationship with them may have increased the likelihood that they would actively participate and elaborate on their remarks (Johnson, Adkins and Chauvin, 2020). Thus, whereas this may have been perceived negatively in the past, I now recognise the approach's merits. For instance, in the diabetes physical activity paper utilising semi structured interviews (Kime et al., 2020), recruitment was one of the obstacles; however, the clinicians who were chosen opted to be interviewed by me rather than the other researchers; this was considered a strength and was elaborated upon in the paper.

Transferability

The concept of transferability pertains to the extent to which conclusions can be drawn from a given study and applied to different contexts (Guba, 1981), i.e., whether the information is transferable. Although quantitative generalizability is not applicable to statistical analysis, the reader can determine whether a transfer is possible to their area of interest by reading "thick" descriptions. In addition to access to the original data, the reader must have sufficient information, richness, and thickness to evaluate the material (Johnson, Adkins and Chauvin, 2020) and, ideally, actively evaluate it from their vantage point in order to determine whether or not it can be decontextualized and utilised in light of concepts or

themes highlighted elsewhere. For example, in the context of the semi structure interviews exploring challenges, barriers and solutions to doctors providing physical activity advice, readers of the paper may deem it has transferability to their chosen health care professional or even non health care professional.

Dependability:

Determines the extent to which the data remains consistent across a range of circumstances and over an extended period of time. For consistency and dependability, it is crucial to ensure a transparent, trackable, and consistent research process. This can be accomplished by utilising audit trails to demonstrate a documented, traceable, and coherent process. However, one could contend that reproducibility is not entirely feasible for qualitative data and in fact may run counter to the spirit, essence, and intrinsic worth of qualitative research (Smith and Sparkes, 2019). The unique perspective contributed by a specific participant enhances the depth, variety and richness of the gathered data.

Confirmability: Triangulation and audit are key components to confirmability which aligns with concept of objectivity quantitatively. While confirmability is futile in qualitative data, reflexivity and insight into the experiences, beliefs and position of the research can aid in both understanding their interpretation. Ensuring original transcripts and data collected are kept and transparent allows possibility of other interpretations (Johnson, Adkins and Chauvin, 2020).

Elements such as inter rate reliability, thematic emergence, reflexivity, sample size, and saturation are commonly used in qualitative research. I will explore each element further as for these, I have altered my position since the beginning of my PhD journey.

Sample size

Methods for determining sample size in quantitative research are established and widely used. In qualitative data, sample size is complex and dependent on a number of variables. The number of interviews required has been debated for some time (Guest, Bunce and Johnson, 2006). Data saturation was established in accordance with the principles of grounded theory, and it is widely employed. Historically, it has been considered an indicator of rigour. The researcher's identification of the saturation point (O'Reilly and Parker, 2013), beyond which no new themes emerge, has been incorporated into my own published works; it may also serve as a potential method to prevent excessive data collection. The belief that no further information can be discovered presupposes or leans toward the positivistic viewpoint that the truth has been discovered. It is assumed, in light of my pragmatic and relativist stance, that every participant may contribute novel insights (Varpio et al., 2017). Hence, from a pragmatic standpoint, I would advocate for theme saturation as opposed to information saturation. In forthcoming investigations, I will not only consider this when gathering data, but also when crafting my manuscripts, to ensure that my current stance on saturation is effectively conveyed.

Thematic Emergence

In my qualitative papers, it is customary to analyse and discuss the themes that "emerge" (Corbin and Strauss, 1990). This implies a nearly passive approach to interpretation (O'Reilly and Parker, 2013) when an engaged researcher with their own distinct background, experiences, theoretical leanings, and connection to the data analyses and interprets the data (Watling and Lingard, 2012). As the nature of the narrative in a number of qualitative papers is such that the researchers have identified and eliminated their own biases in order to analyse the data, this is both implausible and obsolete (Watling and Lingard, 2012). Acknowledging the fact that researchers engage deeply with their data, contemplate it, and reflect on it in light of their prior experiences, their position influences their interpretation. As a result of the required active approach, researchers who adopt a passive stance may fail to possess the necessary reflexivity.

Reflexivity

It has been with the process of reflexivity that I have become increasingly involved over time. It is crucial to acknowledge and distinguish our personal beliefs and values, as they influence our analysis of the data and, consequently, the conclusions we arrive at (Olmos-Vega et al., 2023). Qualitative research by nature is subjective (Rees, Crampton and Monrouxe, 2020). Engaging in reflexivity can be important to acknowledging subjectivity and recognising it (Gentles et al., 2014). In retrospect, I would provide a more explicit demonstration of my reflexivity in my published works or as a supplementary resource. In future research I will look to ensure the whole research team takes part in reflexive processes (Rees, Crampton and Monrouxe, 2020)

Inter rater reliability

Reliability between inter coders or inter raters is a prevalent notion in qualitative research. It investigates the degree of overlap between two rates or coders. Once more, this is an instance of a more positivist assumption that a single truth exists; however, the information provided by the inter-rater reliability is rather ambiguous (O'Connor and Joffe, 2020). It could be valuable for the interviewer to transcribe the interview, as they will recall the interview and its details. This can provide further context for the interpretation and may also be facilitated by the interviewer and participant developing a rapport and relationship. Therefore, there is possible value in one interviewer, transcriber and data analyser. There is no consensus around inter coder reliability processes (Campbell et al., 2013). Nevertheless, an additional coder's interpretation of the data could introduce new and additional themes, angles; this notion of a critical friend has also been acknowledged and something I will look to explore and use more.

Delphi Studies

Both an undergraduate and graduate-level curriculum for Sport and Exercise Medicine has been reached in accordance with the findings of the two Delphi studies. On the contrary, several learning outcomes exhibited near-concordance with consensus or fell slightly short of the threshold when contemplating the design of a Delphi. It could have been possible to enhance or revisit the learning outcome had there been a dialogue or discussion involving the expert panel members regarding this matter. This is therefore a limitation of the traditional delphi process(Monforte et al., 2022). Nevertheless, this presents a challenge due to the feedback limitations and the random nature of the design. Further discussion and refinement may be possible regarding other consensus models that have already been mentioned. To further improve Delphi, it may be beneficial to conduct focus groups or interviews with a subset of the Delphi panel to investigate the rationales behind the decision-making in greater depth, with a particular emphasis on the less-than-unanimous learning outcomes or those that were narrowly rejected . By incorporating additional insights, this could have potentially strengthened the manuscript and furnished us with more comprehensive data, as well as opportunities to further refine our learning outcomes.

6 Key findings and outputs of this PhD by published works.

The portfolio of published works highlights the lack of SEM education including PA education in the undergraduate medical curricula. The research also highlights the lack of awareness around SEM as a specialty. The portfolio includes the first-ever original research paper exploring what SEM roles could be in the NHS and using this to aid in the development of both an undergraduate and postgraduate MSc SEM syllabus. These syllabi then gained consensus via a Delphi process to produce the first-ever published

undergraduate SEM and postgraduate SEM syllabus for SEM. Finally, the SEM textbook published by Routledge maps to the newly created postgraduate syllabus and provides the first resource to map to the curriculum and the national syllabus.

Table 13: Research Questions and Outcomes.

Research Questions	Key Findings/Outputs
1. Are there educational gaps and solutions to promoting PA amongst HCPs.	Medical doctors receive little PA education during undergraduate and postgraduate training. This should be addressed and welcomed.
2. What do the NHS and key stakeholders need from SEM?	An NHS SEM service should focus on MSK and concussion with exercise medicine not being a priority.
3. What should a UG SEM syllabus contain?	Via a Delphi process. 48 learning outcomes divided in to nine subthemes were produced
4. What should a PG SEM syllabus contain?	Via a Delphi process. 133 learning outcomes divided into 11 subthemes were produced. A textbook SEM: An Essential Guide has been produced mapping the learning outcomes

shows a graphical representation of all outputs. Table 2 shows the published works that form the portfolio along with details such as title, journal, contribution, and impact factor.

6.1 Graphical representation of published outputs

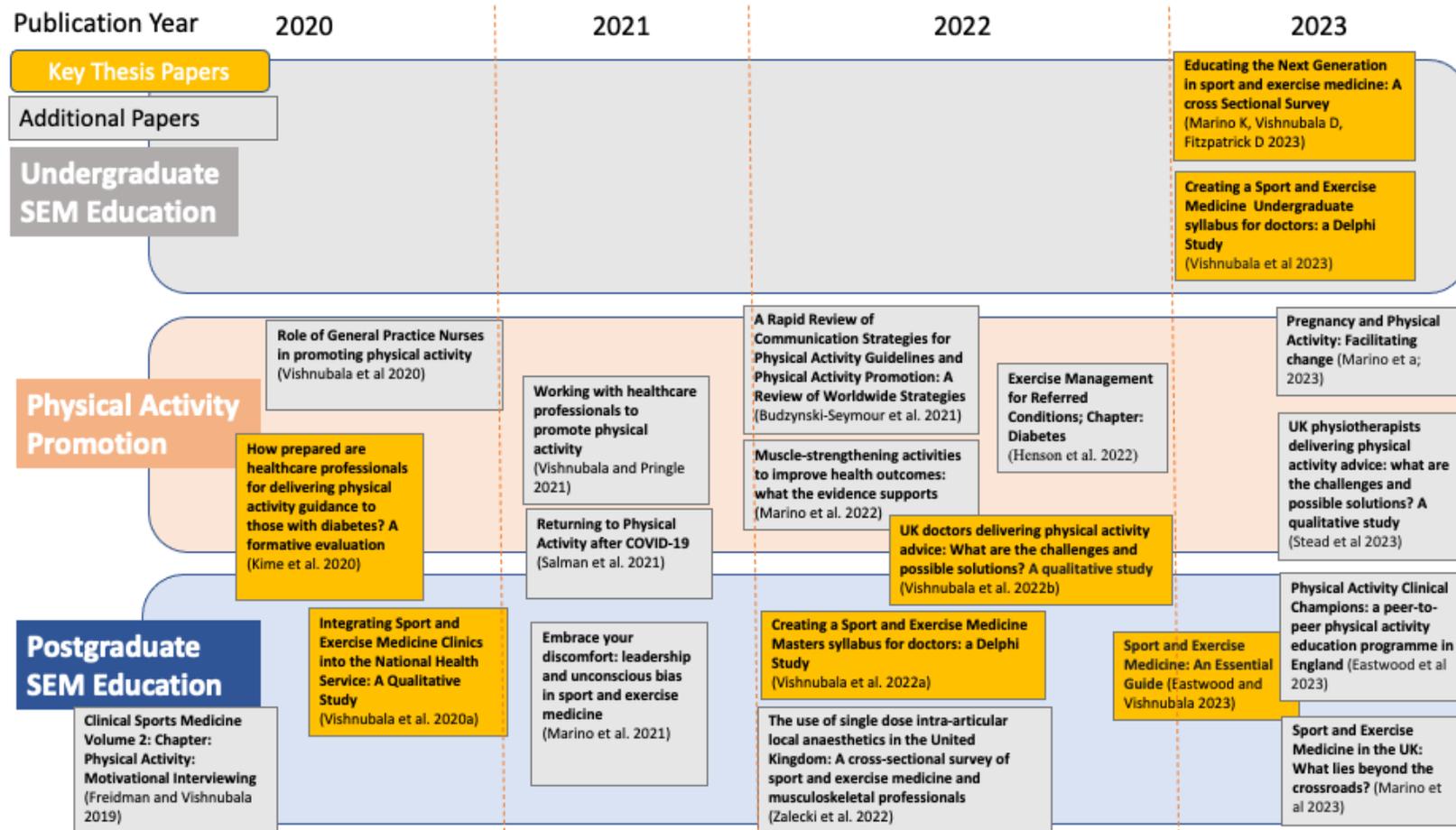


Figure A: Graphical representation of published outputs by theme and year. Gold boxes highlight the key papers that form the golden thread of the portfolio.

6.2 Overview of published outputs forming the portfolio.

Table 2: Overview table of peer-reviewed papers and published books/chapters highlighting the key outputs in gold.

Output Number (Year)	Type	Title of Publication (Reference)	Journal Published (Impact factor: IF)	Contribution and Roles
1 (2020)	Original Research	<u>How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation</u> (Kime et al., 2020)	BMC Health Services Research (IF 2.512)	Conceptualisation: NK AP SZ <u>DV</u> Methodology: NK AP SZ <u>DV</u> Data Gathering NK AP SZ <u>DV</u> Data Analysis NK AP SZ <u>DV</u> Project Administration NK AP SZ <u>DV</u> Writing NK AP SZ <u>DV</u>
2 (2020)	Editorial	<u>Role of General Practice Nurses in promoting physical activity</u> (Vishnubala and Pringle, 2020)	Journal of General Practice Nursing (IF n/a)	Overall Lead: <u>DV</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> AP Data Gathering <u>DV</u> Data Analysis

				<u>DV</u> Project Administration <u>DV</u> Writing <u>DV</u> AP
3 (2020)	Book Chapter	<u>Physical Activity:</u> <u>Motivational</u> <u>Interviewing</u> (Friedman and Vishnubala, 2019)	<u>Clinical Sports</u> <u>Medicine</u> (<u>Brukner and Khan</u>) Publisher: McGraw Hill Medical	Overall Lead: <u>DV</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> DF Data Gathering <u>DV</u> DF Data Analysis <u>DV</u> DF Project Administration <u>DV</u> DF Writing <u>DV</u> DF
4 (2020)	Original	<u>Integrating Sport and</u> <u>Exercise Medicine Clinics</u> <u>into the National Health</u> <u>Service: A Qualitative</u> <u>Study</u> (Vishnubala et al., 2020a)	BMJ Open Sport and Exercise Medicine (IF 3.14)	Overall Lead: <u>DV</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> MKP KE Data Gathering <u>DV</u> Data Analysis <u>DV</u> KM

				Project Administration <u>DV</u> Writing <u>DV</u> SG KE AP PB GF
5 (2021)	Editorial	<u>Embrace your discomfort: leadership and unconscious bias in sport and exercise medicine</u> (Marino et al., 2021)	British Journal of Sports medicine (BJSM) (IF 18.47)	Overall Lead: KM <u>JST</u> Writing KM <u>DV</u> OA PZ JW AS CL DC AO NJ JST
6 (2021)	Editorial/Review	<u>Working with healthcare professionals to promote physical activity</u> (Vishnubala and Pringle, 2021)	Perspectives in Public Health (IF 3.627)	Overall Lead: <u>DV</u> Conceptualisation: <u>DV AP</u> Methodology: <u>DV AP</u> Data Gathering <u>DV</u> Data Analysis <u>DV</u> DF Project Administration <u>DV</u> Writing <u>DV AP</u>
7 (2021)	Review	<u>Returning to Physical Activity after COVID-19</u> (Salman et al., 2021)	BMJ (IF 96.22)	Overall Lead: Conceptualisation: <u>DV</u> DS AHM

				<p>Methodology:</p> <p><u>DV</u> DS AHM</p> <p>Data Gathering</p> <p><u>DV</u> DS AHM</p> <p>Data Analysis</p> <p><u>DV</u> DS AHM</p> <p>Project</p> <p>Administration</p> <p><u>DS</u></p> <p>Writing</p> <p><u>DV</u> DS AHM PF TB</p> <p>JK AM</p>
8 (2021)	Original Research	<p><u>A Rapid Review of Communication Strategies for Physical Activity Guidelines and Physical Activity Promotion: A Review of Worldwide Strategies</u></p> <p>(Budzynski-Seymour et al., 2021)</p>	Journal of Physical Activity and health (IF 2.592)	<p>Overall Lead: E B-S</p> <p>Conceptualisation: E B-S JS</p> <p>Methodology: E B-S JS</p> <p>Data Gathering <u>E B-S</u></p> <p>Data Analysis <u>E B-S</u></p> <p>Project</p> <p>Administration E B-S</p> <p>Writing E-BS KM HM MW</p> <p>CF <u>DV</u> BB CW</p>

9 (2022)	Editorial	<u>Muscle-strengthening activities to improve health outcomes: what the evidence supports</u> (Marino, Vishnubala and Oja, 2022)	British Journal of Sports Medicine (BJSM) (IF 18.47)	Overall Lead: KM Conceptualisation: KM DV Methodology: KM Data Gathering: KM Data Analysis: KM DV PO Project Administration: KM Writing: KM PO DV
10 (2022)	Original	<u>The use of single dose intra-articular local anaesthetics in the United Kingdom: A cross-sectional survey of sport and exercise medicine and musculoskeletal professionals</u> (Zalecki et al., 2022)	Journal of Musculoskeletal Care (IF 1.36)	Overall Lead: CZ Conceptualisation: CZ MS Methodology: KM Data Gathering: CZ Data Analysis: KM DV CZ Project Administration: CZ Writing: KM DV CZ MS
11 (2022)	Original	<u>Creating a Sport and Exercise Medicine</u>	BMJ Open Sport and Exercise	Overall Lead: DV Conceptualisation:

		<p><u>Masters syllabus for doctors: a Delphi Study</u> (Vishnubala et al., 2022a)</p>	<p>Medicine (IF 3.14)</p>	<p><u>DV</u> Methodology: <u>DV</u> Data Gathering <u>DV</u> AI KRM Data Analysis <u>DV</u> AI KRM PB CN AP GF Project Administration <u>DV</u> Writing <u>DV</u> AI KRM PB CN AP GF</p>
<p>12 (2022)</p>	<p>Book Chapter</p>	<p><u>Exercise Management for Referred Conditions;</u> <u>Chapter: Diabetes</u> <u>Chapter Author</u> (Henson, Anyiam and Vishnubala, 2022)</p>	<p>Publisher: Routledge</p>	<p>Overall Lead: <u>DV</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> JH Data Gathering <u>DV</u> OA JH Data Analysis <u>DV</u> OA JH Project Administration <u>DV</u> Writing <u>DV</u> OA JH</p>

13 (2022)	Original	<p><u>UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study</u> (Vishnubala et al., 2022c)</p>	International Journal of Environmental Research and Public Health (IF 3.39)	<p>Overall Lead: DV Conceptualisation: DV AP Methodology: DV Data Gathering: DV AI RB SW Data Analysis: DV KM AI Project Administration: DV Writing: DV KM CN Manuscript review and editing: DV AI KM SW RB DS PB GF AP CN</p>
14	Edited Book	<p><u>Sport and Exercise Medicine: An Essential Guide</u> (Eastwood and Vishnubala, 2023)</p>	Publisher: Routledge	<p>Overall Lead: DV DE Conceptualisation: DV DE Methodology: DV DE Data Gathering: DV DE Data Analysis: DV DE Project Administration</p>

				<u>DV DE</u> Writing <u>DV DE, AL 50</u> contributors Manuscript review and editing <u>DV DE</u>
15	Original	<u>Educating the Next Generation in sport and exercise medicine: A cross Sectional Survey</u> (Marino, Vishnubala and Fitzpatrick, 2023)	Journal of orthopaedics trauma surgery and related research (IF 2.17)	Overall Lead: <u>KM</u> Conceptualisation: <u>KM DF</u> Methodology: <u>KM</u> Data Gathering <u>KM</u> Data Analysis <u>KM DV DF</u> Project Administration <u>KM</u> Writing <u>KM DF DV</u>
16	Original	<u>Creating a Sport and Exercise Medicine Undergraduate syllabus for doctors: a Delphi Study</u> (Vishnubala et al., 2023a)	BMC Medical Education (IF 3.263)	Overall Lead: <u>DV</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> Data Gathering <u>DV AI KRM</u> Data Analysis

				<u>DV</u> AI KRM PB CN AP GF Project Administration <u>DV</u> Writing <u>DV</u> AI KRM PB CN AP GF
17	Original	UK physiotherapists delivering physical activity advice: what are the challenges and possible solutions? A qualitative study (Stead et al., 2023a)	BMJ Open (IF 3.007)	Overall Lead: <u>DV</u> (Co-MSc Supervisor) Conceptualisation: <u>DV</u> AP Methodology: <u>DV</u> AI CN KRM Data Gathering <u>DV</u> CN AS Data Analysis <u>DV</u> CN AS Project Administration AS Writing <u>AS</u> Manuscript review and editing <u>DV</u> AI AP CN KRM AS

18	Editorial	<p><u>Sport and Exercise Medicine: What lies beyond the crossroads?</u> (Marino et al., 2023)</p>	<p>British Journal of Sports Medicine (BJSM) (IF 18.47)</p>	<p>Overall Lead: <u>DV</u> <u>KRM</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> KRM Data Gathering <u>DV</u> KRM Data Analysis <u>DV</u> KRM Project Administration <u>DV</u> KRM Writing <u>DV</u> KRM Manuscript review and editing <u>DV</u> KRM NJ CS NS RC JP LW ET</p>
19	Editorial	<p><u>Physical Activity Clinical Champions: A peer-to-peer physical activity education programme in England.</u> (Eastwood et al., 2023)</p>	<p>British Journal of Sports Medicine (BJSM) (IF 18.47)</p>	<p>Overall Lead: <u>DV</u> DE Conceptualisation: <u>DV</u> Methodology: <u>DV</u> DE Data Gathering <u>DV</u> DE Data Analysis <u>DV</u> DE</p>

				Project Administration <u>DV DE</u> Writing <u>DV DE JV AP</u>
20	Editorial	Pregnancy and Physical Activity: Facilitating Change (Marino et al., 2023)	British Journal of Sports Medicine (BJSM) (IF 18.47)	Overall Lead: <u>DV</u> <u>KRM</u> Conceptualisation: <u>DV</u> Methodology: <u>DV</u> KRM Data Gathering <u>DV</u> KRM Data Analysis <u>DV</u> KRM Project Administration KRM Writing <u>DV</u> KRM GD IM MV

This commentary is structured into four sections, namely the introduction, methods, results, and discussion as the overarching headings. Summaries, figures, summary tables and hyperlinks have been added to this document throughout to facilitate navigation and comprehension.

7 Introduction

7.1 Why is this research important?

Musculoskeletal problems are a significant burden to health services - accounting for one in three of all General Practitioner consultations (Jones and Weiler, 2016). Two-thirds of those with musculoskeletal (MSK) pain do not need a referral to orthopaedic surgeons or rheumatologists but are potentially best placed to be cared for by a Sports and Exercise Medicine Specialist. Additionally, nearly one-third of adults (Figure B and Figure D) in the UK are classified as inactive (exercising less than 30min a week) and the number of inactivity-related long term conditions is growing (Davies et al., 2019). In fact, approximately 1 in 6 deaths and 40% of long term conditions are linked to inactivity, and physical activity can contribute to the primary and/or secondary prevention of more than 20 long-term conditions. With 43% of adults having at least one long-term condition, improving physical activity levels have the potential to have a significantly positive impact on population health.

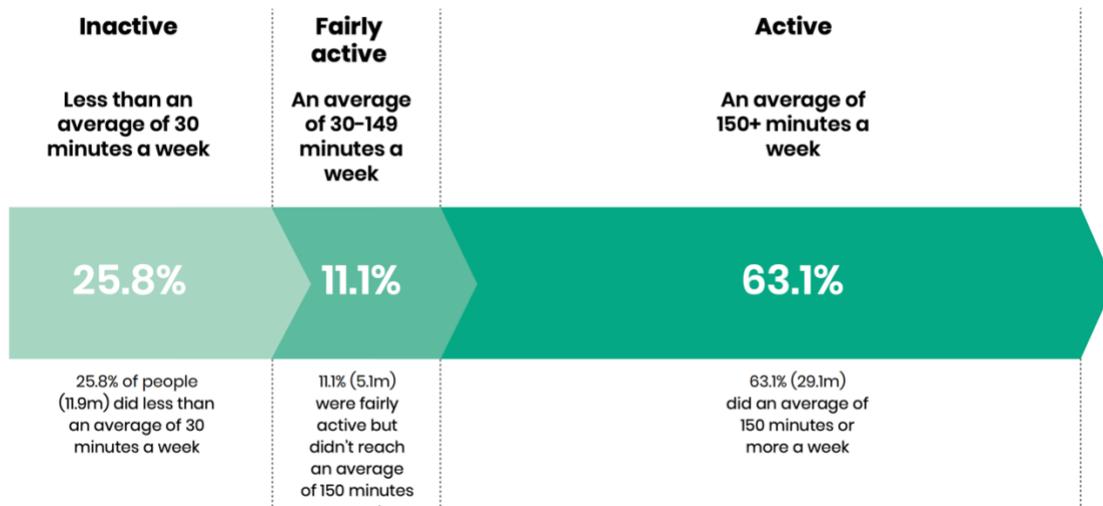


Figure B: Adult physical activity levels UK displayed as a graphical representative of key findings from the Active Lives Survey.



Figure C: Graphical Representation of Potential Roles of SEM and stakeholder allied professions.

Sport and Exercise Medicine doctors have education and training in team care, musculoskeletal medicine and physical activity and could help patients become more active (Jones and Weiler, 2016). Knowledge of physical activity (PA) guidelines by health care professionals (HCPs) is poor, yet if a patient is given PA advice by an HCP, a quarter of patients are likely to go from being inactive to active (Chatterjee et al., 2017).

How Active are Adults in England?

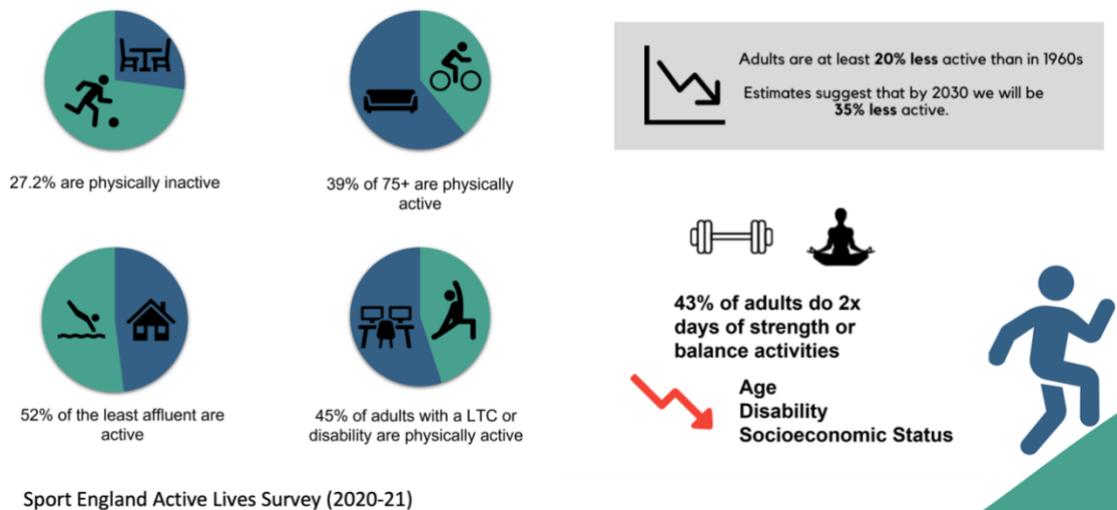


Figure D: Graphical Representation of Sport England Active Lives Survey.

Despite the potential growing need for the skills of SEM doctors as highlighted by the NHS long-term plan (Alderwick and Dixon, 2019) which highlights the need for preventative medicine, with an increasing burden of patients with long-term conditions, there is very little SEM in the medical undergraduate syllabus or awareness of the specialty at a university level (Pandya and Marino, 2018). Many postgraduate SEM-related jobs particularly in team care and MSK have an MSc in SEM as desirable or essential. However, there is currently no consensus on a syllabus for MSc in SEM (Kordi, Dennick and Scammell, 2005). (Kordi, Dennick and Scammell, 2005).

The NHS is struggling and needs to innovate to manage the needs of a growing, ageing population with increasing long term conditions and levels of inactivity (Alderwick and Dixon, 2019). SEM could play an important part (Jones and Weiler, 2016). Exploring the role a broad specialty such as SEM can play in the NHS (Figure C) has also not been investigated which is another research and knowledge gap. Understanding the NHS need of SEM will aid to develop learning outcomes that factor in the needs of the largest employers of doctors and lead to the development of a syllabus that is fit for purpose. The syllabus if implemented can then support the next generation of doctors and postgraduate SEM workforce to work in and support the NHS and have influence on our nation's health at a

time of rising NHS pressures. In the next section, the research aims will be articulated further. Considering the above, the following aims and objectives have been set.

7.2 Research question and aims

Table 3: Shows the aims and key research questions

Overarching Aim: To influence the future of SEM education in the UK
The key research questions that are answered by the core publications: <ol style="list-style-type: none">5. Are there educational gaps and solutions to promoting PA amongst doctors?6. What do the NHS and key stakeholders need from SEM?7. What should an Undergraduate SEM syllabus for medical students contain?8. What should a Postgraduate MSc SEM syllabus for doctors contain?

Considering the aims and questions in Table 3 above, this PhD by published works aims to understand the challenges that SEM as a specialty faces, explore the educational needs of current and future SEM doctors, understand the needs of the NHS from SEM and develop an SEM undergraduate and postgraduate MSc SEM syllabus. The next section explores what this portfolio of work contributes to our current knowledge of SEM education.

7.3 Key contributions to knowledge

The NHS in England is made up of 42 integrated care systems (Sanderson et al., 2023), of which only 15 benefit from SEM expertise and input (FSEM, 2023a). There are only a few NHS jobs in SEM (Jones and Weiler, 2016) despite growing evidence to show the value SEM

can offer (FSEM, 2023a). This portfolio of research has answered several unanswered questions and research/knowledge gaps. This thesis and its associated publications have helped to showcase what role SEM could play in the NHS (Vishnubala et al., 2020a), identify educational gaps and a need for SEM and PA Education (Vishnubala et al., 2022c; Kime et al., 2020), surveyed the British Association of Sport and Exercise Medicine (BASEM), the largest national sports medicine membership organisation in the world, to understand their view on undergraduate SEM education needs (Marino, Vishnubala and Fitzpatrick, 2023) and used the information garnered from all of these pieces of research to develop undergraduate and postgraduate syllabi and gain consensus via a Delphi methodology. The developed SEM syllabi for an undergraduate SEM and an MSc SEM aimed at doctors achieved consensus via Delphi methodology. (Vishnubala et al., 2023a, 2022b). This is the first such published consensus to be carried out in the UK. The syllabi have also been implemented into a tangible output in the form of a SEM textbook published by Routledge (Eastwood and Vishnubala, 2023). It is the only SEM textbook to map to agreed UK standards and has already been adopted by several leading universities, including the University of Leeds.

The undergraduate SEM syllabus has been adopted by the Faculty of Sport and Exercise Medicine (FSEM), which is the national governing body for SEM in the UK as well as the BASEM, a leading organisation with one of the oldest and largest SEM memberships in the world. At the time of writing, It is currently being edited into a public-facing document with supporting information around implementation advice aimed at medical schools. This will enable the syllabus to be visible and allows institutions to implement it into their undergraduate curricula should they wish.

Overall, this collection of research has developed and gained consensus for a UK undergraduate and postgraduate MSc SEM syllabus factoring in the needs of stakeholders (Vishnubala et al., 2022b, 2023b). The next section will explore the relevant literature that grounds this portfolio of work and sets the scene further.

8 Relevant Literature

In this section, I will use the literature to introduce and discuss SEM as a specialty and the development of the medical specialty. This is not a literature review per se. I will then explore the literature pertaining to SEM around developing a syllabus and gaining a consensus. Finally, I will then explore the literature surrounding the promotion of PA by healthcare professionals.

8.1 SEM as a specialty and its development

The specialty of SEM was formally recognised by the GMC in 2005. Initially, it was given approval with the provision that exercise medicine was included due to its perceived importance in NHS settings (Cullen, 2009). Approval was gained around the time of the successful bid for the London Olympics. The specialty encompasses team care, MSK medicine and exercise medicine (Jones and Weiler, 2016). To become a specialist, doctors must undergo further training. The duration of time to get specialist recognition is 8-9 years post-medical school graduation (JRCBT, 2019). The route to specialist recognition is shown in Figure E and will be discussed in 3.2.

There are several key organisations involved in SEM education in the UK. FSEM, as well as the Joint Royal Colleges of Physicians Training Board (JRCPTB, 2021), oversee SEM specialist training in the UK. BASEM provides a broad range of education from undergraduates to early career professionals, those with an extended role, registrars, and specialists (consultants). FSEM also provides professional exams for those wishing to do SEM as an interest or in an extended role as well as those training to be specialists to enter the GMC register.

Regarding scale, there are approximately 180 consultant doctors (specialists) in SEM on the GMC specialist register (FSEM, 2023b; Jones and Weiler, 2016). There are now 19 NHS trusts employing SEM consultants (Jones and Weiler, 2016). The military, NHS and private sector all employ consultant doctors (physicians) in SEM. With the growing number of consultants, FSEM aims to make clear its strengths and possible contributions, particularly in an NHS

setting which is reiterated and laid out its latest strategy document FSEM strategy 2022-2025 (FSEM, 2022).

The need to create and implement SEM services into the NHS has been a key driver for FSEM. The FSEM workforce planning document (FSEM, 2023a) outlines a possible strategy with reasoning. There are several ways SEM could add value, this includes the use of a potential “one-stop shop” with integrated MSK pathways and services. SEM professionals in MSK services are thought to reduce care variation, improve patient experience, be less likely to over-investigate, and likely to be cost-effective (FSEM, 2023a). Of the UK’s 42 Integrated care systems (ICS), only 15 currently have any SEM input into their service offerings.

While significant progress has been made, specialist training numbers have dropped including the loss of training posts in Wales and Scotland (Jones and Weiler, 2016; Marino et al., 2023). Key challenges including increasing training numbers and increasing the number of NHS posts remain, as well as standard setting via professional exams required by doctors working towards specialist recognition in SEM. There are several factors to consider for this drop in training numbers, including a loss of momentum after the London 2012 Olympics, low numbers of NHS posts, and large numbers of SEM consultants practising predominantly within the private sector (Marino et al., 2023).

As specialist training in the UK is paid by taxpayers, specialist training is intended to assist and educate future NHS consultants. Consequently, recognising and comprehending where SEM belongs inside the NHS and how it might provide value as a specialty is key, and, accordingly, FSEM has outlined its stance and aims in its workforce planning document, including increasing the number of SEM consultants, the number of training posts and ensuring that SEM is involved and has an input in MSK commissioning (FSEM, 2023a). The roles and services where SEM might provide support and develop more SEM consultant positions are crucial in possibly expanding the number of trainees and enhancing patient care. The next section explores specialist training in SEM further.

8.2 Specialist training in SEM

Higher specialist training is the route taken by doctors in the UK to become registered specialists on the GMC register and subsequently to qualify or else become eligible for consultant positions (Harries et al., 2016). Figure E shows the specialist training pathway. Training will include rotations in general practice, emergency medicine, rheumatology, orthopaedics, public health, medical specialties, musculoskeletal medicine, paediatric musculoskeletal medicine, prehospital medicine, and elite sports medicine (JRCPTB, 2021). During this period, doctors will cycle through a variety of positions to broaden their medical knowledge and experience as well as fulfil the curriculum requirements of specialist SEM training. In the UK, it might take between 8 and 9 years after medical school graduation to become a specialist in SEM, although in other countries the time required is much shorter (McLarnon and Heron, 2022; Jones and Weiler, 2016). This portfolio does not focus on specialist training, given the recent development of the UK specialist curriculum (JRCPTB, 2021). It is important to consider the specialist curriculum when considering what a syllabus for an MSc SEM for a doctor interested in an extended role needs to contain.

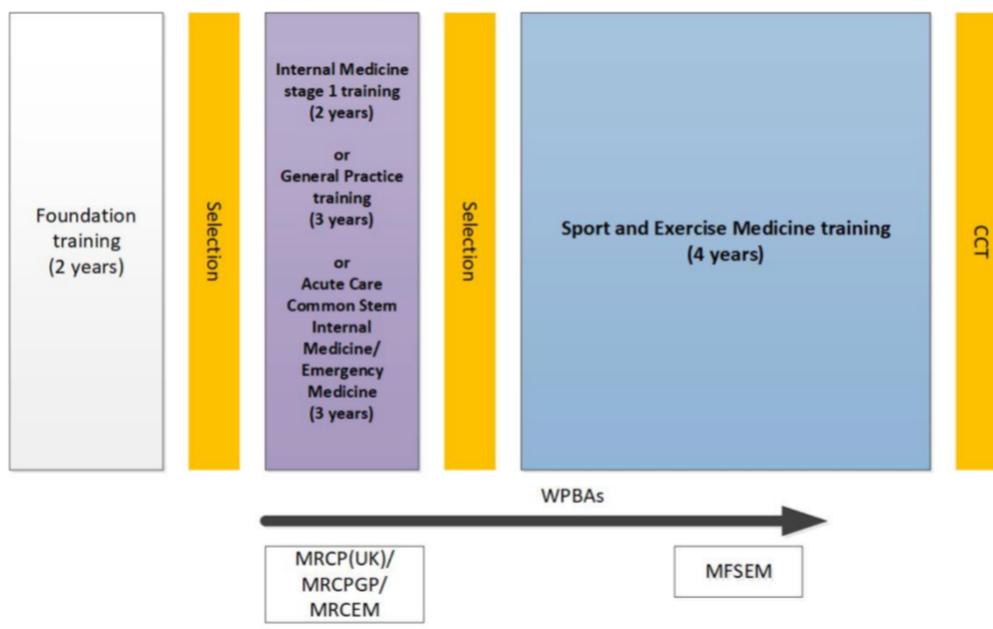


Figure E: Training Pathway to becoming an SEM Specialist.

Doctor With an Extended Role

Several nations recognise SEM as an independent specialty, while others recognise it as a subspecialty or a subject of interest (Neunhaeuserer et al., 2021; Pigozzi, 2009; Jenoura, 2016). A subspecialty requires the clinician to complete training in their initial specialties, such as general practice, rheumatology, or orthopaedics, and then subspecialise further. Given the varied terms used in each country to characterise training and define a specialist, this can be difficult to ascertain. In the UK, specialists are listed on the specialist register of the GMC after undergoing the extensive training already outlined and passing the formal examinations described previously and administered by FSEM. Many physicians complete MSc in SEM or FSEM membership examinations and practise SEM in the capacity of a doctor with special interest. GPs in the UK refer to themselves as GPs with an extended role, formerly known as GPs with a special interest or GPSis (Gérvás et al. 2007; Thomas et al. 2020). In the UK, additional programmes are presently being developed, including the recently introduced diploma in MSK medicine, as well as an exercise medicine exam and a team medicine exam (FSEM, 2022). Diplomats are those who pass this professional knowledge examination and can join the faculty as diplomat members (Hazan, 2022).

It is possible to work privately, for the military, or the NHS, among other locations of work, in the field of SEM (Evans, 2016). This means that those who work in SEM have access to a vast array of possible positions. The preponderance of these positions usually requires an MSc in SEM or a postgraduate diploma in SEM. This is an important distinction to make when examining the literature, given the wide variety of roles, experience, qualifications and titles of a doctor working in the field of SEM. While a GMC curriculum exists for a specialist in SEM, those working with an extended role do not have a defined syllabus or curriculum. The MSc in SEM which is the most common prerequisite to work in an extended role at present, has no nationally agreed syllabus with higher education institutions all running their own syllabi (Kordi, Dennick and Scammell, 2005).

Development of SEM Syllabi

Recognising the challenges, opportunities, and requirements of the specialty is crucial when devising a syllabus. The development of syllabi forms an integral component of this thesis. What should an SEM syllabus for an undergraduate degree or a postgraduate MSc contain? SEM doctors can operate in a variety of settings and capacities (Kordi, Dennick and Scammell, 2005) which presents a challenge without a consistent syllabus. SEM practices and training are universally variable (Neunhaeuserer et al., 2021). There are no published articles on the development of the current UK specialist SEM curriculum. However, there are two papers exploring the development of an international specialist curriculum and one exploring an MSc SEM syllabus, although there is presently no literature available on an undergraduate syllabus. Below, I will explore the three identified papers further.

Paper 1: Defining the Sports Medicine Specialist in the UK: A Delphi Study (Thompson 2004)

The Delphi study had a sample size of 160 participants. The majority of participants in a UK-based Delphi study (Thompson, 2004) comprised of members of the BASEM agreed that orthopaedics, soft tissue medicine, and emergency medicine are essential components of SEM. Seventy-two percent of respondents deemed a functional knowledge of rehabilitation, particularly physiotherapy, to be essential. All other disciplines, including rheumatology, had a 16% agreement rate. This contradicts the current specialist curriculum in the UK which incorporates rheumatology and other topics not regarded essential in this Delphi. Notably, this Delphi was conducted prior to the official recognition of specialty in the UK and, consequently, all respondents were physicians with an interest in the topic rather than "specialists" per se. Anecdotally, at the time of the research, many physicians practising SEM would have been active within the private sector, as there was no GMC specialty recognition or official NHS work, which may have also distorted the results of this Delphi. Only 53% of individuals responded to the survey. The most recent GMC SEM specialist curriculum was updated in 2021 (JRCBT, 2019), although the mechanism by which this was accomplished was neither transparent nor made public or published.

Paper 2 Developing learning outcomes for an ideal MSc Course in Sports and Exercise Medicine (Kordi, Dennick and Scammell, 2005)

This was the only paper exploring an MSc Syllabus in SEM in the literature. The paper produced 29 learning outcomes. The methodology appears to use a survey format to rank agreement of the proposed learning outcomes. The survey was sent to 61 course graduates, 56 teachers, 32 students and 20 course directors. There is very little information about the demographics beyond this. It is unclear who was involved in the development of the draft syllabus. While the survey methodology of ranking agreement appears to align with a Delphi, there was only one round with no opportunity for comments or revisions. While the rigour of the methodology reduces the confidence in the outcomes, it is a useful starting point when looking to develop an MSc SEM syllabus.

Paper 3: International Delphi for a specialist SEM curriculum (Humphries, Jaques and Dijkstra, 2018; Humphries et al., 2021)

A two-part international Delphi for a specialist syllabus for SEM was published first in 2018 and then again in 2021. The syllabus was designed for use in developing nations that may not have the resources to develop a syllabus and where SEM may not be a specialty. The 11 domains developed are shown in Table 4. The curriculum comprises eleven domains and eighty general learning areas, with a separate paper outlining the specific learning areas for each of the general ones. The international syllabus in the SEM group (ISSEMG) contributed to the writing of the article. The group consisted of 17 specialists from 12 countries, whereas the second paper included 26 clinicians with a variety of specialisations drawn from 12 nations. This is the only consensus of a specialist syllabus in the published literature. The methodologies utilised were a modified version of the Delphi methodology, with a threshold of 80% for agreement. According to Keeney (Keeney, Hasson and McKenna, 2006), consensus should aim for a 75% agreement, although there are many factors to consider here. Depending on the round of the Delphi, response rates ranged from 60% to 100%. While a response rate of 60% is not optimal, a response rate of 80% represents an

appropriate target (Msibi et al., 2018). While Kilroy advised that we should ensure that response rates from the panel do not fall below 70% (Kilroy, 2006).

Delphi methodology has been widely used in curriculum development for some time. This is an opportunity to begin with a clean slate when using Delphi. As the expertise is anonymous, a Delphi approach prevents vocal individuals from dominating the consensus process, as may happen in a focus group (Jairath and Weinstein, 1994). The panel's knowledge as subject matter experts is more important than the panel's size (Akins, Tolson and Cole, 2005). The paper by Humphries (Humphries, Jaques and Dijkstra, 2018) indicates that 17 specialists were chosen for the final panel, but it is unclear how they were selected, what their credentials were, or what the inclusion/exclusion criteria were. Consequently, it is difficult to comment further. This presents a fascinating conundrum. The nature of what constitutes an expert has been the subject of considerable debate. However, for our purposes, an expert is regarded as a person with the necessary qualifications and experience in the subject matter being reviewed (Keeney, Hasson and McKenna, 2006) who, therefore, can offer insight. Statistical analyses of Delphi panel dimensions have revealed a wide range of panel size recommendations. A panel size greater than 30 does not enhance Delphi's quality (de Villiers, de Villiers and Kent, 2005).

Table 4: Humphries et al 2018 11 domains for the international SEM Specialist Syllabus

The 11 domains agreed upon from the first paper (Humphries, Jaques and Dijkstra, 2018) were:

1. PA and human health
2. Medical issues related to exercise
3. Injuries related to sports and exercise
4. Nutrition
5. Pharmacology
6. Antidoping
7. Sports team care and sports event medical management
8. PA in challenging environments

9. Specific groups undertaking sports and exercise
10. Intrinsic skills of an SEM physician
11. Extrinsic skills of an SEM physician

This is the only original research consensus on a specialist SEM syllabus available. However, the paper's lack of clarity on the recruitment process of the expert panel selection and lack of inclusion/exclusion criteria should be noted.

8.3 Gaining Consensus for a Syllabus

Gaining a consensus with regards to any curriculum or syllabus is important to ensure that experienced clinicians working in the field of SEM agree these are suitable, appropriate, and relevant learning outcomes. Consensus development methods (CDMs) can support complex decision-making by allowing a systematic approach to the synthesis of expert opinions (Humphrey-Murto et al., 2017). In a CDM, there are repetitive interactions with a particular “expert” group until a consensus is reached.

Several types of CDM are used:

- Nominal Group Technique (NGT)
- Delphi Technique (DT)
- Consensus Development Conference (CDC)
- RAND/UCLA Appropriateness Method (RAM)

Table 5 shows a summary of the different CDM models commonly used. As the method used in the portfolio is a Delphi, this is introduced next and discussed further in Section 4 of the methods.

Table 5: Overview of commonly used consensus development techniques

Consensus Development Method	Overview
Nominal Group Technique (NGT) (McMillan, King and Tully, 2016; Pope, 2000)	A face-to-face approach using small groups across four phases: silent generation, round robin, elucidation, and ranking.
Delphi Technique (DT) (Meskell et al., 2014)	Asynchronous, remote, anonymous approach in which expert participants provide opinions on items and rate/rank them. Multiple rounds occur depending on the design.
Consensus Development Conference (CDC) (Murphy et al., 1998; Arakawa and Bader, 2022)	Small group process with experts presenting evidence to the small group participants. Face-to-face with a chair facilitating the process. Participants then discuss, debate, and come to an agreement
RAND/UCLA Appropriateness Method (RAM) (Brook, 1994) (Raine et al., 2015)	A hybrid method that combines NGT and DT. 5 stage process, with a literature review to generate a list, expert panel rank agreement, then debate the issues and disagreements, following revisions a final round of anonymous ranking.

Delphi Technique (DT)

Since the 1950s, the DT has been widely utilised as a technique for achieving consensus (Meskell et al., 2014). Utilising a group of "expert" participants in an interactive, iterative process. Participants solely interact with the task and not with one another. Participants are required to rate their agreement and opinions/views on each item. The research team then compiles and revises any items that did not meet the predetermined agreement and repeats the procedure with the revised items. The entire procedure is anonymous and

asynchronous potentially enabling greater participation. While the participant's opinion is typically objective, participants cannot develop/discuss/debate the items further.

8.4 Promotion of PA by HCPs

PA or exercise medicine forms a key part of SEM as laid out by the current specialty curriculum (JRCBT, 2019) and FSEM. While it is given importance, where and how it fits into SEM and how SEM would conduct such a role, particularly in an NHS setting, is open to discussion.

At present FSEM's direction and that of the Office of Health Improvement and Disparities (OHID, formerly Public Health England) is around increasing the amount of PA carried out by the public to prevent long-term conditions. FSEM currently runs Moving Medicine (Brannan et al., 2019) which is a PA online resource to be used with patients to provide evidence-based advice on becoming physically active to prevent or manage a range of long term conditions (Brannan et al., 2019). The most recent UK Chief Medical Officer (CMO) states the importance of PA in the primary and secondary prevention of several long term conditions (Davies et al., 2019). The CMOs, Sport England and OHID/PHE have all identified HCPs as being integral to the promotion of PA to patients (Brannan et al., 2019). However, several studies suggest a lack of awareness and knowledge around PA amongst HCPs as well as highlighting other barriers such as time (Chatterjee et al., 2017; Lowe et al., 2017) and lack of centralised resources. There appears to be a gap in the literature around proposed solutions that help HCP promote and develop PA with their patients (Chatterjee et al., 2017).

With this in mind, OHID ran the Moving Health Care Professionals Programme (MHHP), which aims to increase awareness, knowledge, and confidence around PA among HCPs (Brannan et al., 2019). The programme commissioned online learning for HCPs via BMJ and eLearning for health and tried to influence the undergraduate and postgraduate curricula by running work groups and lobbying the medical school's council (MSC), GMC and individual

medical schools (Brannan et al., 2019). OHID also ran a unique peer-to-peer education model for 8 years called the PA Clinical Champions Programme (Brannan et al., 2019). The programme recruited a range of clinicians to act as PA clinical champions and deliver a standardised training session to HCPs. The programme had nearly 50+ champions. The programme has educated over 40 000 HCPs and has been further evaluated. The evaluation showed that there was an increase in knowledge of PA by HCPs, there was an increase in confidence around discussing PA with patients and, finally, HCPs post-training increased the number of conversations they had around PA (Sport England, 2021). Following the transition of PHE to the OHID, the programme has been put out for tender by Sport England to make it a sustainable programme. A collaborative bid led by the Advanced Wellbeing Research Centre (AWRC) of Sheffield Hallam University has been accepted and the programme will restart in September 2023 and will look to also develop a more sustainable model moving forward with a places-based focus.

9 Methods

Table 6: Shows the aims and key research questions.

Overarching Aim: To influence the future of SEM education in the NHS.
The key research questions that are answered by the core publications: 5. Are there educational gaps and solutions to promoting PA amongst doctors? 6. What do the NHS and key stakeholders need from SEM? 7. What should an Undergraduate SEM syllabus for medical students contain? 8. What should a Postgraduate MSc SEM syllabus for doctors contain?

To achieve the aims and answer the questions highlighted in Table 6 a range of methods were considered. Research questions 1-2 have been grouped due to their similar methodology, as have 3-4.

9.1 Questions 1-2: Qualitative Research

The first two questions, as discussed in the relevant literature Section 3.4, have been explored, albeit predominantly via surveys. The surveys highlight some areas but given the limitations of surveys in allowing a thorough expansion and exploration of the comments made, a focus group or interview approach may aid in answering the question better. Due to the busy nature of the individuals involved from a practical viewpoint, as well as to avoid issues regarding bias and dominance, a semi-structured interview approach was taken. Question 2 would also be best served following a similar approach. There is no original research around this question, only editorials discussing the role of SEM in the NHS.

9.2 Semi-Structured Interviews

Through semi-structured interviews, a small number of participants can investigate an issue or question in depth. Four of the original research publications for the thesis are semi-structured interviews. Semi-structured interviews require a relational approach based on active involvement and inquiry (Braun and Clarke, 2006). In addition, it demands well-developed interviewing abilities. In lieu of a transactional question-and-answer structure, the approach should be iterative and evolve as the conversation develops. As with the great majority of qualitative research, the objective of these interviews is to attempt to comprehend the topic from the perspective of the participants; explore the relevance of people's perspectives; and investigate their lived experiences (Agostinone-Wilson, 2012). To properly respond to questions 1 and 2, it is vital to study and analyse personal experiences, attitudes, beliefs, perceptions, perceived barriers, and offered solutions. The semi-structured interviews used in this thesis were designed using a ten-step process shown in Table 7 (Braun and Clarke, 2006).

Table 7: Development approach for semi-structured interviews using Braun and Clarke as the framework.

Step	
1	Clarify and ensure clear purpose and scope
2	Identify the participants required. What are the inclusion and exclusion criteria?
3	Consider ethical issues
4.	Consider the logistics
5	Developing the interview guide
6	Establishing trust and rapport
7	Conducting the interview
8	Memo-ing and reflection
9	Data analysis
10	Trustworthiness of the data

Notably, the interview guide was created with an iterative approach involving several pilot interviews and stakeholder input. In qualitative research, it is challenging to identify the requisite number of participants and relevant amount of data. However, participant homogeneity, interview quality, and thematic saturation were all evaluated (Malterud, Siersma and Guassora, 2016) and considered.

9.3 Thematic evaluation

The idea that qualitative research is less rigorous is widespread (Braun and Clarke, 2006). According to several studies, qualitative researchers do not often specify their analytical methods (Attride-Stirling, 2001). Researchers offer an explanation and justification of their analysis methods (Braun and Clarke, 2006). Thematic analysis is a type of analysis in which data, in this instance semi-structured interview data, are examined to detect recurrent patterns. Following the selection of codes, themes are developed by employing the codes (Braun and Clarke, 2006). Inductive coding produces concepts based on given data (Thorne 2000). In contrast to deductive reasoning, inductive reasoning involves investigating or testing concepts. Due to the scarcity of previously published research, exploring PA and SEM, an inductive approach was utilised. The codes will then be examined and organised into themes and subthemes (Kiger and Varpio, 2020). To ensure the dependability of qualitative research, criteria comprising credibility, transferability, dependability, and confirmation should all be considered (Guba and Lincoln, 1989).

9.4 Questions 3-4: Syllabi development

To comprehend what should be included in the proposed syllabi, it is necessary to consult with knowledgeable, experienced professionals (Powell, 2003). Several techniques for achieving consensus have been highlighted. Due to the impracticality of gathering experts in person, face-to-face methods were ruled out. Face-to-face group work's potential for dominance and bias were also considered during decision-making. Therefore, while the hybrid approach of RAM had merits, an asynchronous, anonymous, and online approach utilising Delphi appears both plausible and practical. Delphi methods have been widely

utilised in curriculum and syllabus creation for some time (Meshkat et al., 2014). There is an opportunity to start from scratch with a Delphi (Fitch et al., 2008); however, given that a draft syllabus was developed by the research team and sent to the panel, this constitutes a modified Delphi. To prevent participant exhaustion and attrition, a two-stage approach was utilised. Consequently, this is a modified two-stage Delphi project, yet Delphi rounds could continue if a consensus is not reached (Green et al., 1999). Due to the anonymity of the expertise, a Delphi prevents vocal individuals from dominating the consensus process, as they would in a focus group (Jairath and Weinstein, 1994). It eliminates the inherent biases, such as conformity and dominance, that can arise in face-to-face group meetings (Nasa, Jain and Juneja, 2021). A flow chart showing the process of the modified Delphi is shown in Figure F.

9.4.1 Panel Identification for the Delphi Technique

It is believed that the panel's knowledge as subject matter experts is more crucial than its size (Akins, Tolson and Cole, 2005). The composition of a panel and the definition of an "expert" are contentious issues. Considering these considerations, an expert as a person who possesses the requisite skills and knowledge of the topic under evaluation, and who can therefore offer insight (Keeney, Hasson and McKenna, 2006). In terms of the number of panellists, analyses of Delphi panel sizes have revealed a wide range of values. In terms of panel size, a panel size of more than 30 is not believed to improve Delphi quality (de Villiers, de Villiers and Kent, 2005)

Recruitment and Access Negotiation for Panel Members

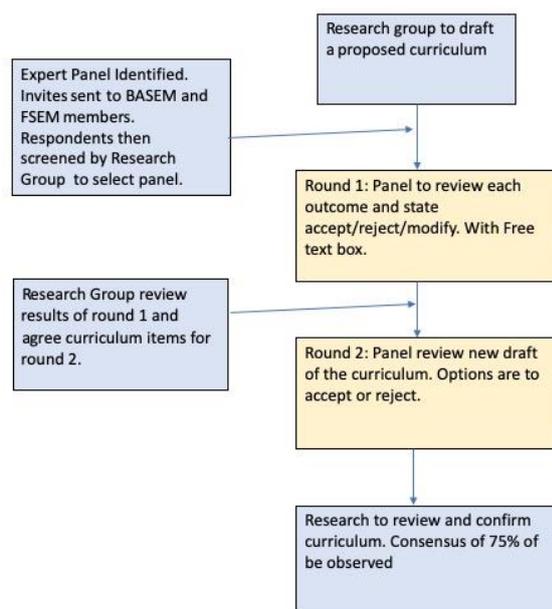
Panel members were approved by the research team and pilot group. Members of the panel will be "sourced" from the BASEM and the FSEM. Given that this is one of the smallest specialties in the UK, most experts on the GMC specialist register or doctors with a substantial interest tend to be members of one or both organisations.

Consensus and Response Rate

During Phase 1, panel members examined each curriculum item and will be allowed to accept, reject, or comment. Thereafter, they will be able to add an open comment.

The research team will then compile, evaluate, and create a new curriculum based on this data. To preserve academic rigour, it would be necessary to ensure that response rates from the panel do not fall below 70% (Kilroy, 2006). According to Keeney, 75% agreement is deemed to constitute a consensus (Keeney, Hasson and McKenna, 2006). It is important to note, however, that the greater the homogeneity of a group, the higher the percentage of agreement that may be required.

Figure F: Shows an overview of the modified Delphi methodology used in both undergraduate and postgraduate MSc SEM syllabus development.



9.5 Reflexive considerations from

This must be discussed in the first person, given that I will critically examine and acknowledge my own role as a researcher, my biases, assumptions, and possible influences that may impact my research. I will explore several domains that make up the reflexive considerations.

In my capacity as NHS England Training programme director for sports medicine in Yorkshire and having designed and led an MSc in SEM and taught on two others, I will have preconceived ideas of what a syllabus for undergraduate and postgraduate should contain. Given the broad research group I had for the Delphi and the large expert panel, this will have aided in mitigating that. As OHID's lead doctor for a national peer-to-peer PA education programme, I have developed a syllabus and later a curriculum around PA education of health care professionals as well as taught over 3000 HCPs. Therefore, again, I have several preconceived ideas about the role of education and the solutions required to increase PA advice provided by HCPs. Using a second coder to independently code and explore intercoder variability will have aided to some extent in managing potential biases I may have and the potential subjectivity that is inherent in analysing qualitative data. This should improve the robustness of the process and the validity and credibility of the output.

I had no specific relationship with any participant in the qualitative interviews and, for the Delphi, the participants were anonymised to avoid any biases when looking at the data given that the SEM community is relatively small.

9.6 Ethical considerations

All original research had university ethical approval. Given the nature of the research, the risk of harm, both physical and emotional, was extremely low. Delphi-related research was remotely done by the participant. The qualitative interviews have the possibility of causing participants emotional/psychological discomfort although, given the nature of this topic, this is extremely unlikely. No psychological or physical harm was caused to the knowledge of all involved in the research that form this thesis.

10 Results

The portfolio focuses on syllabus development at its centre, with several supporting research articles that aid in identifying the need and contributing to the construction of the first iteration of the curriculum prior to gaining consensus via an iterative process. The portfolio may be broken down into two themes. These consist of undergraduate education and postgraduate education. Table 8 below displays the seven selected publications that comprise the "golden thread" of the thesis. To maintain consistency, the numbering matches those in other tables. This section highlights and provides an overview of the results related to the key published papers.

Table 8: Key Publications that form the portfolio of published works.

Output Number	Type	Title of Publication (Reference)
1	Original Research	<u>How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation</u> (Kime et al., 2020)
4	Original	<u>Integrating Sport and Exercise Medicine Clinics into the National Health Service: A Qualitative Study</u> (Vishnubala et al., 2020a)
11	Original	<u>Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi Study</u> (Vishnubala et al., 2022a)
13	Original	<u>UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study</u> (Vishnubala et al., 2022c)
14	Edited Book	<u>Sport and Exercise Medicine: An Essential Guide</u> (Eastwood and Vishnubala, 2023)

15	Original	<u>Educating the Next Generation in sport and exercise medicine: A cross Sectional Survey</u> (Marino, Vishnubala and Fitzpatrick, 2023)
16	Original	<u>Creating a Sport and Exercise Medicine Undergraduate syllabus for doctors: a Delphi Study</u> (Vishnubala et al., 2023b)

10.1 Key Publications (Full Papers)

All seven key publications are available in full below.

RESEARCH ARTICLE

Open Access

How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation



N. Kime^{1*}, A. Pringle², S. Zwolinsky³ and D. Vishnubala⁴

Abstract

Background: Physical activity is recognised as important for diabetes management and improved overall health of individuals with diabetes, yet many adults with diabetes are inactive. Healthcare professionals have been identified as key to promoting physical activity, including individuals with diabetes, but are ill-prepared to deliver this. Our paper evaluates the barriers/facilitators of healthcare professionals' delivery of physical activity guidance to adults with diabetes and aims to inform efforts to investigate and enhance their preparedness to promote physical activity.

Methods: A sequential mixed method, two-phase design was adopted involving a purposeful sample of healthcare professionals. Phase one was an online pilot survey designed to test assumptions around healthcare professionals' knowledge, training and preparedness to deliver physical activity guidance. Phase two comprised eighteen semi-structured interviews, thematically analysed to provide an in-depth exploration of healthcare professionals' experiences of delivering physical activity guidance to adults with diabetes.

Results: Healthcare professionals are committed to promoting physical activity to adults with diabetes and are reasonably confident in giving basic, generic guidance. Yet, significant challenges prevent them from achieving this in their practice, including: lack of education and training around physical activity, diabetes and health; ignorance of recommended physical activity and diabetes guidelines; lack of awareness of referral options; limited time and accessibility to appropriate resources. Nevertheless, healthcare professionals believed discussions around physical activity needed to be an integral part of consultations, incorporating improved communication strategies for conveying key physical activity messages.

Conclusions: HCPs have a key role in the promotion of physical activity to people with long-term conditions such as diabetes and they are identified within both the strategic policy context and national interventions for physical activity. Yet, this study indicated that HCPs face multiple and at times complex barriers to physical activity promotion generally and with diabetes patients. Conversely HCPs also reported what works, why and how, when promoting physical activity. Rich information derived from the day-to-day, working healthcare professional is integral to shaping future practices going forward. The bottom up, iterative design adopted in this study provides an approach to tap into this information.

Keywords: Healthcare professionals, Physical activity, Diabetes

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Output 1: How prepared are healthcare professionals for delivering physical activity guidance. To those with diabetes? A formative evaluation

Background

Diabetes and its consequences are a major problem for health systems around the world, reaching epidemic proportions over the last 30 years [1]. Worldwide, over 420 million people are currently living with diabetes [2]. Furthermore, the absolute global economic burden of diabetes was \$1.3 trillion in 2015 [3] and in 2016, around 1.6 million deaths were directly caused by diabetes [2]. Fortunately, diabetes and its consequences are - for the most part - manageable. Medication, regular screening, treatment for complications, improved physical activity (PA) levels and diet can all help to avoid, delay or manage diabetes [2]. Yet, much of the responsibility for facilitating the requisite behaviour change lies at the feet of healthcare professionals (HCPs) [4]. Although the evidence base surrounding theoretical frameworks and systems-based approaches to behaviour change point to the powerful impact of concurrently addressing underlying influences on behaviour [5–7], unhealthy practices are often socially reinforced [8, 9]. Therefore, effective, cost effective, sustainable and implementable strategies that can help alleviate pressure on HCPs and struggling health systems remain in short supply.

Contemporary national programmes for increasing PA focus on the promotion of PA, including for those people living with a long-term conditions, for example diabetes [10]. As part of national initiatives, such as Sport England's Local Physical Activity Delivery Pilots, HCPs are expected to have an important role supporting both in the local community and community agencies tasked with promoting PA [10, 11].

While HCPs appear confident prescribing medication, screening, treatment and diet interventions for patients living with diabetes, there is less confidence and consensus among HCPs regarding the promotion of PA [12]. This could be problematic as the UK Chief Medical Officers (CMO) PA guidelines 2019 update, 'developing options for future communication and surveillance', highlighted the importance of a broad group of HCPs in promoting PA [13] and the Royal College of General Practitioners (RCGP) have identified PA as a strategic priority [14]. Many complex and multifaceted barriers account for insufficient levels of activity [15]. For example, HCPs do not always know what to recommend to people living with diabetes when asked about incorporating PA into their lives [16]. Further, HCPs and patients have cited this lack of knowledge, combined with the fear of hypoglycaemia and a loss of glycaemic control as a primary reason for non-engagement [17]. This fear may, in some way, account for people with diabetes being among the least physically active in society [18] and why a high proportion of patients living with diabetes struggle to maintain a healthy weight [19].

Allaying these fears are important since a physically active lifestyle is critical for blood glucose management

and overall health in individuals with diabetes and prediabetes [20]. Adults with a high exercise capacity display reduced risk of coronary artery disease, myocardial ischaemia and stroke, regardless of their diabetes status [21]. In addition, compared to those individuals with type 1 who are inactive, their active counterparts have lower levels of retinopathy and microalbuminuria [22], an increased likelihood of reaching HbA1c, blood pressure and BMI targets [19] and decreased total daily insulin needs [23]. With this in mind and in line with current guidance, PA should be undertaken, recommended and prescribed to all individuals with a metabolic condition as part of diabetes management and overall health [24].

Adopting person-centred, behavioural approaches in this context may improve the chances of achieving the desired PA outcomes. These approaches indicate that regular positive experiences promote the motivation and capability to adopt a behaviour, whereas negative experiences can lower motivation and perceived capability [5, 25]. Highlighting the unique needs of adults with diabetes and the challenges they face around PA is likely to be of great importance. Previous research has highlighted the role that HCPs play in providing information and appraising social support in the form of education around diabetes and PA [15]. In addition, there is a growing need to improve knowledge around PA in relation to diabetes among HCPs [12, 16], alongside appropriate and individualised application of this, integrated within a programme that emphasises the importance of PA in diabetes management. Importantly, these ideas require a detailed understanding of the preparedness of HCPs for delivering guidance and support to participants, as well as a detailed appreciation of mediated approaches to PA promotion, developed for adults with diabetes. These approaches are expected to help to develop a better understanding of what works - or not, why and how. In doing so, bottom up, exploratory and iterative approaches have been recommended [26] and deployed with professional groups who have a responsibility for the provision of PA and public health [27]. This can help establish the basis for forming and refining intervention activities including those aimed at enhancing the preparedness of HCPs.

Therefore, the aim of the work was to conduct a formative evaluation of HCPs working in primary care and the community around the delivery of PA guidance for those with diabetes. The evaluation details information relating to the characteristics, decisions and behaviours of these HCPs, to inform and develop future education and training programmes for this group and, therefore, improve diabetes service provision in respect of PA. An important aspect of the study was to identify the challenges faced by HCPs and understand what worked less well and why, important criteria for the successful management of PA promotion interventions [28]. Here we describe this formative evaluation process and identify

those factors that need to be considered prior to designing a behavioural intervention aimed at HCPs.

Methods

Study overview

This exploratory research study adopted a sequential mixed method design. The quantitative survey element of the research was implemented first and the findings were used to inform the qualitative interviews. As this study was exploratory, a non-probability sample of experts practicing within the field of diabetes and physical activity were recruited. This type of approach has been used previously in PA research to provide more in-depth accounts from health and social care professionals [27]. This involved a two phase, multi-site approach to evaluate the delivery of PA guidance by HCPs - working in either primary care or the community - to patients living with diabetes (including type 1 diabetes, type 2 diabetes and pre-diabetes). HCPs working in secondary care were not involved in this study. The study took place in the Yorkshire region between February and July 2018. A purposive sampling strategy was used to recruit HCPs who saw patients with diabetes as part of their role. Inclusion and exclusion criteria were based on whether a HCP was qualified, which was determined by the Health Care Personnel Law and Legal Definition. This states that Health Care Personnel are persons who have special education on health care and who are directly related to provision of health care services. The inclusion criteria were HCPs who met this definition.

Participants were first approached through General Practice surgeries and the researchers' existing links with community organisations. An initial email was sent to HCPs inviting them to participate by the research team. Those that wanted to take part were given an information sheet and asked to provide written consent.

The first phase of this study utilised an online pilot survey with HCPs. It was designed to test assumptions around HCPs knowledge, levels of training and preparedness to deliver PA guidance to patients living with diabetes. The findings from this pilot phase were used to determine the most appropriate lines of questioning and issues to be unpicked during the semi-structured interviews in phase two. The second phase of the study was based on a phenomenological approach that focused on HCPs experiences [29]. This was the most appropriate theoretical framework for exploring HCPs understanding of PA and diabetes and their preparedness for delivering it to adults with diabetes. Phase 2 involved individual, semi-structured qualitative interviews with HCPs. The interviews provided an in-depth exploration, as recommended by Knight et al. [16], of HCPs experiences of delivering PA guidance to patients living with diabetes, giving them an opportunity to talk freely about their

experiences. This combined approach facilitated a more robust and informative investigation of the current situation.

Data collection

Online pilot survey

A small purposive sample of HCPs participated in the bespoke online pilot survey, hosted by Qualtrics [30]. The pilot included multiple choice and open text response questions on participants own engagement in PA, previous education, their work-based training and knowledge of PA and diabetes, and the practicalities of delivering PA guidance in an appointment setting. The pilot survey took approximately 15 min to complete.

Semi-structured interviews

Reflecting the importance of using iterative bottom up and exploratory approaches when understanding and investigating HCPs practices [26], individual semi-structured interviews were conducted face-to-face or by telephone. The research team facilitated the interviews, either individually or in pairs. Each interview lasted between 15 min and 1 h. They were arranged at a time to suit the participants and in the case of face-to-face interviews, were held either in the work place or the participants' homes. An interview schedule was developed to guide the questions, which was piloted beforehand with a small number of HCPs. A semi-structured, deductive and inductive approach guided the interviews, which meant that the questions were aligned to both the main themes arising from the survey and the issues that arose directly from the participants as the interview progressed. This strategy allowed the participants to talk freely and share their views and experiences in respect of PA and diabetes. The questions centred on how prepared HCPs felt to deliver PA to those with diabetes, including the support they received and the barriers they faced. The interview schedule is available as supplementary material. Interviews were conducted until no new themes emerged and, therefore, data saturation was achieved. They were recorded with the participants' consent and no participation incentives were offered. Appropriate University ethical and local research and governance approval were obtained.

Data analysis

Online pilot survey

Descriptive statistics were used to describe data from the online pilot survey. All analyses were undertaken using IBM SPSS Statistics v25. Due to the sample size ($N = 6$) in phase one, there is an increased risk of disclosing information about individuals. For example, there are many cells with small counts, under 5. Although the tables themselves do not reveal the identity of an individual, there is a risk that combining or linking

tables within this data set may result in a secondary disclosure. By adopting a policy of small number suppression, data cannot be reported from phase one. Nevertheless, data from the pilot study suggested that although many participants were physically active themselves, there were significant shortfalls in training and knowledge around PA promotion for people living with diabetes. As a result, confidence to deal with the practicalities of delivering PA guidance in an appointment setting appeared low.

Individual interviews

The interviews were transcribed, and qualitative data analysis was conducted using a thematic approach [31]. This process involved generating categories and coding data so that common themes and links could be identified, but at the same time ensuring the data remained a faithful representation of the participants' comments [32]. As a means of reducing interpretation bias and increasing trustworthiness, transcripts were analysed by more than one member of the research team, all experienced in conducting qualitative analysis. In addition, participants verified the themes arising from the analytic process as a means of establishing the credibility of the findings. The researchers were aware of their influence on the study and endeavoured to employ reflexivity throughout the study process, using techniques such as critical reflection, note-taking and an assessment of their individual impact on data interpretation. A potential conflict of interest and ethical consideration was that one of the authors knew several of the participants, which may have led to coercive practices being employed. However, all participants were given an information sheet and asked to sign a consent form. The voluntary nature of participation was emphasised. In reality, the fact that some participants knew one of the authors turned out to be a strength of the study, since the author in question enabled access to a 'hard-to-engage' group, who ordinarily may not have set aside the time to participate in the study. Indeed, we came across cases where participants asked if they could be interviewed by this colleague and in doing so, we responded to participants' needs and a trusting and safe relationship was established.

Results

A total of 6 HCPs (4 Females; 2 males) participated in phase 1, some of whom participated in phase 2. A total of 18 HCPs (11 females; 7 males), participated in Phase 2. Of these, 15 participants were General Practitioners (GPs) and 3 were nurses employed either in a General Practice surgery or in the community. We present the results using a series of themes and selected excerpts in the following section which follows an approach we have used previously in the published literature [15].

Individual interview results

Training/education for HCPs

One of the most striking aspects of the interviews was that all HCPs, except one, stated that they had received little or no pre-registration education in physical activity or exercise (PA/E), both as a mediator for a healthy lifestyle or for preventing and managing diabetes, as part of their undergraduate or post-graduate training. The little training that they had received around PA/E was generic, in terms of being "good for your health" rather than specific to diabetes. As one HCP commented,

"During medical training I received no physical activity training at all...So, if you then asked me specifically how much I should do or what I should be telling them [patients with diabetes], I'd probably just say, 'you should do more' and that would probably be about where my medical training ends on that front" (HCP 9).

The exception to this was one HCP, whose initial degree included information on PA/E and at-risk groups. Other than this, any training or education in PA/E and diabetes that HCPs had received was undertaken whilst in their current role as part of their continuous professional development (CPD). This was largely undertaken on an ad-hoc basis and by individuals who took the initiative and chose to complete self-directed learning, for example, e-learning modules on the British Medical Journal website or attendance at study days. However, unless HCPs had an interest in PA/E, it was not an area in which they would voluntarily seek training, as exemplified by these HCPs,

"It's (PA/E) not in a GP curriculum, it's not in GP training, it's not in undergraduate training. So, unless you've found someone enthusiastic or somewhere to go and you're interested in learning, it wouldn't be something you'd do" (HCP 9).

"Well, I guess when it comes to diabetes specifically, we know a lot about the disease, the physiology, and I guess the drug management, but when it comes to the physical activity side of stuff I can't think of a single time I ever had any kind of lecture or group session to do with that. I think physical activity in general is really poorly taught to doctors, and when I've had to learn stuff I've had to go and... It's all very self-directed. I have actively to go and seek that information out. I can't think of a single time either at medical school or during my... or my training when we covered those topics" (HCP 13).

For those HCPs who had completed CPD training on PA/E and diabetes, the focus was on type 2 diabetes,

rather than type 1 diabetes or pre-diabetes. The emphasis was on medication and diet, and not PA/E, as a way of managing diabetes, as highlighted by one participant,

“There was never anything that was like here’s how to manage diabetes, on the lifestyle measure, physical activity. It was much more on the lines of, ‘right, diabetes, you need to discuss diet, you need to start thinking about medication’” (HCP 11).

Worryingly, even for those who had previously worked in a diabetes-specific role, PA/E was not a recognised component of diabetes management,

“I did actually do a diabetes job for four months. I wouldn’t say exercise was really discussed and since then, exercise-wise, pretty much zero CPD-wise” (HCP 8).

Guidelines for PA and diabetes care

All the participants were unfamiliar with any guidelines relating to PA/E and diabetes and had no idea where to go to find out specific information. Some participants referred to the British Medical Journal (BMJ) or the National Institute for Clinical Excellence (NICE), largely because they chose to be proactive, but the information sought mainly related to the treatment of diabetes rather than PA/E:

“There isn’t one consistent guidance for diabetes...I wouldn’t know if there was an authority to follow in the UK. NICE has a little bit of guidance about it, but again, it’s fairly broad” (HCP 9).

Of greater concern was the fact that only a small number of participants were familiar with the generic PA/E recommendations according to the CMO guidelines. Of these a few could recite the number of minutes for moderate and high intensity exercise per week, but as one HCP stated, this was despite having read any guidelines,

“I think I’d probably just have an image of what I’d say in my head, but that’s not based on being up-to-date...that I’ve read in the last 5 years” (HCP 10).

In addition, those HCPs involved in delivering medical training commented on the fact that even new doctors were unaware of the current PA/E guidelines for the general population,

“I was giving a talk to F1s (Foundation doctors) and I showed them the Government guidelines and the Chief Medical Officer guidelines [for PA/E]. We asked the question, ‘have you seen this before?’ I think one

person put their hand up to say they’d seen it. It was a group of 30. No-one knew the guidelines” (HCP 9).

Given the lack of training and education or awareness of where to find information on PA/E and diabetes, some HCPs stated that they felt their day-to-day practice was compromised in respect of delivering PA/E guidance to their patients,

“I can’t speak for all doctors, but I have a feeling that the sentiment is shared, we kind of feel a bit out of our depth when it comes to physical activity in general, especially when it comes to physical activity and diabetes” (HCP 13).

Nevertheless, they provided advice to their patients, which was largely based on opinion rather than recommended guidelines or policy,

“I guess most of the guys I work with would say, ‘you should do more exercise’ or ‘you should eat better’. Everyone has an opinion, but it’s based on their opinions rather than necessarily formal training...so we give the advice that we think is best” (HCP 9).

Perceptions of practice for promoting PA with patients with diabetes

Even though most HCPs had not received any formal training in PA/E in general or as a means of managing diabetes, and furthermore, were unaware of current PA/E guidelines, HCPs believed that many of their peers were aware of the need for more people to adopt lifestyle recommendations. They referred to the importance of exercise, diet and losing weight as generic considerations for the population in general, but also, as a means of reducing the likelihood of developing pre-diabetes and type 2 diabetes. Some HCPs placed a greater significance on PA/E rather than medication as a more effective way of managing type 2 diabetes,

“I’m definitely a less is more doctor. If I can stop people’s medications, then I’m thrilled. But that’s why I sought it [PA/E] out, because there’s good evidence now that exercise and weight loss is probably at least as effective, if not more effective, than medication [for type 2]” (HCP 1).

A misconception as to what constitutes PA, as opposed to exercise, was prevalent amongst HCPs. When asked specifically about this issue, many believed there were a lot of mixed messages around PA, exercise and sedentary time, in terms of their meanings and recommendations for increasing activity. For those HCPs who

could differentiate PA from exercise, they made a distinction between the two when advising patients and were able to emphasise the importance of fitting activity into everyday life,

“I also try to say they don’t need to specifically go out and exercise, but if they put some music on at home and they do lots of house jobs in that day, they actually use quite a lot of energy... Try and look at what you’re doing in a day and see where you can build in activity. When you do it regularly it becomes behaviour” (HCP 2).

Some HCPs believed that the existing PA/E support which was currently available was aimed at structured, formal exercise and not every day PA, when, in fact, the reverse should be the case with HCPs encouraging people to be more physically active within their everyday environment.

HCPs current practice

It was clear that there was no ‘one size fits all’ approach regarding HCPs delivery of PA/E guidance to their patients, irrespective of whether a patient had diabetes. Each HCP tackled PA/E differently depending on their role. Amongst GPs there were some commonalities. For example, they referred to the lack of time and not being able to fit PA/E, alongside other priorities, into one consultation. Therefore, the bulk of the responsibility for PA/E guidance was left to the practice nurses, although many GPs thought nurses probably placed a greater emphasis on diet rather than PA/E. When asked, GPs were unclear about the exact nature of the advice proffered by the practice nurses,

“I wouldn’t be 100% certain about how much time or information they’re [patients] given about exercise” (HCP 11).

In fact, practice and community nurses stated that they did address PA/E with all their patients who had diabetes, regardless of the type. This was achieved through an individualised, person-centred approach, focusing on a patient’s diabetes in the context of their lifestyle,

“I look at the person holistically – look at their medication, look at their current physical activity and look at the overall gains of physical activity to mental health, but also the weight loss and the impact that that will have on their physical health in reducing their blood sugars and the stabilisation of their diabetes” (HCP 6).

HCPs in general reported that of the patients they saw with diabetes, the majority had type 2 or pre-diabetes.

Therefore, the emphasis was on weight loss or calorie counting through a combination of diet and PA/E. HCPs tried to give practical advice according to the individual and sought to ascertain: firstly, the level of PA/E that the individual was currently doing and secondly, determine whether the individual knew the recommended amount of PA/E that they should be doing. Finally, HCPs presented opportunities for being more active which were tailored to the individual’s lifestyle and, therefore, more likely to appeal to the individual,

“Then if we both thought they weren’t doing enough, or they’d like to do more to help their condition, I’d probably explore the type of things that they would be interested in doing, that they could sustain doing... rather than telling them what they should” (HCP 10).

Confidence in delivering PA/E advice to patients

Most HCPs felt reasonably confident in giving basic, generic PA/E advice to their patients. This consisted of exploring the activities that patients currently engaged in and encouraging patients to be more active in the context of their everyday lives. However, when asked about giving PA/E advice to those with diabetes, specifically type 2 diabetes, there was a divergence of opinion amongst HCPs. Some were reluctant to offer advice,

“On a 1-10 scale, with 10 being really confident, probably like 3-4. My advice to them would probably be really generic lifestyle and physical activity advice that I’d give to anyone. Specifically, how I’d tailor that to diabetes [type 2], I would not know how to” (HCP 13).

Others reported feeling confident that they could apply their knowledge, however limited, to pre-diabetes and type 2 diabetes, but unless they had received specific PA/E training in relation to type 1 diabetes, they lacked the confidence to deliver PA/E advice in this context,

“Someone who was pre-diabetic and overweight, I’d feel pretty confident. If there was someone who had poorly controlled type 1 who was on high doses of insulin, I’d feel quite nervous about giving too specific advice about how much physical activity they could safely do... I’d probably avoid the conversation altogether, to be honest” (HCP 10).

An important point raised by a few of the HCPs was the level of confidence that patients placed in their HCP. They felt that this was a significant factor in determining if a patient engaged in PA/E. Key to this was the perceived knowledge of HCPs around PA/E and the way information was delivered. Essentially, if HCPs seemed

confident and knew what they were talking about, this instilled confidence in their patients,

“If you can get that engagement with them, that’s the other big thing. I think a lot to do with that is if they’re confident with you, you’re giving good messages...and they’re comfortable with you” (HCP 17).

Signposting and access to supportive resources

Most HCPs had limited knowledge about appropriate community services and support for patients who wanted to be more active. This was the case regardless of whether their patients had diabetes. They cited insufficient time to research what was available, an inability to keep track of local services and not knowing who to contact as the main factors,

“I wouldn’t actually know what’s available because it changes all the time according to funding and stuff in the area” (HCP 3).

Even when HCPs were aware of a local service, most notably, Exercise on Prescription, the National Diabetes Prevention Programme or DESMOND (Diabetes Education and Self-Management for Ongoing and Newly Diagnosed), they were unclear about how to access information to pass onto their patients,

“I found that there wasn’t very much information out there and that made it difficult for me to refer people in. People need to know...they’re asking you what it’s about and you think, ‘there’s only so much I can tell you’” (HCP 5).

In terms of in-house referrals, HCPs tended to signpost patients to either the practice nurse, visiting dietitian or in the case of one practice, a gym/personal trainer service.

The consensus was that if everything was in one location, there was an increased likelihood that patients would engage,

“I would argue that it (physical activity promotion) would come better from being from your GPs surgery than it would from the local authority. For the average lay person on the street, I suspect if they’ve got a health issue they’re not going to go on the council website, they’re going to come to us. And then if we send them to someone else to do it, that’s a barrier, in something that’s already got 20 barriers to doing the exercise” (HCP 1).

Some practices offered free education sessions for those with pre-diabetes or newly diagnosed type 2 patients.

However, HCPs were unsure about the content of these sessions, whether PA/E was covered in the curriculum, and even whether they were effective,

“There’s no good scheme to refer them to. There’s a pre-diabetes education session, but it’s a one-off session and it’s theoretical. I don’t think it’s enough to make someone change” (HCP 9).

Future developments and improvements in PA and diabetes

All HCPs highlighted the need for a greater emphasis on PA/E, in medical school curriculums and as part of CPD, both generic and applied to specific conditions such as diabetes. In the patient consultation, HCPs thought that PA/E should be an integral component, rather than, at best, an add-on at the end. HCPs referred to the fact that currently, there is no requirement to discuss PA/E in a consultation because it is not linked to a target and, therefore, not incentivised,

“The only thing that drives me absolutely insane is the fact that the funding is completely the wrong way round. We’ve got QOF (quality and outcomes framework) targets for their HbA1c, their blood pressure, whether they’ve had their feet checked...and there’s no mention of exercise or weight loss. I would love the funding to be attached to sustained weight loss or sustained activity, or at least providing them with discussions about their activity. It would actually focus the problem on what’s actually underlying, rather than how they’re actually fixing it” (HCP 1).

When asked what HCPs needed to help them focus on PA/E in the consultation, they referred to concise information, i.e. a leaflet like the existing diet sheets, which was regarded as more convenient than having to look on a website,

“I’d probably say a one-page summary outline with reference to all the kind of key facts, with evidence supporting it, as to what we ought to be doing as clinicians for patients with diabetes, exercise and how to go about delivering that” (HCP 13).

Likewise, regarding patient education and PA/E, HCPs thought that information needed to be succinct with clear guidelines for the patient to follow. Also, tailored patient information was important. It was suggested that one way of achieving this was through an interactive patient hub or one-stop shop,

“Some sort of resource in that way in which you can click on to things and it takes you to something a bit

more specific for you and gives you more tailored advice, would be useful" (HCP 18).

Many HCPs stated that PA/E promotion should be part of the practice nurse role rather than GPs since practice nurses saw patients with diabetes on a more regular basis. In addition, HCPs felt they needed improved strategies for communicating PA/E guidance effectively,

"Just getting the information across. May be some tips on how to get that information across and how to approach it with those patients, because they're not always the most receptive to the information we try to give them" (HCP 12).

From an HCP perspective, time was often a constraint on whether they delivered any PA/E advice. HCPs stated that if they had up-to-date and readily available information on current PA/E recommendations and local services, they would be more likely to discuss PA/E in what was often a time-pressured consultation,

"For me it's how we can get experts to make sure the resources are up-to-date, in an easy to find place, that's marketed to the clinician and realistic to what we can do in practice" (HCP 9).

Discussion

HCPs represent an important ingredient in efforts to promote PA within the population [13, 31, 33], including those with long-term conditions and this is reflected by their prominence in key national policy and interventions [10–14]. In this respect, understanding the barriers and facilitators that HCPs face are important in developing effective and supportive strategies and interventions that enhance their preparedness for PA promotion.

With those thoughts in mind, this study identified both the strengths of HCPs and the challenges they face in their efforts to promote PA for patients with diabetes. In line with previous research [34], our study encountered a genuine commitment by HCPs to promote PA despite difficult and challenging circumstances impacting their day to day work such as time [35, 36], large caseloads and competing demands as reported in other studies [37]. It has also been reported that medical students and doctors who are physically active themselves are much more likely to counsel their patients on PA and increasing the activity levels of medics has been suggested as an ingredient of a possible strategy for PA promotion in patients [38]. In this study, a number of HCPs reported in the interview data that they were physically active themselves and so this commitment to encouraging PA in their patients may also reflect their personal interest in sport and PA.

The commitment to PA promotion, including to those patients with diabetes is important, given the pivotal role of HCPs in national strategies and programmes designed for promoting PA, including those focused on patients with long-term conditions [10, 13, 39]. Indeed, the RCGP [14] identify PA as a strategic priority, while the 2019 CMO Physical Activity Guidelines have identified HCPs as being important in implementing PA messages to a range of groups [13]. Going forward, for the first time, the UK PA guidelines will be accompanied by a planned and coordinated communication strategy to support the implementation of the revised PA guidelines. Communication has been notably absent in recent PA guidelines and was recommended in technical reports aimed at supporting the new guidelines [40]. This is a positive development given HCPs in this study expressed concern about the fragmentation of resources to support PA advocacy.

That said, it is important that HCPs feel efficacious and knowledgeable in promoting PA to patients, including possessing an understanding of patients' needs, motives and determinants, in addition to the current PA guidelines [34].

In the UK, multiple HCPs present with diverse levels of training and experience [41]. In this study we encountered instances where HCPs lacked knowledge on the recommended guidelines on PA, including PA and diabetes, as reported elsewhere [39, 42]. In these circumstances HCPs expressed understandable discomfort. A lack of knowledge around the PA guidelines has been identified for other conditions within the literature [43, 44], but also for diabetes. Indeed, Knight et al., [16] showed two thirds of HCPs were unfamiliar with the evidence-based guidance leaving them unable to offer basic advice on insulin action [41]. Furthermore, Cuthill and Shaw [38] have identified that clinicians' knowledge of the relevant UK recommendations was reported in several studies to be as low as 7–27%. In part, this reflects the level of training and support HCPs receive, including training on PA which is an important component of effective PA promotion [39]. However, only very exceptionally did we encounter HCPs who had received full undergraduate training in PA and its relationship with health. Indeed a lack of training on PA promotion has been reported as a challenge, with HCPs in this study highlighting a lack of knowledge and skills as a result of little or no reference to PA in their undergraduate curriculum, which is documented elsewhere [38, 39, 45–47]. Interestingly enough, financial incentives have been suggested as interventions to incite HCPs to promote PA [39], yet we did not encounter this response in our study.

Looking forward, research has identified that future medical students want to receive more training on PA [48] and reports indicate that this issue is now receiving greater attention in undergraduate medical school curricula [49], for

example, through Exercise Works! (<http://www.exercise-works.org/>). Yet this does little to solve the immediate training needs of HCPs currently in post, including those in our study, where other options are needed. Also, it is important to mention that having accurate knowledge of the dose of activity recommended for health benefits is not enough to translate into improved PA promotion for the population alone. Doctors and indeed all HCPs must be confident and competent in administering advocacy, promotion and counselling skills [38] and this is an important part of CPD strategies.

HCPs in this study reported that there were options to engage in CPD and indeed several participants identified professional bodies that offered CPD opportunities with accreditation and as part of nationally recognised programmes. This is a step in the right direction, but HCPs reported needing to be motivated to seek out these CPD opportunities, some of which they accessed through their own volition. With those thoughts in mind, the RCGP are collaborating with Public Health England on the GP Clinical Champion Programme for PA [50, 51]. This involves recruiting HCPs such as GPs, nurses and other allied HCPs to a 'championing' and 'advocacy' role for PA, where the incumbents establish and build new local networks to promote the case for PA promotion with fellow HCPs through training and education opportunities [52].

Given the importance of competence and confidence in PA advocacy [38], for those HCPs who expressed a lack of confidence in their ability to disseminate information and advice, the Clinical Champion Programme is a positive development, but a more developmental approach, such as mentoring or peer-led training, might also be valuable in refining the skills and competencies for PA advocacy. For example, a Sport and Exercise Medicine pilot is underway at Oxfordshire University Hospital Trust. The programme adopts a peer-led approach to training HCPs in PA across a variety of clinical pathways and an Active Hospital toolkit is also in development (<https://www.sportengland.org/our-work/health-and-inactivity/moving-healthcare-professionals/>).

A further component of PA promotion by HCPs is an awareness of PA opportunities. In this study, HCPs referred to a lack of awareness of local services and options for referring patients into local PA programmes operating in the community [53]. This is arguably exacerbated by major reform of public health both locally and nationally which in turn has implications for PA promotion. Nationally there has been a reduction in funding for local authorities for public health operation. The UK Comprehensive Spending Review reports that spending will fall by at least £600 million in real terms by 2020/21, an annual reduction of 3.9% [54, 55], resulting in funding for PA opportunities being scaled back in

some areas [56]. The current economic climate may mean that the presence of PA opportunities such as Exercise Referral Schemes (ERS), which for a long time have been an important and readily available instrument in the PA armoury [38, 53] will be deemed resource intensive and may no longer be available. Already, this has meant that in some instances the commissioning process has led to a scaling back or restructuring of ERS in some local areas. Indeed, in one of the local contexts where this study took place, the local ERS had been restructured [57]. In some cases, this has reduced the number and type of options open for HCPs to refer patients to PA services. Changes in local PA provision may place further demands on HCPs to seek out the information on PA for patients from non-centralised sources, in turn contributing to time pressures faced by HCPs in their daily work and reported elsewhere [34]. Indeed, doctors report feeling insufficiently equipped to provide support or information to their patients [39]. In this study, online web-based sources of information on PA support and services were sometimes referred to as an easier option in providing information to patients, but knowing where to seek information was not always easy in practice, with information on PA located in multiple locations placing further time demands on already busy HCPs to seek out these resources. It remains to be seen if the updated 2019 PA guidelines [13], which is not only by a communication strategy, but also by a series of infographics available in centralised locations, helps address this challenge and would be a worthy focus of future investigations.

To support HCPs attempts to promote PA and in response to the pressures faced by HCPs, Moving Medicine (MM) was launched in 2018. MM is an interactive, evidence-based, internet tool to support brief advice in PA across a range of diseases and conditions [58]. Importantly, it houses information on PA in a central location. The intervention includes a series of modules linked to a range of conditions (including type 2 diabetes) in which PA can have a positive impact. It offers HCPs several strategies: time bound consultations, promotional materials and resources to assist patients through the process of being more physically active, as well as resources for patients that can be distributed. This is another step in the right direction and evaluation of this programme. However, given the responses of HCPs in this study, the evaluation should not only include impact outcomes on PA levels, but also process outcomes on the use and usability of resources [26, 59]. In particular, the extent to which MM helps HCPs overcome some of the commonly reported barriers in this study, such as confidence, competence time, knowledge and accessibility. Formative evaluative approaches like the one deployed in this study are likely to be valuable in this respect.

Limitations and strengths

This study has several limitations and strengths. Limitations include a lack of representation from nurses who take on an important role in PA promotion [52, 60] and form an essential component in the dissemination of the updated UK CMO PA guidelines [13]. Many of the participants in this study thought PA was important. Efforts to promote PA for long term conditions are likely to involve a critical mass of HCPs including advocates and non-advocates. In that respect, it would have been insightful to have engaged those HCPs who felt PA was not important to better understand their reasons for this. This is also important in developing interventions that facilitate awareness, engagement and preparedness for PA promotion.

In thinking about how such activities are deployed, the authors encountered reluctance from some GPs to speak with outsiders or researchers from beyond their own professional circles. The strengths included an approach which identified a lack of presumed knowledge of the guidelines around PA and diabetes and an understandable anxiety amongst participants about this. This in part may have contributed to some of the difficulties when recruiting HCPs for this study, especially GPs. In overcoming this challenge, a further strength was the training of co-author and GP as a researcher who was involved in data collection. This helped address some of the preconceived misgivings about speaking with outsiders [61] preferring to speak with researchers who were both known and trusted and where a previous relationship existed. Furthermore, given the time pressures that busy HCPs faced in participating in this study, when they would otherwise be doing important tasks such as writing up patient notes and arranging referrals, the team adopted a flexible and accommodating approach around their availability. Equally important, this study provides some valuable insights into how to conduct research with this group and in this context.

Conclusions

This evaluation presents new insights into the preparedness of HCPs for delivering PA guidance to adults with diabetes and also valuable information for how to undertake research in this setting and these groups. Using a sequential mixed method, two-phase approach, we have identified the factors underpinning the decision-making processes and behaviours of HCPs, as well as the challenges they face, when promoting PA to the diabetes community. Importantly, we have provided an opportunity for HCPs to tell their story through insightful accounts and through a trusted source. Given the importance of PA within the strategic and policy context for PA, rich information derived from the day-to-day, working HCP is integral to shaping future practices going forward. With those thoughts in mind, we provide the following recommendations.

Recommendations

- Undergraduate education focused on PA and health conditions, including type 1 diabetes, type 2 diabetes and pre-diabetes.
- CPD opportunities for PA training and diabetes.
- Mentoring of HCPs who are new to the role or who just lack confidence in their ability to disseminate advice on PA to those with diabetes.
- Accessible, central database of current local PA providers.
- Tailored resources (web-based and printed) for HCPs and patients with diabetes.
- Consistent, joined-up approach between primary, secondary and community services regarding PA promotion for those with diabetes.
- PA services / programmes tailored specifically to patients with diabetes that are affordable.
- Continued and on-going dialogue with HCPs about their needs when promoting PA.
- Adopting a qualitative approach in investigating the barriers and facilitators that HCP face include non-supporters when developing interventions that help facilitate their engagement and involvement.

Abbreviations

BMI: Body Mass Index; BMJ: British Medical Journal; CMO: Chief Medical Officers; CPD: Continuous Professional Development; DESMOND: Diabetes Education and Self-Management for Ongoing and Newly Diagnosed; ERS: Exercise Referral Schemes; GP(s): General Practitioner(s); HCPs: Healthcare Professionals; MM: Moving Medicine; NICE: National Institute for Clinical Excellence; PA: Physical Activity; PA/E: Physical Activity or Exercise; RCGP: Royal College of General Practitioners

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Authors' contributions

All authors - NK, AP, SZ and DV - made substantial contributions to the conception, design, analysis and interpretation of the data. All authors were involved in writing the manuscript and all authors have read and approved the final version of the manuscript. All authors have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Availability of data and materials

The data generated and analysed during the current study are not publicly available due to the risk of individual privacy being compromised, but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The Research Ethics Committee at Leeds Beckett University granted ethical approval for this research (Reference Number 49891). Informed consent to participate was obtained in writing from all the participants involved.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Output 4: Integrating SEM Clinics into the NHS: A Qualitative Study.

Integrating sport and exercise medicine clinics into the National Health Service: a qualitative study

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ABSTRACT

Objectives To explore the services National Health Service (NHS)-based sport and exercise medicine (SEM) clinics can offer, and the barriers to creating and integrating SEM services into the NHS.

Methods Semi-structured interviews were undertaken to collect data from identified 'stakeholders'. Stakeholders were identified as individuals who had experience and knowledge of the speciality of SEM and the NHS. An inductive thematic analysis approach was taken to analyse the data.

Results N=15 stakeholder interviews. The management of musculoskeletal (MSK) injuries (both acute and chronic) and concussion were highlighted as the two key services that SEM clinics can offer that would most benefit the NHS. MSK ultrasound was also mentioned by all stakeholders as a critical service that SEM clinics should provide. While exercise medicine is an integral part of SEM, SEM clinics should perhaps not have a heavy exercise medicine focus. The key barriers to setting up SEM clinics were stated to be convincing NHS management, conflict with other specialities and a lack of awareness of the speciality.

Conclusion The management of acute MSK injuries and concussion should be the cornerstone of SEM services, ideally with the ability to provide MSK ultrasound. Education of others on the speciality of SEM, confirming consistent 'unique selling points' of SEM clinics and promoting how SEM can add value to the NHS is vital. If the successful integration of SEM into the NHS is not widely achieved, we risk the NHS not receiving all the benefits that SEM can provide to the healthcare system.

INTRODUCTION

Sport and exercise medicine (SEM) was established as an independent medical speciality in the UK in 2005 as an important aspect of the London 2012 Olympic Games health legacy commitment.^{1,2} There are many facets to the speciality, which is reflected in the breadth of the training programme (figure 1).^{3,4}

Decline of SEM in the NHS?

There are now over 147 SEM doctors on the General Medical Council Specialist Register, and every year approximately nine new specialist trainees begin training in the UK.^{5,6} In

Summary box

What are the new findings?

- ▶ Providing expert care of MSK injuries and of concussion are deemed the two key services that SEM clinics can provide for NHS.
- ▶ While exercise medicine is an essential part of the SEM speciality, it should perhaps not be a focus of SEM clinics.
- ▶ Convincing management, resistance from other specialities and lack of knowledge of the speciality were listed as key barriers to integrating SEM into the NHS.
- ▶ Educating about SEM clinics is vital to its success. We need more formal clarification of the 'unique selling point' of SEM clinics, and this advertised more widely.

How it might help clinical practice in the future?

- ▶ The findings of this study could be used to influence the SEM registrar curriculum to include information on setting up SEM clinics in order to empower newly qualified SEM consultants to feel more comfortable setting up SEM services.
- ▶ Better definition on how SEM can be integrated into the NHS could result in more successful SEM NHS services and increased funding into SEM, allowing the healthcare system to benefit more from the services SEM can offer.

recent years, there has been a decline in growth of the speciality, highlighted by a loss of SEM training posts in Scotland and Wales.^{7,8} This drop can be attributed to several factors such as the loss of momentum following the London 2012 Olympic games (a similar loss of momentum has been observed after previous olympic events).⁹ Perhaps due to the low number of National Health Service (NHS) SEM posts, the majority of SEM trainees work in the private sector once they become consultants, and, anecdotally, some no longer work within NHS settings at all despite the fact that many view it as a desirable work setting.¹⁰



Figure 1 Key aspects involved in speciality training curriculum for SEM in the UK.⁴ MSK, musculoskeletal; SEM, Sport and Exercise Medicine.

Current relationship between SEM and the NHS

The Faculty of Sport and Exercise Medicine (FSEM) promotes SEM as a cost-effective approach to the prevention and management of illness and injury and is calling for an increase in SEM consultants in the NHS.¹¹ In support of this, one study found that 93% of the clinicians surveyed felt that there was a role for SEM in the NHS.¹² Given the training and expertise of SEM consultants, they may be considered well placed to aid the NHS in dealing with high levels of physical inactivity, and the burden placed on the system by musculoskeletal (MSK) issues.¹¹ Current NHS SEM services have been shown to reduce surgical interventions, reduce the number of scans requested and improve patient satisfaction, and can therefore be beneficial to the NHS.¹³

To establish a mutually beneficial relationship, more clarity is needed over the role of SEM in the NHS. The need to better define how SEM fits into the NHS has been raised for many years.^{5 7 14} Though several case studies highlight examples of integration across the UK, more research is needed to explore how SEM can be better integrated into the NHS.¹⁵ As such, this study aims to explore what individuals working in SEM think about what services an NHS-based SEM clinic could provide that would be of most value, and the barriers to creating and integrating such a service within the NHS.

METHODS

A qualitative approach using semi-structured interviews was used in this study. Research ethics approval was

granted from the Faculty of Medicine and Health Sciences Research Ethics Committee, University of Nottingham (reference: 212-1802; 12 February 2018).

Participants and recruitment

Stakeholder groups were defined based on identifying individuals with experience and knowledge of the speciality of SEM, and of working in the NHS. Participants were recruited (February–April 2018) from these stakeholder groups subject to the inclusion criteria (table 1) using purposive sampling by email.¹⁵

Data collection

The interview schedule is provided in figure 2. Each participant was given a unique anonymised code. These data were recorded in a key file with the participant speciality (ie, the stakeholder group interviewees' belong to). No other personal data were recorded. All interviews were conducted by the lead author and digitally audio

Table 1 Inclusion criteria for the study

1. Belong to a stakeholder group (as per table 2)
2. Have actively worked in SEM, including: SEM clinics, elite sport, public health, with more than 3 years experience working in SEM or working with SEM practitioners
3. Have had more than 5 years experience working in the NHS

NHS, National Health Service; SEM, sport and exercise medicine.

Interview Guide

1. Are you aware of the speciality of Sport and Exercise Medicine?
 2. How do you feel SEM could best be incorporated into the NHS?
 3. What key services should SEM clinics be offering that would provide most benefit to the NHS?
 4. In your opinion, what are the most common conditions SEM clinics should be seeing?
 5. What would you feel are the barriers to setting up SEM clinics in your:
 - a) Trust?
 - b) Department?
- Specifically for SEM Consultants and Registrars:
6. Do you feel prepared to set up an SEM service?
 - 7a. If not, what would you want to learn and how?
 - 7b. If you have, what are the most important learning points you would want others to know before setting one up?
- Final question, asked to all participants:
8. Do you have any other comments?

Figure 2 Interview guide used for every interview. SEM, sport and exercise medicine.

recorded. All recordings were transcribed verbatim. Any identifiable information discussed during the interviews were redacted from the transcripts. Interviews continued until data saturation was reached.^{16 17}

Data analysis

An inductive thematic analysis approach was taken to analyse the interview transcripts.¹⁸ In terms of epistemology, a realist approach was adopted as the research team believed there was likely to be a single truth in answer of the objectives, in keeping with the realist paradigm.¹⁹ Braun and Clarke's six-step process was followed and used to extract meaning and concepts from the data in order to identify patterns, and ultimately generate themes, which were managed using Trello software (version 3.40).^{20 21} To ensure reliability, two members of the research team started the coding process by reading, five (33%) randomly selected interview transcripts separately and discussed their coding decisions together, working through differences of opinion until a consensus was made. A reflective journal was kept to determine the extent to which thoughts and observations were data-driven and without researcher influence, in order to manage unconscious bias. Once all interviews had been coded and themes had been finalised, five randomly selected transcripts were given to the same reviewers to code to check whether extracts represented the themes appropriately. There was a 79% similarity. A result of over 70% has previously been deemed acceptable.²²

RESULTS

Demographic information

Seven stakeholder groups were identified (table 2). Sixteen individuals were invited to participate in the study, and 15 participated (93%) covering all stakeholder groups. The interviews lasted 23 min 10 s on average, ranging from 14 min 38 s to 31 min 03 s. The stakeholders included 4 female and 11 males with an average age of 41 (range 34–47) years. They were all working in the UK.

Interview results from consultants and teaching staff

Five themes and 15 subthemes were identified from the transcripts (table 3).

Table 2 The seven stakeholder groups and number of participants per group

Stakeholder group	Participants (n)
1. Accident and emergency doctors with an SEM interest	2
2. SEM registrars	2
3. General practitioners with extended role in MSK	1
4. MSK radiologists	2
5. Orthopaedic surgeons	2
6. Physiotherapists	2
7. SEM consultants	4

MSK, musculoskeletal; SEM, sport and exercise medicine.

Table 3 Themes and subthemes

Refined themes	Subthemes
1. Roles believed to be key to being an SEM clinician	1(a) Demonstrate clinical leadership (7) 1(b) Expert in MSK medicine (15) 1(c) Perform MSK ultrasound (15) 1(d) Provide physical activity (PA) education (10)
2. Services SEM clinics can offer that would provide the most value to the NHS	2(a) Management of MSK injuries (acute and chronic) (15) 2(b) Management of concussion (11)
3. Sources that SEM clinics receive referrals from (not included in full as deemed not relevant to study objective)	3(a) A&E (8) 3(b) GP (14) 3(c) Physiotherapists (13) 3(d) Orthopaedics (10)
4. Clinicians' recognise there are common barriers to setting up an SEM clinic	4(a) Resistance from management (8) 4(b) Conflict with other specialities (9) 4(c) Lack of awareness of the speciality (15)
5. Learning points for setting up SEM clinics (from Q7b only asked to SEM consultants and registrars (n=6))	5(a) Increasing awareness of SEM (6) 5(b) Meeting with the 'right' influencers (4)

In brackets is the number of participants that mentioned the sub-theme.

A&E, accident and emergency; GP, General practitioner; MSK, musculoskeletal; NHS, National Health Service; SEM, sport and exercise medicine.

1. Roles believed to be key to being an SEM clinician

1(a) Demonstrate clinical leadership

Clinical leadership was brought up in the context of incorporating MSK services into the NHS, either through Clinical Commissioning Groups (CCGs) or by showing leadership.

The work could be within CCGs looking at transforming outdated systems and medical management into streamlining conservative treatment of MSK issues. Participant 8.

SEM doctors should be able to show medical leadership within MSK medicine' (participant 5).

1(b) Experts in MSK medicine

MSK medicine was identified by all participants as a critical service that should be provided by SEM clinics in order to add value to the NHS.

MSK medicine is a vital part of SEM clinics, providing knowledge of MSK injuries and the skill to assess, diagnose and treat. Participant 9

1(c) Perform MSK ultrasound

All participants also identified MSK ultrasound as a service, SEM clinics should offer.

We do diagnostic ultrasound, it saves the patient having to go through a radiology department. Participant 13

The ability of SEM clinicians to manage MSK issues and be able to also use ultrasound to aid with diagnosis and treatment (via ultrasound-guided injections) was seen as valuable by nine participants, with one participant describing an SEM clinic as a 'one-stop shop' (participant 7).

1(d) Provide physical activity (PA) education

Various participants maintained that SEM clinicians should be involved in providing and promoting education regarding PA.

The advice regarding PA, I think there's a massive need for this going forward. Participant 11.

However, the best way for SEM clinicians to promote PA was unclear.

I think there are different ways of promoting PA—do you need a separate clinic? I'm still myself trying to work out how it will work as a job role for a SEM doctor. Participant 9

In regard to how best exercise medicine should be promoted, several participants mentioned it should be done as part of wide-spread public health initiatives and that large organisations are already taking lead on this.

There's a definite role for exercise medicine in public health. Participant 6.

The Faculty [FSEM] have taken on the role of educating on PA. Participant 8

2. Services SEM clinics can offer that would provide the most value to the NHS

The management of non-surgical MSK injuries (both acute and chronic) and concussion were highlighted as

the two key areas in which SEM could add the most value to the NHS.

2(a) Management of MSK injuries (acute and chronic)

Regarding the management of MSK injuries, one participant highlighted the challenges of managing acute MSK issues in accident and emergency (A&E) settings owing to time pressures.

It is very difficult to fully assess MSK injuries' and that it was a good idea to 'have a clinic to follow that up because people have got more dedicated time. Participant 14

2(b) Management of concussion

Concussion was flagged up by over half of the participants as an opportunity to incorporate SEM into the NHS. Many highlighted the poor knowledge around concussion management and that concussion clinics 'could be an extra service that an SEM Consultant would be well trained to deliver' (participant 6).

In the next 10 years, we'll see more NHS Concussion Clinics. Participant 8

4. Clinicians' recognise there are common barriers to setting up an SEM clinic

4(a) Resistance from management

When asked, over half of the participants posited that managers were one of the biggest barriers to integrating SEM services into the NHS. It was felt that managers are under increasing financial strain and they

would have thought sports would have to be rationed for more serious medical conditions. Participant 13

The majority of participants reiterated the idea that it can be 'difficult to innovate' (participant 3) within hospital settings and getting managerial approval for creating change in hospitals can be difficult.

A lot of the NHS is resistant to change and because SEM is still quite new, there are already a number of established pathways. Participant 15

4(b) Conflict with other specialities

Several participants commented on the concept of SEM being perceived as encroaching onto other specialities and 'pinching work', which may result in other specialities being 'resistant to us' (participant 11).

For example, with ultrasound, we may be taking away from interventional radiology. Participant 12

Radiology and orthopaedics were singled out as the two specialities most likely to be affected by this issue.

People are worried about their own specialty so that would be orthopaedic surgeons, physios, radiologists who don't want to be de-skilled or lose the areas of interest that they have themselves. Participant 1.

4(c) Lack of awareness of the speciality

The lack of awareness of the SEM speciality was commented on by several participants as a barrier to integrating it into the NHS.

I think it's lack of familiarity because people won't know what you can do and what you can offer.'
Participant 4

Most health professionals are 'unaware of the speciality (participant 10).

SEM does not have 'an identity as to where they sit (participant 3).

It was mentioned that if potential sources of referrals to SEM clinics have a lack of awareness of the speciality will result in a lack of engagement with the SEM service.

Potential sources of referrals 'don't really know what they should be referring' (participant 15).

5. Leaning points for setting up SEM clinics

5(a) Increasing awareness of SEM

Participants provided solutions for many of the identified barriers which included education of a range of stakeholders and referring professionals.

few people know SEM services exist and even less know what sort of things and patients should be referred to them. Participant 9

5(b) Meeting with the 'right' influencers

In addition, when setting up a service, advice from one of the participants included meeting the medical director to ensure the issue is being discussed with the right influencers.

it was a big learning experience for me... if I was to do it again I would want the big influential people on board from the get go. Participant 1

DISCUSSION

This research has provided three key findings. First, the key services that SEM clinics can offer the NHS are in the management of MSK injuries and concussion. Second, the main barriers to setting up a SEM clinic are getting managerial agreement, conflict with other specialities and a lack of awareness of the speciality. Third, the main perceived solution to reducing the impact of the identified barriers is to improve education among the medical profession about the speciality of SEM.

Defining a place for SEM in the NHS

The management of MSK injuries and concussion were highlighted as the two key areas in which SEM services can provide useful services to the NHS. Regarding MSK injuries, this includes both acute injuries usually presenting via A&E, and chronic injuries usually presenting via general practice. The benefit of utilising MSK ultrasound and injection therapies in the management of MSK injuries was also identified by several stakeholders as a key service

that SEM clinics can provide. MSK consultations are thought to account for nearly 30% of all general practice consultations with nearly 82% not requiring surgery.^{23 24} These patients will therefore typically re-present in general practice recurrently which is an inefficient use of NHS resources.¹⁴ SEM consultants play a key role here in non-surgical management, enabling cost-saving and improved pathways for patients.¹³ Regarding the presentation of acute injuries, A&E departments are notoriously time pressured and overworked.^{25 26} Fundamentally, A&E does not have enough time to assess acute injuries thoroughly, and the acute swelling post injury means A&E potentially is not the ideal setting to assess certain injuries. Given that 7.7% of A&E attendances are directly related to playing sport, SEM clinics may result in reduced workload for overstretched A&E services without the need to outsource to private care.²⁷

Concussion is well covered on a SEM syllabus and the management of concussion was also highlighted as a key service that SEM clinics could provide.⁴ Concussion is also a common presentation, and given the majority of GPs and A&E doctors do not feel confident in how to manage it, this is an area that SEM clinics could help relieve pressure from overloaded departments.²⁸⁻³¹

SEM, exercise medicine and the NHS

Physical inactivity costs the UK economy over £7.4 billion a year.³² To begin to address this, FSEM recently launched 'Moving Medicine', a website designed to support healthcare professionals integrate PA advice into clinical practice.³³ For the day-to-day clinical work of a SEM doctor, it is unclear exactly what an exercise medicine service within the NHS could, or should, look like, and whether SEM clinics should facilitate exercise medicine. The value of exercise medicine is not being debated, rather the question is regarding the most effective method and setting for delivering it.³⁴ While it is always essential to provide brief PA advice where appropriate as per NICE guidance, the findings of this study suggest SEM clinics may not be the most effective setting for having a heavy exercise medicine focus.³⁵ SEM clinicians of course have a responsibility to promote, integrate and facilitate exercise as medicine within society and the healthcare system. However, exercise medicine may be best dealt with through public health initiatives to promote both individual and population-level change rather than through individual-level behaviour change promoted through SEM clinics, an idea that has been highlighted previously.³⁶

Key barriers to integrating SEM into the NHS

The need for SEM to build collaborative relationships with other specialities was highlighted in this study and has been emphasised previously.^{34 37} Caution should be applied to not cross the boundaries of other specialities, but instead take a cooperative approach and explain how SEM can add value. Another major barrier appeared to be awareness of the speciality among other medical professionals. If the



knowledge of the speciality is poor, it is hard to cultivate a reputation, resulting in SEM clinics not receiving referrals that should have been sent to the service.

What are the next steps?

The findings of this study have highlighted a key solution to better incorporating SEM into the NHS is to improve education about SEM among the medical profession, a finding supported by previous studies.^{12 38} It is unsurprising that other professions have a lack of knowledge about the SEM speciality, particularly in relation to how it works as a speciality within the NHS, when the speciality itself appears to not have clear definitions over its place in healthcare. SEM urgently needs to confirm its identity within the NHS.

Despite the barriers mentioned in this study, several SEM services are already in place.¹³ It is important to ensure that the value of SEM clinics is observed and documented to ensure they continue to be funded by the NHS. Otherwise, we risk the NHS not benefiting from the services that SEM clinics can offer.

Strengths and limitations

This study had several strengths including a high inter-rater reliability to ensure trustworthiness of coding, achieving data saturation (despite a limited number of interviews conducted) and utilising a qualitative design to uncover insightful data. As ever, there were limitations such as the potential influence of the interviewer on data collection and analysis. A reflective journal was kept to minimise this. Interview participants were selected depending on them being viewed as a stakeholder by the research team and was therefore open to selection bias. It may have been beneficial to get the views of other SEM-related specialities such as podiatrist, chiropractors and osteopaths. In addition, opinions could be explored from individuals that work outside of the NHS, policymakers or government figures. It would have also been of benefit to interview patients that had attended SEM clinics to explore what they thought of the services they had received. Future studies could consider seeking opinions from a broader range of stakeholders.

CONCLUSION

This study has provided data that supports the management of MSK injuries and concussion as the two key areas in which SEM clinics can offer valuable services to the NHS. The management of these two areas should be targeted as the 'unique selling point' of SEM clinics, ideally with the ability to provide MSK ultrasound and injection therapies. These clinicians felt that it is more important for SEM clinics to prioritise these services over exercise medicine, which, while highly important for SEM and public health, should be dealt with at a public health, population-based level rather than have a heavy focus in SEM clinics. The perceived barriers to SEM clinics being created were lack of

knowledge regarding the speciality from potential referral sources, potential conflict with other specialities, and gaining support from management. This preliminary research can be used to guide further studies exploring how best to integrate SEM into the NHS. If the successful integration of SEM into the NHS is not widely achieved, we risk the NHS not receiving all the benefits that SEM can provide.

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Contributors All authors contributed to the final paper. DV, MKP and KE were involved in developing the concept and design. DV carried out all data collection. Analysis of the data was completed by DV and KM. Write-up was contributed to by all authors and further guidance and advice provided by SG, KE, AP, PB and CF.

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Output 11: Creating a SEM MSc Syllabus for Doctors: A Delphi Study.

Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi study

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ABSTRACT

Objective Sport and Exercise Medicine (SEM) Masters curricula vary. This Delphi study is aimed to create a consensus curriculum for doctors undertaking SEM Masters courses.

Methods A modified Delphi survey was used. An expert panel was established of individuals deemed to have adequate knowledge of the field. The research group developed the initial draft of the curriculum by collating and reviewing previously published UK-based postgraduate SEM-related curricula. There were two phases. In phase 1 the expert group either accepted, rejected or modified each learning objective (LO). During phase 2 the expert group were asked to accept or reject each LO that did not get accepted outright previously. The research group analysed the levels of agreements and the comments given by the expert panel after each phase.

Results The expert panel consisted of 45 individuals, with 35 completing phase 2 (78% retention rate). Of the 136 LOs initially collated: 71 (52%) were accepted outright, 60 (44%) were altered in some way and reincluded in phase 2, and 5 (4%) were removed after phase 1. The research group added 2 (1%) new LOs on reflection over comments made by the expert panel. The final curriculum contained 133 LOs, divided into 11 subthemes.

Conclusions The findings will better inform educators when developing SEM Masters curricula and inform students what they should look for when considering an SEM Masters. This consensus curriculum is an important step in standardising postgraduate SEM education.

INTRODUCTION

Sports and Exercise Medicine (SEM) became established as a specialty in 2005 in the UK and this has driven increasing demand for education on its core components.¹ SEM postgraduate education varies throughout the world. Some countries offer postgraduate courses in SEM, such as Masters of Science or Postgraduate Diplomas.² Within the UK, there is currently no consensus on what learning objectives (LOs) should be included within both SEM Masters and Diploma courses. Consequently, students undertaking postgraduate SEM qualifications at different

key messages

What are the new findings

- This Delphi study has produced an up-to-date consensus on what skills and knowledge are expected of an individual with a Masters in Sport and Exercise Medicine (SEM) in the UK.
- Practical skills such as ultrasound, joint and soft tissue injections and compartment pressure testing were deemed too specialised to be included in SEM Masters curricula.
- How to develop and deliver exercise medicine services and musculoskeletal services were also deemed inappropriate to include on SEM Masters curricula.

What is already known

- An important aspect in the ongoing evolution of SEM is ensuring adequate SEM skills and knowledge in individuals working as SEM clinicians.
- There is currently no standardisation of SEM Masters courses in the UK.

universities will develop different skills, leading to less standardisation of clinicians employed in SEM posts.

Increased integration of SEM into the National Health Service (NHS) could provide significant benefits.³ An important aspect for the evolution of SEM in the UK is ensuring the development of SEM curriculum for every level of training. Many SEM jobs in the UK require having an SEM Masters in their eligibility criteria. However, there is limited previous research looking into what a Masters course in SEM should include. A study in 2005 in the UK developed LOs for an ideal SEM Masters course, although how the findings influenced or were implemented into curricula is unknown.² This Delphi study aims to develop an up-to-date consensus on what skills and knowledge are expected of an individual with a Masters in SEM in the UK. This will aid in creating a unified and standardised SEM Masters education by universities

throughout the UK. It will also ensure students can appreciate whether their SEM Masters education has provided the necessary skills and objectives to work as a competent SEM clinician.

This study has focused specifically on what LOs doctors undertaking an SEM Masters should hope to achieve. It should be noted that other healthcare professionals also undertake Masters degrees in SEM, and the LOs for these groups are likely to be different due to their role within the multidisciplinary team.

METHODS

Study design

A modified Delphi survey was used to seek consensus on a postgraduate SEM Masters curriculum for doctors. Expert contributions to the study remained anonymous to the research group, in keeping with the principles of Delphi methodology.⁴

Establishing the research group

The research group included the authors DV, KRM, PB, CN, AP and GF. The research group were selected due to their experience in medical education. DV, CN and AP have experience in the exercise medicine sector. DV and CN have experience in delivering SEM education. DV and KRM have undertaken a Masters in SEM. GF and PB have experience in Delphi methodology. DV and KRM have experience in the education of early career SEM professionals through British Association of Sport and Exercise Medicine (BASEM) and roles within UK Universities. Content decisions were finalised by the research group.

Expert Delphi panel

Experts are defined as individuals with knowledge and experience. For this study, they must have adequate knowledge in postgraduate SEM education.^{5,6} Invitations to express interest in being on the expert panel were emailed to all members of the BASEM and the Faculty of Sport and Exercise Medicine (FSEM) via their mailing lists. In addition, members of the research group shared invitations to submit interest in being on the expert panel via social media.

In their expressions of interest individuals were asked demographic information and questions selected by the research panel to determine eligibility. The following eligibility criteria were used:

- ▶ Doctors that have completed their Foundation Training.
- ▶ Hold a higher qualification in SEM: specifically either an SEM Masters degree or diploma. Alternatively, they could have membership or fellowship of the FSEM (MFSEM/FFSEM)
- ▶ Have been a doctor for more than 5 years
- ▶ Working in the UK at the time of the study.

The research group reviewed the responses and removed those that did not match the eligibility criteria. Regarding the size of the expert panel, a panel size of

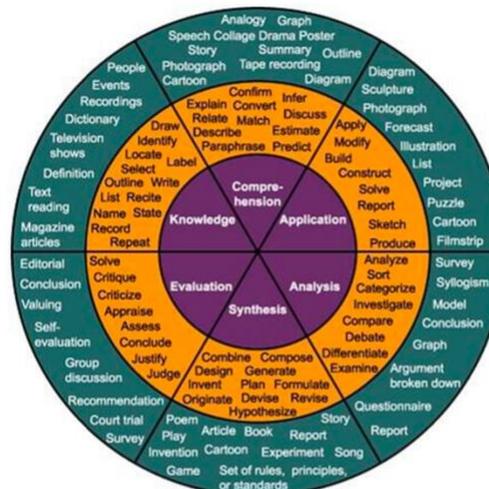


Figure 1 Bloom's taxonomy wheel. Level 1 is knowledge, level 6 is evaluation. Image used within rules of license (creative commons attribution—sharealike license). Taken from: <https://www.wylio.com/credits/flickr/4100721032#>.

more than 30 is not considered to improve the quality of the study.^{4,7}

Development of the initial curriculum

The research group developed the initial curriculum draft by collating and combining previously published LOs from UK-based SEM specialty training curriculums and a previous paper exploring the LOs required for an ideal SEM Masters curriculum published in 2006.^{2,8,9} This approach was used to ensure no potential relevant LOs were omitted. The LOs taken from the pre-existing curricula were grouped into suitable themes by the research group using themes previously published. All LOs were reviewed by the research group and edited, if needed, using Bloom's taxonomy wheel (figure 1) to make them suitable for postgraduate level.¹⁰

Procedure

The initial survey to express interest in joining the expert panel was made using Google Forms (Google). Demographic information was obtained through this form. For the Delphi itself, electronic surveys were created using Qualtrics software and a link to it was emailed to all eligible members of the expert panel.¹¹ The participant information sheet was attached to the email, along with contact details of the research group. Consent was gained via a mandatory question given before starting the Delphi. The instructions clearly stated that experts should consider the curriculum to be relevant for doctors undertaking a Masters in SEM, not considering other professions that may also undertake a Masters in SEM.

Engagement from the expert panel is crucial for any Delphi study and the aim was for the response rate to not fall below 70%.¹² Experts were given 12 days to complete each phase of the Delphi. Non-responders after 8 and 10 days received a system-generated reminder. Text reminders were also sent to the expert panel if no response had been received on day 11. Only experts that completed phase 1 of the Delphi were invited to participate in phase 2. The data were collected between October and November 2020.

Phase 1: review of the draft curriculum

During phase 1, panel members reviewed the curriculum and were asked to accept, reject or modify each item. Participants were given the option of providing an anonymous comment after each decision. The percentages of agreement for each LO were calculated and, along with all comments, were read through and discussed by the research group. The response to each LO was discussed regardless of the level of agreement from the expert panel. After the collected data were reviewed, the research group agreed to either accept, reject or alter each LO to create a second version of the proposed curriculum. LOs with levels of agreement above 75% with no comments were accepted. The research group reviewed all comments on LOs that had been accepted and the LOs were amended accordingly and included in phase 2. LOs with levels of agreement below 75% without comments were rejected. For those with comments, these were reviewed by the research group, and where it was felt appropriate a modified LO was added for further review in phase 2.

Phase 2: second review of proposed curriculum (accept or reject)

A link to the second version of the curriculum was sent to all expert panel members that completed phase 1. For this phase, they were only provided with the option to accept or reject each LO. As reported by Keeney *et al*, a consensus was defined by 75% agreement.¹⁵ Previous literature reports varied levels appropriate for consensus, ranging from 70% to 100%.⁶ There was an optional open comments box at the end of each theme for further comments. The LOs accepted outright after phase 1 and did not require further input were included for reference. Again, the percentage of agreement was calculated, the research group reviewed all comments and a consensus was reached to either accept or reject each LO. Phase 2 would be repeated until a final consensus on the syllabus was reached.

RESULTS

The initial proposed curriculum

There were 136 LOs collated from prior SEM syllabi. The research group divided these across 11 distinct themes.

The expert panel

Of the 94 people interested in being on the expert panel, 48% (45/94) met the eligibility criteria. The reasons for non-eligibility included having worked as a doctor for less than 5 years (n=19), not holding an SEM Masters/Diploma/FFSEM/MFSEM (n=17) and not being based in the UK

Table 1 The reasons for alterations to LOs after phase 1

Reasons for alteration	Number of learning objectives (LOs) altered
Spelling and grammar (including re-wording)	44 (32%)
Alteration to Bloom taxonomy level	34 (25%)
Objective made more specific	10 (7%)
Objective made more broad	2 (1%)

The percentage of LOs altered for each reason is also provided.

(n=13). The expert panel consisted of 20 SEM consultants, 4 orthopaedic consultants, 1 rheumatology consultant, 17 general practitioners, 11 SEM registrars and 14 doctors that did not specify their training or job role but did confirm that they had been a doctor for more than 5 years. All the 14 doctors that did not specify their training/job role had completed a SEM MSc or Diploma and 57% had been a doctor for 13 years or more. Twenty-one individuals on the expert panel (47%) had experience teaching SEM Masters and Diploma courses.

Phase 1

In phase 1 of the study there was a 100% (45/45) response rate from the expert panel. Fifty-two per cent (71/136) of the LOs were accepted without the need for alteration, and 44% (60/136) were altered. The reasons for alterations are given in **table 1**. Thirty LOs were altered for more than one reason. Regarding the alterations made to the Bloom taxonomy level, 44% (n=15) were moved to a higher taxonomy level, 41% (n=14) were moved to a lower taxonomy level and for the final 15% (n=5) the wording was altered but the LO was kept within the same taxonomy level.

Five LOs (4%) were rejected and all were removed due to being deemed too high level for postgraduate SEM Masters. The objectives removed for being too high level are given in **table 2**, alongside comments given by the expert panel that contributed to the research group deciding on their removal. The first two LOs listed in **table 2** regarding developing, leading and delivering exercise medicine services and MSK services received an agreement of 78% and 80%, respectively. Despite being above the approval threshold, the research group discussed these objectives at length, taking on board comments given by the expert panel, and determined these LOs were too high a level for a Masters level.

On reviewing the comments given by the expert panel, the research team added the following two LOs to the proposed curriculum:

1. Discuss a range of common ethical issues in a team sport environment (added to 'sports team and event management' subtheme)
2. Recognise the key medico-legal requirements and considerations in team medicine (added to 'sports team and event management' subtheme).

Table 2 The LOs removed after phase 1 and comments given by the expert panel which contributed to justifying the removal of the LO

Learning objective (LO) removed	Expert panel quotes supporting the removal
1. Develop, lead and deliver both paediatric and adult exercise medicine services	<i>Be able to contribute to the delivery of - Reduce the taxonomy order (Participant 41)</i>
2. Develop, lead and deliver both paediatric and adult musculoskeletal services	<i>Demonstrate awareness of - Not all MSc courses offer the chance for delivery (Participant 39)</i>
3. Perform a targeted ultrasound examination of a peripheral musculoskeletal problem	<i>Does not need to be part of SEM MSc - needs to be a separate course (participant 21) Reject as this is an additional skill that isn't going to be taught as part of MSc (participant 30)</i>
4. Inject a variety of joints and soft tissues with radiological guidance	<i>Does not need to be part of SEM MSc - needs to be a separate course (participant 21) I don't feel this is mandatory for MSc level (participant 42)</i>
5. Perform compartment pressure testing	<i>Not sure this is an essential component- would be done in Secondary Care (participant 33) Reject as advanced skill? beyond this level - know how it is done (participant 28)</i>

SEM, Sport and Exercise Medicine.

These were both added due to comments made by members of the expert panel at the end of the survey when asked if they had any final thoughts. The first was added due to a participant stating: 'I would also add a section on Ethics and how this may impact the SEM physician' (participant 31). The second was added due to a member of the expert panel stating: 'Medico-legal issues in sports' (participant 18). On discussing these within the research group the value of both comments were noted, and it was therefore deemed important to add related LOs.

Phase 2

Of the 45 that completed phase 1, 78% (35/45) of these individuals also completed phase 2. All LOs (100%) were accepted in phase 2 of the study, with all objectives achieving over 85% agreement. No alterations were made to any LOs. Therefore, no further phases were required. The final curriculum consisted of 11 subthemes (outlined in table 3) and 133 LOs. The full version of the final curriculum can be found in the online supplemental information.

DISCUSSION

Summary of findings

An expert panel of 45 (100% of those eligible) completed phase 1 of this modified Delphi study, with 35 also completing phase 2 (78% retention rate). One hundred and thirty-six LOs were reviewed, with five removed during phase 1 after being deemed too high level for an SEM Masters degree. Two additional LOs were added, resulting in a final curriculum of 133 LOs, all of which were accepted by the expert panel during phase 2.

The importance of a standardised SEM Masters curriculum for doctors

Obtaining a high-quality and relevant education in SEM should be a critical goal for all physicians working in SEM.¹⁴ Although there is no specific data on this, anecdotally, the research group is aware that a large proportion of doctors working in the field of Sport and Exercise Medicine are not SEM consultants or on SEM specialty training programmes. For this group, their SEM knowledge and experience will be heavily influenced through the completion of an SEM Masters. It is reasonable to assume physicians will want their SEM Masters to be as relevant as possible to being an SEM physician, particularly given the cost and time-commitment of undertaking a Masters degree.

Table 3 The finalised subthemes and number of learning objectives within each subtheme

Subtheme	Number of objectives in subtheme
1. Physical activity and human health	13
2. Medical issues related to exercise	16
3. Injuries related to SEM	22
4. Basic science in SEM	18
5. Clinical pharmacology	6
6. Antidoping	4
7. Sports team and event management	28
8. Physical activity in challenging environments	1
9. Specific groups in SEM	11
10. Intrinsic skills of an SEM clinician	3
11. Extrinsic skills of an SEM clinician	11
Total	133

As a relatively new specialty SEM is continuing to find its place within the UK healthcare system; many fellow healthcare professionals have limited knowledge of the specialty and the skills SEM physicians possess.^{15,16} As a specialty we need to demonstrate we can stand alongside conventional specialties by being prepared to methodically examine our practice, ensure physicians practising within SEM are sufficiently capable and ensure they are working at a high level consistent throughout the UK.¹⁷ It is becoming increasingly common for SEM posts to include having an SEM Masters in their desirable or essential job criteria. The need to standardise SEM Masters curricula is therefore becoming increasingly important. It will be beneficial to the professionalism of the specialty to ensure individuals working in SEM posts that require an SEM Masters possess similar, consistent skills and knowledge.

Aspects too specialist for SEM Masters level

The expert panel rejected the practical LOs around performing ultrasound, joint and soft tissue injections and compartment pressure testing, with comments implying that they are too high level for SEM Masters courses. Ultrasound imaging is increasingly used in SEM to diagnose and monitor injuries; diagnostic ultrasound has previously been described as the 'sports physicians stethoscope'.¹⁸ A 2017 International Consensus statement outlining a generic syllabus for SEM specialty training includes an 'advanced skill' of 'targeted ultrasound examination of a peripheral musculoskeletal problem'.⁹ How best to provide ultrasound training to SEM clinicians, or a consensus decision as to whether it is needed, remains a controversial issue.¹⁸ The research group anecdotally acknowledges that many SEM clinicians choose to self-fund ultrasound training courses and equipment. The findings of this study indicate that ultrasound training should not be included in SEM Masters' teaching.

LOs focused on developing and delivering exercise medicine services and musculoskeletal services were also not deemed appropriate to include in this curriculum, with several expert panel members commenting on issues with SEM Masters including these LOs. The research group discussed these objectives at length and deemed that these objectives would be more suitable for SEM consultant level or specialist SEM trainees. FSEM have created resources to aid SEM doctors in setting up SEM clinics and services, such as 'Sport and Exercise Medicine: A Fresh Approach in Practice' published in 2014.¹⁹ Interestingly, the 2017 International Consensus syllabus for SEM specialist training does not include learning how to set up an SEM service, nor does the most recent UK SEM specialist training programme curriculum.^{8,9} With increasing interest in how SEM can best be integrated into the NHS given the benefits SEM services can provide, it would be of great interest for further research be done to determine how the SEM specialty can most effectively increase the number of SEM services offered in the UK.³

Catering to all SEM Masters students

Doctors at any stage in training can undertake a Masters in SEM, and doctors at different stages in training may require different outcomes from a Masters course. It is also important to acknowledge that other healthcare professionals undertake an SEM Masters degree, such as physiotherapists, osteopaths and sports therapists. While there will be overlap, the outcomes these professionals wish to achieve from an SEM Masters are likely to be different to the LOs for doctors. Future research may consider exploring an appropriate SEM Masters curriculum for other healthcare professionals; it would be interesting to compare and contrast these with this curriculum.

Strengths

A modified Delphi was conducted thoroughly, following the appropriate methodology.⁴ The expert panel consisted of highly qualified individuals from relevant professional backgrounds. A high level of engagement and response rate was achieved. Many, often detailed, comments were received from expert panel members to justify responses. The research group contains individuals with a wide range in level of training. A high level of acceptance was achieved for each of the LOs included in the final curriculum. As no repeats to phase 1 or phase 2 were required, there were only two rounds of the Delphi before the finalised curriculum being created. Less than three rounds are recommended to reduce participation fatigue.^{13,20,21}

Limitations

Although demographic data was removed, due to the nature of the questions asked to deem eligibility criteria, the research group may have been able to deduce who expert panel members were, resulting in bias. In addition, despite Masters degrees being primarily academic degrees, the only mention of research in the final proposed curriculum is in one LO listing research as a skill commonly used in practice by SEM physicians that the learner should be able to demonstrate. This is likely due to vocational-based curriculums being used to create the initial proposed list of LOs developed by the research group. It may be appropriate for educators creating curricula for SEM Masters to consider including additional research-related LOs. Given the nature of a Delphi study, the study is limited by the research group members and expert panel. The study methodology is by design opinion-based and open to researcher and participant bias. In addition, it would have been beneficial to know the specific training/job role of the 14 doctors on the expert panel that did not provide this information. However, all of these doctors had an MSc or Diploma in SEM and had all been a doctor for 5 years or more, with the majority having been a doctor for over 10 years.

CONCLUSION

The findings of this study will better inform educators involved in developing SEM Masters curricula, and inform students as to what they should look for when considering undertaking a Masters in SEM. This consensus curriculum is an important step in the standardisation of postgraduate SEM education. The next step will be to ascertain views of the finalised consensus curriculum from individuals involved in delivering, teaching and examining SEM masters content in the UK.

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Syllabus for doctors on Postgraduate SEM Masters courses

1. Physical Activity and Human Health	
	Demonstrate an understanding of the role of physical activity in the prevention and treatment of common long-term health conditions
	Advise on and promote population health through physical activity
	Make use of physical activity guidelines and recommendations in practice
	Analyse current UK screening programmes to promote health
	Analyse key national and international physical activity resources available to patients and clinicians
	Discuss how to overcome the following barriers to physical activity: environmental, social, physical, cultural, religious and psychological
	Demonstrate the ability to prescribe physical activity in healthy individuals and also individuals with disease
	Critically apply physical activity guidelines in both the prevention and management of chronic disease
	Design a physical activity programme for a variety of special populations (e.g. older adults, pregnancy, disability, children)
	Analyse and overcome factors that may impact physical activity prescribing
	Recognise the importance of communicating the physical activity message beyond the individual
	Demonstrate an understanding of public health policy development and implementation in relation to physical activity and health
	Understand and promote integrated sport and physical activity opportunities for school aged children and adolescents in order to promote a lifelong relationship with physical activity
2. Medical Issues Related to Exercise	
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Neurological conditions
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Respiratory conditions including: Asthma - Chronic Obstructive Pulmonary Disease - Exercise Induced Laryngeal Obstruction - Exercise Induced Bronchospasm
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common infectious diseases
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Cardiovascular conditions including: HOCM and other cardiomyopathies – Structural abnormalities – Arrhythmias – Valvular disease – Hypercholesterolaemia – Hypertension – Ischaemic heart disease - Heart failure - Inherited channelopathies - Congenital disease
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common gastrointestinal conditions

Syllabus for doctors on Postgraduate SEM Masters courses

Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common renal and urogenital conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Metabolic conditions including: Diabetes – Thyroid disease – Obesity
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common ENT conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common immunological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common haematological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common dermatological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Rheumatological conditions including: Inflammatory and seronegative arthritis, Osteoarthritis, Fibromyalgia and chronic pain, Connective tissue disorders, Hypermobility syndromes, Osteoporosis
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Psychological and mental health conditions including: Eating and body perception disorders in the developing athlete - Anxiety - Depression – Stress - Trauma
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Adult musculoskeletal conditions including: Acute pain - Acute musculoskeletal conditions - Chronic pain - Chronic musculoskeletal conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Paediatric musculoskeletal conditions including: Fractures - Ligamentous injuries and complications - Apophyseal injuries -

Syllabus for doctors on Postgraduate SEM Masters courses

	Overuse injuries - Growth plate stress - Osteochondritis dissecans - Snapping hip - Shoulder instability - Patella instability - SUFE - Perthes - Scoliosis - Talipes - Flexible pes planus - Chest wall deformities - Timings of growth plate closure
	Demonstrate the ability to deliver age appropriate injury rehabilitation programmes illustrating understanding of the biomechanical principles underpinning the individuals' chosen activity
3. Injuries Related to SEM	
	Apply the principles of prevention, diagnosis, and treatment of injuries related to sports and physical activity
	Analyse management plans for optimal treatment of patients across the spectrum of musculoskeletal problems in accordance with latest guidelines and best practice, and involving other allied health professionals where appropriate
	Apply knowledge of the pathophysiology of tissue injury and subsequent clinical symptoms and presentations of musculoskeletal disease to the management and rehabilitations of a range of common presentations
	Analyse the evidence-based management of common head and neck injuries
	Analyse the evidence-based management of common upper limb injuries
	Analyse the evidence-based management of common trunk, abdominal and thoracic spinal injuries
	Analyse the evidence-based management of common lumbar spine and pelvic injuries
	Analyse the evidence-based management of common lower limb injuries including: Tendinopathies - Ligament injuries - Avulsion injuries - Dislocation - Fracture management Other common soft tissue injuries
	Recognise red flags which may indicate malignancy or infection
	Interpret the findings of radiological and other relevant investigations to determine differential diagnoses
	Apply the principles of biomechanics to different sporting and physical activities and in the context of injury
	Recognise the role of physical activity in rehabilitation
	Devise a rehabilitation programme in relation to common sports injuries
	Analyse the role of surgery in the management of common sports injuries
	Analyse rehabilitation progression and return to activity factors when managing common musculoskeletal conditions
	Be able to interpret human movement analysis - basic kinematics and kinetics
	Explain the role of biomechanical analysis of sport specific techniques in the management of sports related injuries
	Analyse the effects of variations in biomechanics and the influence of posture on common musculoskeletal presentations
	Analyse the role of orthotics in the management of common sports injuries
	Recognise the role of splinting, bracing and taping techniques
	Apply an understanding of level 3 safeguarding knowledge to a range of hypothetical or retrospective cases
	Discuss the relevance of common radiological investigations including the suitability of each modality for a range of contexts
4. Basic Science in SEM	
	Analyse the principles of exercise physiology including: types of physical activity, effects of physical activity and maximising adaptations to sport and physical activity

Syllabus for doctors on Postgraduate SEM Masters courses

	Discuss the principles of body morphology in the context of sport and physical activity
	Apply the key principles of sports psychology to sport and physical activity
	Analyse the impact of common diseases and medications on normal exercise physiology
	Describe clinically relevant regional anatomy including normal variations
	Describe the anatomy of joints and musculo-tendinous units
	Describe the characteristics of bone, tendon, ligament, articular cartilage and muscle
	Apply anatomical knowledge to history taking, physical examination and imaging
	Describe cellular metabolism and biomechanical pathways of energy production
	Apply the principles of strength and conditioning to formulate a basic plan
	Undertake appropriate assessments of fitness
	Discuss energy release from various sources including fats, carbohydrates, proteins
	Discuss physiological responses and adaptations to exercise
	Discuss the role of genetics in sport and physical activity
	Discuss the role of macro and micronutrients
	Discuss the key principles of hydration in sport and physical activity
	Discuss the benefits and risks of nutritional supplements in sport and physical activity
	Discuss the effects of alcohol on performance
	5. Clinical Pharmacology
	Discuss the issues of medication abuse in elite athletes
	Discuss the influence of medications used in the treatment of disease on physical activity capacity
	Discuss medication and exercise interactions which may cause or worsen disease
	Prescribe safely by considering, contraindications, side effects, drug interactions and dosage of commonly used drugs in sport and physical activity
	Discuss the regulations regarding travelling with medicines
	Discuss the governance of medicine storage and management systems
	6. Antidoping
	Apply knowledge of the WADA prohibited list in both practice and hypothetical scenarios
	Understand the WADA therapeutic use exemption process
	Detail the consequences of doping: health risks, sanctions and responsibilities
	Recognise suitable resources and tools to support athletes and clinicians regarding medications and anti-doping
	7. Sports Team and Event Management
	Describe the roles of the SEM physician in the team environment
	Describe the features of good team dynamics
	Describe the role of the main organisations of sport, sports medicine and health promotion at a national and international level
	Discuss the relevant medical codes on the ethical treatment of athletes (e.g. Olympic code, FSEM code)
	Analyse the components and processes of pre-participation screening for athletes and event participants
	Discuss the key components of pre-season and pre event medical organisation
	Analyse the recognition and management of disordered eating and RED-S

Syllabus for doctors on Postgraduate SEM Masters courses

Discuss the equipment, medical supplies and facilities required for team and event care
Perform risk assessments of training and competition venues
Discuss common match and event day medical issues
Demonstrate the on-field assessment and management of sports injuries and medical conditions
Discuss the psychological aspects of motivation, arousal and performance
Discuss a range of common ethical issues in a team sport environment
Recognise the key medicolegal requirements and considerations in team medicine
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Cardiorespiratory arrest
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Sudden death in sport, both cardiac and traumatic causes
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Concussion and head injury
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Acute musculoskeletal and soft tissue injuries
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Basic management of fracture and dislocations
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
The acutely unwell patient
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Eye and ENT emergencies
Apply the principles of pre-hospital care to a range of common sport and physical activity emergencies
Demonstrate simple skin closure and suturing and have an awareness of the indications for each
Demonstrate basic airway management and deliver effective resuscitation
Demonstrate defibrillation and cardiorespiratory resuscitation
Advise on screening programmes to detect those at risk of sudden death in sport

Syllabus for doctors on Postgraduate SEM Masters courses

	Discuss the findings of any abnormalities raised during screening with athletes, family members and carers
	Demonstrate prompt assessment of the acutely deteriorating patient, including those who are shocked or unconscious, and deliver appropriate, evidence-based care
8. Physical Activity in Challenging Environments	
	Be able to manage common issues in SEM relating to physical activity in extreme environments including: cold environments, hot environments and altitude (
9. Specific Groups in SEM	
	Be able to manage issues in SEM relating to specific groups of athletes in sport including: paediatric, female, ageing, adventure sports and athletes with a disability
	Apply the effects of the ageing process when providing physical activity advice
	Apply knowledge of the physiological changes during and after pregnancy when providing physical activity advice to pregnant and post-partum individuals
	Demonstrate the ability to advise women on undertaking safe exercise throughout the lifespan including advising on energy balance, bone health and hormonal influences
	Discuss the management of common issues affecting disabled athletes and exercisers in relation to sports and physical activity
	Discuss physical problems experienced by amputees and wheelchair users with everyday living and with respect to sport
	Discuss contraception options in athletes
	Demonstrates an awareness of the unique needs of patients with disabilities, the barriers faced in participating in physical exercise and the ability to advise those with disabilities how to undertake safe exercise
	Understanding the social, psychological religious and cultural factors that influence physical activity participation and demonstrate initiatives to overcome these
	Demonstrates knowledge of the anatomical, physiological, psychosocial, sexual and educational development of children and adolescents in the management of musculoskeletal conditions
	Demonstrates knowledge of the aspects that enhance care during the transition and transfer between paediatric and adult services across healthcare
10. Intrinsic Skills of a SEM Clinician	
	Demonstrate the following skills commonly used in practice by SEM physicians: Communication - Collaboration - Leadership and management - Health advocacy - Safety - Research - Teaching - Learning - Professionalism -Consideration of ethics, cultural religious and LGBTQ awareness
	Demonstrate the ability to work within a multidisciplinary team
	Demonstrate the need to coordinate care across multiple agencies to address physical, psychological and social needs in community, secondary care, recreational and elite sporting environments
11. Extrinsic Skills of a SEM Clinician	
	Perform a comprehensive examination of the musculoskeletal and neurological systems and interpret the findings sufficiently to develop a clinically reasoned diagnosis and management plan
	Perform a sport-specific medical and musculoskeletal screening examination

Syllabus for doctors on Postgraduate SEM Masters courses

Provide safe and effective immediate medical care for on-field injuries and medical events
Perform concussion screening examinations, baseline and postinjury, and interpret the results
Recognise the indications of a range of radiological and other investigations relating to sport and physical activity
Analyse ECG findings in an athlete and recognise the indications for onward referral
Discuss the indications, benefits and risks of a variety of common joint and soft tissue injections
Have an understanding of the role of a range of commonly used protective braces
Recognise the indications for taping joints, tendons and muscles and its role in injury prevention and treatment
Interpret simple video analysis of a variety of sporting skills including running gait
Analyse the indications for and findings of resting and exercise lung function tests

UK Doctors Delivering PA Advice: What are the challenges and possible solutions? A Qualitative Study.



Article

UK Doctors Delivering Physical Activity Advice: What Are the Challenges and Possible Solutions? A Qualitative Study

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Abstract: Despite strategies to enable Health Care Professionals (HCPs) to give physical activity (PA) advice to patients, this appears to be rarely done in consultations. The aims of the present study were to gain an understanding of doctors' awareness of current PA guidelines and to explore their opinions on barriers and solutions. A qualitative approach using semi-structured interviews was adopted. This study included 15 doctors currently working in the UK's National Health Service (NHS). A thematic analysis approach was used to analyse the transcripts. Four themes and twelve sub-themes were deciphered. Intrinsic factors limiting the delivery of PA advice included a lack of knowledge of PA guidelines and PA being an afterthought. Barriers to delivering PA guidance included a lack of PA education, time pressures, and patient engagement. Solutions included staff training, incorporating PA into undergraduate training, and encouraging staff to be physically active. Methods to optimise PA guidance included individualised PA advice, local exercise services and schemes, utilising online and visual resources, and motivational interviewing. This study provides an updated insight into doctors' opinions on barriers and solutions to discussing PA with patients. It is clear that further work is needed to ensure greater awareness of PA guidelines amongst clinicians.

Keywords: physical activity; adults; medical education

1. Introduction

Despite significant evidence that physical activity (PA) has numerous benefits on physical and mental health and well-being, levels of physical inactivity are increasing [1,2]. In the United Kingdom (UK), the Chief Medical Officer (CMO) recommends that adults aged 19–64 years should complete at least 150 min of moderate activity, or 75 min of vigorous activity, each week, as well as muscle-strengthening activities at least twice per week [3]. Despite the well-documented benefits of PA, most adults globally fail to reach these recommendations [2]. According to the most recent Active Lives Adult Survey, between November 2020 and 2021 in the UK, 61% of adults were receiving at least 150 min of PA per week, with 27% classed as inactive, meaning they engaged in less than 30 min of moderate PA per week [4]. In recent years, physical inactivity and sedentary behaviour have been under increased focus as they have been found to be independent risk factors for mortality and non-communicable diseases [5,6]. With the COVID-19 pandemic and subsequent lockdowns, researchers have found that PA levels in the UK have decreased

further, associated with reduced physical function and increased mental ill-health [7,8]. It is, therefore, of increasing importance to optimise strategies to increase engagement with PA.

The UK CMO highlighted the importance of healthcare professionals (HCPs) in promoting PA to patients in their updated guidance released in 2019 [3]. There have been schemes to engage HCPs in discussing PA with patients, such as Make Every Contact Count (MECC), which aims to improve confident discussions of PA with patients through HCP training [9]. Despite this, a recent study of 839 UK-based GPs found that only 36% were “somewhat familiar” with the PA guidelines [10].

The aims of the present study were to gain an updated, in-depth understanding of doctors’ awareness of current PA guidelines and explore their opinions of any potential barriers and solutions for doctors engaging in PA discussions with their patients.

2. Materials and Methods

2.1. Design

A qualitative approach was taken, utilising semi-structured interviews [11]. Ethics approval was given by the Faculty of Biological Sciences at the University of Leeds (27 July 2020/BIOSCI 19-039).

2.2. Participants and Procedures

The inclusion criteria for this study included UK-based doctors currently working in the National Health Service (NHS), including doctors working in hospitals and primary care. Participants were excluded from the study if their medical degree was not from a UK University or if they were currently not practising medicine. The participant recruitment process for this study involved advertising through a range of channels, including social media (Twitter and LinkedIn) and by word of mouth. Recruitment was aimed at clinicians who are patient-facing but working across primary and secondary care. This was intentionally broad to reflect the opinions of all those participants who would normally be expected to provide PA guidance. Guidance on PA concerns almost all clinicians working within healthcare. Participants that expressed interest in these channels were sent a copy of the participant information sheet and consent forms, which were signed electronically and returned. Participants were contacted to arrange an interview either in person or online via Zoom. At the start of each interview, participants confirmed they had read the participant information sheet and gave verbal consent to be included in the study. Recruitment and interviews continued until data saturation was reached; this is the point at which no new emerging themes were identified [12].

2.3. Data Collection

Data were collected using semi-structured interviews to gather in-depth and informative responses [13]. This interview method was chosen as the research design as it enabled the interviewer to clarify statements and enquire about further information [11]. The interview guide contained 20 questions and is provided in the Appendix A. The questions promoted open dialogue between the interviewer and participant to elicit maximal information [13], and probing was used when appropriate if initial responses were limited [14]. The last question of the interview enquired whether the participants had any other comments to make to allow for new information and ideas [15]. Several questions were specifically included in the interview to gain an understanding of the participant’s awareness of PA guidelines, including asking if they meet the current UK guidelines for PA themselves, awareness of the PA guidelines, awareness of the CMO PA guidance and awareness of the Moving Medicine resource, an online PA resource for HCPs (<https://movingmedicine.ac.uk/>).

DV, AI, RB, and SW were all involved in data collection. DV provided training to AI, RB, and SW and observed one interview per interviewer to ensure consistency. Interviews were conducted via Zoom between March 2021 and May 2021; only audio was recorded for all interviews. Any identifiable information on the recordings was removed. It was made

clear that data would remain anonymous and confidential, and participation was entirely optional. Participants were informed that they could withdraw from the interview at any stage. Unique codes were used throughout the study to preserve participants' identities. Recordings were transcribed verbatim.

2.4. Data Analysis

Thematic analysis was used to analyse the transcripts [16], which enables a rich and detailed account of the data to be obtained [17]. The six-step process is used to extract meaning and concepts from data to identify patterns and ultimately generate themes [18]. Refinements to the themes and subthemes continued until nothing substantial was added. A recursive process was used in the analysis, moving back and forth between transcripts and themes as needed [16]. Themes were reviewed regularly until there was a distinct and coherent meaning for each. Transcripts were analysed by KM and DV separately. A reflective journal was utilised to evidence the extent to which thoughts and observations were data-driven and without researcher influence, in turn reducing the likelihood of researcher bias. Together, themes and sub-themes were discussed and agreed upon. NVIVO 11 software was utilised to manage extracts from the interviews and illustrate themes. Example quotes from transcripts were presented in tables for each theme and sub-theme. Signs of data saturation were first seen at 10 participants, and no new themes were identified following participants 12 to 15, signifying complete data saturation and that enough information was gained to ensure repeatability [19]. Microsoft Excel was used to collate and summarise qualitative data, which included demographic information of participants (years of experience, current primary healthcare setting, job role and location of work), and frequencies and proportions of responses to questions asked about participant understanding and awareness of PA guidelines.

3. Results

3.1. Participant Characteristics

Fifteen participants expressed interest in participating in the study. As all were eligible, a total of 15 participants were included in the study. Interviews varied in length between 20 min and 45 min, with an average of 29 min. Data saturation was reached at participant 15; at this point, no more emerging themes or new responses were found. Due to data saturation being reached, no further participants were recruited.

Participant characteristics can be found in Table 1 below. The majority of participants (73%) had 6–10 years of experience working as a doctor. The job role of participants varied widely across different specialities, from foundation year 1 doctors to qualified General Practitioners and one Sport and Exercise Medicine Consultant. The majority of participants were located in either northwest England (60%) or Yorkshire and Humber (27%). While the majority of participants were physically active and meeting the CMO PA guidelines (80%), only 27% of participants were aware of the CMO PA Guidelines, and only 33% were aware of Moving Medicine as a resource.

Table 1. Participant characteristics.

Characteristic	Category	N (%)
Years of experience	0–5	3 (20%)
	6–10	11 (73%)
	15+	1 (7%)
Current primary healthcare setting	Inpatients	4 (27%)
	Outpatients	2 (13%)
	Inpatients and outpatients	2 (13%)
	Primary Care	6 (40%)
	Academic or leadership role	1 (7%)

Table 1. Cont.

Characteristic	Category	N (%)
Job role	Foundation Year 1	3 (20%)
	Medical Registrar	1 (7%)
	Psychiatry Registrar	1 (7%)
	Paediatric registrar	1 (7%)
	General Practitioner registrar	3 (20%)
	Qualified General Practitioner	3 (20%)
	SEM registrar	2 (13%)
	SEM Consultant	1 (7%)
UK region	West Midlands	0
	East Midlands	1 (7%)
	Yorkshire and Humber	4 (27%)
Meeting CMO's PA guidelines for aerobic exercise	Northwest	9 (60%)
	London	1 (7%)
Meeting CMO's PA guidelines for aerobic exercise	Yes	12 (80%)
	No	3 (20%)
Aware of CMO's PA guidelines	Yes	4 (27%)
	No	11 (73%)
Aware of Moving Medicine	Yes	5 (33%)
	No	9 (67%)

CMO, Chief Medical Officer; N, number; PA, physical activity; SEM, sport and exercise medicine; UK, United Kingdom.

3.2. Themes and Sub-Themes

A total of 122 codes were generated from the 15 transcripts. Connections between these codes were found to coalesce into 4 themes and 12 sub-themes, summarised in Table 2. Themes and subthemes are listed in order of when they were deciphered from the data; the order does not signify importance. Next to the participant quote is the assigned identification number for the participant in brackets.

Table 2. Themes and sub-themes.

Theme	Sub-Themes
Intrinsic factors limiting delivery of PA advice	Lack of knowledge of PA guidelines PA is often an afterthought
Barriers to delivering PA guidance	Lack of PA education Time pressures Patient engagement
Solutions to increase staff awareness and successful implementation of PA guidelines	Staff training Incorporating PA into undergraduate training Encouraging staff to be active themselves
Methods to optimise PA advice	Individualised PA advice Local exercise services and schemes Utilising online & visual resources

3.3. Theme 1—Intrinsic Factors Limiting Delivery of PA Advice

3.3.1. Lack of Knowledge of PA Guidelines

A lack of knowledge and awareness of the PA guidelines was mentioned in the majority of interviews. There was a broad lack of awareness of PA guidelines amongst the interviewees. Similar comments were made by several interviewees when asked about their knowledge of PA, with one stating: 'I wouldn't say I [I am] confident to be honest' (2) and another commenting: 'I think I've looked at them many years ago, but they don't come to mind particularly often' (6). Going a step beyond the knowledge of PA guidelines to giving advice and prescribing exercise, one interviewee stated: 'I feel confident in prescribing medication. I feel less confident in giving exercise advice' (15).

3.3.2. PA Is Often an Afterthought

Many interviewees emphasised that PA is often not a top priority for medical professionals during consultations, with one interviewee stating: 'It's tricky because it's often not the top thing that you talk about' (11). Several interviewees asserted that it would be advantageous to incorporate PA into the taught consultation structure: 'If it becomes part of our natural history taking and we're looking at them as a whole ... you could then capture a lot of factors that can then change in the future' (14).

3.4. Theme 2—Barriers to Delivering PA Guidance

3.4.1. Lack of PA Education

A lack of PA education during undergraduate and postgraduate training was highlighted during the interviews. One interviewee stated when asked if they had received any PA education: 'Nothing formal from my recollection' (9), and another stated 'I wouldn't say I received formal education with regards to delivering physical activity advice. It's been a more informal and implicit kind of education mostly during my time on placement during medical school' (1). Another interviewee added to this: 'a lot of it does stem from the neglect from medical school regarding physical activity teaching' (3).

3.4.2. Time Pressures

Time constraints were mentioned in most interviews and by all those working in primary care settings. Regarding giving PA advice in practice, one interviewee said: 'with their time constraints of a GP 10 min consultations you're less likely to achieve it' (5). Another added a similar comment: 'I know GPs are hard-pressed; they've got so much pressure to deal with so many issues coming in within 10 min. That is just not possible to give effective PA advice that patients can take in and understand' (2). However, several interviewees did express altering views, with one interviewee stating: 'it doesn't take that much time to add [physical activity] into what you're speaking about' (4).

3.4.3. Patient Engagement

It was mentioned in multiple interviews that the patients themselves, understandably, play a large role in whether PA advice will be successful in creating behavioural change. One interviewee explained: 'It's very patient-dependent. He wants to lose weight and he's keen to get [PA advice] it's easier to talk to them' (12). Self-motivation was highlighted as an important factor, with the same interviewee stating: 'it's more like empowering them to do it themselves as well' (12). Another added: 'If they're not ready to engage, there's no point in me saying "you should run half an hour, five times a week" because they're just going to go on deaf ears and I'm going to lose that rapport with them' (15).

3.5. Theme 3—Solutions to Increasing Staff Awareness and Successful Implementation of PA Guidelines

3.5.1. Staff Training

Increased education and teaching of PA for medical staff was a common theme throughout the transcripts. One interviewee stated: 'I think a baseline would be useful for us all because it's so beneficial and pretty much for every single patient, especially with chronic disease' (8). Regarding staff training, the importance of including up-to-date research and statistics in PA education was mentioned by interviewees, with one stating: 'have those comparison tables, comparison charts that show statistics even if the number needed to treat' (4). Another interviewee commented: 'obviously evidence-based medicine is such an important part of delivering safe and high-quality patient care' (1), and another added: 'if you empower them, give them the knowledge that it is not just 'oh it might be useful' but actually clinically it's been shown the evidence is there and the evidence is strong' (5).

3.5.2. Incorporating PA into Undergraduate Training

Incorporating more PA into undergraduate curricula was mentioned by many interviewees as a method of increasing knowledge among medical professionals. One interviewee stated: 'I think that's really important to do, yes 100%' (12). Another interviewee commented: 'it needs to be better integrated within medical school and linking it in towards the earlier years of your career as well because that's where you start developing your practice in action' (1).

3.5.3. Encouraging Staff to Be Active Themselves

The concept of encouraging staff to be physically active was mentioned by several interviewees, with one commenting: 'I suppose if you're more active yourself, it's probably easier to give tailored advice to people who live in the same city as you' (4). Another interviewee stated: 'it's a case of practice what you preach' (5).

3.6. Theme 4—Methods to Optimise PA Advice

3.6.1. Individualised PA Advice

Ensuring that PA advice is targeted individually was mentioned numerous times throughout the interviews, highlighting that it is beneficial to have a good knowledge and understanding of the person you are pitching the PA advice to. One interviewee stated: 'you have to know your patient and know how best to pitch the idea to them' (12). Another stated: 'I think finding out what they're interested in, some people prefer different forms of exercise' (14), and they added 'if you can work it into their daily routine, walk to school rather than drive to school sort of things can really make a difference in terms of like the whole family exercise' (14). Motivational interviewing was highlighted as an important aspect of optimising PA advice. One interviewee stated: 'I think having that motivational interviewing approach to the consultation has helped, I think bearing in mind physical activity when talking about different chronic or acute health conditions has helped, again, patient-led' (7). Another interviewee commented on how they have personally found motivational interviewing to be effective: 'I usually use now some motivational interviewing approach, starting with assessing via open questions, what they do at the moment, what they know about the possible benefits of exercise, whether they've contemplated—where they are on the state of change sequence from that point of view' (10).

3.6.2. Local Exercise Services and Schemes

Local exercise services, such as referring to an exercise programme, and schemes such as the couch-to-5k, were highlighted by several interviewees as useful methods to encourage patients to increase their PA levels. One interviewee said: 'people seem to really like that flexibility around it' (15). Another interviewee gave a specific example: 'one of them is a local football team and they've set up half-term fitness regimes and places that kids can go and learn about diet and exercise, so I have referred to them a couple of times' (14).

3.6.3. Utilising Online and Visual Resources

The use of visual and online resources was highlighted, with one interviewee stating: 'I like to give outpatient leaflets, especially if they've got an arthritic issue, for example, that has exercises on there that they can use' (15), and adding to this 'in recent time, you can text people with the website, so I'll text them with the website for the NHS and their guidance about a healthy lifestyle' (15). Another interviewee stated: 'I know there are resources online, where they have information for each chronic condition . . . I know there is specific kind of guidance of how to go about giving physical activity education to patients in those areas' (1).

Moving Medicine (an online PA resource for HCPs) was mentioned specifically by several of the interviewees, with one stating about the moving medicine website: 'I just have a flick-through on the conditions and then I can either print it out or just made a note on it and then relay that information to the patients' (1). However, only 33% (5/15) of

participants were aware of this resource, and no participants described using it regularly. Reasons for this were described as due to setting and lack of time or familiarity. In contrast, a few interviewees commented on the difficulties of finding the appropriate online or visual resources, with one stating: 'obviously there are some available but finding the right ones is usually quite tricky' (3). Only four participants (27%) were familiar with the UK CMO PA guidelines, and participants from either those aware or not aware felt that resources needed more promotion, as most HCPs would not be aware of them.

4. Discussion

The aims of this study were to explore the understanding of doctors in the UK of the PA guidelines and barriers and solutions to engaging in discussions on PA with patients. Thoughts and opinions were obtained from doctors in England in a variety of different specialties and at a variety of stages in training. This study found that some issues related to delivering PA advice include a lack of knowledge of the PA guidelines, a lack of priority for giving PA advice, time pressures, and patient engagement. Solutions given included staff training on PA, incorporating PA into the undergraduate curriculum, encouraging staff themselves to be active, providing individualised advice, utilising local exercise services and online or visual resources, and using motivational interviewing to facilitate the advice being given.

4.1. Improving Knowledge, Confidence, and the Priority Given to Providing PA Advice

Improving inactivity levels in society is a complex and multifactorial issue, demonstrated well by the fact that limited solutions have been developed to combat the rise in physical inactivity despite extensive evidence of the benefits of being active for health and quality of life. The findings of this study are in line with previous papers highlighting the lack of knowledge and confidence of HCPs in giving PA to patients [10,20–22]. Indeed, 10% of junior doctors felt they had been adequately trained in PA [23]. Improving this could lead to PA being discussed during more consultations. Indeed, improved training and education for doctors were highlighted as solutions from the findings of this research.

This study found that PA being an afterthought and not a priority is a reason why it may not be mentioned during consultations. A similar finding of lack of priority to PA advice during consultations was found amongst physiotherapists [22]. Interestingly, one study found that 98.9% of GPs believe that PA is important for health [10]. Therefore, while the benefits are well acknowledged by doctors, it continues to not be thought of as a priority during consultations. Potentially, this is due to PA not being highlighted throughout training as an important aspect to consider. It has been suggested that PA levels be considered a vital sign [24] and, given the wide-ranging impacts of PA on health, it would be prudent for discussion regarding PA to be taught at an early stage of medical training when students are developing and consolidating consultation skills and evaluating vital signs. This may help PA discussions become a natural part of consultations for doctors of the future. The findings of this study, therefore, support previous calls for PA to be better embedded into the training of medical staff and into undergraduate curricula [25,26]. Currently, in the UK, the medical curriculum, which is published by the General Medical Council and forms the framework for all UK medical schools, gives little priority to PA. In fact, there is only one outcome related to PA, and that is within the context of weight loss only [27]. Including PA in curricula at an early stage and throughout training may increase the priority given to discussing PA during consultations. The Office of Health Improvement and Disparities (OHID) currently runs the moving HCPs programme, which is a whole system educational approach to embedding PA into clinical practice [28].

4.2. Encouraging a More Physically Active Workforce

Encouraging doctors to be active as a way of encouraging the promotion of PA to patients is an interesting concept and finding of this study. However, this is not a novel concept, with a range of global research suggesting that doctors who are active are more

likely to give physical activity advice to their patients [29–31]. A study performed in Glasgow in 2019 found that 63.9% of 332 doctors met the recommended volume of aerobic activity, while only 23.5% achieved the recommended account of muscle-strengthening activities [21]. They concluded that their results indicated doctors are as active as the UK general public. Another recent study found that 58% of 245 UK doctors met the PA guidelines, again concluding no significant difference from levels in the general population [31]. Clearly, encouraging medical staff to be active is valuable in promoting health among the staff themselves and the individual benefits they will gain from this and in ensuring a healthy workforce. Previously there have been calls for the NHS to better encourage, support, and facilitate staff to engage in PA [31]. The moral debate of whether doctors need to, or should be, role models for patients regarding health behaviours [32] is beyond the scope of this article. However, the findings of this study support the concept that promoting PA among HCPs might result in PA being discussed more often with patients [33].

4.3. Utilising Resources

Time pressures are an issue throughout healthcare and have been highlighted numerous times throughout the literature as a reason why PA is not discussed with patients by HCPs [20,25,34,35]. This is supported by the findings of this study. A solution to this may be optimising the way in which PA can be delivered. Referring to local supported exercise services was highlighted during the interviews.

Utilising online and visual aids to promote PA to patients was also highlighted as a potential solution. Signposting to useful resources may also aid with the issue of having limited time during consultations. In addition, this study found that ensuring PA guidance is individualised is beneficial in optimising the PA advice given. With regard to online and visual aids, the importance of ensuring that they are specific for individual patients has been noted in recent years, with resources such as the CMO's PA guidance and Moving Medicine (an online aid for providing PA advice to patients) having targeted advice for specific population groups such as age groups and different chronic health conditions [36]. It should be kept in mind that resources that are online may perpetuate inequalities, as patients without the socioeconomic capacity to purchase technology or digital literacy may not be able to easily access these resources.

4.4. Limitations and Strengths

There is a risk of participant bias, as those who are more interested in PA may have been more likely to volunteer. However, based on the backgrounds of the doctors interviewed, the research team remained confident that the majority of participants were doctors without a specific PA interest or expertise. Most participants were based in Yorkshire and Humber and northwest England, and it would have been advantageous to gain a broader view from doctors based in other locations in the UK. There is potential for researcher bias and the reliability of interpretations of the interview data, although Braun and Clarke's six steps were used to reduce this. The data were also analysed independently by DV and KM, and the themes were discussed to reduce the potential for bias. Strengths of this research included in-depth qualitative accounts from doctors about the issues and challenges they faced when promoting PA, as well as possible areas that could be improved to help promote PA. The involvement of this group in shaping interventions is essential, given that HCPs have been identified as being key for promoting PA [3,25].

It should be acknowledged that this project specifically focused on PA guidelines for healthy adults. Alternative guidelines are recommended for specific population groups such as pregnant women, older adults, and those with chronic health conditions. It would be beneficial for future research to explore HCPs' thoughts and opinions on delivering PA advice for specific groups. It should also be noted that longer durations of higher intensity activity can actually be detrimental to certain health conditions such as chronic fatigue syndrome and long COVID-19 [37].

5. Conclusions

This paper provides an updated insight into doctors' views and opinions on barriers and solutions to discussing PA with patients. It is clear that further work needs to be done to ensure greater awareness of PA guidelines amongst clinicians so that they, in turn, can best advise their patients, improve the health of the nation, and reduce morbidity and mortality. Barriers to delivering PA advice included lack of PA education, time pressures, patient engagement, and limited staff training. Incorporating PA education in undergraduate training was highlighted as a possible solution, as was increasing awareness of resources to support clinicians. Increasing PA advice given to patients requires a multifaceted approach, including increasing education of HCPs, raising awareness of patient resources and awareness of local services, as well as wider healthcare system-wise change.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of the Faculty of Biological Sciences at the University of Leeds (27 July 2020/BIOSCI 19-039).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available to avoid the potential identification of interviewees based on comments made.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study.

INTERVIEW GUIDE

[Thank the participant for attending the interview.]

[Participant to have read the PIS and consent form and returned a completed copy of the consent to the researcher prior to the interview.]

[Researcher and participant to introduce themselves. Researcher to introduce the evaluation and the purpose of the interview.]

[Reiterate that the information participants provide will be anonymised and confidential. Check that the participant is comfortable with the interview being recorded.]

In this interview, I am interested in hearing about your experiences of delivering physical activity guidance to a patient and your opinion as a clinician on the barriers, challenges, and solutions to improving health care professionals given PA advice and views on current interventions/developments.

Please be assured that you will remain anonymous, and the research team will not share your comments with anyone else, so be as honest as you can. If there are any questions that you would prefer not to answer, you do not have to answer them. If at any point you do not understand what I am asking or need some clarification, please feel free to ask as we go along. You will be given an opportunity to say anything that we have not covered at the end of the interview

Do you have any questions about the interview before we begin?

Demographics

State your role, experience, and current location of work (primary or secondary care).

What is your speciality/discipline?

How many years of post-graduation experience do you have?

Which statement best describes your own PA:

1. Currently meeting the CMO PA guidelines of 150 min moderate/75 min vigorous or combination of both;
2. Currently doing some PA 30 min moderate physical activity (MPA), but not meeting CMO PA guidelines of 150 min moderate/75 min vigorous or combination of both;
3. Currently doing less than 30 min MPA.

Tell me about the education and training that you have received in relation to Physical Activity (PA):

Did it take.

Development;

How much time?

Knowledge of PA guidelines

[Feelings/confidence around delivering CMO PA guidance.]

[Why? Confidence? is it their role?]

If someone is diagnosed with a chronic disease that can be improved by PA, what do you currently do in terms of delivering PA guidance?

[Explore who delivers guidance, whether part of standard procedure or ad hoc, whether the content of guidance is general advice or adheres to guidelines;

Why this approach;

What they think of this approach;

What individuals/practices could do differently;

What works well and why?

What needs to change for this to happen;

Signposting, etc.]

What do you do differently for those who have a chronic disease and those who do not in terms of delivering PA guidance?

Given an Example.

What works well and why?

What works less well?

What would be your 'top tip' for promoting PA to your patients with chronic disease and those without?

[Explore what they do well and would share with their fellow colleagues as something that is exemplar practice.]

What would help you deliver the CMO PA guidelines to your patients?

Prompts here, time, resources, partnerships with providers, better training, other people I could refer to in-house, policy commitment for PA promotion.

What, in your opinion, are the challenges and barriers that prevent IICPs from giving physical activity advice?

Prompts here: Consider intrinsic and extrinsic

How do you engage or recruit hard-to-engage HCPs who are less enthusiastic or even anti-PA?

What works, why and how?

What works less well and why?

Should we not bother recruiting those HCPs who are less enthusiastic, yes or no and why?

Education

What IICP education do you feel is most effective at enabling IICPs to promote the guidelines?

Prompts:

The 2019 guidelines;

Infographics;

PA training;

Mentoring;

What works well and why?

How can we embed more physical activity into undergraduate and postgraduate curriculums?

Consider delivery type/method, scalability, assessment.
 What are the solutions to increase HCP physical activity advice?
 Consider policy, motivating practices, clinicians.
 Resources and Interventions;
 2019 Guidelines.
 Do you think the 2019 update has been helpful or not?
 Why is this?
 Have you seen the CMO PA infographics? If so, which ones?
 If yes—how do you use it?
 What else would you like to see in the guidelines?
 Prompts: 24 h message, inclusion of guidelines on sleep and PA, specific diseases,
 other groups?
 What other actions or resources should accompany the implementation of the CMO
 PA guidelines?
 Prompts: CMO PA Guidelines, communication strategy;
 A campaign with TV, radio, social media advertising;
 Better resourcing to support the campaign;
 Inclusion of communication experts on different platforms;
 Coordinated approach with other health issues.
 How do you feel about mandatory induction? Y/N? Timescale?
 Do you use any other PA-related guidelines?
 Yes/No? Why?
 Have some prompts.
 Moving Medicine:
 Do you know about MM?
 MM is an online suite of resources that provide time-specific consultations for HCP
 across 11 conditions.
 Do you currently use moving medicine resources?
 If you do use it, how do you use it?
 If you do not use it, why not?
 What works well and why?
 What does not work well and why?
 Content, coverage, access, style?
 In your opinion, what could be improved about moving medicine to make it more fit
 for your purpose as a clinician?
 Can you give an example of where you have done this?
 Is there anything else that you would like to add about delivering PA before we finish
 or anything you have not said?
 [Thank the participant and remind them of the contact details on the PIS should they
 have any questions, want to request a lay summary, etc.]

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Output 15: Educating the next generation in SEM: A cross-sectional survey



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Research

Educating the next generation in sport and exercise medicine: A cross sectional survey

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Abstract

Background: Sport and Exercise Medicine (SEM) is a relatively new specialty, and it is not well incorporated into undergraduate medical education. Previous studies have highlighted that medical students would benefit from increased teaching on SEM, and that students would like more SEM teaching. The aim of this project is to establish which SEM-related topics are deemed to be most important to incorporate into undergraduate medical education and confirm whether medical students would benefit from increased SEM exposure.

Methods: An online survey was distributed to all members of the British Association of Sport and Exercise Medicine (BASEM) via email, and it was shared on Twitter via BASEM and the research team.

Results: A total of 126 responses were analysed. The majority of respondents works in SEM, or were interested in pursuing a career in SEM. Musculoskeletal (MSK) examination skills, exercise to prevent and manage disease, and MSK injuries and conditions were deemed to be the most important SEM-related topics to teach medical students. Use of social media and pitch side case were deemed the least important. Respondents thought medical students do not receive enough SEM teaching at medical school and could benefit from increased SEM exposure.

Conclusion: This study supports the opinion that medical students would benefit from increased SEM exposure. This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. In response to this survey a Delphi study is being conducted in the UK to establish a consensus undergraduate SEM curriculum for medical students.

Keywords: Shoulder arthroscopy; glycine effect; electrolytes imbalance; complications; fluid overload.

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Output 15: Educating the next generation in SEM: A Cross-Sectional Survey

INTRODUCTION

Sports and Exercise Medicine (SEM) is a recognised specialty with its own higher specialist training programme and increasing numbers of SEM departments are becoming established in the National Health Service (NHS) [1]. In keeping with this increased opportunity for SEM in postgraduate training, there is increasing need to develop interest and knowledge among junior clinicians and students [2]. For students and junior clinicians interested in SEM there are limited options available to learn more about the specialty, with few resources aimed at this level of training [3]. There have been a number of research papers and editorials published in recent years calling for an increase in SEM in the undergraduate medical curriculum [3–8]. However, none report novel data to directly support their conclusions.

The primary objective of this study is to establish which SEM-related topics are deemed most important to be taught as part of undergraduate medical education in the United Kingdom (UK). Secondary objectives include determining how often SEM is taught at medical school and understanding thoughts on whether students would benefit from more SEM teaching.

METHODS

An online survey was created using Google Forms (Google Inc. USA). All members of the British Association of Sport and Exercise Medicine (BASEM) were emailed a link to the survey in June 2018. Participants responded over a three-month period. The survey was also shared via BASEM's twitter account and by the twitter accounts of the research team (KM and DF). Informed written consent was obtained via a compulsory question at the start of the questionnaire. This was an internal organization survey conducted with permission from said organization. Due to this, and no identifiable information being collected, ethical approval was not sought. This is in line with the Declaration of Helsinki on 'Ethical Principles for Medical Research Involving Human Subjects' created by The World Medical Association, Inc. [9–11].

Participants were eligible to complete the survey if they

were UK medical students or qualified doctors. The questionnaire aimed to explore several elements of SEM teaching to undergraduate level and is given in Appendix 1. Where appropriate, data were divided into 2 subgroups of juniors (medical students and pre-registrar doctors), and seniors (Consultants, General Practitioners and Registrars) for comparison between groups. In addition, where appropriate seniors were separated into those that worked or trained in SEM or not to establish differences of opinion. Statistical analysis was performed using Microsoft Excel. Where median values are given, they are reported as median and inter-quartile range. Where appropriate, data were assessed for normality using Shapiro-Wilcox and the Mann-Whitney U test was used to determine differences between groups. Statistical significance was set at $p < 0.05$.

RESULTS

The survey received 136 responses. Eight participants were not eligible due to not being a doctor or medical student. Incomplete surveys ($n = 2$) were removed, leaving 126 responses. Consultants made up 34% of participants, 25% were General Practitioners, 10% were registrars, 13% were pre-registrar level doctors, and 19% were medical students.

72% of senior clinicians were working or training in SEM. 69% of juniors were interested in pursuing a career in SEM. 66% of all respondents had an additional degree in SEM.

IMPORTANCE OF SEM RELATED TOPICS

Participants were asked to rank how important it is that various SEM-related topics are included in undergraduate medical education. There were statistical differences between responses from juniors compared with seniors for the topics of nutrition, exercise physiology, working as a team doctor, and pitch side care. In each case, juniors deemed them to be more important than seniors. The results are given in Table 1

Table.1 Participants were asked to rank how important it is that each topic is included in undergraduate education. 1 = not important at all, 10 = very important. P value given for comparing responses from juniors, with responses from seniors. Statistically significant p values are in bold.

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Topic	Median (IQR)	Median (IQR) for juniors	Median (IQR) for seniors	P value
Musculoskeletal Examination Skills	10 (10 - 9)	10 (10 - 9)	10 (10 - 9)	0.934
Exercise to prevent and manage disease	10 (10-9)	10 (10 - 9)	10 (10 - 9)	0.465
MSK injuries and conditions	9 (10 - 8)	8 (10 - 8)	9 (10 - 8)	0.516
Nutrition's	8 (9 - 6)	8 (10 - 6)	7 (9 - 6)	0.024
Rehabilitation	8 (9 - 6)	8 (9 - 6)	7 (9 - 6)	0.126
Exercise Physiology	7 (8 - 6)	8 (9 - 6)	7 (8 - 5)	0.005
SEM in specialist groups (eg disability, women, older athletes, children's)	7 (8 - 5)	7 (8 - 5)	7 (8 - 5)	0.151
Biomechanics	6 (8 - 5)	7 (8 - 4)	6 (8 - 5)	0.624
Drugs in sport	5 (7 - 4)	6 (8 - 4)	5 (7 - 3)	0.346
Sport Psychology	5 (7 - 3)	6 (8 - 4)	5 (6 - 3)	0.065
Working as a team doctor	5 (7 - 2)	6 (8 - 3)	4 (6 - 2)	0.004
Sports Ethics and law	5 (6 - 3)	5 (7 - 3)	5 (6 - 2)	0.338
Pitch side care	5 (6-2.25)	5.5 (8 - 3)	5 (6 - 2)	0.016
Use of social Media	5 (6 - 2)	5 (6 - 2)	4.5 (6 - 1)	0.181

THOUGHTS ON AMOUNT OF SEM TEACHING

All juniors were asked how often they had been exposed to SEM during medical school. The majority had either never been exposed to SEM during medical school (60%) or had been exposed to it 1-2 times a year (37%). The remaining 3% were exposed to SEM 1-2 times a month (Figure 1).

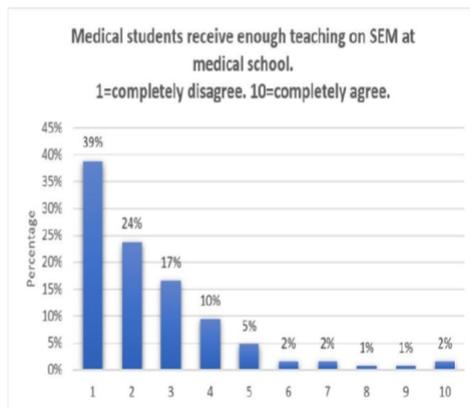


Fig.1 Responses when participants were asked if they agree or disagree with the statement 'Medical students receive enough teaching on SEM at medical school' 17(12) 2022

In this figure the results given when participants were asked whether medical students receive enough teaching on SEM. The median score for seniors was 2(3 - 1) and for juniors was 1(2 - 1). There was a statistically significant difference between the two groups (p = 0.004). There was no statistically significant difference between those seniors working or training in SEM and those that are not (p > 0.05) (Figure 2).

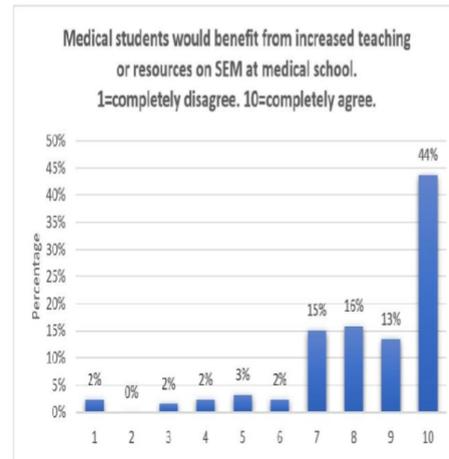


Fig 2. Responses when participants were asked if they agree or disagree with the statement 'Medical students would benefit from increased teaching or resources on SEM at medical school'

Figure 2 shows that participants think students would benefit from increased teaching or resources on SEM at medical school. There was no statistically significant difference in opinion between juniors and seniors (p = 0.908). Senior clinicians thought it was important for all medical students to have increased teaching or resources on SEM (median of 9 (7-10)), as well as those specific medical students interested in pursuing SEM (median of 10 (8-10)). There was a statistically significant difference between those seniors working or training in SEM and those that are not, with those working in SEM believing more strongly that medical students would benefit from increased SEM teaching or resources. The median for SEM professionals was 9(10 - 8) and the median for non-SEM professionals was 8(10 - 7) (p = 0.005).

DISCUSSION

THE MOST RELEVANT SEM RELATED TOPICS

The key findings of this study are that MSK examination THE JOURNAL OF ORTHOPAEDICS TRAUMA SURGERY AND RELATED RESEARCH

skills, exercise to prevent and manage disease, and MSK injuries and conditions are deemed to be the most important SEM-related topics to teach to undergraduates. Social media use and pitch side care were deemed the least important. This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. The findings of this study are important because they will determine how best we move forward in terms of the education we provide to undergraduate level. The majority of research thus far around incorporating SEM into medical curricula has been focused on exercise medicine [12]. Aside from exercise medicine, as far as the research team is aware, there are no SEM-focused resources aimed at the level of medical students. In addition, there is no SEM syllabus for medical students and new clinicians outlining what SEM they should know for their level in training.

BEING AN SEM DOCTOR- MORE THAN BEING PITCHSIDE

The difference of opinion between juniors and senior clinicians in the topics of working as a team doctor and pitch side care is of particular interest. It is a controversial topic within the SEM community that SEM doctors only work with elite athletes and sports teams, and the importance of highlighting that SEM is much broader than this has been highlighted previously [13]. Anecdotally, the authors acknowledge that the MSK medicine and exercise medicine aspects of SEM are often over-looked by those with limited experience of the specialty. Arguably these are the aspects of SEM that can best be utilized in a number of different specialties throughout the NHS. It may therefore be valuable for students and new clinicians to have some knowledge of SEM that will be valuable in a variety of different clinical settings.

THE BENEFITS OF MORE SEM EDUCATION

The survey findings suggest that students and clinicians of all grades are of the opinion that medical students would benefit from having more exposure to SEM during medical school, an opinion expressed previously [14–16]. However, there is limited data supporting this theory, which is an important finding of this study. In addition, this study found that seniors believe increased

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SEM teaching would be beneficial for all students, not just those interested in pursuing a career in SEM. There are potentially several reasons for this. Firstly, the lack of exposure to SEM results in a lack of awareness of what is involved in SEM, including its place in health service provision [17]. A lack of awareness of the specialty of SEM has been demonstrated among the medical profession [18, 19]. This may mean that SEM NHS services are not being utilized due to lack of awareness of these services existing, resulting in patients not benefitting from referrals to SEM departments.

Secondly, inactivity is a significant risk factor for disability and death and to combat this as a society promoting physical activity as a form of medicine is of paramount importance [20]. If we are encouraging more people to be active, it follows that more people will suffer from sports-related injuries. We need our doctors of the future to be prepared and confident to deal with the MSK injuries that will potentially increase as a result of this. Furthermore, aspects of the SEM curriculum are applicable in many parts of medicine [21]. For example, both exercise and musculoskeletal medicine are relevant in General Practice, whilst exercise physiology is important in Anesthetics.

STRENGTH AND LIMITATIONS

This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. Views were collated from individuals in a variety of stages in their career in order to compare differences between sub-groups.

A limitation of this study is that most participants have an existing interest in SEM. The majority of participants were working in, or interested in working in, SEM and therefore are potentially biased towards feeling more SEM exposure would be of benefit. Further research should aim to gain opinions of non-SEM doctors, and students and juniors not interested in pursuing SEM, to establish how applicable SEM skills and knowledge is to the wider medical profession. Furthermore, as the survey was shared on social media, a response rate cannot be calculated.

CONCLUSION

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This study has found that MSK examination skills, exercise to prevent and manage disease, and MSK injuries and conditions were deemed the most important SEM-related topics to include in medical student education. Use of social media, pitchside case, sports ethics and law, and working as a team doctor were deemed the least important SEM-related topics for undergraduate education. Respondents thought medical students do not receive enough SEM teaching at medical school and could benefit from increased SEM teaching/resources, which supports previous research findings. In response to the findings of this survey, a Delphi study is being undertaken to further clarify an SEM undergraduate syllabus. In addition, educational SEM & musculoskeletal resources have been created specifically aimed for the level of medical students and junior clinicians.

DECLARATIONS

Ethics approval and consent to participate: This was an internal organisation survey conducted with permission

from said organisation. Due to this, and no identifiable information being collected, ethical approval was not sought. This is in line with the Declaration of Helsinki on 'Ethical Principles for Medical Research Involving Human Subjects' created by The World Medical Association, Inc. Informed written consent was obtained via a compulsory question at the start of the questionnaire, and all participants were over the age of 18. All methods were carried out in accordance with relevant guidelines and regulations.

ABBREVIATION

KM and DF conceived the design of the study, contributed to the collection of the data, KM, DV and DF performed statistical analysis of the data. All authors (KM, DF and DV) contributed to the manuscript writing and approved the final version applicable

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RESEARCH

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Creating a sport and exercise medicine undergraduate syllabus: a delphi study



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Abstract

Background Sport and Exercise Medicine (SEM) is a growing speciality in the United Kingdom (UK). This growth has not been replicated in SEM teaching at an undergraduate level and SEM-related topics in schools of medicine in the UK are under-represented. As SEM continues to develop as a specialty it is important to consider how it is embedded at all levels of training. The aim of this project was to establish a consensus on SEM-related skills and knowledge relevant for undergraduate medical students in the UK, ultimately creating a curriculum of learning objectives (LOs).

Methods A modified Delphi survey was utilised to seek consensus on LOs suitable for incorporation into UK medical school curricula. An expert panel with adequate knowledge in the field was recruited. The initial curriculum was created by the research team using already established postgraduate SEM curricula. All learning objectives were sent to the expert panel for opinions in phases. Levels of agreement and comments made by the expert panel were reviewed after each phase until a consensus on each learning objective was made.

Results The expert panel was made up of 45 individuals, with 35 also completing phase 2 (78% retention rate). The initial curriculum contained 58 learning objectives separated into 9 themes. In phase 1 31% (18/58) were accepted outright, 48% (28/58) were altered and 19% (11/58) were rejected. Two additional learning objectives were added. Of the 49 LOs included in phase 2, 98% (48/49) were accepted. The final curriculum was made up of 9 sub-themes and 48 LOs.

Conclusion Sport and Exercise Medicine is a broad ranging and rapidly growing speciality. It is important to establish SEM education in all levels of medical education, including undergraduate level. This is the first published version of a Delphi SEM curriculum for undergraduate medical teaching.

Keywords Medical education, Sport and exercise medicine, Undergraduate

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Output 16: Creating a SEM Undergraduate syllabus: A Delphi Study

Background

Sport and Exercise Medicine (SEM) is a growing medical speciality in the United Kingdom (UK) and worldwide. SEM is a medical speciality that includes team medicine, exercise medicine and musculoskeletal medicine. SEM could be an important medical speciality to improving the health status and quality of life of patients by both increasing and maintaining physical activity levels. Physical inactivity is a leading cause of disease burden and an important modifiable risk factor alongside smoking. [1] The past few years have seen position statements, the creation of multiple postgraduate SEM courses, and an international Delphi study to create a curriculum for SEM practitioners. [1–3] However, this growth has not been replicated in SEM teaching at an undergraduate level, and SEM-related topics in schools of medicine in the UK are under-represented. [4–6] The General Medical Council's "Outcomes for Graduates" and Health Education England's "Future Doctors" reference the growing need for doctors to be skilled in providing tailored exercise medicine advice to patients, and in demonstrating core musculoskeletal skills. [7,8] Most medical specialties currently have a syllabus to which they expect medical students to achieve outcomes by the end of their undergraduate career.

Worldwide, the integration of sport and exercise medicine teaching into undergraduate curricula is also an issue. In the USA, Asif et al. (2022) conducted a Delphi study for an exercise medicine core curriculum because medical trainees in the USA were found to receive relatively few hours of teaching [9]. This global training issue also affects the Middle East and Europe. [10,11]

As SEM continues to develop as a specialty it is important to consider how it is embedded at all levels of training. In the UK, it is common practice by the majority of royal colleges to produce an undergraduate curriculum. Creating and encouraging the use of that curriculum by medical schools could be useful to ensuring exposure and interest to the specialty. SEM is a relatively young specialty, having been formally established in 2005, and no equivalent undergraduate curriculum has been established to date. [12] With this in mind, the aim of this project was to establish a consensus on SEM-related skills and knowledge relevant for undergraduate medical students in the UK, ultimately creating a curriculum of learning objectives (LOs). This will act as a guide for the teaching of SEM at undergraduate level and standardise undergraduate SEM teaching throughout the UK. The majority of medical schools do not follow, nor need to follow published royal college undergraduate curriculums, their priority it to ensure they meet GMC outcomes for graduates. Specific learning outcomes are usually created by the medical school and for the majority of specialties this is entirely appropriate given they

are large specialties found in all areas. SEM however, is a small speciality with only 173 Consultant doctors on the GMC specialist register based in a narrow range of locations and with currently a limited but growing NHS presence. [13] It is therefore unlikely that all medical schools have access to Sport and Exercise Medicine Clinicians. It is hoped this consensus of LOs will encourage medical schools to increase the amount of SEM teaching incorporated into medical school curricula.

Methods

Study Design

A modified Delphi survey was utilised to seek consensus on LOs suitable for incorporation into UK medical school curricula. The original delphi method was developed by Dalkey and Helmer and is an iterative process designed to determine consensus through exposing the expert panel to multiple iterations of data, in this case learning outcomes. [14,15] There are a variety of observed ways of delivering a delphi however its overall distinct features including the use of an expert panel and a round based, iterative approach. Delphi methodology is used extensively in curriculum development. [16] This delphi was defined as modified and therefore variant methodology due to the creation of the draft curriculum by the research group rather than the use of the expert group to create the original curriculum. [15] This methodology was used to avoid multiple rounds and therefore the risk of poor response rates with progressive rounds. [17] This study involved the creation of the original draft curriculum by the research team, which was put through 2 rounds of review by the expert panel before being finalised by the research team. In keeping with the principles of Delphi methodology, contributions given by the expert panel were kept anonymous to the research group throughout the process. [18] The methodology used in this study was also used for a Delphi study conducted by members of the research team for postgraduate SEM curricula, the same expert panel was utilised for both studies. [19].

Establishing the research group

The research group was made up of DV, AI, KM, TP, DS, AP, CN, PB and GF. This group was formed to incorporate individuals with experience in a wide variety of related topics including medical education, delivering SEM education, experience undertaking and/or teaching on undergraduate medical degrees, SEM Masters courses and Delphi methodology. In addition, individuals were included due to their experience with the Undergraduate Sport and Exercise Medicine Society (USEMS) and their interest in the specialty of SEM. USEMS is a UK based, non-profit society aimed at promoting the specialty of SEM for undergraduates. [20] All decisions regarding

content were finalised by the research group such as reviewing and amending learning outcomes based on comments from the expert panel following the first round.

Expert Delphi Panel

Individuals suitable for joining the expert panels are defined as individuals with knowledge and experience in the subject area. [21,22] All members of the British Association of Sport and Exercise Medicine (BASEM) and the Faculty of Sport and Exercise Medicine (FSEM) were emailed invitations to express interest in joining this expert panel. Invitations to submit interest were also shared on Twitter by the research group.

Individuals expressing interest in joining the expert panel were asked demographic information and questions selected by the research panel to determine eligibility. The eligibility criteria were selected to ensure the expert panel was made up of individuals with adequate knowledge in the field of SEM. It was not determined whether the participants had prior experience of writing LOs.

The eligibility criteria used consisted of:

- *Doctors that have completed their Foundation Training.*
- *Achieved a higher qualification in SEM: specifically, either a SEM masters degree/diploma, or membership/fellowship of the FSEM (MFSEM/FFSEM).*
- *Graduated more than 5 years prior to the start of the study.*
- *Working in the United Kingdom at the time of the study.*

Individuals that did not meet the eligibility criteria were removed by the research group. A panel size of at least 30 was aimed for as the quality of a Delphi study has

previously not been found to be improved by a panel size greater than 30. [18,23]

Development of the initial curriculum

A documentary analysis was performed and LOs included in previously published UK-based SEM specialty training and SEM Masters curricula were combined by the research group. Each learning outcome was then discussed by the research group at a meeting. Learning outcomes that were duplicated or deemed inappropriate for an undergraduate medical student were either removed or amended based on research group consensus. Following the research group review and consensus an initial draft of the curriculum was created. [2,23,24,25] The LOs in these curricula were grouped into relevant themes as determined by the research group. All LOs were reviewed by the research group before being amended or removed if required. Bloom's taxonomy was used to establish an appropriate level for undergraduate medical students as agreed by the research group (Fig. 1). [26] Reducing the Bloom's taxonomy level was the main reason for amending a learning outcome at the draft curriculum phase by the research group. The Bloom's taxonomy levels used are given in Fig. 1.

Procedure

Google Forms (Google Inc. USA) was used to create the initial survey for those wishing to express interest in joining the expert group, and demographic information was collected via this form. Qualtrics software was used to create the electronic surveys for the Delphi. [27] This survey was emailed to all individuals deemed eligible to join the expert panel. Participant information sheets were emailed to all eligible individuals. Written informed consent to participation was gained by all members of the expert panel via a mandatory question asked at the start of the survey. The survey instructions stated clearly that experts should consider the relevance of individual LOs for medical student level when answering the survey.

Data were collected from October 2020 to November 2020. Members of the expert panel were given 12 days to respond to each phase of the Delphi. A system-generated email was sent after day 8 and day 10 to non-responders to act as reminders. In addition, members received a text message if no response had been received by day 10. The research group aimed for the response rate to not fall below 70% as expert panel engagement is vital for Delphi studies. [28].

Phase 1: First review of learning objectives.

Members of the expert panel were asked to either accept, reject or modify each LO in the proposed curriculum. To ensure standardisation of approach, the expert panel were asked to focus not only on the content or topic conveyed in the learning outcome but also on the level of

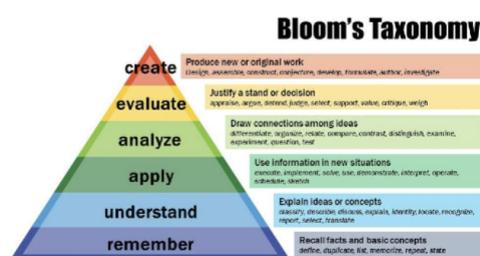


Fig. 1 Bloom's taxonomy. Level 1 is knowledge to level 6 which is creation. Image used within rules of license (creative commons attribution-sharealike license). Taken from: https://commons.wikimedia.org/wiki/File:Bloom%27s_Revised_Taxonomy.jpg

Table 1 Alterations. The reasons for alterations to learning objectives after phase 1. Eleven LOs (19%) were rejected and removed due to either lack of relevance to undergraduate level (n = 7) or overlap with other LOs in the curriculum (n = 4). The objectives removed for being too high level, and examples of quotes from the expert panel supporting their removal, are given in Table 2. The objectives removed due to overlap are given in Table 3 alongside the remaining LOs that they overlapped with

Reasons for alteration	Number of learning objectives altered
Spelling and grammar (including re-wording)	14
Alteration to Bloom taxonomy level	8
Objective made more specific	15

Bloom's taxonomy used. An explanation of Blooms taxonomy as well as links to further resources were provided to the expert panel. A consensus of opinion was defined by 75% agreement, as reported previously by Keeney et al. [18] Ranges from 70 to 100% have been reported in previous literature as appropriate for consensus. [19,29] Participants had the option of providing anonymous comments after reviewing each LO. For each LO the percentage of agreement was calculated and any anonymous comments regarding that LO were reviewed by the research group. All comments for all LOs were reviewed regardless of the level of agreement. The research group then accepted, rejected or altered each LO depending on the responses given to create a second draft of the curriculum. If a level of agreement of 75% or above was received with no comments given, the LO was accepted outright with no further need for review. If comments were given, the research group discussed the comments and, if appropriate, amended the LO and included it in the second draft of the curriculum for further review. If the level of agreement was below 75% and no comments were given, the LO was rejected. If comments were given, the research group reviewed the comments and, when appropriate, amended the LOs and included them again in the second draft of the curriculum for further review.

Phase 2: Second Review of learning objectives.

The second draft of the curriculum, based on responses given in phase 1, was sent via email only to members of the expert panel that had completed phase 1. In phase 2 members of the expert panel were asked to either accept or reject each LO and again there was the option to provide anonymous comments this time after review of each theme rather than each LO. The LOs accepted outright in phase 1 did not require a response but were included for reference. Again, percentages of agreements and comments were reviewed by the research team and decisions were made to accept or reject each LO. A level of agreement of 75% of above was again utilised. Phase 2 would be repeated until a final consensus on each LO was reached.

Results

The initial proposed curriculum

There were 58 LOs collated from prior SEM syllabi. These were grouped into 9 core themes by the research group.

Table 2 Removed LOs The LOs removed after phase 1 and the comments given by the expert panel that were reviewed by the research group and justify the removal

Learning objective (LO) removed	Expert panel quotes supporting removal
Outline neurological issues in relation to exercise	<i>There is a limited time within which an understanding of all these issues isn't able to be achieved and is covered in the wider curriculum (Participant 21)</i>
Outline renal and urogenital issues in relation to exercise	<i>Not sure how this could tie in to an UG syllabus (Participant 37)</i>
Outline ENT issues in relation to exercise	<i>ENT is too niche (Participant 16)</i>
Outline basic biomechanics in relation to different sporting and exercise activities and in the context of injury	<i>Huge area - think unnecessary when need to cover the basics in medicine (Participant 21)</i>
Outline the role of WADA and UKAD	<i>Not sure this necessarily needs to be in curriculum at UG level as PG level (Participant 43)</i>
Describe the on-field and emergency assessment and management of sports injuries and medical conditions	<i>Pre-hospital care generally not taught at UG level (Participant 37)</i>
Discuss the following in relation to SEM: eye and ENT emergencies	<i>Relatively small topic and could be integrated with other topics (Participant 16)</i>

The Expert Panel

Of the 94 people who expressed interest in being on the expert panel, 48% (45/94) met the eligibility criteria. The reasons for non-eligibility included having worked as a doctor for less than 5 years (n = 19), not holding a SEM MSc/Postgraduate Diploma/FFSEM/MFSEM (n = 17) and not being based in the UK (n = 13). The expert panel was made up of 20 SEM consultants, 4 orthopaedic consultants, 1 rheumatology consultant, 17 GPs, 11 SEM registrars and 14 doctors that did not specify their training or job role but did confirm that they had been a doctor for more than 5 years. Thirty-eight individuals (82%) stated they had experience of teaching medical students.

Phase 1

In phase 1 of the study there was a 100% (45/45) response rate from the expert panel. 31% (18/58) of LOs were accepted without need for alteration and 48% (28/58) were altered in some way. The reasons for alterations are given in Table 1. Nine LOs were altered for more than one reason. Regarding the 8 alterations made to the

Table 3 Overlapping LOs. The LOs removed after phase 1 due to overlap with other learning objectives are given on the left. The related learning objective(s) that remained are on the right

Learning objective removed	Remaining learning objective(s) justifying removal
Describe general pathology of the musculoskeletal system.	Relate musculoskeletal anatomical knowledge to common conditions and presentations. Outline the principles of tissue injury and repair in the musculoskeletal system.
Describe the findings of common radiological investigations.	Recognise the indications for common radiological investigations.
Describe the findings of radiological and other relevant investigations.	Recognise the indications for common radiological investigations.
Discuss the following in relation to SEM: Cardiorespiratory arrest.	Recognise the role of pre-hospital care in sport and physical activity. Demonstrate basic life support in a simulated environment.

Bloom's taxonomy level, 6 (75%) were kept at the level but alterations were made to utilise a more appropriate

word from the same taxonomy level, and 2 (25%) were moved up one level.

After review and discussion by the research group 2 additional learning objectives were added: 'Outline the pharmacological management of acute pain in musculoskeletal conditions in sport and physical activity' and 'Identify common adult musculoskeletal conditions'. This was due to it being noted that chronic pain was mentioned in other learning objectives, but the management of acute pain was not covered by any learning objectives and there being no learning objectives specifically including adult musculoskeletal conditions. With the removal of 11 learning objectives and 2 learning objectives added, a total of 49 learning objectives were included in the curriculum for phase 2.

Phase 2

Of the 45 members of the expert panel that completed phase 1, 78% (35/45) also completed phase 2. 98% (48/49) of LOs were accepted in phase 2 of the study, with these objectives achieving over 75% acceptance. Table 4 gives the level of acceptance for each LO following phase 2. The LO that did not reach 75% agreement was 'Outline haematological changes and responses to physical activity'

		Theme								
		1	2	3	4	5	6	7	8	9
Learning Objective	a		100%	94%	97%			86%	94%	92%
	b	100%	100%		81%	94%			94%	
	c	100%	78%		97%			97%	89%	
	d	94%	97%		100%			89%		
	e		89%					97%		
	f		72%					100%		
	g		86%					94%		
	h		97%	97%				89%		
	i		94%							
	j		97%							
	k									

Table 4 Levels of acceptance. The percentage (%) level of acceptance for each learning objective after phase 2. Greyed out boxes indicate the learning objective was accepted outright in phase 1. The black box indicates that the learning objective that did not meet the acceptance criteria

(LO 2f in Table 3). Ten LOs needed to be altered but, as these were all minor grammar and spelling changes, it was felt that there was no need for any further phases. The final curriculum was made up of 9 sub-themes and 48 LOs. Table 5 shows the finalised sub-themes and number of objectives in each sub-theme. The full version of the agreed curriculum can be found in the [supplementary material](#). In the final curriculum, 54% (26/48) of the LOs were in level 1 (knowledge) of Bloom's taxonomy, 42% (20/48) were in level 2 and the remaining 4% (2/48) were in level 3.

The finalised curriculum can be found in the [supplementary material](#).

Discussion

This study has utilised Delphi methodology to create an SEM curriculum for undergraduate medical education. The Delphi panel consisted of a broad range of practitioners, with the majority having experience of teaching undergraduate medical student. The final curriculum was made up of 48 LOs.

Physical activity LOs in the proposed curriculum

The initial proposed curriculum contained 11 objectives relating to medical issues related to exercise, of which 10 were accepted by the expert panel. The one LO that was not accepted related to knowledge of haematological changes in response to exercise (72% acceptance). This was deemed too specific and not at the right level for undergraduate learners. Four LOs were also included in the separate category of physical activity and human health, covering LOs related to physical activity guidelines, common barriers to physical activity and recognising useful physical activity resources. Physical activity reduces the incidence of non-communicable disease (NCDs) such as diabetes mellitus, ischaemic heart disease, several cancer types, and has therapeutic effects in multiple conditions such as musculoskeletal pain,

risk of falls and chronic obstructive pulmonary disease (COPD). [30] Despite this, clinicians are often not confident in advising and prescribing exercise interventions. [31] Multiple barriers were found such as fear of exacerbating the condition, insufficient knowledge on which types of exercise are the most beneficial for their patient group, and contraindications. Recent evidence also suggests that medical students themselves appreciate that physical activity is important in preventing disease, but they do not feel confident in physical activity guidelines and would like more teaching on this topic. [11,32,33] There has been a push to better incorporate exercise medicine into undergraduate healthcare curricula, and research into how best to do this. [4,32,34] The findings of this study support the embedding of exercise medicine into undergraduate medical curricula and highlights key LOs that should be covered.

Global application

8 out of the 9 subthemes in the present study were also included in the medical specialty syllabus designed by the international syllabus in Sport and Exercise medicine Group (ISSEMG) [2]. This consensus included a total of 11 subthemes. The differences are likely explained by the undergraduate focus in this study. The USA and Middle Eastern studies also included many overlapping undergraduate themes including physical activity and human health, antidoping and specific groups in SEM. [9,10]

Ensuring suitability for undergraduate level

Of interest, many LOs were rejected in the first phase of the study due to being topics deemed too SEM-specific for undergraduate curricula, with comments made that they were more appropriate for postgraduate level. In addition, the vast majority of LOs accepted in the final curriculum were in either levels 1 or 2 of Bloom's taxonomy. This suggests that lower levels of Blooms taxonomy appear to be more appropriate for undergraduate level in sport and exercise medicine curricula.

Overlap between other specialties

SEM-related topics extend into numerous specialties already well established in the undergraduate medical curricula such as: orthopaedics, rheumatology, and public health. Many of the LOs included in the finalised curriculum produced by this study are likely already covered in medical curricula. For example, many of the 10 LOs in the injuries related to SEM category such as 'outline common upper limb injuries' and 'recognise the indications for common radiological investigations' are likely to overlap with orthopaedic and musculoskeletal modules already incorporated into medical school education. Similarly, the LOs in the intrinsic skills of an SEM physicians including demonstrating skills such as communication,

Table 5 Finalised curriculum subthemes. The finalised subthemes and number of objectives in each sub-theme

Sub-Theme	Number of objectives in sub-theme
1. Physical Activity and Human Health	4
2. Medical Issues Related to Exercise	10
3. Injuries Related to SEM	10
4. Basic Science in SEM	7
5. Clinical Pharmacology	2
6. Antidoping	1
7. Sport Team and Event Management	9
8. Specific Groups in SEM	3
9. Intrinsic Skills of a SEM Physician	2
Total	48

collaboration and describing the importance of a multi-disciplinary team approach are already covered in medical curriculum.

Implementation into established undergraduate medical curricula

Whilst this study attempts to map the components of SEM onto a curriculum, actually placing these onto existing curricula remains challenging. The General Medical Council (GMC), who set the core curriculum objectives for medical students to learn during their training, mention SEM-related topics in a number of LOs in "Outcomes for Graduates". [7] However, medical schools have relative autonomy on the timing and level of depth required for its graduates. Previous reviews of United Kingdom (UK) medical schools have suggested that a proportion of medical schools have not been able to demonstrate evidence of exercise medicine teaching across the core curricula. [5].

While the overlap with other specialties will make embedding this suggested curriculum easier, it is appreciated that there are barriers due to limited space in already crowded medical curricula. Following this study, suggested next steps are to discuss this curriculum with individuals involved in creating, implementing and teaching undergraduate medical curricula to identify feasibility and practical steps for adoption.

Strengths and Limitations

Our panel consisted of qualified and experienced professionals from relevant backgrounds. The majority of our panel were senior clinicians. In addition, between reviews there was a high response rate, representing a good internal validity. The retention rate between Phase 1 and Phase 2 was above 75%, which improves the reliability of the study. One main limitation was that, due to SEM being a relatively small, albeit growing, speciality, the vast majority of our panel were highly interested in SEM, thereby introducing potential selection bias.

Conclusion

Sport and Exercise Medicine is a broad ranging and rapidly growing speciality, with significant importance in tackling the burden against NCDs. It is important to establish SEM education in all levels of medical education, including undergraduate level. To our knowledge, this is the first published version of a Delphi SEM curriculum for undergraduate medical teaching. Future work should explore the opinions of individuals working in medical education, and those whose primary focus is not in SEM, to discuss opinions and how it could be best implemented into medical school curricula. In addition, it would be advantageous to compare this curriculum

with undergraduate SEM curriculums used in other countries around the world.

List of Abbreviations

SEM	Sports and Exercise Medicine
UK	United Kingdom
LOs	Learning objectives
USEMS	Undergraduate Sport and Exercise Medicine Society
BASEM	British Association of Sport and Exercise Medicine
FSEM	Faculty of Sport and Exercise Medicine
MFSEM	Membership of the FSEM
FFSEM	Fellowship of the FSEM

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-023-04139-x>.

Supplementary Material 1

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Not applicable.

Authors' contributions

DV conceived the idea of creating a piece of work on this topic. DV, AI, and KM were involved in data collection. DV, AI, KM, TP, DS, AP, CN, PB, GF sat on the research group and analysed the data. All authors contributed to the critical revision and approval of the final editorial.

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Data Availability

The data for this study is stored on Hull York Medical School servers and is not publicly available. Data can be made available upon reasonable request to the corresponding author.

Declarations

Competing interests

The authors have no competing interests to declare.

Ethics approval and consent to participate

Ethics approval was granted by the Hull York Medical School ethics committee board. Ethics ID number: 17 08. Informed written consent to participation was gained by all members of the expert panel. The study was carried out according to the Helsinki Declaration.

Consent for publication

Not applicable.

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Undergraduate Education Overview

The research portfolio begins with paper 15, which explores the perspectives of BASEM members. The survey examined what was being taught at the UG level, as well as what topics members felt was crucial to include in a SEM UG curriculum. In 2018, the first collection of data was undertaken. The results were utilised to aid the research team in creating the initial undergraduate curriculum for the modified Delphi study, paper 16 (Vishnubala et al., 2023a) in conjunction with the findings of papers 1 and 4.

Postgraduate Education Overview

The postgraduate focus culminates with the publication of output 11: PG SEM MSc syllabus (Vishnubala et al., 2022a) that gained consensus via Delphi methodology. The emphasised concepts and material from outputs 4 and 13 served as a vital resource for the development of the preliminary draft syllabus for the PG MSc Delphi. Output 4 explores the NHS's needs for SEM through stakeholder engagement, and output 13 highlighted educational needs were both key to developing the original draft syllabus for the Delphi. BMJ Open SEM published the paper outlining the Delphi process that was utilised to obtain a consensus on an MSc SEM curriculum. The final syllabus also formed the framework for output 14 which is the SEM textbook published by Routledge.

In the following section, the key papers and their findings are discussed and their implications for the overall aims:

10.2 How prepared are healthcare personnel to provide PA advice to individuals with diabetes? A formative assessment

Output 1 (Kime et al., 2020) is a qualitative piece of research investigating the preparation of primary care health care practitioners to provide PA counselling to people with diabetes. A survey followed by 18 semi-structured interviews comprised the second phase of this

sequential mixed-methods two-phase design. The investigation was published in the BMC. The paper noted that, among the 18 primary care healthcare professionals interviewed, there was a clear recognition of the importance of physical activity; however, participants were generally unaware of the CMO PA guidelines and lacked formal training. This was of particular interest to the broader scope of the doctoral work. In addition, they had a limited understanding of the community's physical activity-related services. This was essential knowledge and highlighted the need and significance of developing an SEM syllabus that could be implemented in both UG and PG environments.

It highlighted the need to investigate the knowledge of healthcare professionals, as well as the solutions and barriers to promoting PA in the NHS. Both physicians and physiotherapists were subsequently the subjects of two additional qualitative research studies (Vishnubala et al., 2022c; Stead et al., 2023). Kime's study also highlighted the need to strengthen PA education for undergraduates and postgraduates. As such, it was a crucial piece of research that led to the development of the Delphi studies (Vishnubala et al., 2023b; 2022a), which form the core of this portfolio and will be discussed in greater detail later.

10.3 A Qualitative Study on the Integration of SEM Clinics into the National Health Service

Output 4 (Vishnubala et al., 2020a) investigates what input the NHS wants from a SEM service and SEM physicians using a qualitative technique consisting of semi-structured interviews.

The report highlighted several significant findings. One suggestion was to improve SEM education and recognition of the specialty.

This proposal was an additional crucial element in the construction of a Delphi-based undergraduate programme in SEM for medical students (Vishnubala et al., 2023b). Another noteworthy conclusion indicated that musculoskeletal (MSK) and concussion services should be prioritised by SEM in the NHS. These findings were crucial to the creation of the first iteration of the postgraduate MSc SEM syllabus prior to consensus by Delphi methodology

(Vishnubala et al., 2022b). Recognising what key stakeholders feel is the role of SEM in the NHS is another key component in developing syllabi.

10.4 Creating a SEM Masters curriculum for physicians: a Delphi Study

The fourth output synthesises many of the data from the preceding articles, which helped construct a Delphi research (Vishnubala et al., 2022b) to produce a consensus of learning objectives for an MSc in SEM. Using a modified Delphi procedure with two rounds of expert panel review and input, a consensus was established. The expert panel was comprised of 45 individuals. Of the initial 136 learning outcomes, 44% were modified after round 1, and 4% were eliminated post-round 1, and 2 learning outcomes were added. The final 133 learning outcomes were divided into 11 domains as shown in Table 9.

Table 9: Agreed subthemes and number of learning objectives for the MSc SEM Syllabus

Sub-theme	Number of Learning Objectives in the Sub-Theme
12. PA and Human health	13
13. Medical Issues related to exercise	16
14. Injuries related to SEM	22
15. Basic Science in SEM	18
16. Clinical Pharmacology	6
17. Antidoping	4
18. Sports Team and Event Management	28
19. PA in Challenging Environments	1
20. Specific Groups in SEM	11
21. Intrinsic Skills of an SEM Clinician	3
22. Extrinsic Skills of an SEM Clinician	11
Total	133

10.5 Developing a SEM Undergraduate Curriculum for Physicians: A Delphi Study

A second Delphi to develop a consensus for what a UG syllabus in SEM should comprise was performed (Vishnubala et al., 2023b). Based on suggestions from prior studies (outputs 1, 4, 15), which indicated that solutions required both undergraduate and graduate education, this research was done. The technique followed the same methodology as the postgraduate Delphi output 11 research published in BMJ Open SEM. This is the first-ever consensus on a Sport and exercise E-Medicine undergraduate curriculum and the only undergraduate SEM curriculum ever published. The expert panel was made up of 45 participants with a retention rate of 78% by round 2. Of the original 58 learning objectives, 31% were accepted, 48% were modified, and 19% rejected. Some 48 learning outcomes were finally accepted, constituting 9 subthemes.

There has been a movement to better include exercise medicine in undergraduate healthcare courses, as well as a study into how this might be accomplished (Carter-Roberts et al., 2021; Pugh et al., 2020).

Recent data reveals that medical students themselves recognise the importance of physical exercise in illness prevention, but they lack confidence in PA standards and would want further instruction on this issue (Radenkovic et al., 2019; Carrard et al., 2019). The findings of this study support the incorporation of exercise medicine into the undergraduate medical curriculum and identify essential topics that should be addressed. Table 10 shows the agreed subthemes and the number of learning outcomes.

Table 10: Agreed subthemes and number of learning objectives for the undergraduate SEM Syllabus.

Sub-theme	Number of Learning Objectives in the Sub-Theme
10. PA and Human health	4
11. Medical Issues related to exercise	10
12. Injuries related to SEM	10
13. Basic Science in SEM	7
14. Clinical Pharmacology	2
15. Antidoping	1
16. Sports Team and Event Management	9
17. Specific Groups in SEM	3
18. Intrinsic Skills of an SEM Clinician	2
Total	48

10.6 What are the challenges and potential solutions for UK physicians providing PA advice?

This output (Vishnubala et al., 2022c) examines the challenges and solutions physicians face when providing PA advice in an NHS setting, following the identification of this issue in our second paper (Vishnubala et al., 2020a). The data were analysed using inductive thematic analysis and semi-structured interviews. Current PA education for physicians, according to the research, is limited, but there are opportunities to increase and enhance PA education. In addition, the paper identifies and discusses additional important obstacles and solutions for increasing PA advice in the NHS. Several government agencies, including the Department of Health and OHID, as well as lottery-funded Sport England, are working on a few initiatives and campaigns to promote PA knowledge and advice among patients and HCPs. The results provide solutions and identify critical obstacles to surmount. As primary author, I was

responsible for all aspects of this paper, including conceptualisations, data acquisition, analysis, and writing.

This paper has a unique contribution in that it is the only paper to examine this issue through the lens of the NHS Clinician using a methodology other than a survey, allowing for a deeper understanding. A similar methodology was used to pose the same questions to NHS physiotherapists (Stead et al., 2023a)

From the 15 semi-structured interviews, a total of 122 codes were produced which were distilled into four themes and twelve subthemes (Table 11). Exploring the education elements of physical activity advice by healthcare professionals in NHS settings of relevance the subthemes included challenges such as a lack of awareness of guidelines, PA as an afterthought (culture), a lack of PA education, and solutions centred on adding PA to UG and PG staff training were all proposed. The findings highlight the need to develop a syllabus that addresses some of the difficulties mentioned. As PA is a key part of SEM, and not routinely covered in medical school curricula, unlike musculoskeletal medicine for example, this was a useful addition to drive the development of the UG and PG syllabi development.

Table 11: Shows the themes and subthemes generated.

Theme	Sub-Theme
Intrinsic factors limiting delivery of PA advice	Lack of knowledge of PA guidelines PA is often an afterthought
Barriers to delivering PA Guidance	Lack of PA Education Time Pressures Patient Engagement
Solution to increase staff awareness of successful implementation of PA guidelines	Staff Training Incorporating PA into undergraduate training Encouraging staff to be active themselves
Methods to optimise PA Advice	Individualised PA Advice Local exercise services and schemes Utilising online and visual resources

10.7 Education of the Next Generation in SEM: A Cross-Sectional Survey) is the fifteenth deliverable

The final output (Marino, Vishnubala and Fitzpatrick, 2023) is a survey of the membership of the ASEM to study a variety of issues, including what the members thought to be vital undergraduate education topics. The paper was published in 2023, although the initial data collection took place in 2018.

In addition to stressing the need for additional SEM education at the undergraduate level, this research analyses those topics which respondents felt were important for inclusion in a curriculum at that level. This was yet another important piece of research that contributed to the development of the original undergraduate Delphi syllabus. The survey had 126 eligible participants. Findings included most participants saying they were not exposed to SEM in medical school as well as participants ranking the importance of topics with a disparity between seniors and early carer doctors around the topics of nutrition, exercise physiology, team care, and pitch-side care, which senior doctors felt were less important to an UG. However again this data was highly influential in creating the first iteration of the SEM UG syllabus.

10.8 Printed textbooks

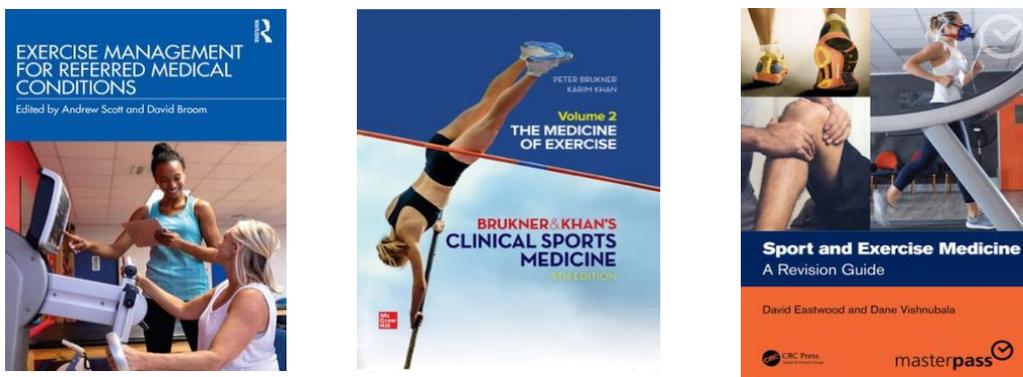
Two book chapters and one edited book which includes a total of three co-written chapters form the first output in this area is a book chapter titled Clinical Sports Medicine (I am a co-author of a chapter on motivational interviewing by Brukner and Khan; Friedman and Vishnubala, 2019)Friedman and Vishnubala, 2019). The importance of behavioural change was highlighted in the range of the published works (Vishnubala and Pringle, 2021; Vishnubala et al., 2020b; Kime et al., 2020; Vishnubala et al., 2022c).(Vishnubala and Pringle, 2021; Vishnubala et al., 2020b; Kime et al., 2020; Vishnubala et al., 2022c).

The chapter on Type 2 diabetes and exercise prescription (Henson, Anyiam and Vishnubala, 2022) published by Routledge in the book *The Management of PA for Referred Medical Conditions*; covered areas highlighted in outputs 1 and 13 and aim to provide a tangible resource to improve an HCP confidence and expertise surrounding exercise prescription in diabetes. **Error! Reference source not found.** illustrates the covers for each of the three books.

SEM: A Essential Guide by Eastwood and Vishnubala

This book, *Sport and Exercise Medicine: An Essential Guide*, was published on March 30th, 2023 by Routledge (Eastwood and Vishnubala, 2023). It maps to most of the postgraduate SEM curricula (Vishnubala et al., 2022b) and covers important components of the Delphi MSc curriculum paper. This is the first textbook that was exclusively created for postgraduate SEM MSc degrees. Of note, DV co-authored three chapters on Public Health, PA, and Radiology.

Figure G: Images of published books



11 Discussion

The discussion has been separated into undergraduate and postgraduate SEM curriculum development.

Output 1 (Kime et al., 2020) identified the importance of HCPs wanting to feel more confident around PA promotion as well as highlighting the need to know the CMO PA guidelines that were already known (Westland et al. 2018) Chatterjee?. There is also a need

for medical students to gain more education about PA (Gates et al., 2019) which while known was reinforced as a solution in the paper. Exercise Medicine/PA forms part of SEM and is reflected in its inclusions in the undergraduate SEM syllabus produced.

Developing further on output 1 (Kime et al., 2020), 90% of early career doctors feel they have not been appropriately trained in PA (Osborne et al., 2017a). Improving and increasing education could aid in PA being discussed more in consultations. Our research suggests the need to improve training and education in the PA space with calls by many of the participants to embed further in UG and PG education (Kime et al., 2020; Pandya and Marino, 2018). The outcomes for graduates (GMC, 2018) published by the GMC provide a framework that is used by all medical schools to form their curriculum (Sharma, Murphy and Doody, 2019). There is only one outcome that is related to PA and, unfortunately, this is around weight loss, for which the current evidence supports nutrition over PA.

MSK examination skills, exercise to prevent and manage disease, and MSK injuries and disorders are the most significant SEM-related subjects to teach students, according to the findings of output 15 (Marino, Vishnubala and Fitzpatrick, 2023). Social media usage and pitch-side maintenance were found to be the least significant. This study is the first to identify SEM-related topics that would be important to teach medical students. Until this point, the majority of research on the introduction of SEM into medical curricula has concentrated on exercise medicine (West and Griffin, 2017). In addition, numerous components of the SEM curriculum are transferrable to other medical specialties (Davies et al., 2019). First, a lack of exposure to SEM leads to a lack of knowledge of what SEM comprises, especially its function in the delivery of healthcare (O'Halloran et al., 2009; Osborne et al., 2017b) It has been discovered that the medical community is lacking in SEM expertise and its awareness (Vishnubala et al., 2020a). Exposure to SEM in undergraduate education could increase awareness of the speciality and therefore its development and role in the NHS. At present several NHS challenges could be supported by SEM but potentially, due to a lack of awareness of the specialty, it is potentially being underutilised

Having a recognised undergraduate SEM syllabus could aid with further recognition of the specialty by future doctors, although the challenge still lies in its implementation. However, should a medical school wish to increase their SEM exposure, this provides a framework to support them. It is important to note, that there is no evidence to support the increase in uptake of a medical subject in the undergraduate curriculum if the relevant medical faculty/college publishes an undergraduate syllabus. It is worth arguing however that there is nothing to refute it either. Raising awareness of SEM further in the undergraduate space, either by encouraging medical schools to take up the syllabus or influencing the GMCs outcomes for graduates, are all potential next steps. In a crowded medical school curriculum herein lies the challenge. Exploring and trialling implementation strategies would be an appropriate next step. This may include developing resources, toolkits and materials that allow a medical school to “pick it up” and deliver the education.

Postgraduate

The paper exploring what NHS SEM services could look like with key stakeholders highlights the importance of musculoskeletal medicine and concussion as the most important services. It was felt that while exercise medicine was important that it would probably not form the main part of an SEM clinic. This however conflicts to some extent with the FSEM position however they still note MSK being the priority (FSEM, 2023a). There was an acknowledgement that many stakeholders in the NHS and allied specialties were not aware of SEM, and this could be addressed arguably by an undergraduate syllabus which is likely to give all medical students SEM exposure rather than at a postgraduate level which would focus only on those already interested. The ability to one-stop shop where MSK ultrasound and injections were also provided was seen as attractive. The recognition of stakeholder needs and thoughts on what an NHS service could look like is important to consider the knowledge and skills required for a qualification such as an MSc in SEM that a doctor may take to work in an extended role.

The MSc consensus highlights the challenges of deciding what should be in an MSc when the individual joining such a programme may vary in their experience and knowledge. The MSc practical learning outcomes for ultrasonography, joint and soft tissue injections, and

compartment pressure testing were deemed too advanced for SEM Masters programmes by the expert council. The study team however observes anecdotally that many SEM doctors pay for their own ultrasound equipment and training courses. The findings of this study indicate that master's degree programmes in SEM should not incorporate ultrasound training. Stakeholders in NHS settings believed that ultrasonography was a vital aspect of the service although, nevertheless, SEM physicians' opinions on what the MSc should comprise may reflect perhaps their prejudices towards when the MSc should be completed in training and what it aims to accomplish. It is hoped that many existing programmes may adopt or integrate the consensus syllabus into their curriculum. However, given the large changes programmes may have to undergo to implement this, this may prove challenging. The next step may be to explore a documentary analysis and explore the MSc SEM syllabi at all UK institutions and compare this to our findings to explore differences and similarities in the scale of change being asked of various institutions. Having a MSc that uses the same syllabus may give employers confidence, as the variation at present for something that can be essential or desirable on job applications is large.

The Developed Syllabi

Extant undergraduate SEM syllabi are aimed at medical schools, while the MSc in SEM may be offered by a range of UK institutions that run an MSc in SEM courses. Of the learning outcomes identified, a commonality arose between the UG and PG in terms of themes. However, the number of LOs, the breadth of topics, and the level of Bloom's taxonomy as would be expected varies (see Table 12 for comparison). Bloom's taxonomy (see Figure H) is used to write learning outcomes and to differentiate lower-order outcomes requiring less cognitive processing from those that require higher levels (Adams, 2015). Most discussions and changes to learning outcomes revolved around the level of taxonomy required. The undergraduate level could thus be seen as the foundational syllabus to the postgraduate course which is possibly intended for more established clinicians. However, there are overlaps, given that many MSc courses in SEM admit intercalated medical students between

years 3 and 4 and clinicians undertaking an MSc in SEM, as doctors can vary from immediately post-graduation to experienced senior clinicians.

Table 12: Comparison of subthemes and number of learning outcomes.

Sub-theme	MSc SEM: No. of Learning Objectives in the Sub-theme	Undergraduate SEM No. of Learning Objectives in the Sub- Theme
12. PA and Human Health	13	4
13. Medical Issues related to exercise	16	10
14. Injuries related to SEM	22	10
15. Basic Science in SEM	18	7
16. Clinical Pharmacology	6	2
17. Antidoping	4	1
18. Sports Team and Event Management	28	9
19. PA in Challenging Environments	1	
20. Specific Groups in SEM	11	3
21. Intrinsic Skills of an SEM Clinician	3	2
22. Extrinsic Skills of an SEM Clinician	11	
Total	133	48

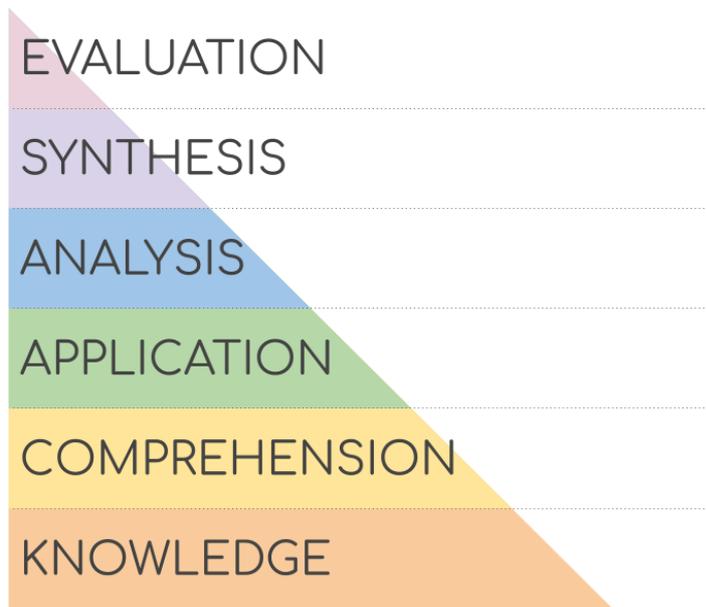


Figure H: Bloom's Taxonomy.

Strengths and Limitations

Strengths and limitations are discussed for each publication. It is worth noting that all research carried out was UK based and on UK participants. Of note, given the small SEM community, even after anonymising the expert panel, it was possible to identify some participants based on their free text comments which could have introduced some bias. In comparison to the literature reviewed, clear inclusion and exclusion criteria for the expert panel were implemented, and both Delphi papers had high response rates and consensus levels, as outlined previously. Given the same expert panel was used for both the undergraduate and postgraduate Delphi, there is concern around possible survey fatigue and its potential impact on the final syllabi.

Strengths and Limitations: A Personal Critical Reflection

My stance and approach toward several frequently employed qualitative methods, including some of those utilised in the published papers, have evolved over the past five years because of my personal development and accumulation of experience in qualitative

research. Due to what feels a drive to ensure qualitative research is as 'trustworthy' as quantitative research—which is erroneously perceived as more rigorous by many, qualitative researchers have continued to rely on post-positivist theories, including grounded theory. Guba and Lincoln's criterion although criticised is widely recognised as a framework for enhancing the rigour of qualitative research (Nowell et al., 2017).

Guba and Lincoln's Criteria

Guba and Lincoln (Guba and Lincoln, 1989) established a set of criteria that they referred to increase the "rigour" or "trustworthiness." The trustworthiness criteria encompassed the following quantitative terms: confirmability (objectivity), credibility (internal validity), transferability (external validity), and dependability (reliability). The categories provide a practical foundation for initiating a discourse on the development of my own personal qualitative development. Nevertheless, the criteria have faced criticism due to their ambiguity regarding the attainment of trustworthiness and the inconsistent degree of implementation and interpretation of the criteria (Forero et al., 2018). According to Rezaie (Rezaie, Radfar and Hemmati MaslakPak, 2021) the lack of consistency in implementing the criteria undermines their reproducibility and transparency. It is important to note, however, that regarding qualitative research in the same way that one might approach quantitative research by a positivistic approach to its criteria and aligning them with the former may not be the best approach (Varpio et al., 2017). Once more, researchers who examine qualitative research from the perspective of quantitative research have expressed concerns regarding the generalisability or transferability of qualitative findings beyond specific contexts (Tuckett, 2005). I will discuss the various methods for enhancing rigour that have caused the greatest shift in my position.

Credibility

Credibility investigates validity or internal dependability. Numerous strategies are considered in order to guarantee credibility. This entails prolonged engagements, member checking, persistent observation, and triangulation, among other techniques. Credibility is arguably wrongly predicated on the positivistic or objectivist position that it is possible to discover a single truth or fact (Varpio et al., 2017). Several strategies have been proposed to enhance credibility (Guba and Lincoln, 1989), including spending more time in the setting collecting data, which may result in greater trust and intimacy, and 'richer' data. The interviews with health care professionals regarding physical activity lasted, on average, thirty minutes. The quantitative approach of selecting large samples and removing researcher bias around participants is contrasted with qualitative approaches to recruitment and sampling, such as purposeful sampling. I was able to select participants who possess the requisite expertise and experience in the field of interest. Furthermore, the possibility of a professional relationship with them may have increased the likelihood that they would actively participate and elaborate on their remarks (Johnson, Adkins and Chauvin, 2020). Thus, whereas this may have been perceived negatively in the past, I now recognise the approach's merits. For instance, in the diabetes physical activity paper utilising semi structured interviews (Kime et al., 2020), recruitment was one of the obstacles; however, the clinicians who were chosen opted to be interviewed by me rather than the other researchers; this was considered a strength and was elaborated upon in the paper.

Transferability

The concept of transferability pertains to the extent to which conclusions can be drawn from a given study and applied to different contexts (Guba, 1981), i.e., whether the information is transferable. Although quantitative generalizability is not applicable to statistical analysis, the reader can determine whether a transfer is possible to their area of interest by reading "thick" descriptions. In addition to access to the original data, the reader must have sufficient information, richness, and thickness to evaluate the material (Johnson, Adkins and Chauvin, 2020) and, ideally, actively evaluate it from their vantage point in order to determine whether or not it can be decontextualized and utilised in light of concepts or

themes highlighted elsewhere. For example, in the context of the semi structure interviews exploring challenges, barriers and solutions to doctors providing physical activity advice, readers of the paper may deem it has transferability to their chosen health care professional or even non health care professional.

Dependability:

Determines the extent to which the data remains consistent across a range of circumstances and over an extended period of time. For consistency and dependability, it is crucial to ensure a transparent, trackable, and consistent research process. This can be accomplished by utilising audit trails to demonstrate a documented, traceable, and coherent process. However, one could contend that reproducibility is not entirely feasible for qualitative data and in fact may run counter to the spirit, essence, and intrinsic worth of qualitative research (Smith and Sparkes, 2019). The unique perspective contributed by a specific participant enhances the depth, variety and richness of the gathered data.

Confirmability: Triangulation and audit are key components to confirmability which aligns with concept of objectivity quantitatively. While confirmability is futile in qualitative data, reflexivity and insight into the experiences, beliefs and position of the research can aid in both understanding their interpretation. Ensuring original transcripts and data collected are kept and transparent allows possibility of other interpretations (Johnson, Adkins and Chauvin, 2020).

Elements such as inter rate reliability, thematic emergence, reflexivity, sample size, and saturation are commonly used in qualitative research. I will explore each element further as for these, I have altered my position since the beginning of my PhD journey.

Sample size

Methods for determining sample size in quantitative research are established and widely used. In qualitative data, sample size is complex and dependent on a number of variables. The number of interviews required has been debated for some time (Guest, Bunce and Johnson, 2006). Data saturation was established in accordance with the principles of grounded theory, and it is widely employed. Historically, it has been considered an indicator of rigour. The researcher's identification of the saturation point (O'Reilly and Parker, 2013), beyond which no new themes emerge, has been incorporated into my own published works; it may also serve as a potential method to prevent excessive data collection. The belief that no further information can be discovered presupposes or leans toward the positivistic viewpoint that the truth has been discovered. It is assumed, in light of my pragmatic and relativist stance, that every participant may contribute novel insights (Varpio et al., 2017). Hence, from a pragmatic standpoint, I would advocate for theme saturation as opposed to information saturation. In forthcoming investigations, I will not only consider this when gathering data, but also when crafting my manuscripts, to ensure that my current stance on saturation is effectively conveyed.

Thematic Emergence

In my qualitative papers, it is customary to analyse and discuss the themes that "emerge" (Corbin and Strauss, 1990). This implies a nearly passive approach to interpretation (O'Reilly and Parker, 2013) when an engaged researcher with their own distinct background, experiences, theoretical leanings, and connection to the data analyses and interprets the data (Watling and Lingard, 2012). As the nature of the narrative in a number of qualitative papers is such that the researchers have identified and eliminated their own biases in order to analyse the data, this is both implausible and obsolete (Watling and Lingard, 2012). Acknowledging the fact that researchers engage deeply with their data, contemplate it, and reflect on it in light of their prior experiences, their position influences their interpretation. As a result of the required active approach, researchers who adopt a passive stance may fail to possess the necessary reflexivity.

Reflexivity

It has been with the process of reflexivity that I have become increasingly involved over time. It is crucial to acknowledge and distinguish our personal beliefs and values, as they influence our analysis of the data and, consequently, the conclusions we arrive at (Olmos-Vega et al., 2023). Qualitative research by nature is subjective (Rees, Crampton and Monrouxe, 2020). Engaging in reflexivity can be important to acknowledging subjectivity and recognising it (Gentles et al., 2014). In retrospect, I would provide a more explicit demonstration of my reflexivity in my published works or as a supplementary resource. In future research I will look to ensure the whole research team takes part in reflexive processes (Rees, Crampton and Monrouxe, 2020)

Inter rater reliability

Reliability between inter coders or inter raters is a prevalent notion in qualitative research. It investigates the degree of overlap between two rates or coders. Once more, this is an instance of a more positivist assumption that a single truth exists; however, the information provided by the inter-rater reliability is rather ambiguous (O'Connor and Joffe, 2020). It could be valuable for the interviewer to transcribe the interview, as they will recall the interview and its details. This can provide further context for the interpretation and may also be facilitated by the interviewer and participant developing a rapport and relationship. Therefore, there is possible value in one interviewer, transcriber and data analyser. There is no consensus around inter coder reliability processes (Campbell et al., 2013). Nevertheless, an additional coder's interpretation of the data could introduce new and additional themes, angles; this notion of a critical friend has also been acknowledged and something I will look to explore and use more.

Delphi Studies

Both an undergraduate and graduate-level curriculum for Sport and Exercise Medicine has been reached in accordance with the findings of the two Delphi studies. On the contrary, several learning outcomes exhibited near-concordance with consensus or fell slightly short of the threshold when contemplating the design of a Delphi. It could have been possible to enhance or revisit the learning outcome had there been a dialogue or discussion involving the expert panel members regarding this matter. This is therefore a limitation of the traditional delphi process(Monforte et al., 2022). Nevertheless, this presents a challenge due to the feedback limitations and the random nature of the design. Further discussion and refinement may be possible regarding other consensus models that have already been mentioned. To further improve Delphi, it may be beneficial to conduct focus groups or interviews with a subset of the Delphi panel to investigate the rationales behind the decision-making in greater depth, with a particular emphasis on the less-than-unanimous learning outcomes or those that were narrowly rejected . By incorporating additional insights, this could have potentially strengthened the manuscript and furnished us with more comprehensive data, as well as opportunities to further refine our learning outcomes.

12 Key findings and outputs of this PhD by published works.

The portfolio of published works highlights the lack of SEM education including PA education in the undergraduate medical curricula. The research also highlights the lack of awareness around SEM as a specialty. The portfolio includes the first-ever original research paper exploring what SEM roles could be in the NHS and using this to aid in the development of both an undergraduate and postgraduate MSc SEM syllabus. These syllabi then gained consensus via a Delphi process to produce the first-ever published

undergraduate SEM and postgraduate SEM syllabus for SEM. Finally, the SEM textbook published by Routledge maps to the newly created postgraduate syllabus and provides the first resource to map to the curriculum and the national syllabus.

Table 13: Research Questions and Outcomes.

Research Questions	Key Findings/Outputs
5. Are there educational gaps and solutions to promoting PA amongst HCPs.	Medical doctors receive little PA education during undergraduate and postgraduate training. This should be addressed and welcomed.
6. What do the NHS and key stakeholders need from SEM?	An NHS SEM service should focus on MSK and concussion with exercise medicine not being a priority.
7. What should a UG SEM syllabus contain?	Via a Delphi process. 48 learning outcomes divided in to nine subthemes were produced
8. What should a PG SEM syllabus contain?	Via a Delphi process. 133 learning outcomes divided into 11 subthemes were produced. A textbook SEM: An Essential Guide has been produced mapping the learning outcomes

13 Future Research

The objective of the portfolio outputs is to shape the trajectory of SEM education.

Numerous potential avenues for future research exist. These will be dissected and examined in greater detail below.

Curriculum and Syllabus Development

The syllabi that were developed and published are the first Sport and Exercise Medicine related syllabi to achieve consensus. However, as previously mentioned, implementation is the subsequent phase. What obstacles, motivators, and levers will impact the implementation of this curriculum at a medical school? What would enable the implementation of that? This subject may be investigated in numerous ways. Gaining input from key stakeholders, including medical students, academics, council members, and tutors, could be beneficial in the early stages of identifying obstacles, drivers, and levers. This information could then be utilised to shape and influence the design of a pilot programme for implementation, which could subsequently undergo additional evaluation.

The emphasis of the portfolio was on syllabi for the MSc and undergraduate levels. As previously mentioned, the GMC specialist curriculum was not developed using a rigorous methodological process; therefore, it might be advantageous to examine its strengths and weaknesses with the input of a variety of stakeholders prior to possibly conducting another consensus development model study. By employing a combination of qualitative methodologies, it might be feasible to investigate alongside key stakeholders the curriculum's present strengths, weaknesses, gaps, and opportunities. Directors of training programmes, physicians-in-training, the national specialist advisory group for sport and exercise medicine, representatives from other medical specialties, NHS England, and OHID are all potential stakeholders.

An additional acknowledged deficiency in education pertains to the absence of a curriculum for a team physician. Physicians specialising in sport and exercise medicine are highly involved in team sports. Nevertheless, a syllabus regarding their knowledge or abilities lacks

consensus. The Faculty of Sport and Exercise Medicine has asked for my assistance in creating a team physician syllabus and gaining a consensus. Therefore, this is likely to be my next priority.

It is critical to emphasise the significance of engaging patients, who may consult a physician equipped with the knowledge and skills under discussion, in the process. A crucial stakeholder, the patient contributes an aspect, understanding, and proficiency that are absent among other stakeholders. This could have included professional athletes and patients who have access to SEM services privately, through the NHS, in the SEM syllabi. A current constraint of mine is the inability to incorporate end users in the co-production process; however, I aspire to investigate their thoughts, opinions, concerns, and inquiries pertaining to the published syllabi in the future.

Physical Activity promotion by health care professionals

The investigation of the barriers, challenges, solutions, knowledge, abilities, and self-assurance of healthcare professionals who provide physical activity has generated its own collection of papers. Presently, papers examining physicians, physiotherapists, and nurses have been published, while a manuscript concerning midwives is in draught form. Absence of undergraduate and postgraduate instruction in physical activity is one of the issues highlighted in the papers. The papers put forth several potential solutions that could undergo piloting and evaluation. The difficulty in providing patients with physical activity recommendations is determining which outcome to evaluate. What can be achieved? Ideally, it would be desirable to ascertain whether the patient has increased their level of physical activity subsequent to receiving the advice. Nevertheless, due to the logistical complexities associated with longitudinal measurement, approximating cost savings and health benefits through modelling is prevalent. By becoming a member of the Sport England, AWRC research group, I hope to collaborate with a more diverse group of individuals in an effort to advance this agenda and research.

Other allied and related health care professionals, such as care workers and social prescribers, who have substantial patient contact but are sometimes overlooked, are not examined in the papers. This again presents an opportunity to examine the same issue through the perspective of an alternative group of individuals, thereby contributing to a more comprehensive comprehension of the matter and ensuring that all viewpoints are taken into account when devising solutions.

14 Reflections of own scholarly learning

Undertaking a PhD by published works has been an interesting journey. Undertaking alongside full-time work has helped me to critically look at how I spend my time most effectively across my teaching and leadership activities alongside the research.

Having never published a first-author paper until this process began, this has been a journey of understanding the academic world, developing writing styles and structures, and learning to take disappointment and criticism from editors and reviewers positively to improve the paper. This has been highlighted, I hope by the increasing number of outputs, culminating in recognition of my work with an invited role as an associate editor for BMJ Open Sport and Exercise Medicine journal. As someone who was exposed predominantly to quantitative research in medical school, I have found qualitative research enjoyable and more in line with the questions I tend to be interested in exploring and understanding. Recognising my own biases and the overall importance of reflexivity in a qualitative researcher is important and this portfolio catalogues my transition to a researcher, and I look forward to continuing to develop.

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Vishnubala, D. et al. (2022a). Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi study. *BMJ Open Sport & Exercise Medicine*, 8 (2), p.e001252. [Online]. Available at: doi:10.1136/bmjsem-2021-001252.

Vishnubala, D. et al. (2022b). Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi study. *BMJ Open Sport & Exercise Medicine*, 8 (2), p.e001252. [Online]. Available at: doi:10.1136/bmjsem-2021-001252.

Vishnubala, D. et al. (2022c). UK Doctors Delivering Physical Activity Advice: What Are the Challenges and Possible Solutions? A Qualitative Study. *International Journal of Environmental Research and Public Health*, 19 (19), p.12030. [Online]. Available at: doi:10.3390/ijerph191912030.

Vishnubala, D. et al. (2023a). Creating a sport and exercise medicine undergraduate syllabus: a delphi study. *BMC Medical Education*, 23 (1), p.179. [Online]. Available at: doi:10.1186/s12909-023-04139-x.

Vishnubala, D. et al. (2023b). Creating a Sport and Exercise Medicine Undergraduate syllabus for doctors: a Delphi Study. *BMC Medical Education*, (Unpublished).

Vishnubala, D. and Pringle, A. (2020). Role of GPNs in promoting physical activity. *Journal of General Practice Nursing*.

Vishnubala, D. and Pringle, A. (2021). Working with healthcare professionals to promote physical activity. *Perspectives in Public Health*, 141 (2). [Online]. Available at: doi:10.1177/1757913920978253.

Watling, C. J. and Lingard, L. (2012). Grounded theory in medical education research: AMEE Guide No. 70. *Medical Teacher*, 34 (10), pp.850–861. [Online]. Available at: doi:10.3109/0142159X.2012.704439.

West, L. R. and Griffin, S. (2017). Sport and exercise medicine in the UK: what juniors should know to get ahead. *British Journal of Sports Medicine*, 51 (21), pp.1567–1569. [Online]. Available at: doi:10.1136/bjsports-2016-096631.

Westland, H. et al. (2018). Nurses' perceptions towards the delivery and feasibility of a behaviour change intervention to enhance physical activity in patients at risk for cardiovascular disease in primary care: a qualitative study. *BMC Family Practice*, 19 (1), p.194. [Online]. Available at: doi:10.1186/s12875-018-0888-1.

Zalecki, C. J. et al. (2022). The use of single dose intra-articular local anaesthetics in the United Kingdom: A cross-sectional survey of sport and exercise medicine and musculoskeletal professionals. *Musculoskeletal Care*. [Online]. Available at: doi:10.1002/msc.1618.

16 List of References for the Full Portfolio

The references below relate to all 20 items of the published works portfolio. The items highlighted in bold relate to the key publications in the portfolio.

Budzynski-Seymour, E. et al. (2021). A rapid review of communication strategies for physical activity guidelines and physical activity promotion: A review of worldwide strategies. *Journal of Physical Activity and Health*, 18 (8). [Online]. Available at: doi:10.1123/jpah.2020-0832.

Eastwood, D. and Vishnubala, D. (2023). *Sport and Exercise Medicine, A Revision Guide*. 1st ed. Routledge.

Friedman, D. and Vishnubala, D. (2019). Prescribing physical activity: motivational interviewing. In: Brukner, P. and Khan, K. (Eds). *Brukner; Khan; Clinical Sports Medicine: The Medicine of Exercise, Volume 2, 5e*. Sydney, Australia: McGraw-Hill Education (Australia) Pty Ltd. [Online]. Available at: csm.mhmedical.com/content.aspx?aid=1164802408.

Henson, J., Anyiam, O. and Vishnubala, D. (2022). Type 2 Diabetes. In: Scott, A. and Broom, D. (Eds). *Exercise Management for Referred Medical Conditions*. 1st ed. Routledge.

Kime, N. et al. (2020). How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation. *BMC Health Services Research*, 20 (1). [Online]. Available at: doi:10.1186/s12913-019-4852-0.

Marino, K. R. et al. (2021). Embrace your discomfort: Leadership and unconscious bias in sport and exercise medicine. *British Journal of Sports Medicine*, 55 (6). [Online]. Available at: doi:10.1136/bjsports-2020-103061.

Marino, K., Vishnubala, D. and Fitzpatrick, D. (2023). Educating the Next Generation in sport and exercise medicine: A Cross Sectional Survey. *Journal of Orthopaedic Trauma Surgery and Related Research*.

Marino, K., Vishnubala, D. and Oja, P. (2022). Muscle-strengthening activities to improve health outcomes: what the evidence supports. *British Journal of Sports Medicine*, 56, p.bjsports-2022. [Online]. Available at: doi:10.1136/bjsports-2022-105481.

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Vishnubala, D. et al. (2020). Integrating sport and exercise medicine clinics into the National Health Service: A qualitative study. *BMJ Open Sport and Exercise Medicine*, 6 (1). [Online]. Available at: doi:10.1136/bmjsem-2020-000888.

Vishnubala, D. et al. (2022a). Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi study. *BMJ Open Sport & Exercise Medicine*, 8 (2), p.e001252. [Online]. Available at: doi:10.1136/bmjsem-2021-001252.

Vishnubala, D. et al. (2022b). UK Doctors Delivering Physical Activity Advice: What Are the Challenges and Possible Solutions? A Qualitative Study. *International Journal of Environmental Research and Public Health*, 19 (19), p.12030. [Online]. Available at: doi:10.3390/ijerph191912030.

Vishnubala, D. et al. (2023). Creating a sport and exercise medicine undergraduate syllabus: a Delphi study. *BMC Medical Education*, 23 (1), p.179. [Online]. Available at: doi:10.1186/s12909-023-04139-x.

Vishnubala, D. and Pringle, A. (2020). Role of GPNs in promoting physical activity. *Journal of General Practice Nursing*.

Vishnubala, D. and Pringle, A. (2021). Working with healthcare professionals to promote physical activity. *Perspectives in Public Health*, 141 (2). [Online]. Available at: doi:10.1177/1757913920978253.

Zalecki, C. J. et al. (2022). The use of single dose intra-articular local anaesthetics in the United Kingdom: A cross-sectional survey of sport and exercise medicine and musculoskeletal professionals. *Musculoskeletal Care*. [Online]. Available at: doi:10.1002/msc.1618.

17 Appendix

17.1 Appendix A: Copies of Contributing Statements from co-authors

From: Khan, Karim karim.khan@ubc.ca
Subject: Re: Statement of Contribution 1/1
Date: 6 January 2023 at 01:09
To: Dane Vishnubala dane.vishnubala@icloud.com
Cc: Daniel Friedman ddfriedman@gmail.com, peterbrukner@gmail.com



Hi Dane,
I hope you are doing well and I wish you success with your PhD by publication. I can confirm your contribution to CSM as below.

For the following book chapter: [Physical Activity: Motivational Interviewing](#) (Friedman and Vishnubala 2019) from Brukner and Khan's Clinical Sports Medicine Edition 5 Volume 2.

You provided the initial draft and substantial revisions were made by both co-authors. From there on.

As with all CSM chapters Peter and I have final sign off and responsibility. We retain all rights to the text for future editions. (We need to spell that out for legal Dane).

Dictated to my iPhone !?

On Jan 6, 2023, at 12:01 PM, Dane Vishnubala <dane.vishnubala@icloud.com> wrote:

[CAUTION: Non-UBC Email]

Dear Professor Karim Khan,

Happy new year! I hope you are keeping well and you have more time post leading the BJSM. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following chapter in your book.

I am applying for a PhD by publication and as part of this need statements from any corresponding authors/editors to confirm my level of involvement. An email will suffice if you are happy to.

For the following book chapter: [Physical Activity: Motivational Interviewing](#) (Friedman and Vishnubala 2019) from Brukner and Khan's Clinical Sports Medicine Edition 5 Volume 2.

I would be grateful if you could confirm that I drafted the initial draft chapter before revisions were made by the co-author Daniel Friedman.

Hope that is all ok and thank-you once again for the opportunity to contribute a few years back,

Best wishes

Dane

From: Andy Pringle A.Pringle@derby.ac.uk
Subject: RE: Statement of contribution 3/3
Date: 6 January 2023 at 08:48
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dane,

Thank you for your email. I confirm your contribution to this research output.

Best wishes

Andy



Professor Andy Pringle
Professor of Physical Activity & Health Intervention

Sport, Outdoor and Exercise Science

School of Human Sciences

T: 01332 591903

E: A.Pringle@derby.ac.uk

W: <https://www.derby.ac.uk/staff/andy-pringle/>

Latest Publication: <https://doi.org/10.3390/ijerph19052945>

Special Issue:

https://www.mdpi.com/journal/ijerph/special_issues/aging_physical_intervention

Scholar: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=andy+pringle&oq=

Sciprofiles: [Andy Pringle \(sciprofiles.com\)](https://sciprofiles.com)



From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 06 January 2023 00:01
To: Andy Pringle <A.Pringle@derby.ac.uk>
Subject: Statement of contribution 3/3

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear Professor Pringle,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, [Working with healthcare professionals to promote physical activity](#) (Vishnubala and Pringle 2021)

I would be grateful if you could confirm that Following joint conceptualisation, I led on all elements of this paper from literature review and the write up of the manuscript.

Hope that is all ok

best wishes

Dane

The University of Derby has a published policy regarding email and reserves the right to monitor email traffic. If you believe this was sent to you in error, please reply to the sender and let them know.

From: Andy Pringle A.Pringle@derby.ac.uk
Subject: RE: Statement of contribution 1/3
Date: 6 January 2023 at 08:49
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dane,

Thank you for your email. I confirm your contribution to this research output.

Best wishes

Andy



Professor Andy Pringle
Professor of Physical Activity & Health Intervention

Sport, Outdoor and Exercise Science
School of Human Sciences

T: 01332 591903

E: A.Pringle@derby.ac.uk

W: <https://www.derby.ac.uk/staff/andy-pringle/>

Latest Publication: <https://doi.org/10.3390/ijerph19052945>

Special Issue:

https://www.mdpi.com/journal/ijerph/special_issues/aging_physical_intervention

Scholar: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=andy+pringle&oq=

https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=andy+pringle&oq=

Sciprofiles: [Andy Pringle \(sciprofiles.com\)](https://sciprofiles.com/andy-pringle)



From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 05 January 2023 23:55
To: Andy Pringle <A.Pringle@derby.ac.uk>
Subject: Statement of contribution 1/3

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear Professor Pringle,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, [How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation](#) (Kime et al. 2020). I would be grateful if you could confirm that I Contributed to design of the interviews. A significant amount of the data collection, Contribution to analysis and write up

Hope that is all ok

best wishes

Dane

The University of Derby has a published policy regarding email and reserves the right to monitor email traffic.

From: Andy Pringle A.Pringle@derby.ac.uk
Subject: RE: Contribution statement 2/3
Date: 6 January 2023 at 08:49
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dane,

Thank you for your email. I confirm your contribution to this research output.

Best wishes

Andy



Professor Andy Pringle
Professor of Physical Activity & Health Intervention

Sport, Outdoor and Exercise Science
School of Human Sciences

T: 01332 591903

E: A.Pringle@derby.ac.uk

W: <https://www.derby.ac.uk/staff/andy-pringle/>

Latest Publication: <https://doi.org/10.3390/ijerph19052945>

Special Issue:

https://www.mdpi.com/journal/ijerph/special_issues/aging_physical_intervention

Scholar: [https://scholar.google.com/scholar?](https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=andy+pringle&oq=)

[hl=en&as_sdt=0%2C5&q=andy+pringle&oq=](https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=andy+pringle&oq=)

Sciprofiles: [Andy Pringle \(sciprofiles.com\)](https://sciprofiles.com/andy-pringle)



From: Dane Vishnubala <dane.vishnubala@icloud.com>

Sent: 05 January 2023 23:57

To: Andy Pringle <A.Pringle@derby.ac.uk>

Subject: Contribution statement 2/3

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear Professor Pringle,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, [Role of General Practice Nurses in promoting physical activity](#) (Vishnubala and Pringle 2020)

I would be grateful if you could confirm that I led on all elements of this paper from conceptualisation, literature review and the write up.

Hope that is all ok

best wishes

Dane

The University of Derby has a published policy regarding email and reserves the right to monitor email traffic. If you believe this was sent to you in error, please reply to the sender and let them know.

Kev University contacts: <http://www.derby.ac.uk/its/contacts/>

From: Gabrielle Finn gabrielle.finn@manchester.ac.uk
Subject: Re: Statement of Contribution
Date: 6 January 2023 at 12:31
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dane,

Please accept this email as confirmation of your significant contributions, in terms of leading the I conceptualisation, data collection, analysis, and write-up for the 4 papers listed below.

Best, Gabrielle

Professor Gabrielle Finn PhD, BSc(Hons), PGCertTLHE, PGDipELM, FAS, FRSB, PFHEA, NTF

Pronouns: she/her

Vice Dean (Teaching, Learning and Students), Faculty of Biology, Medicine and Health, The University of Manchester

Professor of Medical Education - Division of Medical Education, School of Medical Sciences

Principal Fellow of the Higher Education Academy and National Teaching Fellow

Office: 1st floor, Core Technology Facility, 46 Grafton Street, Manchester, M13 9NT

Twitter: @gabs_finn

Email: gabrielle.finn@manchester.ac.uk

*Please note that I often work outside office hours and do not expect a reply out with your scheduled hours. Apologies for delays in replies to emails – please prompt if required.

Website: www.paintmeanatomy.com

Associate Editor – Anatomical Sciences Education

New book: [Applied Philosophy in Health Professions Education](#)

Latest report on [Fitness to Practise in Dentistry](#)

<https://sites.manchester.ac.uk/inequalities-in-clinical-academic-careers/>

EA: AnnMarie Entwistle

Tel: (+44) 161 275 5777

Email: annmarie.entwistle@manchester.ac.uk

From: Dane Vishnubala <dane.vishnubala@icloud.com>

Date: Friday, 6 January 2023 at 00:43

To: Gabrielle Finn <gabrielle.finn@manchester.ac.uk>

Subject: Statement of Contribution

Dear Professor Gabrielle Finn,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following papers we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice. As I was the lead Author and you were my academic supervisor and lead, I wonder if you can confirm my contribution to the following papers:

lead, I wonder if you can confirm my contribution to the remaining papers.

[Integrating Sport and Exercise Medicine Clinics into the National Health Service: A Qualitative Study](#)

(Vishnubala et al. 2020a)

[Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi Study](#)

(Vishnubala et al. 2022a)

[UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study](#)

(Vishnubala et al. 2022b)

Creating a Sport and Exercise Medicine Undergraduate syllabus for doctors: a Delphi Study

(Vishnubala et al 2023)

I would be grateful if you could confirm that I led on all elements of this paper from conceptualisation, data collection, analysis to write up for the 4 papers above for which I am first author,

Hope that is all ok

best wishes

Dane

From: Craig Zalecki craigzalecki@gmail.com
Subject: Re: Statement of contribution 1/1
Date: 6 January 2023 at 11:33
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dr Vishnubala,

I can confirm that you contributed to the data analysis in addition to significant input into the drafting of the manuscript.

BW

Dr CJ Zalecki

On Fri, 6 Jan 2023, 00:31 Dane Vishnubala, <dane.vishnubala@icloud.com> wrote:

Dear Dr Craig Zalecki,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper,

[The use of single dose intra-articular local anaesthetics in the United Kingdom: A cross-sectional survey of sport and exercise medicine and musculoskeletal professionals](#)

(Zalecki et al. 2022)

I would be grateful if you could confirm that I contributed to the analysis of the data as well as a significant contribution on the drafting of the final manuscript

Hope that is all ok

best wishes

Dane

From: David Eastwood dr.david.eastwood@gmail.com
Subject: Re: Statement of Contribution 1/1
Date: 6 January 2023 at 18:48
To: Dane Vishnubala dane.vishnubala@icloud.com



To whom it may concern,

I can confirm Dr Dane Vishnubala's contribution is as stated; including ideas and design of book concepts, editor of the book in its entirety and co-authorship of three chapters.

Please do not hesitate to contact me for further information.

Kind regards,

Dr David Eastwood

On Fri, Jan 6, 2023 at 12:47 AM Dane Vishnubala <dane.vishnubala@icloud.com> wrote:

Dear Dr David Eastwood,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following book: [Sport and Exercise Medicine: An Revision Guide](#)
(Eastwood and Vishnubala 2023)

I would be grateful if you could confirm that I have led the design and concepts of the books with its use of summary infographics and SBA integrated into one, and have contributed to the edit of the books as well as co authored 3 chapters.

Hope that is all ok

best wishes

Dane

From: ANYIAM, Oluwaseun (EAST AND NORTH HERTFORDSHIRE NHS TRUST) o.anyiam@nhs.net
Subject: RE: Statement of contribution 1/1
Date: 6 January 2023 at 18:01
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dr Vishnubala,

I can confirm that you co-led the writing of the chapter titled "Diabetes" in the book titled "Exercise Management for Referred Conditions", including its initial drafts.

Kind regards,

Dr Oluwaseun Anyiam

From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 06 January 2023 00:38
To: ANYIAM, Oluwaseun (EAST AND NORTH HERTFORDSHIRE NHS TRUST) <o.anyiam@nhs.net>; seun.anyiam@gmail.com
Subject: Statement of contribution 1/1

You don't often get email from dane.vishnubala@icloud.com. [Learn why this is important](#)

This message originated from outside of NHSmail. Please do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear Dr Oluwaseun Anyiam,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following book chapter which we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

[Exercise Management for Referred Conditions; Chapter: Diabetes](#)
[Chapter Author](#)

I would be grateful if you could confirm that I co-led the writing of this chapter including initial drafts of this chapter.

Hope that is all ok
best wishes
Dane

This message may contain confidential information. If you are not the intended recipient please:

i) inform the sender that you have received the message in error before deleting it; and
ii) do not disclose, copy or distribute information in this e-mail or take any action in relation to its content (to do so is strictly prohibited and may be unlawful).
Thank you for your co-operation.

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From: Katie Marino katiemarino@live.co.uk
Subject: Re: Contributing author statements 1/3
Date: 7 January 2023 at 08:00
To: Dane Vishnubala dane.vishnubala@icloud.com



Hi Dane,

I can confirm that you were a contributing author and contributed to the critical revision and approval of the final editorial as stated in the Contributors section.

Best wishes,
Katie Marino

(+44) 07888308646 @krmarino1
GP Trainee (Academic)- University Hospitals of North Midlands NHS Trust
Sport and Exercise Medicine MSc- University of Nottingham
Head of Membership Services - British Association of Sport and Exercise Medicine
Associate Editor- British Journal of Sports Medicine

From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 06 January 2023 00:15
To: Katie Marino <katiemarino@live.co.uk>
Subject: Contributing author statements 1/3

Dear Dr Marino,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, [Embrace your discomfort: leadership and unconscious bias in sport and exercise medicine](#)

(Marino et al. 2021)

I would be grateful if you could confirm that I was a Contributing author to manuscript revisions

Hope that is all ok
best wishes
Dane

From: Katie Marino katiemarino@live.co.uk
Subject: Re: Contribution statement 2/3
Date: 7 January 2023 at 08:00
To: Dane Vishnubala dane.vishnubala@icloud.com



Hi Dane,

I can confirm you contributed to this paper and reviewed and edited the text and approved the final version as stated in the Contributions section.

Best wishes,
Katie Marino

(+44) 07888308646 @krmarino1
GP Trainee (Academic)- University Hospitals of North Midlands NHS Trust
Sport and Exercise Medicine MSc- University of Nottingham
Head of Membership Services - British Association of Sport and Exercise Medicine
Associate Editor- British Journal of Sports Medicine

From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 06 January 2023 00:15
To: Katie Marino <katiemarino@live.co.uk>
Subject: Contribution statement 2/3

Dear Dr Marino,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, [Muscle-strengthening activities to improve health outcomes: what the evidence supports](#)

(Marino et al. 2022)

I would be grateful if you could confirm that I reviewed the original draft, performed a rapid review of the literature in order to review and edit the manuscript

Hope that is all ok
best wishes
Dane

From: Katie Marino katiemarino@live.co.uk
Subject: Re: Contributing statement 3/3
Date: 7 January 2023 at 08:00
To: Dane Vishnubala dane.vishnubala@icloud.com



Hi Dane,

I can confirm you contributed to the analysis of the data and contributed to the manuscript write up of this paper.

Best wishes,
Katie Marino

(+44) 07888308646 @krmarino1
GP Trainee (Academic)- University Hospitals of North Midlands NHS Trust
Sport and Exercise Medicine MSc- University of Nottingham
Head of Membership Services - British Association of Sport and Exercise Medicine
Associate Editor- British Journal of Sports Medicine

From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 06 January 2023 00:15
To: Katie Marino <katiemarino@live.co.uk>
Subject: Contributing statement 3/3

Dear Dr Marino,

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, **Educating the Next Generation in sport and exercise medicine: A cross Sectional Survey (Marino et al 2023)**

I would be grateful if you could confirm that I contributed to the analysis of the data and contributed to the manuscript write up

Hope that is all ok
best wishes
Dane

From: Salman, David d.salman11@imperial.ac.uk
Subject: RE: Statement of contribution 1/1
Date: 7 January 2023 at 12:02
To: Dane Vishnubala dane.vishnubala@icloud.com



Dear Dane

I can confirm that, for paper, [Returning to Physical Activity after COVID-19](#) (Salman et al. 2021) published in the BMJ, you helped conceive the idea together with the co-author team, and contributed to all elements of this paper from conceptualisation, literature review to editing the manuscript/write up.

Best Wishes
David

David Salman MRCP MRCGP PhD PGDip (SEM)
GP | IPPRF Research Fellow in Physical Activity, Imperial College London | Clinical Fellow in Sports and Exercise Medicine, Imperial College NHS Trust

Email: d.salman11@imperial.ac.uk / d.salman@nhs.net
Web: <https://www.imperial.ac.uk/people/d.salman11>

From: Dane Vishnubala <dane.vishnubala@icloud.com>
Sent: 06 January 2023 00:33
To: Salman, David <d.salman11@imperial.ac.uk>
Subject: Statement of contribution 1/1

This email from dane.vishnubala@icloud.com originates from outside Imperial. Do not click on links and attachments unless you recognise the sender. If you trust the sender, add them to your [safe senders list](#) to disable email stamping for this address.

Dear Dr David Salman

I hope you are well. I would be grateful if you could reply to this email with a brief statement to confirm my involvement in the following paper we have co-authored together. As you know, I am applying for a PhD by publication and as part of this need statements from any corresponding authors to confirm my level of involvement. An email will suffice.

For the following paper, [Returning to Physical Activity after COVID-19](#) (Salman et al. 2021)

I would be grateful if you could confirm that I conceived the idea with the other co-authors and contributed to all elements of this paper from conceptualisation, literature review to the write up.

Hope that is all ok
best wishes
Dane

From: Alexandra Stead astead96@googlemail.com
Subject: Re: Confirmation of contribution
Date: 6 August 2023 at 20:30
To: Dane A Vishnubala Dane.Vishnubala@hyms.ac.uk



You don't often get email from astead96@googlemail.com. [Learn why this is important](#)

Hi Dane,

I am well thank you and hope you are too.

Please see my statement below:

I can confirm my paper builds upon Dane's previous research, which was referenced multiple times within my paper. Dane was co-supervisor for my MSc project, initially providing the idea for the project and contributing with every step during the development of the paper throughout the publication and editing process. Whilst the final paper, [UK physiotherapists delivering physical activity advice: what are the challenges and possible solutions? A qualitative study \(Stead et al., 2023a\)](#), was written by myself, Dane provided review and editing prior to submission.

Hope the above is sufficient, let me know if you need anything further.

Kind regards,
Alex

On 5 Aug 2023, at 23:07, Dane A Vishnubala <Dane.Vishnubala@hyms.ac.uk> wrote:

Dear Alex

I hope you are keeping well? I would be grateful if you could provide a brief statement to confirm my involvement in the follow paper which we have co-authored together. As you know, I am applying for a PhD by published work, which requires statements from corresponding authors to confirm my involvement.

For the following papers:

[UK physiotherapists delivering physical activity advice: what are the challenges and possible solutions? A qualitative study \(Stead et al., 2023a\)](#)

I would be grateful if you could confirm that this paper builds on my previous research. I conceived the idea and co supervised your MSc project and contributed to all elements of the research. The manuscript was written by yourself and I was part of the team that provided review and edit prior to submission. I would be grateful if you can confirm my involvement by replying to this email.

Best wishes

Dane

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Dr Dane Vishnubala MBBS PGCE MRCGP MSc DipSEM(UK) FFSEM FHEA
Academic Phase 2 Lead | Procedural Skills Lead
Consultant Physician Sport and Exercise Medicine | GP

Pronouns: He/Him
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From: Katie Marino katie.marino@basem.co.uk
Subject: Re: Confirmation of contribution
Date: 6 August 2023 at 12:45
To: Dane A Vishnubala Dane.Vishnubala@hyms.ac.uk



Hi Dane,

I can confirm your contributions to both papers as you've stated is accurate.

Best wishes,
Katie

GP Trainee (Academic)- University Hospitals of North Midlands NHS Trust
Sport and Exercise Medicine MSc- University of Nottingham
Board Lead for Membership Services- British Association of Sport and Exercise Medicine
Associate Editor- British Journal of Sports Medicine

On 5 Aug 2023, at 23:02, Dane A Vishnubala <Dane.Vishnubala@hyms.ac.uk> wrote:

Dear Katie

I would be grateful if you could provide a brief statement to confirm my involvement in the follow paper which we have co-authored together. As you know, I am applying for a PhD by published work, which requires statements from corresponding authors to confirm my involvement.

For the following papers:

[Sport and Exercise Medicine: What lies beyond the crossroads?](#)
(Marino et al 2023)

[Pregnancy and Physical Activity: Facilitating Change](#)
(Marino et al 2023)

I would be grateful if you could confirm that I conceived and co-led the 2 editorials via my role as editor of the special edition of the BJSM. I provided input on the structure and content of both editorials and reviewed and supported the edit of the final manuscript. You can confirm this by replying to this email.

Best wishes

Dane

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From: David Eastwood dr.david.eastwood@gmail.com 
Subject: Re: Confirmation of contribution
Date: 7 August 2023 at 13:04
To: Dane A Vishnubala Dane.Vishnubala@hyms.ac.uk



I confirm the contents of your email in your contribution to the highlighted paper.

Kind regards
Dr Dave Eastwood

On Sat, Aug 5, 2023 at 11:02 PM Dane A Vishnubala <Dane.Vishnubala@hyms.ac.uk> wrote:

Dear David,

I would be grateful if you could provide a brief statement to confirm my involvement in the follow paper which we have co-authored together. As you know, I am applying for a PhD by published work, which requires statements from corresponding authors to confirm my involvement.

For the following paper:

[Physical Activity Clinical Champions: A peer to peer physical activity education programme in England.](#)
(Eastwood et al 2023)

I would be grateful if you could confirm that I conceived and co-led the editorial via my role as editor of the special edition of the BJSM. I provided input on the structure and content of the editorials and reviewed and supported the edit of the final manuscript. You can confirm this by replying to this email.

Best wishes

Dane



Dr Dane Vishnubala MBBS PGCE MRCP MSc DipSEM(UK) FFSEM FHEA
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17.2 Appendix B: Statement of Data used in a previous award

Output 4: Integrating Sport and Exercise Medicine Clinics into the National Health Service:

A Qualitative Study

Output 4 (Vishnubala et al., 2020a). The research was originally carried out and contributed to my MSc in Sport and Exercise Medicine at University of Nottingham. The data was however fully re-analysed and recoded and a second coder was used to ensure rigour of methodology. The final manuscript was drafted by myself with further revisions and edits by supporting co-authors. The final manuscript is significantly different to the original thesis. My original MSc supervisor was Professor Edwards. The paper was published in BMJ Open SEM.

17.3 Appendix C: All full papers

See Table 2 for Links to all published papers.

RESEARCH ARTICLE

Open Access

How prepared are healthcare professionals for delivering physical activity guidance to those with diabetes? A formative evaluation



N. Kime^{1*}, A. Pringle², S. Zwolinsky³ and D. Vishnubala⁴

Abstract

Background: Physical activity is recognised as important for diabetes management and improved overall health of individuals with diabetes, yet many adults with diabetes are inactive. Healthcare professionals have been identified as key to promoting physical activity, including individuals with diabetes, but are ill-prepared to deliver this. Our paper evaluates the barriers/facilitators of healthcare professionals' delivery of physical activity guidance to adults with diabetes and aims to inform efforts to investigate and enhance their preparedness to promote physical activity.

Methods: A sequential mixed method, two-phase design was adopted involving a purposeful sample of healthcare professionals. Phase one was an online pilot survey designed to test assumptions around healthcare professionals' knowledge, training and preparedness to deliver physical activity guidance. Phase two comprised eighteen semi-structured interviews, thematically analysed to provide an in-depth exploration of healthcare professionals' experiences of delivering physical activity guidance to adults with diabetes.

Results: Healthcare professionals are committed to promoting physical activity to adults with diabetes and are reasonably confident in giving basic, generic guidance. Yet, significant challenges prevent them from achieving this in their practice, including: lack of education and training around physical activity, diabetes and health; ignorance of recommended physical activity and diabetes guidelines; lack of awareness of referral options; limited time and accessibility to appropriate resources. Nevertheless, healthcare professionals believed discussions around physical activity needed to be an integral part of consultations, incorporating improved communication strategies for conveying key physical activity messages.

Conclusions: HCPs have a key role in the promotion of physical activity to people with long-term conditions such as diabetes and they are identified within both the strategic policy context and national interventions for physical activity. Yet, this study indicated that HCPs face multiple and at times complex barriers to physical activity promotion generally and with diabetes patients. Conversely HCPs also reported what works, why and how, when promoting physical activity. Rich information derived from the day-to-day, working healthcare professional is integral to shaping future practices going forward. The bottom up, iterative design adopted in this study provides an approach to tap into this information.

Keywords: Healthcare professionals, Physical activity, Diabetes

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Background

Diabetes and its consequences are a major problem for health systems around the world, reaching epidemic proportions over the last 30 years [1]. Worldwide, over 420 million people are currently living with diabetes [2]. Furthermore, the absolute global economic burden of diabetes was \$1.3 trillion in 2015 [3] and in 2016, around 1.6 million deaths were directly caused by diabetes [2]. Fortunately, diabetes and its consequences are - for the most part - manageable. Medication, regular screening, treatment for complications, improved physical activity (PA) levels and diet can all help to avoid, delay or manage diabetes [2]. Yet, much of the responsibility for facilitating the requisite behaviour change lies at the feet of healthcare professionals (HCPs) [4]. Although the evidence base surrounding theoretical frameworks and systems-based approaches to behaviour change point to the powerful impact of concurrently addressing underlying influences on behaviour [5–7], unhealthy practices are often socially reinforced [8, 9]. Therefore, effective, cost effective, sustainable and implementable strategies that can help alleviate pressure on HCPs and struggling health systems remain in short supply.

Contemporary national programmes for increasing PA focus on the promotion of PA, including for those people living with a long-term conditions, for example diabetes [10]. As part of national initiatives, such as Sport England's Local Physical Activity Delivery Pilots, HCPs are expected to have an important role supporting both in the local community and community agencies tasked with promoting PA [10, 11].

While HCPs appear confident prescribing medication, screening, treatment and diet interventions for patients living with diabetes, there is less confidence and consensus among HCPs regarding the promotion of PA [12]. This could be problematic as the UK Chief Medical Officers (CMO) PA guidelines 2019 update, 'developing options for future communication and surveillance', highlighted the importance of a broad group of HCPs in promoting PA [13] and the Royal College of General Practitioners (RCGP) have identified PA as a strategic priority [14]. Many complex and multifaceted barriers account for insufficient levels of activity [15]. For example, HCPs do not always know what to recommend to people living with diabetes when asked about incorporating PA into their lives [16]. Further, HCPs and patients have cited this lack of knowledge, combined with the fear of hypoglycaemia and a loss of glycaemic control as a primary reason for non-engagement [17]. This fear may, in some way, account for people with diabetes being among the least physically active in society [18] and why a high proportion of patients living with diabetes struggle to maintain a healthy weight [19].

Allaying these fears are important since a physically active lifestyle is critical for blood glucose management

and overall health in individuals with diabetes and prediabetes [20]. Adults with a high exercise capacity display reduced risk of coronary artery disease, myocardial ischaemia and stroke, regardless of their diabetes status [21]. In addition, compared to those individuals with type 1 who are inactive, their active counterparts have lower levels of retinopathy and microalbuminuria [22], an increased likelihood of reaching HbA1c, blood pressure and BMI targets [19] and decreased total daily insulin needs [23]. With this in mind and in line with current guidance, PA should be undertaken, recommended and prescribed to all individuals with a metabolic condition as part of diabetes management and overall health [24].

Adopting person-centred, behavioural approaches in this context may improve the chances of achieving the desired PA outcomes. These approaches indicate that regular positive experiences promote the motivation and capability to adopt a behaviour, whereas negative experiences can lower motivation and perceived capability [5, 25]. Highlighting the unique needs of adults with diabetes and the challenges they face around PA is likely to be of great importance. Previous research has highlighted the role that HCPs play in providing information and appraising social support in the form of education around diabetes and PA [15]. In addition, there is a growing need to improve knowledge around PA in relation to diabetes among HCPs [12, 16], alongside appropriate and individualised application of this, integrated within a programme that emphasises the importance of PA in diabetes management. Importantly, these ideas require a detailed understanding of the preparedness of HCPs for delivering guidance and support to participants, as well as a detailed appreciation of mediated approaches to PA promotion, developed for adults with diabetes. These approaches are expected to help to develop a better understanding of what works - or not, why and how. In doing so, bottom up, exploratory and iterative approaches have been recommended [26] and deployed with professional groups who have a responsibility for the provision of PA and public health [27]. This can help establish the basis for forming and refining intervention activities including those aimed at enhancing the preparedness of HCPs.

Therefore, the aim of the work was to conduct a formative evaluation of HCPs working in primary care and the community around the delivery of PA guidance for those with diabetes. The evaluation details information relating to the characteristics, decisions and behaviours of these HCPs, to inform and develop future education and training programmes for this group and, therefore, improve diabetes service provision in respect of PA. An important aspect of the study was to identify the challenges faced by HCPs and understand what worked less well and why, important criteria for the successful management of PA promotion interventions [28]. Here we describe this formative evaluation process and identify

those factors that need to be considered prior to designing a behavioural intervention aimed at HCPs.

Methods

Study overview

This exploratory research study adopted a sequential mixed method design. The quantitative survey element of the research was implemented first and the findings were used to inform the qualitative interviews. As this study was exploratory, a non-probability sample of experts practicing within the field of diabetes and physical activity were recruited. This type of approach has been used previously in PA research to provide more in-depth accounts from health and social care professionals [27]. This involved a two phase, multi-site approach to evaluate the delivery of PA guidance by HCPs - working in either primary care or the community - to patients living with diabetes (including type 1 diabetes, type 2 diabetes and pre-diabetes). HCPs working in secondary care were not involved in this study. The study took place in the Yorkshire region between February and July 2018. A purposive sampling strategy was used to recruit HCPs who saw patients with diabetes as part of their role. Inclusion and exclusion criteria were based on whether a HCP was qualified, which was determined by the Health Care Personnel Law and Legal Definition. This states that Health Care Personnel are persons who have special education on health care and who are directly related to provision of health care services. The inclusion criteria were HCPs who met this definition.

Participants were first approached through General Practice surgeries and the researchers' existing links with community organisations. An initial email was sent to HCPs inviting them to participate by the research team. Those that wanted to take part were given an information sheet and asked to provide written consent.

The first phase of this study utilised an online pilot survey with HCPs. It was designed to test assumptions around HCPs knowledge, levels of training and preparedness to deliver PA guidance to patients living with diabetes. The findings from this pilot phase were used to determine the most appropriate lines of questioning and issues to be unpicked during the semi-structured interviews in phase two. The second phase of the study was based on a phenomenological approach that focused on HCPs experiences [29]. This was the most appropriate theoretical framework for exploring HCPs understanding of PA and diabetes and their preparedness for delivering it to adults with diabetes. Phase 2 involved individual, semi-structured qualitative interviews with HCPs. The interviews provided an in-depth exploration, as recommended by Knight et al. [16], of HCPs experiences of delivering PA guidance to patients living with diabetes, giving them an opportunity to talk freely about their

experiences. This combined approach facilitated a more robust and informative investigation of the current situation.

Data collection

Online pilot survey

A small purposive sample of HCPs participated in the bespoke online pilot survey, hosted by Qualtrics [30]. The pilot included multiple choice and open text response questions on participants own engagement in PA, previous education, their work-based training and knowledge of PA and diabetes, and the practicalities of delivering PA guidance in an appointment setting. The pilot survey took approximately 15 min to complete.

Semi-structured interviews

Reflecting the importance of using iterative bottom up and exploratory approaches when understanding and investigating HCPs practices [26], individual semi-structured interviews were conducted face-to-face or by telephone. The research team facilitated the interviews, either individually or in pairs. Each interview lasted between 15 min and 1 h. They were arranged at a time to suit the participants and in the case of face-to-face interviews, were held either in the work place or the participants' homes. An interview schedule was developed to guide the questions, which was piloted beforehand with a small number of HCPs. A semi-structured, deductive and inductive approach guided the interviews, which meant that the questions were aligned to both the main themes arising from the survey and the issues that arose directly from the participants as the interview progressed. This strategy allowed the participants to talk freely and share their views and experiences in respect of PA and diabetes. The questions centred on how prepared HCPs felt to deliver PA to those with diabetes, including the support they received and the barriers they faced. The interview schedule is available as supplementary material. Interviews were conducted until no new themes emerged and, therefore, data saturation was achieved. They were recorded with the participants' consent and no participation incentives were offered. Appropriate University ethical and local research and governance approval were obtained.

Data analysis

Online pilot survey

Descriptive statistics were used to describe data from the online pilot survey. All analyses were undertaken using IBM SPSS Statistics v25. Due to the sample size ($N = 6$) in phase one, there is an increased risk of disclosing information about individuals. For example, there are many cells with small counts, under 5. Although the tables themselves do not reveal the identity of an individual, there is a risk that combining or linking

tables within this data set may result in a secondary disclosure. By adopting a policy of small number suppression, data cannot be reported from phase one. Nevertheless, data from the pilot study suggested that although many participants were physically active themselves, there were significant shortfalls in training and knowledge around PA promotion for people living with diabetes. As a result, confidence to deal with the practicalities of delivering PA guidance in an appointment setting appeared low.

Individual interviews

The interviews were transcribed, and qualitative data analysis was conducted using a thematic approach [31]. This process involved generating categories and coding data so that common themes and links could be identified, but at the same time ensuring the data remained a faithful representation of the participants' comments [32]. As a means of reducing interpretation bias and increasing trustworthiness, transcripts were analysed by more than one member of the research team, all experienced in conducting qualitative analysis. In addition, participants verified the themes arising from the analytic process as a means of establishing the credibility of the findings. The researchers were aware of their influence on the study and endeavoured to employ reflexivity throughout the study process, using techniques such as critical reflection, note-taking and an assessment of their individual impact on data interpretation. A potential conflict of interest and ethical consideration was that one of the authors knew several of the participants, which may have led to coercive practices being employed. However, all participants were given an information sheet and asked to sign a consent form. The voluntary nature of participation was emphasised. In reality, the fact that some participants knew one of the authors turned out to be a strength of the study, since the author in question enabled access to a 'hard-to-engage' group, who ordinarily may not have set aside the time to participate in the study. Indeed, we came across cases where participants asked if they could be interviewed by this colleague and in doing so, we responded to participants' needs and a trusting and safe relationship was established.

Results

A total of 6 HCPs (4 Females; 2 males) participated in phase 1, some of whom participated in phase 2. A total of 18 HCPs (11 females; 7 males), participated in Phase 2. Of these, 15 participants were General Practitioners (GPs) and 3 were nurses employed either in a General Practice surgery or in the community. We present the results using a series of themes and selected excerpts in the following section which follows an approach we have used previously in the published literature [15].

Individual interview results

Training/education for HCPs

One of the most striking aspects of the interviews was that all HCPs, except one, stated that they had received little or no pre-registration education in physical activity or exercise (PA/E), both as a mediator for a healthy lifestyle or for preventing and managing diabetes, as part of their undergraduate or post-graduate training. The little training that they had received around PA/E was generic, in terms of being "good for your health" rather than specific to diabetes. As one HCP commented,

"During medical training I received no physical activity training at all...So, if you then asked me specifically how much I should do or what I should be telling them [patients with diabetes], I'd probably just say, 'you should do more' and that would probably be about where my medical training ends on that front" (HCP 9).

The exception to this was one HCP, whose initial degree included information on PA/E and at-risk groups. Other than this, any training or education in PA/E and diabetes that HCPs had received was undertaken whilst in their current role as part of their continuous professional development (CPD). This was largely undertaken on an ad-hoc basis and by individuals who took the initiative and chose to complete self-directed learning, for example, e-learning modules on the British Medical Journal website or attendance at study days. However, unless HCPs had an interest in PA/E, it was not an area in which they would voluntarily seek training, as exemplified by these HCPs,

"It's (PA/E) not in a GP curriculum, it's not in GP training, it's not in undergraduate training. So, unless you've found someone enthusiastic or somewhere to go and you're interested in learning, it wouldn't be something you'd do" (HCP 9).

"Well, I guess when it comes to diabetes specifically, we know a lot about the disease, the physiology, and I guess the drug management, but when it comes to the physical activity side of stuff I can't think of a single time I ever had any kind of lecture or group session to do with that. I think physical activity in general is really poorly taught to doctors, and when I've had to learn stuff I've had to go and... It's all very self-directed. I have actively to go and seek that information out. I can't think of a single time either at medical school or during my... or my training when we covered those topics" (HCP 13).

For those HCPs who had completed CPD training on PA/E and diabetes, the focus was on type 2 diabetes,

rather than type 1 diabetes or pre-diabetes. The emphasis was on medication and diet, and not PA/E, as a way of managing diabetes, as highlighted by one participant,

“There was never anything that was like here’s how to manage diabetes, on the lifestyle measure, physical activity. It was much more on the lines of, ‘right, diabetes, you need to discuss diet, you need to start thinking about medication’” (HCP 11).

Worryingly, even for those who had previously worked in a diabetes-specific role, PA/E was not a recognised component of diabetes management,

“I did actually do a diabetes job for four months. I wouldn’t say exercise was really discussed and since then, exercise-wise, pretty much zero CPD-wise” (HCP 8).

Guidelines for PA and diabetes care

All the participants were unfamiliar with any guidelines relating to PA/E and diabetes and had no idea where to go to find out specific information. Some participants referred to the British Medical Journal (BMJ) or the National Institute for Clinical Excellence (NICE), largely because they chose to be proactive, but the information sought mainly related to the treatment of diabetes rather than PA/E:

“There isn’t one consistent guidance for diabetes...I wouldn’t know if there was an authority to follow in the UK. NICE has a little bit of guidance about it, but again, it’s fairly broad” (HCP 9).

Of greater concern was the fact that only a small number of participants were familiar with the generic PA/E recommendations according to the CMO guidelines. Of these a few could recite the number of minutes for moderate and high intensity exercise per week, but as one HCP stated, this was despite having read any guidelines,

“I think I’d probably just have an image of what I’d say in my head, but that’s not based on being up-to-date...that I’ve read in the last 5 years” (HCP 10).

In addition, those HCPs involved in delivering medical training commented on the fact that even new doctors were unaware of the current PA/E guidelines for the general population,

“I was giving a talk to F1s (Foundation doctors) and I showed them the Government guidelines and the Chief Medical Officer guidelines [for PA/E]. We asked the question, ‘have you seen this before?’ I think one

person put their hand up to say they’d seen it. It was a group of 30. No-one knew the guidelines” (HCP 9).

Given the lack of training and education or awareness of where to find information on PA/E and diabetes, some HCPs stated that they felt their day-to-day practice was compromised in respect of delivering PA/E guidance to their patients,

“I can’t speak for all doctors, but I have a feeling that the sentiment is shared, we kind of feel a bit out of our depth when it comes to physical activity in general, especially when it comes to physical activity and diabetes” (HCP 13).

Nevertheless, they provided advice to their patients, which was largely based on opinion rather than recommended guidelines or policy,

“I guess most of the guys I work with would say, ‘you should do more exercise’ or ‘you should eat better’. Everyone has an opinion, but it’s based on their opinions rather than necessarily formal training...so we give the advice that we think is best” (HCP 9).

Perceptions of practice for promoting PA with patients with diabetes

Even though most HCPs had not received any formal training in PA/E in general or as a means of managing diabetes, and furthermore, were unaware of current PA/E guidelines, HCPs believed that many of their peers were aware of the need for more people to adopt lifestyle recommendations. They referred to the importance of exercise, diet and losing weight as generic considerations for the population in general, but also, as a means of reducing the likelihood of developing pre-diabetes and type 2 diabetes. Some HCPs placed a greater significance on PA/E rather than medication as a more effective way of managing type 2 diabetes,

“I’m definitely a less is more doctor. If I can stop people’s medications, then I’m thrilled. But that’s why I sought it [PA/E] out, because there’s good evidence now that exercise and weight loss is probably at least as effective, if not more effective, than medication [for type 2]” (HCP 1).

A misconception as to what constitutes PA, as opposed to exercise, was prevalent amongst HCPs. When asked specifically about this issue, many believed there were a lot of mixed messages around PA, exercise and sedentary time, in terms of their meanings and recommendations for increasing activity. For those HCPs who

could differentiate PA from exercise, they made a distinction between the two when advising patients and were able to emphasise the importance of fitting activity into everyday life,

“I also try to say they don’t need to specifically go out and exercise, but if they put some music on at home and they do lots of house jobs in that day, they actually use quite a lot of energy... Try and look at what you’re doing in a day and see where you can build in activity. When you do it regularly it becomes behaviour” (HCP 2).

Some HCPs believed that the existing PA/E support which was currently available was aimed at structured, formal exercise and not every day PA, when, in fact, the reverse should be the case with HCPs encouraging people to be more physically active within their everyday environment.

HCPs current practice

It was clear that there was no ‘one size fits all’ approach regarding HCPs delivery of PA/E guidance to their patients, irrespective of whether a patient had diabetes. Each HCP tackled PA/E differently depending on their role. Amongst GPs there were some commonalities. For example, they referred to the lack of time and not being able to fit PA/E, alongside other priorities, into one consultation. Therefore, the bulk of the responsibility for PA/E guidance was left to the practice nurses, although many GPs thought nurses probably placed a greater emphasis on diet rather than PA/E. When asked, GPs were unclear about the exact nature of the advice proffered by the practice nurses,

“I wouldn’t be 100% certain about how much time or information they’re [patients] given about exercise” (HCP 11).

In fact, practice and community nurses stated that they did address PA/E with all their patients who had diabetes, regardless of the type. This was achieved through an individualised, person-centred approach, focusing on a patient’s diabetes in the context of their lifestyle,

“I look at the person holistically – look at their medication, look at their current physical activity and look at the overall gains of physical activity to mental health, but also the weight loss and the impact that that will have on their physical health in reducing their blood sugars and the stabilisation of their diabetes” (HCP 6).

HCPs in general reported that of the patients they saw with diabetes, the majority had type 2 or pre-diabetes.

Therefore, the emphasis was on weight loss or calorie counting through a combination of diet and PA/E. HCPs tried to give practical advice according to the individual and sought to ascertain: firstly, the level of PA/E that the individual was currently doing and secondly, determine whether the individual knew the recommended amount of PA/E that they should be doing. Finally, HCPs presented opportunities for being more active which were tailored to the individual’s lifestyle and, therefore, more likely to appeal to the individual,

“Then if we both thought they weren’t doing enough, or they’d like to do more to help their condition, I’d probably explore the type of things that they would be interested in doing, that they could sustain doing... rather than telling them what they should” (HCP 10).

Confidence in delivering PA/E advice to patients

Most HCPs felt reasonably confident in giving basic, generic PA/E advice to their patients. This consisted of exploring the activities that patients currently engaged in and encouraging patients to be more active in the context of their everyday lives. However, when asked about giving PA/E advice to those with diabetes, specifically type 2 diabetes, there was a divergence of opinion amongst HCPs. Some were reluctant to offer advice,

“On a 1-10 scale, with 10 being really confident, probably like 3-4. My advice to them would probably be really generic lifestyle and physical activity advice that I’d give to anyone. Specifically, how I’d tailor that to diabetes [type 2], I would not know how to” (HCP 13).

Others reported feeling confident that they could apply their knowledge, however limited, to pre-diabetes and type 2 diabetes, but unless they had received specific PA/E training in relation to type 1 diabetes, they lacked the confidence to deliver PA/E advice in this context,

“Someone who was pre-diabetic and overweight, I’d feel pretty confident. If there was someone who had poorly controlled type 1 who was on high doses of insulin, I’d feel quite nervous about giving too specific advice about how much physical activity they could safely do...I’d probably avoid the conversation altogether, to be honest” (HCP 10).

An important point raised by a few of the HCPs was the level of confidence that patients placed in their HCP. They felt that this was a significant factor in determining if a patient engaged in PA/E. Key to this was the perceived knowledge of HCPs around PA/E and the way information was delivered. Essentially, if HCPs seemed

confident and knew what they were talking about, this instilled confidence in their patients,

“If you can get that engagement with them, that’s the other big thing. I think a lot to do with that is if they’re confident with you, you’re giving good messages...and they’re comfortable with you” (HCP 17).

Signposting and access to supportive resources

Most HCPs had limited knowledge about appropriate community services and support for patients who wanted to be more active. This was the case regardless of whether their patients had diabetes. They cited insufficient time to research what was available, an inability to keep track of local services and not knowing who to contact as the main factors,

“I wouldn’t actually know what’s available because it changes all the time according to funding and stuff in the area” (HCP 3).

Even when HCPs were aware of a local service, most notably, Exercise on Prescription, the National Diabetes Prevention Programme or DESMOND (Diabetes Education and Self-Management for Ongoing and Newly Diagnosed), they were unclear about how to access information to pass onto their patients,

“I found that there wasn’t very much information out there and that made it difficult for me to refer people in. People need to know...they’re asking you what it’s about and you think, ‘there’s only so much I can tell you’” (HCP 5).

In terms of in-house referrals, HCPs tended to signpost patients to either the practice nurse, visiting dietitian or in the case of one practice, a gym/personal trainer service.

The consensus was that if everything was in one location, there was an increased likelihood that patients would engage,

“I would argue that it (physical activity promotion) would come better from being from your GPs surgery than it would from the local authority. For the average lay person on the street, I suspect if they’ve got a health issue they’re not going to go on the council website, they’re going to come to us. And then if we send them to someone else to do it, that’s a barrier, in something that’s already got 20 barriers to doing the exercise” (HCP 1).

Some practices offered free education sessions for those with pre-diabetes or newly diagnosed type 2 patients.

However, HCPs were unsure about the content of these sessions, whether PA/E was covered in the curriculum, and even whether they were effective,

“There’s no good scheme to refer them to. There’s a pre-diabetes education session, but it’s a one-off session and it’s theoretical. I don’t think it’s enough to make someone change” (HCP 9).

Future developments and improvements in PA and diabetes

All HCPs highlighted the need for a greater emphasis on PA/E, in medical school curriculums and as part of CPD, both generic and applied to specific conditions such as diabetes. In the patient consultation, HCPs thought that PA/E should be an integral component, rather than, at best, an add-on at the end. HCPs referred to the fact that currently, there is no requirement to discuss PA/E in a consultation because it is not linked to a target and, therefore, not incentivised,

“The only thing that drives me absolutely insane is the fact that the funding is completely the wrong way round. We’ve got QOF (quality and outcomes framework) targets for their HbA1c, their blood pressure, whether they’ve had their feet checked...and there’s no mention of exercise or weight loss. I would love the funding to be attached to sustained weight loss or sustained activity, or at least providing them with discussions about their activity. It would actually focus the problem on what’s actually underlying, rather than how they’re actually fixing it” (HCP 1).

When asked what HCPs needed to help them focus on PA/E in the consultation, they referred to concise information, i.e. a leaflet like the existing diet sheets, which was regarded as more convenient than having to look on a website,

“I’d probably say a one-page summary outline with reference to all the kind of key facts, with evidence supporting it, as to what we ought to be doing as clinicians for patients with diabetes, exercise and how to go about delivering that” (HCP 13).

Likewise, regarding patient education and PA/E, HCPs thought that information needed to be succinct with clear guidelines for the patient to follow. Also, tailored patient information was important. It was suggested that one way of achieving this was through an interactive patient hub or one-stop shop,

“Some sort of resource in that way in which you can click on to things and it takes you to something a bit

more specific for you and gives you more tailored advice, would be useful" (HCP 18).

Many HCPs stated that PA/E promotion should be part of the practice nurse role rather than GPs since practice nurses saw patients with diabetes on a more regular basis. In addition, HCPs felt they needed improved strategies for communicating PA/E guidance effectively,

"Just getting the information across. May be some tips on how to get that information across and how to approach it with those patients, because they're not always the most receptive to the information we try to give them" (HCP 12).

From an HCP perspective, time was often a constraint on whether they delivered any PA/E advice. HCPs stated that if they had up-to-date and readily available information on current PA/E recommendations and local services, they would be more likely to discuss PA/E in what was often a time-pressured consultation,

"For me it's how we can get experts to make sure the resources are up-to-date, in an easy to find place, that's marketed to the clinician and realistic to what we can do in practice" (HCP 9).

Discussion

HCPs represent an important ingredient in efforts to promote PA within the population [13, 31, 33], including those with long-term conditions and this is reflected by their prominence in key national policy and interventions [10–14]. In this respect, understanding the barriers and facilitators that HCPs face are important in developing effective and supportive strategies and interventions that enhance their preparedness for PA promotion.

With those thoughts in mind, this study identified both the strengths of HCPs and the challenges they face in their efforts to promote PA for patients with diabetes. In line with previous research [34], our study encountered a genuine commitment by HCPs to promote PA despite difficult and challenging circumstances impacting their day to day work such as time [35, 36], large caseloads and competing demands as reported in other studies [37]. It has also been reported that medical students and doctors who are physically active themselves are much more likely to counsel their patients on PA and increasing the activity levels of medics has been suggested as an ingredient of a possible strategy for PA promotion in patients [38]. In this study, a number of HCPs reported in the interview data that they were physically active themselves and so this commitment to encouraging PA in their patients may also reflect their personal interest in sport and PA.

The commitment to PA promotion, including to those patients with diabetes is important, given the pivotal role of HCPs in national strategies and programmes designed for promoting PA, including those focused on patients with long-term conditions [10, 13, 39]. Indeed, the RCGP [14] identify PA as a strategic priority, while the 2019 CMO Physical Activity Guidelines have identified HCPs as being important in implementing PA messages to a range of groups [13]. Going forward, for the first time, the UK PA guidelines will be accompanied by a planned and coordinated communication strategy to support the implementation of the revised PA guidelines. Communication has been notably absent in recent PA guidelines and was recommended in technical reports aimed at supporting the new guidelines [40]. This is a positive development given HCPs in this study expressed concern about the fragmentation of resources to support PA advocacy.

That said, it is important that HCPs feel efficacious and knowledgeable in promoting PA to patients, including possessing an understanding of patients' needs, motives and determinants, in addition to the current PA guidelines [34].

In the UK, multiple HCPs present with diverse levels of training and experience [41]. In this study we encountered instances where HCPs lacked knowledge on the recommended guidelines on PA, including PA and diabetes, as reported elsewhere [39, 42]. In these circumstances HCPs expressed understandable discomfort. A lack of knowledge around the PA guidelines has been identified for other conditions within the literature [43, 44], but also for diabetes. Indeed, Knight et al., [16] showed two thirds of HCPs were unfamiliar with the evidence-based guidance leaving them unable to offer basic advice on insulin action [41]. Furthermore, Cuthill and Shaw [38] have identified that clinicians' knowledge of the relevant UK recommendations was reported in several studies to be as low as 7–27%. In part, this reflects the level of training and support HCPs receive, including training on PA which is an important component of effective PA promotion [39]. However, only very exceptionally did we encounter HCPs who had received full undergraduate training in PA and its relationship with health. Indeed a lack of training on PA promotion has been reported as a challenge, with HCPs in this study highlighting a lack of knowledge and skills as a result of little or no reference to PA in their undergraduate curriculum, which is documented elsewhere [38, 39, 45–47]. Interestingly enough, financial incentives have been suggested as interventions to incite HCPs to promote PA [39], yet we did not encounter this response in our study.

Looking forward, research has identified that future medical students want to receive more training on PA [48] and reports indicate that this issue is now receiving greater attention in undergraduate medical school curricula [49], for

example, through Exercise Works! (<http://www.exercise-works.org/>). Yet this does little to solve the immediate training needs of HCPs currently in post, including those in our study, where other options are needed. Also, it is important to mention that having accurate knowledge of the dose of activity recommended for health benefits is not enough to translate into improved PA promotion for the population alone. Doctors and indeed all HCPs must be confident and competent in administering advocacy, promotion and counselling skills [38] and this is an important part of CPD strategies.

HCPs in this study reported that there were options to engage in CPD and indeed several participants identified professional bodies that offered CPD opportunities with accreditation and as part of nationally recognised programmes. This is a step in the right direction, but HCPs reported needing to be motivated to seek out these CPD opportunities, some of which they accessed through their own volition. With those thoughts in mind, the RCGP are collaborating with Public Health England on the GP Clinical Champion Programme for PA [50, 51]. This involves recruiting HCPs such as GPs, nurses and other allied HCPs to a 'championing' and 'advocacy' role for PA, where the incumbents establish and build new local networks to promote the case for PA promotion with fellow HCPs through training and education opportunities [52].

Given the importance of competence and confidence in PA advocacy [38], for those HCPs who expressed a lack of confidence in their ability to disseminate information and advice, the Clinical Champion Programme is a positive development, but a more developmental approach, such as mentoring or peer-led training, might also be valuable in refining the skills and competencies for PA advocacy. For example, a Sport and Exercise Medicine pilot is underway at Oxfordshire University Hospital Trust. The programme adopts a peer-led approach to training HCPs in PA across a variety of clinical pathways and an Active Hospital toolkit is also in development (<https://www.sportengland.org/our-work/health-and-inactivity/moving-healthcare-professionals/>).

A further component of PA promotion by HCPs is an awareness of PA opportunities. In this study, HCPs referred to a lack of awareness of local services and options for referring patients into local PA programmes operating in the community [53]. This is arguably exacerbated by major reform of public health both locally and nationally which in turn has implications for PA promotion. Nationally there has been a reduction in funding for local authorities for public health operation. The UK Comprehensive Spending Review reports that spending will fall by at least £600 million in real terms by 2020/21, an annual reduction of 3.9% [54, 55], resulting in funding for PA opportunities being scaled back in

some areas [56]. The current economic climate may mean that the presence of PA opportunities such as Exercise Referral Schemes (ERS), which for a long time have been an important and readily available instrument in the PA armoury [38, 53] will be deemed resource intensive and may no longer be available. Already, this has meant that in some instances the commissioning process has led to a scaling back or restructuring of ERS in some local areas. Indeed, in one of the local contexts where this study took place, the local ERS had been restructured [57]. In some cases, this has reduced the number and type of options open for HCPs to refer patients to PA services. Changes in local PA provision may place further demands on HCPs to seek out the information on PA for patients from non-centralised sources, in turn contributing to time pressures faced by HCPs in their daily work and reported elsewhere [34]. Indeed, doctors report feeling insufficiently equipped to provide support or information to their patients [39]. In this study, online web-based sources of information on PA support and services were sometimes referred to as an easier option in providing information to patients, but knowing where to seek information was not always easy in practice, with information on PA located in multiple locations placing further time demands on already busy HCPs to seek out these resources. It remains to be seen if the updated 2019 PA guidelines [13], which is not only by a communication strategy, but also by a series of infographics available in centralised locations, helps address this challenge and would be a worthy focus of future investigations.

To support HCPs attempts to promote PA and in response to the pressures faced by HCPs, Moving Medicine (MM) was launched in 2018. MM is an interactive, evidence-based, internet tool to support brief advice in PA across a range of diseases and conditions [58]. Importantly, it houses information on PA in a central location. The intervention includes a series of modules linked to a range of conditions (including type 2 diabetes) in which PA can have a positive impact. It offers HCPs several strategies: time bound consultations, promotional materials and resources to assist patients through the process of being more physically active, as well as resources for patients that can be distributed. This is another step in the right direction and evaluation of this programme. However, given the responses of HCPs in this study, the evaluation should not only include impact outcomes on PA levels, but also process outcomes on the use and usability of resources [26, 59]. In particular, the extent to which MM helps HCPs overcome some of the commonly reported barriers in this study, such as confidence, competence time, knowledge and accessibility. Formative evaluative approaches like the one deployed in this study are likely to be valuable in this respect.

Limitations and strengths

This study has several limitations and strengths. Limitations include a lack of representation from nurses who take on an important role in PA promotion [52, 60] and form an essential component in the dissemination of the updated UK CMO PA guidelines [13]. Many of the participants in this study thought PA was important. Efforts to promote PA for long term conditions are likely to involve a critical mass of HCPs including advocates and non-advocates. In that respect, it would have been insightful to have engaged those HCPs who felt PA was not important to better understand their reasons for this. This is also important in developing interventions that facilitate awareness, engagement and preparedness for PA promotion.

In thinking about how such activities are deployed, the authors encountered reluctance from some GPs to speak with outsiders or researchers from beyond their own professional circles. The strengths included an approach which identified a lack of presumed knowledge of the guidelines around PA and diabetes and an understandable anxiety amongst participants about this. This in part may have contributed to some of the difficulties when recruiting HCPs for this study, especially GPs. In overcoming this challenge, a further strength was the training of co-author and GP as a researcher who was involved in data collection. This helped address some of the preconceived misgivings about speaking with outsiders [61] preferring to speak with researchers who were both known and trusted and where a previous relationship existed. Furthermore, given the time pressures that busy HCPs faced in participating in this study, when they would otherwise be doing important tasks such as writing up patient notes and arranging referrals, the team adopted a flexible and accommodating approach around their availability. Equally important, this study provides some valuable insights into how to conduct research with this group and in this context.

Conclusions

This evaluation presents new insights into the preparedness of HCPs for delivering PA guidance to adults with diabetes and also valuable information for how to undertake research in this setting and these groups. Using a sequential mixed method, two-phase approach, we have identified the factors underpinning the decision-making processes and behaviours of HCPs, as well as the challenges they face, when promoting PA to the diabetes community. Importantly, we have provided an opportunity for HCPs to tell their story through insightful accounts and through a trusted source. Given the importance of PA within the strategic and policy context for PA, rich information derived from the day-to-day, working HCP is integral to shaping future practices going forward. With those thoughts in mind, we provide the following recommendations.

Recommendations

- Undergraduate education focused on PA and health conditions, including type 1 diabetes, type 2 diabetes and pre-diabetes.
- CPD opportunities for PA training and diabetes.
- Mentoring of HCPs who are new to the role or who just lack confidence in their ability to disseminate advice on PA to those with diabetes.
- Accessible, central database of current local PA providers.
- Tailored resources (web-based and printed) for HCPs and patients with diabetes.
- Consistent, joined-up approach between primary, secondary and community services regarding PA promotion for those with diabetes.
- PA services / programmes tailored specifically to patients with diabetes that are affordable.
- Continued and on-going dialogue with HCPs about their needs when promoting PA.
- Adopting a qualitative approach in investigating the barriers and facilitators that HCP face include non-supporters when developing interventions that help facilitate their engagement and involvement.

Abbreviations

BMI: Body Mass Index; BMJ: British Medical Journal; CMO: Chief Medical Officers; CPD: Continuous Professional Development; DESMOND: Diabetes Education and Self-Management for Ongoing and Newly Diagnosed; ERS: Exercise Referral Schemes; GP(s): General Practitioner(s); HCPs: Healthcare Professionals; MM: Moving Medicine; NICE: National Institute for Clinical Excellence; PA: Physical Activity; PA/E: Physical Activity or Exercise; RCGP: Royal College of General Practitioners

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Authors' contributions

All authors - NK, AP, SZ and DV - made substantial contributions to the conception, design, analysis and interpretation of the data. All authors were involved in writing the manuscript and all authors have read and approved the final version of the manuscript. All authors have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Availability of data and materials

The data generated and analysed during the current study are not publicly available due to the risk of individual privacy being compromised, but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The Research Ethics Committee at Leeds Beckett University granted ethical approval for this research (Reference Number 49891). Informed consent to participate was obtained in writing from all the participants involved.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Role of GPNs in promoting physical activity

Healthcare settings, including primary care, have been identified as important for the promotion of physical activity (PA) for a number of reasons (Pringle et al, 2010; National Institute for Health and Care Excellence [NICE], 2013; Kime and Pringle, 2018; Kime et al, 2020). Primarily, they provide the opportunity for general practice nurse (GPN) involvement (Harris et al, 2017), which in turn offers a chance to assess a patient's health profile, needs and motives (Dutton et al, 2016). Repeated contact with patients also facilitates continuity of care (Harris et al, 2017) and the opportunity to follow up patients, coupling PA information with treatment (Fong et al, 2018). Importantly, the nursing profession are respected sources of advice for lifestyle behaviours and are able to reach a large proportion of the population who may benefit from additional PA (McPhail and Schippers, 2012; Kime et al, 2020). This paper puts forward a range of strategies that GPNs can adopt when promoting being physically active.

KEY WORDS:

- Physical activity (PA)
- Behaviour change
- Health promotion
- Intervention

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Physical activity (PA) can play a crucial role in improved health outcomes (Department of Health [DH], 2019). Thirty-nine different disease-specific clinical guidelines support PA and exercise promotion, usually as a primary treatment and management recommendation, covering a wide range of diseases and conditions (Weiler, 2012). Moreover, around 93% of GPs feel that PA is

Physical activity for adults and older adults



important in primary care and that they have adequate knowledge to intervene (Douglas, 2006), while patients and providers believe that primary healthcare professionals (HCPs) are suitable conduits for providing PA advice (Taylor et al, 2003). There is renewed interest in the promotion of PA given the substantial investment by Sport England in the local physical activity delivery pilots, some of which have been established using whole system approaches to promote PA and other initiatives (Sport England, 2017; Brannan et al, 2019).

Healthcare providers represent an important ingredient in efforts to promote PA (Lobelo and de Quevedo, 2016; UK Physical Activity Guidelines Review, 2018; Kime et al, 2020; Ohlsson-nevo et al, 2020). These providers include general practice nurses (GPNs), who can play an integral part in helping people to become more active (McKenna et al, 1998; Dutton et al, 2016; Harris et al, 2017). It has been suggested that a broad set of factors impact on PA behaviour, such as social support, self-efficacy, time, money, and access (Eldredge, 2016; Kay, 2018). With those thoughts in mind, policy, environmental and interpersonal and intra-personal factors can impact on nurses' abilities to promote PA in practice settings, many of which are beyond their immediate control, such as:

- Time pressures and competing demands (Clark et al, 2017; Kime et al, 2020; Reed et al, 2020)
- Policy requirements
- High stress and fatigue (Torquati et al, 2018)
- Patient perceptions surrounding surveillance (Lindqvist et al, 2018)
- Availability of pragmatic tools and approaches (Clark et al, 2017)
- Knowledge (Shirazipour et al, 2018)
- Difficulties managing PA alongside other areas of health behaviours (Torquati et al, 2018).

Clearly, there is work to be done to ensure that healthcare providers and the nursing profession have effective and implementable systems in place that motivate and enable desired outcomes.

RECOMMENDATIONS — THE COST OF UNDERACHIEVEMENT

For good physical and mental health, adults should aim to be physically active every day. Any activity is better than none, and more is better still. For example (DH, 2019):

- Adults should do activities to develop or maintain strength in the major muscle groups. These could include heavy gardening, carrying heavy shopping, or resistance exercise. Muscle strengthening activities should be done on at least two days a week, but any strengthening activity is better than none
- Each week, adults should accumulate at least 150 minutes (two and a half hours) of moderate intensity activity (such as brisk walking or cycling); or 75 minutes of vigorous intensity activity (such as running); or even shorter durations of very vigorous intensity activity
- Adults should aim to minimise the time spent being sedentary, and, when physically possible, should break up long periods of inactivity with light activity.

However, in 2015–16, 26% of adults engaged in less than 30 minutes of PA a week and over 50% failed to achieve these guidelines (Townsend et al, 2015). Furthermore, physical inactivity levels continue to rise, representing a leading risk factor for ill health and many chronic diseases, including type 2 diabetes, cardiovascular disease and some cancers (Lee et al, 2012; Newton et al, 2015). Physical inactivity and sedentary behaviour is linked to declining health at all ages (O'Donoghue et al, 2016; NHS Digital, 2017), and the economic implications of low PA levels across the lifespan are also damaging for the NHS. Indeed, figures report that physical inactivity cost the NHS £455 million in 2013–14 (Public Health England [PHE], 2016).

PROMOTING THE BENEFITS OF PHYSICAL ACTIVITY (PA)

Social, mental and physical health-related benefits of regular PA are well-documented (DH, 2019). For example, achieving PA guidelines can reduce mortality rates by around 30% (Arem

et al, 2015). Evidence also supports the importance of PA in the primary and secondary prevention of chronic diseases (Reiner et al, 2013; Rea, 2017). For example, it is known to decrease the likelihood of someone developing cardiovascular disease and can help to reduce its impact (Alves et al, 2016). Similarly, in the case of type 2 diabetes, PA positively impacts its prevention and management (Colberg et al, 2010). With this in mind, GPNs can play an important role in the promotion of PA to patients (Kime et al, 2020), and are a strong predictor of lifestyle modifications (Morrato et al, 2006). Nevertheless, some patients find it difficult to change unhealthy practices and incorporate positive activity-related behaviours into their lives. Equally, there are those who want and, indeed, exhibit a readiness to change, but, in some instances, experience a lack of PA-related support and guidance (Olsen, 2017; Kime and Pringle, 2018).

Ultimately, PA is underutilised as a prevention strategy, especially considering that research has shown that if 12 inactive patients receive PA promotion, at least one of them will become active (Williams et al, 2013). Worryingly, PA is not routinely addressed by HCPs and even when it is, patients are not always provided with appropriate information that is meaningful and actionable (Knight et al, 2016; Hillier et al, 2017). Advising patients to be active in practice settings is often insufficient by itself to initiate and sustain long-term increases in PA levels (Eden et al, 2002).

Thus, GPNs need to include the use of positive language that is empowering for the individual, mutual decision-making and goal-setting. Indeed, public health guidance recommends the involvement of the patient in identifying and shaping solutions which improve their health, including those approaches aimed at increasing PA participation (South et al, 2015). Other important considerations include the development of a tailored activity plan, follow-up support and guidance (Marcus and Forsyth, 2009). Yet, several notable barriers prevent the effective implementation of these principles into practice, including time pressures, limited resources

and expertise, and the seemingly inevitable delays diffusing scalable innovations into practice in real world settings (Estabrooks et al, 2018).

PROMOTING PA IN PRACTICE

Current research suggests that 'brief PA interventions can increase self-reported PA in the short term, but there is insufficient evidence about the impact of brief interventions over the longer term' (Lamming et al, 2017). Nevertheless, brief interventions have been proven to be cost-effective (Anokye et al, 2014), and are part of a range of strategies for the promotion of PA in general practice (NICE, 2013; Pringle et al, 2010; Vijay et al, 2016), including:

- Brief PA advice
- Pedometers
- Green prescriptions
- Motivational interviewing.

However, understanding the limits and boundaries of such strategies is important for dealing with the multifaceted problems that are encountered when promoting PA (Zwolinsky and Pringle, 2017), as not only is physical inactivity a complex practice, but also the challenges associated with increasing activity levels are equally difficult. Contemporary thinking suggests that practices, such as inactivity, involve behaviour that, over time, becomes replicated and embedded within communities (Blue et al, 2016). This reinforces the need for nurses to blend the right mix of intervention, implementation and contextual information about a patient's individual circumstances (Michie, 2011). In the authors' experience, without proper attention to system level change across the behavioural continuum, for patients and practice staff, brief interventions and advice will struggle to make either party healthier, happier, or better off.

However, identifying and dealing with the right levers of change (i.e. unhealthy behaviours and/or practices) is often more difficult than it appears. Failure to do this often means that the behaviour — in this instance, widespread chronic inactivity — is increasingly difficult

to address. The first step is to look for tell-tale signs that the wrong levers of change are being dealt with. For example, if the identified solution does not solve the problem, i.e. the inactivity problem is not getting any better in spite of best intervention efforts, the wrong determinants are being addressed. Further, if the same issue is constantly being discussed, i.e. 'why won't patients listen to advice and be more active?', this is an indication that there is another issue that needs discussing. Confronting this correctly takes time and skill. Given that there has been a marked increase in GP and GPN direct face-to-face consultations over the last decade, there certainly appears to be ample opportunity to intervene with brief interventions and advice (Baird et al, 2016).

The role that GPs and GPNs play in raising awareness and providing education/information for the promotion of PA in general practice is important and difficult in equal measure (Clark et al, 2017; Reed et al, 2020). Research suggests that more than half of all patients reported that their GP gave them no PA and exercise advice (Darzi, 2008). This may, in part, be due to only 13% of GPs being able to describe current PA recommendations (Douglas, 2006). This suggests that alongside other barriers, in reality, HCPs may not be adequately equipped to deal with this issue. Indeed, recent research identified that HCPs lacked knowledge of the PA guidelines for adults (Shirazipour et al, 2018), including adults with specialised health conditions, such as spinal chord injury, bowel disease and type 1 diabetes (Knight et al, 2016; Olsen, 2017; Lindqvist et al, 2018; Shirazipour et al, 2018; Kime et al, 2020).

As already discussed, surgery staff report a lack of time and resources as key barriers to routinely providing advice about PA (Douglas, 2006; Clark et al, 2017; Kime et al, 2020). Nevertheless, research suggests that GPs elicit higher incremental cost effectiveness ratios for green prescriptions compared to nurses (Elley et al, 2004). This may be related to patients' views that GPs

are a reliable source of information (Douglas et al, 2006). That said, nurses have been identified as respected sources of advice on PA (McPhail and Schippers, 2012; Kime et al, 2020) and excellent case studies exist (Bennett, 2017).

In reality, lack of training and knowledge may be the principle barriers to counselling efforts (Kime et al, 2020). In the US, for example, only 13% of medical schools include PA in their curriculum; this number is likely to be even lower in the UK (Garry et al, 2002). However, a number of projects now target the education of HCPs. For example, the moving healthcare professionals programme (Brannan et al, 2019) and Public Health England runs the PA Clinical Champion scheme, a peer-to-peer education programme (PHE, 2018). Additionally, there have been a number of resources added to the undergraduate curriculum in a bid to plug this knowledge gap. However, all of these newly developed resources are optional. Promoting PA and lifestyle is now a key clinical priority area for the Royal College of GPs, with a committee set up to tackle this problem in primary care.

Generally, one of the biggest problems with interventions to improve PA levels is the illusion that they have effectively intervened already (Kime et al, 2020). In primary care, as in many other areas of health, changes in behaviour are influenced by a broad range of social and environmental determinants, such as social support, skills, time

Practice point

The Royal College of General Practice and Public Health England Clinical Champion Programme recruits healthcare professionals such as GPs, nurses and other allied health professionals to a championing role for PA. As part of the role, 'Champions' draw on their local networks and standing and act as advocates for PA, including the provision of training and education to healthcare professionals (Public Health England, 2018).

and resources (Grenny, 2013). Getting 'buy in' at all levels and from all parties is key for a system level change. Failure to do so will not motivate, provide the requisite resources to do the job, or engage the mandatory levers of change across the system. The PA Clinical Champion scheme may be a small, but significant step in the right direction.

WHAT CAN GPNs DO TO PROMOTE PA?

Recent initiatives and developments in PA policy and practice continue to underscore the importance of HCPs, including nurses, in promoting PA (UK PA Guidelines Review, 2018; Sport England, 2017; Brannan et al, 2019; DH, 2019; Moving Medicine, 2019). As discussed, HCPs and nurses face a number of barriers that impact on promoting PA (Kime et al, 2020; Reed et al, 2020), although some of these, such as time, resources, competing demands on time, and training, are beyond the control of practitioners and solutions require structural changes to how services are delivered. This may include prioritising PA, provision of resources, including time for PA, the development and investment of resources, and changes in working practices. That said, many nurses do promote PA and the following six questions offer some practical sources of support and help.

Why bother promoting PA?

Evidence supports that when undertaken in line with recommended guidelines, PA can be an effective health-enhancing

behaviour for a range of health conditions, as well as enjoyable, fun and social (DH, 2019). Moreover, for some, it can and will be life changing, because it provides an opportunity to improve the quality of their lives by experiencing the holistic (physical, social, emotional and psychological) benefits from being physically active (DH, 2019).

What can you do?

Brief advice, i.e. verbal advice or discussions, on PA has been shown to be effective and is recommended in NICE guidance (2013).

This includes negotiation or encouragement, with or without written or other support or follow-up. It can vary from basic advice to more extended, individually focused discussion (NICE, 2013). Further information on what brief advice involves and when and how it can be promoted can be found in *Box 1* or: www.nice.org.uk/guidance/ph44/chapter/1-Recommendations

When is it realistic for you to promote PA within your work?

Think about when the issue of PA can be raised during your working day, and which patients might benefit from this — considering which patients might be unresponsive or more responsive.

What are the chief medical officer's recommendations and what resources are available to promote PA?

It is good to know the guidelines, e.g. the chief medical officer's guidelines (www.gov.uk/government/publications/physical-activity-guidelines-infographics) and to think about how frequent, how

intense, how often, and what type of PA should be promoted and for whom. Do not forget about reducing sedentary behaviours (i.e. prolonged sitting).

Other useful resources also exist, including a series of infographics, which can be found at: www.gov.uk/government/publications/physical-activity-guidelines-uk-chief-medical-officers-report.

Alternatively, listen to Viv Bennett's, chief nursing officer at Public Health England, expert opinion on why doing some physical activity is better than nothing (www.nursingtimes.net/opinion/expert-opinion/when-it-comes-to-physical-activity-doing-something-is-better-than-nothing/7021850.article).

It is also important to know what PA opportunities exist locally, and this varies greatly by region.

What, if any, training or help do you need to promote PA?

Public Health England provides locally tailored training sessions for nurses in primary and secondary care (PHE, 2018). These focus on practical tips to integrate PA advice into everyday nursing practice. Sessions are delivered by a trained facilitator known as a 'clinical champion', i.e. a doctor, nurse or HCP recruited and trained by Public Health England. These sessions are practical and interactive and are based on the latest national and international data, research and evidence. Continuing professional development (CPD) material, which aims to develop professional understanding, confidence and expertise for nursing practice, has been developed for the training course. At the time of writing, the sessions are free for HCPs. To book a session for your clinical workplace, please contact: PhysicalActivity@phe.gov.uk

CONCLUSION

The health benefits of PA are well established and HCPs, including GPNs, can play an important role in helping people adopt and keep physically active. **GPN**

Box 1

PA — brief advice for adults in primary care (NICE, 2013)

Recommendations:

- Identify adults who are inactive
- Give and follow-up on brief advice with these people
- Incorporate brief advice with commissioning. This includes ensuring that brief advice is assimilated into care pathways, as well as in services where groups are more likely to be inactive
- Ensure that symptoms to support brief advice are in place, such as read codes, resources to document follow-up and information about local opportunities to be active
- Provide information and training to primary care practitioners.

Declaration of interest:

Dane Vishnubala is currently the Public Health England Lead Doctor for the Physical Activity Clinical Champions Education programme.

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Revalidation Alert

Having read this article, reflect on:

- The impact of being physically inactive and having a sedentary lifestyle
- The significance of educating patients about the importance PA
- The benefits of PA to patients
- Strategies you can adopt to promote being physically active.

Then, upload the article to the new, free GPN revalidation e-portfolio as evidence of your continued learning: www.gpnursing.com/revalidation

Integrating sport and exercise medicine clinics into the National Health Service: a qualitative study

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ABSTRACT

Objectives To explore the services National Health Service (NHS)-based sport and exercise medicine (SEM) clinics can offer, and the barriers to creating and integrating SEM services into the NHS.

Methods Semi-structured interviews were undertaken to collect data from identified 'stakeholders'. Stakeholders were identified as individuals who had experience and knowledge of the speciality of SEM and the NHS. An inductive thematic analysis approach was taken to analyse the data.

Results N=15 stakeholder interviews. The management of musculoskeletal (MSK) injuries (both acute and chronic) and concussion were highlighted as the two key services that SEM clinics can offer that would most benefit the NHS. MSK ultrasound was also mentioned by all stakeholders as a critical service that SEM clinics should provide. While exercise medicine is an integral part of SEM, SEM clinics should perhaps not have a heavy exercise medicine focus. The key barriers to setting up SEM clinics were stated to be convincing NHS management, conflict with other specialities and a lack of awareness of the speciality.

Conclusion The management of acute MSK injuries and concussion should be the cornerstone of SEM services, ideally with the ability to provide MSK ultrasound. Education of others on the speciality of SEM, confirming consistent 'unique selling points' of SEM clinics and promoting how SEM can add value to the NHS is vital. If the successful integration of SEM into the NHS is not widely achieved, we risk the NHS not receiving all the benefits that SEM can provide to the healthcare system.

INTRODUCTION

Sport and exercise medicine (SEM) was established as an independent medical speciality in the UK in 2005 as an important aspect of the London 2012 Olympic Games health legacy commitment.^{1,2} There are many facets to the speciality, which is reflected in the breadth of the training programme (figure 1).^{3,4}

Decline of SEM in the NHS?

There are now over 147 SEM doctors on the General Medical Council Specialist Register, and every year approximately nine new specialist trainees begin training in the UK.^{5,6} In

Summary box

What are the new findings?

- ▶ Providing expert care of MSK injuries and of concussion are deemed the two key services that SEM clinics can provide for NHS.
- ▶ While exercise medicine is an essential part of the SEM speciality, it should perhaps not be a focus of SEM clinics.
- ▶ Convincing management, resistance from other specialities and lack of knowledge of the speciality were listed as key barriers to integrating SEM into the NHS.
- ▶ Educating about SEM clinics is vital to its success. We need more formal clarification of the 'unique selling point' of SEM clinics, and this advertised more widely.

How it might help clinical practice in the future?

- ▶ The findings of this study could be used to influence the SEM registrar curriculum to include information on setting up SEM clinics in order to empower newly qualified SEM consultants to feel more comfortable setting up SEM services.
- ▶ Better definition on how SEM can be integrated into the NHS could result in more successful SEM NHS services and increased funding into SEM, allowing the healthcare system to benefit more from the services SEM can offer.

recent years, there has been a decline in growth of the speciality, highlighted by a loss of SEM training posts in Scotland and Wales.^{7,8} This drop can be attributed to several factors such as the loss of momentum following the London 2012 Olympic games (a similar loss of momentum has been observed after previous olympic events).⁹ Perhaps due to the low number of National Health Service (NHS) SEM posts, the majority of SEM trainees work in the private sector once they become consultants, and, anecdotally, some no longer work within NHS settings at all despite the fact that many view it as a desirable work setting.¹⁰



Figure 1 Key aspects involved in speciality training curriculum for SEM in the UK.⁴ MSK, musculoskeletal; SEM, Sport and Exercise Medicine.

Current relationship between SEM and the NHS

The Faculty of Sport and Exercise Medicine (FSEM) promotes SEM as a cost-effective approach to the prevention and management of illness and injury and is calling for an increase in SEM consultants in the NHS.¹¹ In support of this, one study found that 93% of the clinicians surveyed felt that there was a role for SEM in the NHS.¹² Given the training and expertise of SEM consultants, they may be considered well placed to aid the NHS in dealing with high levels of physical inactivity, and the burden placed on the system by musculoskeletal (MSK) issues.¹¹ Current NHS SEM services have been shown to reduce surgical interventions, reduce the number of scans requested and improve patient satisfaction, and can therefore be beneficial to the NHS.¹³

To establish a mutually beneficial relationship, more clarity is needed over the role of SEM in the NHS. The need to better define how SEM fits into the NHS has been raised for many years.^{5 7 14} Though several case studies highlight examples of integration across the UK, more research is needed to explore how SEM can be better integrated into the NHS.¹⁵ As such, this study aims to explore what individuals working in SEM think about what services an NHS-based SEM clinic could provide that would be of most value, and the barriers to creating and integrating such a service within the NHS.

METHODS

A qualitative approach using semi-structured interviews was used in this study. Research ethics approval was

granted from the Faculty of Medicine and Health Sciences Research Ethics Committee, University of Nottingham (reference: 212-1802; 12 February 2018).

Participants and recruitment

Stakeholder groups were defined based on identifying individuals with experience and knowledge of the speciality of SEM, and of working in the NHS. Participants were recruited (February–April 2018) from these stakeholder groups subject to the inclusion criteria (table 1) using purposive sampling by email.¹⁵

Data collection

The interview schedule is provided in figure 2. Each participant was given a unique anonymised code. These data were recorded in a key file with the participant speciality (ie, the stakeholder group interviewees' belong to). No other personal data were recorded. All interviews were conducted by the lead author and digitally audio

Table 1 Inclusion criteria for the study

1. Belong to a stakeholder group (as per table 2)
2. Have actively worked in SEM, including: SEM clinics, elite sport, public health, with more than 3 years experience working in SEM or working with SEM practitioners
3. Have had more than 5 years experience working in the NHS

NHS, National Health Service; SEM, sport and exercise medicine.

Interview Guide

1. Are you aware of the speciality of Sport and Exercise Medicine?
 2. How do you feel SEM could best be incorporated into the NHS?
 3. What key services should SEM clinics be offering that would provide most benefit to the NHS?
 4. In your opinion, what are the most common conditions SEM clinics should be seeing?
 5. What would you feel are the barriers to setting up SEM clinics in your:
 - a) Trust?
 - b) Department?
- Specifically for SEM Consultants and Registrars:
6. Do you feel prepared to set up an SEM service?
 - 7a. If not, what would you want to learn and how?
 - 7b. If you have, what are the most important learning points you would want others to know before setting one up?
- Final question, asked to all participants:
8. Do you have any other comments?

Figure 2 Interview guide used for every interview. SEM, sport and exercise medicine.

recorded. All recordings were transcribed verbatim. Any identifiable information discussed during the interviews were redacted from the transcripts. Interviews continued until data saturation was reached.^{16 17}

Data analysis

An inductive thematic analysis approach was taken to analyse the interview transcripts.¹⁸ In terms of epistemology, a realist approach was adopted as the research team believed there was likely to be a single truth in answer of the objectives, in keeping with the realist paradigm.¹⁹ Braun and Clarke's six-step process was followed and used to extract meaning and concepts from the data in order to identify patterns, and ultimately generate themes, which were managed using Trello software (version 3.40).^{20 21} To ensure reliability, two members of the research team started the coding process by reading, five (33%) randomly selected interview transcripts separately and discussed their coding decisions together, working through differences of opinion until a consensus was made. A reflective journal was kept to determine the extent to which thoughts and observations were data-driven and without researcher influence, in order to manage unconscious bias. Once all interviews had been coded and themes had been finalised, five randomly selected transcripts were given to the same reviewers to code to check whether extracts represented the themes appropriately. There was a 79% similarity. A result of over 70% has previously been deemed acceptable.²²

RESULTS

Demographic information

Seven stakeholder groups were identified (table 2). Sixteen individuals were invited to participate in the study, and 15 participated (93%) covering all stakeholder groups. The interviews lasted 23 min 10 s on average, ranging from 14 min 38 s to 31 min 03 s. The stakeholders included 4 female and 11 males with an average age of 41 (range 34–47) years. They were all working in the UK.

Interview results from consultants and teaching staff

Five themes and 15 subthemes were identified from the transcripts (table 3).

Table 2 The seven stakeholder groups and number of participants per group

Stakeholder group	Participants (n)
1. Accident and emergency doctors with an SEM interest	2
2. SEM registrars	2
3. General practitioners with extended role in MSK	1
4. MSK radiologists	2
5. Orthopaedic surgeons	2
6. Physiotherapists	2
7. SEM consultants	4

MSK, musculoskeletal; SEM, sport and exercise medicine.

Table 3 Themes and subthemes

Refined themes	Subthemes
1. Roles believed to be key to being an SEM clinician	1(a) Demonstrate clinical leadership (7) 1(b) Expert in MSK medicine (15) 1(c) Perform MSK ultrasound (15) 1(d) Provide physical activity (PA) education (10)
2. Services SEM clinics can offer that would provide the most value to the NHS	2(a) Management of MSK injuries (acute and chronic) (15) 2(b) Management of concussion (11)
3. Sources that SEM clinics receive referrals from (not included in full as deemed not relevant to study objective)	3(a) A&E (8) 3(b) GP (14) 3(c) Physiotherapists (13) 3(d) Orthopaedics (10)
4. Clinicians' recognise there are common barriers to setting up an SEM clinic	4(a) Resistance from management (8) 4(b) Conflict with other specialities (9) 4(c) Lack of awareness of the speciality (15)
5. Learning points for setting up SEM clinics (from Q7b only asked to SEM consultants and registrars (n=6))	5(a) Increasing awareness of SEM (6) 5(b) Meeting with the 'right' influencers (4)

In brackets is the number of participants that mentioned the sub-theme.

A&E, accident and emergency; GP, General practitioner; MSK, musculoskeletal; NHS, National Health Service; SEM, sport and exercise medicine.

1. Roles believed to be key to being an SEM clinician

1(a) Demonstrate clinical leadership

Clinical leadership was brought up in the context of incorporating MSK services into the NHS, either through Clinical Commissioning Groups (CCGs) or by showing leadership.

The work could be within CCGs looking at transforming outdated systems and medical management into streamlining conservative treatment of MSK issues. Participant 8.

SEM doctors should be able to show medical leadership within MSK medicine' (participant 5).

1(b) Experts in MSK medicine

MSK medicine was identified by all participants as a critical service that should be provided by SEM clinics in order to add value to the NHS.

MSK medicine is a vital part of SEM clinics, providing knowledge of MSK injuries and the skill to assess, diagnose and treat. Participant 9

1(c) Perform MSK ultrasound

All participants also identified MSK ultrasound as a service, SEM clinics should offer.

We do diagnostic ultrasound, it saves the patient having to go through a radiology department. Participant 13

The ability of SEM clinicians to manage MSK issues and be able to also use ultrasound to aid with diagnosis and treatment (via ultrasound-guided injections) was seen as valuable by nine participants, with one participant describing an SEM clinic as a 'one-stop shop' (participant 7).

1(d) Provide physical activity (PA) education

Various participants maintained that SEM clinicians should be involved in providing and promoting education regarding PA.

The advice regarding PA, I think there's a massive need for this going forward. Participant 11.

However, the best way for SEM clinicians to promote PA was unclear.

I think there are different ways of promoting PA—do you need a separate clinic? I'm still myself trying to work out how it will work as a job role for a SEM doctor. Participant 9

In regard to how best exercise medicine should be promoted, several participants mentioned it should be done as part of wide-spread public health initiatives and that large organisations are already taking lead on this.

There's a definite role for exercise medicine in public health. Participant 6.

The Faculty [FSEM] have taken on the role of educating on PA. Participant 8

2. Services SEM clinics can offer that would provide the most value to the NHS

The management of non-surgical MSK injuries (both acute and chronic) and concussion were highlighted as

the two key areas in which SEM could add the most value to the NHS.

2(a) Management of MSK injuries (acute and chronic)

Regarding the management of MSK injuries, one participant highlighted the challenges of managing acute MSK issues in accident and emergency (A&E) settings owing to time pressures.

It is very difficult to fully assess MSK injuries' and that it was a good idea to 'have a clinic to follow that up because people have got more dedicated time. Participant 14

2(b) Management of concussion

Concussion was flagged up by over half of the participants as an opportunity to incorporate SEM into the NHS. Many highlighted the poor knowledge around concussion management and that concussion clinics 'could be an extra service that an SEM Consultant would be well trained to deliver' (participant 6).

In the next 10 years, we'll see more NHS Concussion Clinics. Participant 8

4. Clinicians' recognise there are common barriers to setting up an SEM clinic

4(a) Resistance from management

When asked, over half of the participants posited that managers were one of the biggest barriers to integrating SEM services into the NHS. It was felt that managers are under increasing financial strain and they

would have thought sports would have to be rationed for more serious medical conditions. Participant 13

The majority of participants reiterated the idea that it can be 'difficult to innovate' (participant 3) within hospital settings and getting managerial approval for creating change in hospitals can be difficult.

A lot of the NHS is resistant to change and because SEM is still quite new, there are already a number of established pathways. Participant 15

4(b) Conflict with other specialities

Several participants commented on the concept of SEM being perceived as encroaching onto other specialities and 'pinching work', which may result in other specialities being 'resistant to us' (participant 11).

For example, with ultrasound, we may be taking away from interventional radiology. Participant 12

Radiology and orthopaedics were singled out as the two specialities most likely to be affected by this issue.

People are worried about their own specialty so that would be orthopaedic surgeons, physios, radiologists who don't want to be de-skilled or lose the areas of interest that they have themselves. Participant 1.

4(c) Lack of awareness of the speciality

The lack of awareness of the SEM speciality was commented on by several participants as a barrier to integrating it into the NHS.

I think it's lack of familiarity because people won't know what you can do and what you can offer.'
Participant 4

Most health professionals are 'unaware of the speciality (participant 10).

SEM does not have 'an identity as to where they sit (participant 3).

It was mentioned that if potential sources of referrals to SEM clinics have a lack of awareness of the speciality will result in a lack of engagement with the SEM service.

Potential sources of referrals 'don't really know what they should be referring' (participant 15).

5. Leaning points for setting up SEM clinics

5(a) Increasing awareness of SEM

Participants provided solutions for many of the identified barriers which included education of a range of stakeholders and referring professionals.

few people know SEM services exist and even less know what sort of things and patients should be referred to them. Participant 9

5(b) Meeting with the 'right' influencers

In addition, when setting up a service, advice from one of the participants included meeting the medical director to ensure the issue is being discussed with the right influencers.

it was a big learning experience for me... if I was to do it again I would want the big influential people on board from the get go. Participant 1

DISCUSSION

This research has provided three key findings. First, the key services that SEM clinics can offer the NHS are in the management of MSK injuries and concussion. Second, the main barriers to setting up a SEM clinic are getting managerial agreement, conflict with other specialities and a lack of awareness of the speciality. Third, the main perceived solution to reducing the impact of the identified barriers is to improve education among the medical profession about the speciality of SEM.

Defining a place for SEM in the NHS

The management of MSK injuries and concussion were highlighted as the two key areas in which SEM services can provide useful services to the NHS. Regarding MSK injuries, this includes both acute injuries usually presenting via A&E, and chronic injuries usually presenting via general practice. The benefit of utilising MSK ultrasound and injection therapies in the management of MSK injuries was also identified by several stakeholders as a key service

that SEM clinics can provide. MSK consultations are thought to account for nearly 30% of all general practice consultations with nearly 82% not requiring surgery.^{23 24} These patients will therefore typically re-present in general practice recurrently which is an inefficient use of NHS resources.¹⁴ SEM consultants play a key role here in non-surgical management, enabling cost-saving and improved pathways for patients.¹³ Regarding the presentation of acute injuries, A&E departments are notoriously time pressured and overworked.^{25 26} Fundamentally, A&E does not have enough time to assess acute injuries thoroughly, and the acute swelling post injury means A&E potentially is not the ideal setting to assess certain injuries. Given that 7.7% of A&E attendances are directly related to playing sport, SEM clinics may result in reduced workload for overstretched A&E services without the need to outsource to private care.²⁷

Concussion is well covered on a SEM syllabus and the management of concussion was also highlighted as a key service that SEM clinics could provide.⁴ Concussion is also a common presentation, and given the majority of GPs and A&E doctors do not feel confident in how to manage it, this is an area that SEM clinics could help relieve pressure from overloaded departments.²⁸⁻³¹

SEM, exercise medicine and the NHS

Physical inactivity costs the UK economy over £7.4 billion a year.³² To begin to address this, FSEM recently launched 'Moving Medicine', a website designed to support healthcare professionals integrate PA advice into clinical practice.³³ For the day-to-day clinical work of a SEM doctor, it is unclear exactly what an exercise medicine service within the NHS could, or should, look like, and whether SEM clinics should facilitate exercise medicine. The value of exercise medicine is not being debated, rather the question is regarding the most effective method and setting for delivering it.³⁴ While it is always essential to provide brief PA advice where appropriate as per NICE guidance, the findings of this study suggest SEM clinics may not be the most effective setting for having a heavy exercise medicine focus.³⁵ SEM clinicians of course have a responsibility to promote, integrate and facilitate exercise as medicine within society and the healthcare system. However, exercise medicine may be best dealt with through public health initiatives to promote both individual and population-level change rather than through individual-level behaviour change promoted through SEM clinics, an idea that has been highlighted previously.³⁶

Key barriers to integrating SEM into the NHS

The need for SEM to build collaborative relationships with other specialities was highlighted in this study and has been emphasised previously.^{34 37} Caution should be applied to not cross the boundaries of other specialities, but instead take a cooperative approach and explain how SEM can add value. Another major barrier appeared to be awareness of the speciality among other medical professionals. If the



knowledge of the speciality is poor, it is hard to cultivate a reputation, resulting in SEM clinics not receiving referrals that should have been sent to the service.

What are the next steps?

The findings of this study have highlighted a key solution to better incorporating SEM into the NHS is to improve education about SEM among the medical profession, a finding supported by previous studies.^{12 38} It is unsurprising that other professions have a lack of knowledge about the SEM speciality, particularly in relation to how it works as a speciality within the NHS, when the speciality itself appears to not have clear definitions over its place in healthcare. SEM urgently needs to confirm its identity within the NHS.

Despite the barriers mentioned in this study, several SEM services are already in place.¹³ It is important to ensure that the value of SEM clinics is observed and documented to ensure they continue to be funded by the NHS. Otherwise, we risk the NHS not benefiting from the services that SEM clinics can offer.

Strengths and limitations

This study had several strengths including a high inter-rater reliability to ensure trustworthiness of coding, achieving data saturation (despite a limited number of interviews conducted) and utilising a qualitative design to uncover insightful data. As ever, there were limitations such as the potential influence of the interviewer on data collection and analysis. A reflective journal was kept to minimise this. Interview participants were selected depending on them being viewed as a stakeholder by the research team and was therefore open to selection bias. It may have been beneficial to get the views of other SEM-related specialities such as podiatrist, chiropractors and osteopaths. In addition, opinions could be explored from individuals that work outside of the NHS, policymakers or government figures. It would have also been of benefit to interview patients that had attended SEM clinics to explore what they thought of the services they had received. Future studies could consider seeking opinions from a broader range of stakeholders.

CONCLUSION

This study has provided data that supports the management of MSK injuries and concussion as the two key areas in which SEM clinics can offer valuable services to the NHS. The management of these two areas should be targeted as the 'unique selling point' of SEM clinics, ideally with the ability to provide MSK ultrasound and injection therapies. These clinicians felt that it is more important for SEM clinics to prioritise these services over exercise medicine, which, while highly important for SEM and public health, should be dealt with at a public health, population-based level rather than have a heavy focus in SEM clinics. The perceived barriers to SEM clinics being created were lack of

knowledge regarding the speciality from potential referral sources, potential conflict with other specialities, and gaining support from management. This preliminary research can be used to guide further studies exploring how best to integrate SEM into the NHS. If the successful integration of SEM into the NHS is not widely achieved, we risk the NHS not receiving all the benefits that SEM can provide.

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Embrace your discomfort: leadership and unconscious bias in sport and exercise medicine

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Unconscious bias is present at all levels of society. It exists within our Sport and Exercise Medicine (SEM) community and is detrimental to the specialty and those it serves. Many may be unaware of how unconscious bias has impacted their career

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trajectory, and that of their peers. This editorial explores the concept of unconscious bias and prompts actions to initiate meaningful change.

HOW UNCONSCIOUS BIAS ARISES?

The human brain is complex, programmed to make quick judgements about people and situations based on visual, verbal and behavioural cues.¹ Over time, unconscious pathways form between these cues and how we judge them, gaining strength with each unchallenged repetition. These habituated norms can leave us feeling unsettled when we experience something outside of our expectations. This is referred to as unconscious bias, a consequence of learnt stereotypes deeply ingrained within our beliefs, influencing the way we automatically and subconsciously engage with people and situations. The nature of our individual bias is nurtured from childhood through cultural conditioning, media portrayals and upbringing.²

Issues of unconscious bias in SEM

While conscious bias has created, and overtly contributes to, many of society's inequalities, unconscious bias is covert, overlooked and too often unaddressed. Unconscious bias has perpetuated inequality resulting in certain groups having fewer rights, privileges and less power than others.³ It is ubiquitous, and

the implications within SEM communities are significant, resulting in women, persons of colour and other marginalised groups being under-represented in research and leadership roles.^{4,5} It is well documented that diversity in the workplace increases engagement, creativity and problem-solving ability within teams.⁶ Without this diversity in SEM, not only will we remain limited in our ability to understand and serve the needs of our patients, but we will also limit our scope of growth and advancement as an industry.

As an SEM professional, here are the eight steps you can take to confront unconscious bias:

1) Acknowledge your own bias

This is an essential starting point. Being aware of your unconscious biases will make you more likely to take action.¹ Increase this awareness by exposing yourself to different perspectives, and by engaging and collaborating with individuals from diverse backgrounds.

2) Change the workplace

For an organisation to sustainably evolve, employees should actively recruit with diversity in mind. Selection panels should be diverse, barriers to entry eliminated and workplaces should actively cultivate an environment in which colleagues can openly discuss issues relating to diversity and inclusivity.

3) Change the culture

Gently call people out when you notice unconscious bias. This can be reframed as an opportunity to reflect and grow rather than as an insult. Sharing success stories of solutions and policies being put in place to address unconscious bias can aid in altering the way society views these issues.

4) Empower diverse voices

It is vital that everyone in a community feels their voice is valued. Be especially

conscious that traditionally devalued groups may struggle to voice their perspectives more than others due to fear of victimisation or due to apathy from being previously unheard.

5) Celebrate progress

It is important to acknowledge and support positive initiatives, and those striving for positive change. Although there are as yet no clear solutions to eliminate unconscious bias completely, progress is possible; inaction is no longer an option. We encourage all SEM organisations to commit to openness and transparency by reporting their diversity statistics and documenting their change initiatives.

6) Be an ally

While mentorship is important for many seeking a career in SEM, having the support and guidance of an established mentor can be transformational for individuals from under-represented and marginalised groups, who frequently face additional challenges. If you are an established SEM clinician, actively seek out individuals from diverse backgrounds to mentor.

7) Practise inclusivity

Be intentional about inclusivity in important conversations. Ask for opinions and carefully consider the different views expressed. Ensuring appropriate representation of diverse populations in research and clinical groups is paramount, along with strongly promoting work aligned with this, which may influence others to follow suit.

8) Lead by example

Emotional intelligence and awareness of bias are associated with strong leadership.⁷ UK SEM specialty training curriculum highlights the importance of leadership skills.⁸ As a community, and as individuals, we need to use our skills and lead the way in tackling unconscious bias.

CALL TO (UNCOMFORTABLE) ACTION FOR THE SEM COMMUNITY

Our collective challenge is to break the uncomfortable silence around issues of representation, equality, equity and justice within SEM communities around the world. Our call to action: be the catalyst for change. We urge readers to initiate these conversations with those around you. Actively support and seek out initiatives aiming to improve diversity and inclusivity. Prepare to be uncomfortable, but remind yourself that discomfort often paves the way for progress.

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Working with healthcare professionals to promote physical activity

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Abstract

The UK Chief Medical Officer guidelines provide convincing evidence of the role of physical activity (PA) in the prevention and management of a number of long-term conditions. Yet physical inactivity remains an important public health priority. Healthcare professionals (HCP) have been identified as being very important for the promotion of PA to their patients. Yet a number of barriers are faced by HCP in this respect including awareness, knowledge, self-efficacy, perceived competence, and time. This paper aims to share current projects and practices and reflect on the challenges of changing the behaviour of HCP to provide physical activity advice.

HEADLINE

Dr Dane Vishnubala, GP and lead doctor for Public Health England's Physical Activity Clinical Champion Programme and Dr Andy Pringle, Fellow of the Royal Society of Public Health, provide a brief rapid review based on their professional experience discussing some of the current interventions helping healthcare professionals promote physical activity and the need to select the most influential determinants for change.

PHYSICAL ACTIVITY AND HEALTH CARE PROFESSIONALS

The UK Chief Medical Officer guidelines provide convincing evidence of the role of physical activity (PA) in the prevention and management of a number of long-term conditions.¹ Yet physical inactivity remains an important public health priority.¹ Healthcare professionals (HCP) have been identified as being very important for the promotion of PA to their patients.² Yet a number of barriers are faced by HCP in this respect including awareness, knowledge, self-efficacy, perceived competence, and time.³⁻⁵

INTERVENTIONS TO PREPARE HEALTHCARE PROFESSIONALS TO PROMOTE PHYSICAL ACTIVITY

A number of interventions have been established to support HCP promoting PA.^{5,6} Many of these

have a relationship with the Moving Health Care Professionals' (MHPP) umbrella of activities funded by Public Health England (PHE) and Sport England. MHPP integrates educational resources into three core domains of medical education; undergraduate, postgraduate and continuous professional development (CPD).⁶ The MHPP PA educational resources for health care professionals are well described by Brannan et al. The structure used by Brannan has been developed further to show other resources available.⁶

UNDERGRADUATE TRAINING

The undergraduate workstream includes influencing HCP curriculums to include PA using tailored resources such as Movement for Movement endorsed by PHE and implemented in medical schools' undergraduate delivery.⁷

Postgraduate and CPD

There are a range of educational resources in the postgraduate area of delivery. The *British Medical Journal* (BMJ) online learning modules were the first iteration with close to 100,000 HCP completing the online learning between January 2014 and April 2018.⁶ The resources have since been updated and now sit on the eLearning for health platform free to all health care professionals. Moving Medicine (MM) is a

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collaboration between PHE, Sport England and the Faculty of Sport and Exercise Medicine. Focused on 11 long-term conditions, MM⁸ is an online resource for HCPs to use with their patient's present to provide brief physical activity advice using a behaviour change framework tailored to the number of minutes the HCP has available.⁸

PHE PHYSICAL ACTIVITY CLINICAL CHAMPIONS

The PHE PA Clinical Champions (PACC) is a peer-to-peer education programme. The programme began in 2014; nationwide, there are currently 43 PACC including 18 doctors, 12 nurses, and 13 allied health care professionals.⁵ PACC deliver standardised PA training in primary and secondary care. The programme has now trained over 25,000 HCP.

RCGP PHYSICAL ACTIVITY AND LIFESTYLE PRIORITY AREAS

RCGP has a range of tools and interventions available for primary care.⁸ This includes a published toolkit of educational resources for GPs. Under this umbrella are a range of other initiatives to promote PA in primary care. The RCGP Park Run Practice encourages GP practices to promote park run to their patients. The Active Practice Charter celebrates and recognises practices who promote PA among their patients and staff. This strategic priority also aims to influence the postgraduate GP curriculum with an emphasis on PA and lifestyle.

ACTIVE HOSPITALS PILOT

Active Hospitals Pilot (AHP) Phase 1 was initially run by Oxford Hospital's Sport

and Exercise Medicine Doctors and aimed to integrate PA into current hospital pathways. Phase 2 of the pilot will commence shortly with further hospitals piloting the approach. The initial independent evaluation by the National Centre for Sport and Exercise Medicine recognises the importance of relationship building and the significant time (6months+) it would take to embed PA into clinical pathways effectively. It also included behavioural change theory in the intervention.

BEHAVIOURAL STRATEGIES

From the perspective of the lead author who is a PA Clinical Champion, changing the behaviour of the HCP is complex as it is challenging.⁹ Knowing what are the most influential determinants to address is an important component of behaviour change intervention design. Targeting influential determinants of behaviour such as HCP awareness and knowledge is being addressed through some of the interventions mentioned above.^{6-8,10} However, increasing awareness and changing knowledge is no guarantee that this will result in changes in behaviour, as other more influential determinants can prevail. For instance, HCP report frustrations that resources for PA have not been centralised or made accessible and report a lack of time to seek out such resources for patients.³ Others report not always feeling confident in providing advice on PA to patients including those with long-term conditions.^{3,4} While education can help, interventions that help in identifying and addressing other influential determinants such as self-efficacy, competence and fear can be equally if not more important. In this respect,

peer-mentoring activities can/have been helpful in building up confidence and competencies to promote PA in different challenging scenarios, a current informal component of Active Hospital Pilot. A number of interventions mentioned already aspire to facilitate organisational change and changes in organisation practices so as to encourage the promotion of PA by HCP. Changing both organisational practices and the culture of an organisation so it becomes a Park Run Practice or an Active Hospital Pilot will not happen overnight and can take time to achieve. This raises the important consideration that the determinants of behavioural change are not only individual, but also environmental, where a broader range of influential social and environmental factors also combine and impact on individual behaviour⁹ or in this case HCP promotion of PA. Therefore, knowing which determinants to address and at which levels, and their relationship with promoting PA and mapping the most influential determinants impacting on behaviours are all important when designing and implementing interventions.⁹ In this respect, Kok and colleagues provide a taxonomy of behaviour change that help HCP to map and plan interventions, so as to focus on the most influential determinants⁹ and is a useful process to this end.

CONCLUSION

Changing behaviour of the HCP to promote physical activity is complex as it is challenging. There are a range of exciting current projects, tools, and resources. It is also important to identify the most important determinants to address for changing

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Key Resources for HCPs to promote Physical Activity:

Active Hospitals Pilot <https://movingmedicine.ac.uk/active-hospitals/>

E Learning for Health Online learning <https://www.e-lfh.org.uk/programmes/physical-activity-and-health/>

LK, Markham CM, Rüter RA, Fernández ME, Kok G, Parcel GS. *Planning health promotion programmes: an intervention mapping approach*. John Wiley & Sons; 2016.

Moving Medicine www.movingmedicine.ac.uk

Physical Activity Clinical Champions Programme <https://publichealthmatters.blog.gov.uk/2018/06/21/clinical-champions-embedding-physical-activity-into-routine-clinical-care/>

RCGP Physical Activity Priority: Toolkit, Park Run and Active Charter <https://www.rcgp.org.uk/clinical-and-research/resources/toolkits/physical-activity-and-lifestyle.aspx>

behaviours at the individual and environmental level and map these interventions accordingly.

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PRACTICE POINTER

Returning to physical activity after covid-19

David Salman,^{1,2} Dane Vishnubala,^{2,3} Peter Le Feuvre,^{1,5} Thomas Beaney,² Jonathan Korgaonkar,⁴ Azeem Majeed,² Alison H McGregor¹

What you need to know

- Risk stratify patients before recommending a return to physical activity in people who have had covid-19. Patients with ongoing symptoms or who had severe covid-19 or a history suggestive of cardiac involvement need further clinical assessment
- Only return to exercise after at least seven days free of symptoms, and begin with at least two weeks of minimal exertion
- Use daily self monitoring to track progress, including when to seek further help

Our professional experience suggests that, after mild suspected covid-19, a proportion of people experience a prolonged recovery, particularly when trying to return to exercise. Moreover, there is increasing recognition of potential long term complications of covid-19, including enduring illness (“post-acute” or “long” covid), cardiopulmonary disease, and psychological sequelae in some people.¹⁻⁴ This article offers a pragmatic approach to help patients safely return to physical activity after symptomatic SARS-CoV-2 infection, focusing on those who have lost fitness or had a prolonged period of inactivity but who do not have an enduring post-acute covid-19 illness. It is based on current evidence and consensus statements, and our own multidisciplinary experience in sports and exercise medicine, rehabilitation, and primary care.

The health benefits of being physically active, from cardiovascular to mental health, are well established.^{5,6} Conversely, the harms of physical inactivity mean it is a major risk factor for non-communicable disease worldwide, alongside others such as cigarette smoking or obesity.⁷ Before the covid-19 pandemic, over a third of people in the UK were not physically active enough for good health.⁸ There is evidence of a further decline in physical activity since the start of the pandemic for people with chronic conditions such as obesity and hypertension⁹; conditions associated with worse outcomes from covid-19.¹⁰ Brief advice in primary care can help people to take up physical activity, with the associated lifelong positive health impacts, and help those recovering from illness to return to previous levels of physical activity or beyond.¹¹ People may feel unsure of how and when to return to physical activity after covid-19, and whether it is safe. Some may have tried to return to their baseline exercise, and found they were unable to do so, causing concern (“When will I get back to normal?”).

Consensus statements published to date have focused on athletes, discussing how and when to return to

sporting activity after covid-19.^{12,13} However, physical activity (any movement of the body where energy is expended) encompasses much more than sport, and is, or should be, part of everyday life. UK public health guidance is for 150 minutes of moderate intensity physical activity (where there is moderate effort, the rate of breathing increases but it is easy to talk) or 75 minutes of vigorous intensity physical activity (the rate of breathing increases and it is difficult to talk) per week, in addition to muscle strengthening activities on at least two days each week.⁶ Although this can include exercise (planned and structured physical activity done with the intention of improving physical fitness^{11,14}) and sport, it can include other activities not traditionally thought of as exercise, such as gardening, carrying heavy shopping bags, or walking. When discussing physical activity with patients, reflect together on their goals and how they might achieve them. Understanding that small modifications count (such as carrying shopping home rather than driving) can help reshape perceptions of what is realistic, practical, and achievable.

What are the risks of physical activity after covid-19?

Current understanding of recovery from covid-19 is limited, but preliminary research has highlighted several key concerns. The first is the potential for cardiac injury, including from viral myocarditis (see box 1). This is important, as taking exercise in the presence of myocarditis is associated with increased morbidity and mortality.¹⁵

Box 1: Myocarditis, covid-19, and exercise

Most data on cardiac injury after covid-19 illness is from patients who were hospitalised and cannot be extrapolated to those with mild illness.¹⁵ Indeed, the incidence of myocarditis in those who were asymptomatic or had mild to moderate disease is unknown.¹³ One study of serum troponin measurements and cardiovascular magnetic resonance imaging in unselected patients after a diagnosis of covid-19 demonstrated ongoing myocardial inflammation in 60% at a median time of 71 days from diagnosis.⁴ Although 33% of participants were classified as severely unwell and required hospitalisation, and 67% were recovering at home, it is unclear how the mildness or severity of illness in the latter group was established, and how the recruitment procedure avoided the potential risks of selection bias. It is also unclear as to whether the findings indicate myocarditis or cardiac injury from other causes, and how clinically important the findings are for long term health or morbidity. Indeed, in an autopsy study of 21 patients who died from covid-19, only three (14%) were found to have

lymphocytic infiltrates suggestive of myocarditis.¹⁶ Moreover, viral myocarditis can be a feature of many circulating viruses, including influenza.¹⁷

Thromboembolic complications, such as pulmonary emboli, are also associated with covid-19.¹⁸⁻²⁰ Long term effects on pulmonary function are not currently known, but data from the 2003 severe acute respiratory syndrome coronavirus (SARS-CoV) epidemic suggest persistent impairments in pulmonary function and exercise capacity in survivors.²¹

Finally, primary psychiatric phenomena, such as psychosis, have been identified as a potential presenting feature of covid-19,²² and psychological sequelae after infection can include post-traumatic stress disorder, anxiety, and depression.²³

Some of these potential risks, viral myocarditis in particular, understandably lead to caution when advising a return to physical activity or exercise after infection. Without evidence from robust studies to inform practice, all current guidance to date is based on consensus or expert opinion. A consensus statement from sports clinicians of the European Federation of Sports Medicine Associations from July 2020 recommends a review with a sports and exercise medicine physician after mild symptomatic infection, and investigations including echocardiography and lung function testing where cardiopulmonary symptoms were present.²⁴ Guidance from the Netherlands Society of Cardiology states that, for those with systemic features including fever, electrocardiography testing should be considered before resumption of activity.²⁵ However, the incidence of myocardial injury (box 1) or thromboembolic complications after mild or moderate covid-19 in the community is

currently unknown but thought to be low. Therefore, a balance is needed between obstructing an already inactive population from undertaking physical activity at recommended levels beneficial for their health, and the potential risk of cardiac or other consequences for a small minority. There is no perfect solution given the current uncertainties and the varying availability of resources globally, such as cardiopulmonary investigations or dedicated sports and exercise medicine services. We advocate a pragmatic approach that enables a gradual return to physical activity while mitigating risks.

How do I know if my patient can safely return to physical activity?

A risk-stratification approach can help maximise safety and mitigate risks, and a number of factors need to be taken into account. First, is the person physically ready to return to activity? In the natural course of covid-19, deterioration signifying severe infection often occurs at around a week from symptom onset. Therefore, consensus agreement is that a return to exercise or sporting activity should only occur after an asymptomatic period of at least seven days,^{21 24 26 27} and it would be pragmatic to apply this to any strenuous physical activity (fig 1). English and Scottish Institute of Sport guidance suggests that, before re-initiation of sport for athletes, activities of daily living should be easily achievable and the person able to walk 500 m on the flat without feeling excessive fatigue or breathlessness.²⁷ However, we recommend considering the person's pre-illness baseline, and tailoring guidance accordingly. Some may not have been able to walk 500 m without breathlessness before their covid-19 illness, and they should not be precluded from starting physical activity at a level tolerable for them (see fig 1, phases 1 to 3).

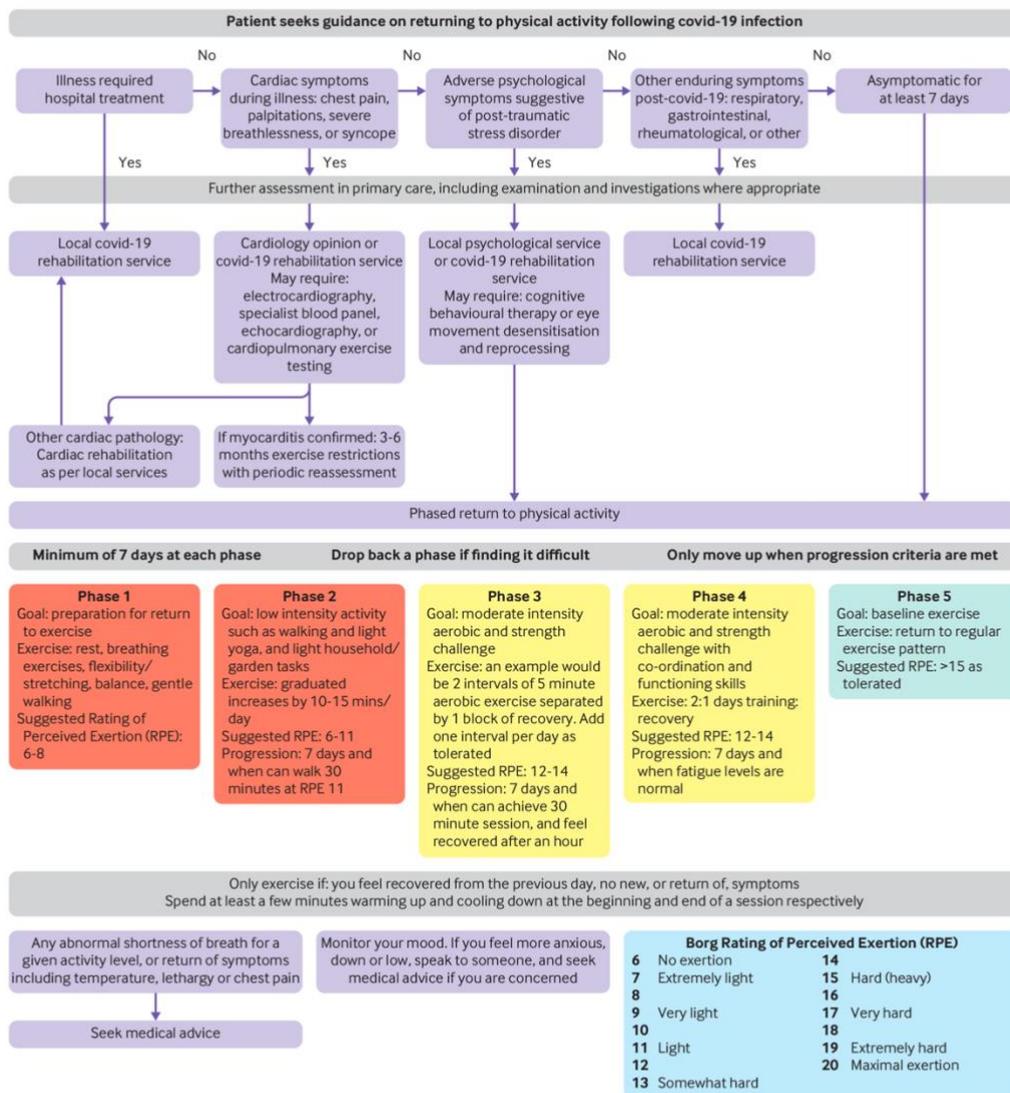


Fig 1 | Suggested return to physical activity after covid-19: risk stratification to exclude features suggestive of myocarditis or post-acute covid-19 and phased resumption of physical activity after 7 days without symptoms²⁸

The second factor is that ongoing symptoms, regardless of system, may be indicative of a post-acute covid-19 illness. This will require assessment in primary care initially, and potentially liaison with local post-covid-19 rehabilitation services.^{1,21} Assessment and management of post-acute covid-19 illness is covered elsewhere.¹ Whether there is a role for graded physical activity as a treatment for this condition is currently unclear.

People who had more severe covid-19 illness, such as those who were hospitalised, are thought to be at higher risk of cardiac complications^{12 13 21 24 25 27} and thromboembolic events.^{15 20} We recommend that their graduated rehabilitation be managed in conjunction, or after discussion and liaison, with local post-covid-19 services. People who did not require hospital treatment but who had symptoms during their illness suggestive of myocardial injury, such as chest pain, severe breathlessness, palpitations, symptoms

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or signs of heart failure, or syncope and pre-syncope, should be assessed with a physical examination and considered for further investigations. Depending on the severity of the symptoms encountered, investigations may include 12-lead electrocardiography, with abnormal findings prompting referral to cardiology or post-covid-19 services.²⁵ The cardio-respiratory examination may reveal signs suggestive of costochondritis or musculoskeletal pain, which can be safely managed in primary care. Discuss findings indicating pulmonary oedema, fibrosis, pleural effusion, added heart sounds, ongoing hypoxia, or new arrhythmias with local post-covid-19 rehabilitation or cardiology services. Investigations in secondary care may include serum troponin levels, electrocardiography, and echocardiography (fig 1).^{12 13 25} Both European and US guidelines advocate restrictions on exercise for three to six months in cases of myocarditis confirmed by cardiac magnetic resonance imaging or endomyocardial biopsy.^{13 17 21 25 29}

Third, with regards respiratory symptoms, persistent cough and breathlessness are expected to resolve after several weeks,¹⁵ but progressive, non-resolving or worsening symptoms may indicate pulmonary-vascular complications such as pulmonary embolism, concomitant pneumonia or post-inflammatory bronchoconstriction,¹⁵ and these patients should be discussed with secondary care services accordingly.

Finally, is the person psychologically ready to embark on a physical activity programme? Physical activity has a positive impact on mood and mental wellbeing^{5 6} and has a role in the prevention and treatment of mental health conditions. The presence of such conditions should not preclude people from physical activity, but allows for additional support when needed. Psychological sequelae of covid-19 infection can be screened for in the consultation. Ask about mood, sleep, appetite, and motivation. Listen to, acknowledge, and validate the patient's concerns. If further support is needed, people can be directed to self care resources, community services, and peer support. In some cases, coordination with local psychological support or post-covid-19 rehabilitation services may be needed (fig 1).¹² Psychological screening tools for returning to physical activity and sport do exist, but they are likely to be outside the scope of the standard primary care consultation.^{27 30}

How do I guide a patient back to physical activity?

There is no clear, evidence based way to guide return to physical activity, but a prudent approach is that it should be gradual, individualised, and based on subjective tolerance of the activity. Once a patient has been risk stratified and symptom-free for at least seven days, a phased approach can be used to increase physical activity levels to either baseline or guideline levels or beyond.²¹ If the person was not physically active before covid-19, this can be an opportune moment to discuss becoming more active. Return, or new development, of symptoms—including cough, abnormal breathlessness, palpitations, fever, and anosmia—indicate the need to stop, seek medical advice if required, and restart the process when symptom-free.²⁷ People might be expected to be more breathless for a given activity after a period of illness or inactivity. However, a degree of subjective assessment is needed to assess if this is consistent with the given activity and level of fitness, and if it is improving. A graduated progression includes increases in volume (time doing the activity) and load (intensity).

Brief discussions regarding physical activity in primary care can follow a modified “3As” approach: ask, assess, and advise/assist.¹¹ Begin by asking for permission to discuss the topic, and gauging the person's current levels of activity. Assess their current

perspectives and goals regarding physical activity and if they would like to do more. Advise by providing information, such as that below, and signposting to resources (box 2). Suggest they set goals and consider monitoring their progress, such as by using a diary. Assist them by helping break down barriers (such as reinforcing that even brief periods of activity are effective for improving health,³¹ household and garden tasks all contribute, and that active travel is often a feasible way of incorporating physical activity into a day).

Box 2: Key physical activity resources to guide patients

- Department of Health and Social Care. UK chief medical officers' physical activity guidelines: infographics (<https://www.gov.uk/government/publications/physical-activity-guidelines-infographics>)
 - Infographics with physical activity guidance across the lifespan, including for older adults, children, and during pregnancy/postpartum period
- Moving Medicine (<https://movingmedicine.ac.uk/>)
 - Online resource for healthcare professionals to help facilitate discussions with patients regarding physical activity
- Couch to 5k (<https://www.nhs.uk/live-well/exercise/couch-to-5k-week-by-week/>)
 - A graded programme to help people gradually ease into running
- OneYou (<https://www.nhs.uk/oneyou/>)
 - Tools and support to help guide and advise on physical activity
- Sport England. Join the movement (<https://www.sportengland.org/jointhemovement>)
 - Physical activity advice and example workouts, including “Stay In Work Out” for exercise during lockdowns or when in isolation
- Chartered Society of Physiotherapists. Helping older people stay active at home (<https://www.csp.org.uk/public-patient/keeping-active-and-healthy/staying-healthy-you-age/staying-strong-you-age/strength>)
 - Simple exercises to help people, in particular older adults, to stay active at home
- We are undefeatable (<https://weareundefeatable.co.uk/>)
 - Guidance on being active for those with chronic health conditions
- Your COVID Recovery (<https://www.yourcovidrecovery.nhs.uk/>)
 - Guidance on all steps on recovery from covid-19, including nutrition and physical activity
- COVID-19: Supporting your recovery (<https://covidpatient-support.lthtr.nhs.uk/#/>)
 - Developed by Lancashire Teaching Hospitals, a resource with all aspects of rehabilitation after covid-19
- Chartered Society of Physiotherapists. Covid-19: the road to recovery (<https://www.csp.org.uk/public-patient/covid-19-road-recovery>)
 - Guidance on graduated return to physical activity after covid-19
- World Health Organization. Support for rehabilitation self-management after COVID-19-related illness (<https://www.euro.who.int/en/health-topics/Life-stages/disability-and-rehabilitation/publications/support-for-rehabilitation-self-management-after-covid-19-related-illness-2020-produced-by-who/europe>)
 - Advice for those who have been discharged from hospital with covid-19, including breathing exercises and physical activity

How to start

Phases 1-2

Begin with light intensity activity for at least two weeks.^{13,21} The Borg Rating of Perceived Exertion (RPE) scale is a subjective assessment of how hard someone feels they are working and can be helpful to guide people in choosing what activities to do as they progress through the phases of increasing physical activity. They rate their complete subjective feeling of exertion, including shortness of breath and fatigue, on a scale from 6 (no exertion at all) to 20 (maximal exertion).²⁸ Light intensity exercise is equivalent to an RPE of under 11 (fig 1), when a person feels minimal to light exertion. They should be able to hold a full conversation without difficulty at this level. Activities might include household and light garden tasks, gentle walking, and balance or yoga exercises.³² Breathing, stretching, and light strengthening activities can also be incorporated.²⁴ Examples of these can be found on the NHS website <https://www.nhs.uk/live-well/exercise/flexibility-exercises/> and in the resources in box 2. We recommend spending seven days (phase 1) on extremely light intensity activity (RPE 6-8), including flexibility and breathing exercises, for as long as the person feels able to do them, followed by a further seven days (phase 2) incorporating light intensity activity (RPE 6-11) such as walking and light yoga, with graduated increases at 10-15 minutes per day at the same RPE when tolerated.

Phases 3-4

Progress to more challenging movement activities depending on pre-illness capacity. These might include intervals of two 5-minute blocks of activity such as brisk walking, going up and down stairs, jogging, swimming, or cycling separated by a block of recovery. The person should not feel that the exercise is "hard," and we would suggest working to an RPE of 12-14 (moderate intensity, not out of breath and could hold a conversation). Progress by adding an interval per day as tolerated.

Phase 4 would involve more complex movement that challenges coordination, strength, and balance, such as running but with changes in direction, side-steps, shuffles, and circuits of body weight exercises, but again without it feeling hard. After completing phase 4, people should then feel able to return to their baseline (pre-covid) level of activity or more.

We propose a minimum of seven days at each phase to prevent sudden increases in training load (see fig 1). However, people should stay at the phase they feel comfortable with for as long as necessary. They should monitor for any inability to feel recovered at 1 hour after exercise and on the day after, abnormal breathlessness, abnormal heart rate, excessive fatigue or lethargy, and markers of mental ill health. If these occur, or the person fails to progress as expected, they should step back to an earlier phase of activity and seek medical advice when unsure. Keeping a diary of exercise progression, along with RPE, any changes in mood, and, for those who are used to measuring it, objective fitness data such as heart rate, can be helpful for monitoring progress.

A patient's perspective

I work as a healthcare assistant and had my first symptoms of covid-19 in April, including shortness of breath, cough, and high heart-rate. Once the fever had ended, I felt extremely fatigued when doing the smallest amount of exercise. I was used to being able to walk and swim for at least an hour and a half, so this was debilitating for me

Using techniques from physiotherapy and the NHS covid patient support website, I slowly started to be able to do more. The exercise I found most helpful was stretching. This helped to expand my chest and lungs, so

the more intense exercises got easier. It helped to be able to do these stretches prior to a more intense exercise such as walking, as my lungs felt they could hold more air. The breathing techniques were particularly helpful and something I do regularly. I found walking to also be most beneficial as it was an exercise I could control. I could walk at a speed and for a distance that was manageable for me and gradually increase this while using a "fitbit" to check my heart rate and recovery time.

It has now been about 10 weeks since my first symptoms, and I would say I am at around 70% of my pre-covid fitness. I am aware of my own limitations and am still working to improve these every day.

Social inequality, physical inactivity, and covid-19

Levels of physical activity vary substantially across society in the UK: women, people from lower socio-economic backgrounds, and those from some ethnic minorities are less likely to be physically active.^{8,33} Multiple factors contribute, including cultural acceptance, prevailing concepts of gender,³⁴ relative cost, time, access to childcare and awareness of available opportunities for physical activity or exercise.³⁵ A qualitative synthesis study of barriers to physical activity in individuals from black and minority ethnic groups³⁶ showed varying concepts of physical activity shaped by socio-cultural factors, and of failures to engage with such individuals at an organisational level. Inequalities in physical activity have impacts across a whole community: unequal distribution of physical activity across a country seems to be associated with an increased prevalence of obesity, to a greater extent than from average levels of activity.³⁷

Although many of the solutions are at a structural and policy level,³³ there is also a key role for physical activity promotion in primary care. We suggest:

- Brief and opportunistic interventions,¹¹ such as when reviewing a patient after covid-19 illness or when discussing long term disease management. Use the 3A framework described in the article to introduce the topic into consultations. The Moving Medicine resource (see box 2) can guide conversations on physical activity. The UK chief medical officers' physical activity guidelines infographics (box 2) can be printed for patients to take home.
- Understanding influences and barriers to physical activity for the patient may inform discussion. For cost, many local leisure services offer discounted access; for time, active travel or commuting can be part of a solution. Social prescribing link workers or navigators can help people access the community services available to them. Fitness and activity opportunities are also included as an option on the service finder page of the NHS website (<https://www.nhs.uk/service-search/other-services/Fitness-activities-and-classes/Location-Search/671>).
- Consider making your practice an "Active Practice": the Royal College of General Practitioners offers advice on this in their Physical Activity and Lifestyle Toolkit (<https://www.rcgp.org.uk/clinical-and-research/resources/toolkits/physical-activity-and-lifestyle.aspx>). Examples of practice-level changes include displaying physical activity guidelines on the right hand side of FP10 prescriptions, sending targeted exercise advice to groups such as those with diabetes or hypertension, and displaying information on local physical activity resources within the practice or on the practice website.

How this article was created

We performed a literature search using Ovid, and searched the Medline, Embase, and Global Health databases using the search terms (physical activity OR exercise OR sport\$ OR rehab\$) AND (coronavirus OR covid 19 OR post-covid\$). Articles from 2019-20 were screened. We also searched for consensus statements and guidelines, including those from the British Association of Sports and Exercise Medicine (BASEM), British Thoracic Society (BTS), Chartered Society of Physiotherapy (CSP), English Institute of Sport (EIS), British Society of Rehabilitation Medicine (BSRM), European Society of Cardiology, and American College of Sports Medicine (ACSM).

Education into practice

- How often do you feel able to recommend physical activity guidance in clinical practice?
- How do you account for social inequalities when discussing lifestyle factors, such as physical activity or diet, in your practice?

How patients were involved in the creation of this article

We thank the patient who provided their personal story of their illness and recovery, and how this affected their return to physical activity. Their recollection, together with those of several other patients, created the impetus for writing this guidance, emphasised the importance of this work, and guided its development.

Contributors: DS, DV, and AHM conceived the article and are guarantors. All authors wrote and reviewed the article, created the boxes, and helped with the figures. PLF was the contact for patient involvement.

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Research Space

Journal article

A rapid review of communication strategies for physical activity guidelines and physical activity promotion: A review of worldwide strategies

Budzynski-Seymour, E., Milton, K., Mills, H., Wade, M., Foster, C., Vishnubala, D., Baxter, B., Williamson, C. and Steele, J.

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A Rapid Review of Communication Strategies for Physical Activity Guidelines and Physical Activity Promotion: A Review of Worldwide Strategies.

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Supplementary Materials

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ABSTRACT

BACKGROUND: To support the strategy development for communication of the updated physical activity (PA) guidelines, the UK Chief Medical Officers' Expert Panel for Communication was created. **METHODS:** To help inform this process a rapid review was performed to identify and describe how other nations are communicating their PA guidelines and PA generally. Elements of the Health-enhancing physical activity (HEPA) policy audit tool (PAT) created by the World Health Organization (WHO) were used to investigate all 195 countries. **RESULTS:** Seventy-seven countries had their own guidelines, 53 used the WHO guidelines, and for 65 countries no guidelines could be found. For the communication, 27 countries used infographics, 56 had government policies/documents, and 11 used a

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mass media campaign. Only 6 of these had been evaluated. Although many countries used infographics, there were no associated evaluations. As such any future communication strategies should incorporate an evaluation. Mass media campaigns had the strongest evidence base, proving to be an effective strategy, particularly when incorporating aspects of social marketing. CONCLUSION: This review provides an insight into strategies countries worldwide have taken to communicate PA guidelines and PA promotion. These should be carefully considered when deciding how best to communicate and promote PA guidelines.

INTRODUCTION

The health benefits of physical activity are well documented and include physiological and psychological outcomes [1,2,3]. The recent construction of national and global physical activity guidelines are testament to their public health impact [4,5]. These guidelines contain summary statements or recommendations, based on the latest evidence, that communicate the necessary amounts of physical activity required for specific and general health gains [6]. Communication theories posit that knowledge plays a part in influencing behaviour change, and further it has been suggested that the details of the recommendation presented in guidelines may be a contributing factor to whether or not people engage in the recommended levels of physical activity [7]. A person's physical activity may be influenced by physical activity recommendations via their communication and messaging [8]. Therefore, public awareness of the recommendations may help facilitate the process of achieving them; however successfully influencing the physical activity levels of a whole population requires the development of effective communication interventions, with the ability to reach a large audience [9]. It is worth noting that, while communication is a significant component in encouraging physical activity participation, in isolation it may not be enough to make the desired change. Nevertheless, understanding how physical activity guidelines are promoted (i.e. what strategies are utilised and their potential impact) is an important starting point for the development of communication interventions.

In the United Kingdom (UK) there are published guidelines for under 5's, young people, adults, older adults, those with a disability, pregnant women, and women after childbirth, which cover both aerobic physical activity and strength-based activity recommendations, and also advice on sedentary time [4, 10]. It has been noted that, at least in England, despite there having been a consistent and robust application of good scientific practices regarding guidelines and recommendations for physical activity, recently there has been a lack of sustainability to campaigns and communication to influence norms and behaviour [11]. Thus, with the launch of the latest physical activity guidelines there was an announcement that a specific expert panel for communication of the Chief Medical Officers' (CMOs) physical activity guidelines would be created. This is similar to Canada, who also followed the production of their 24-hour Movement Guidelines with the development of a Knowledge Translation subcommittee. These endeavours are important as without careful consideration of the approach to communication, there is a risk that the guidelines will fail to reach the intended audiences and end up being unused. There is a need for a coherent plan based upon the best available evidence as to how this important information is disseminated, and this is the aim of the Expert Panel for Communication – to develop a strategy for communicating the messages from the revised UK CMOs' guidelines on physical activity.

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The UK is one of many countries with their own guidelines for physical activity. In all countries with guidelines there is a need to communicate them effectively to the various target audiences. Many countries may indeed have already employed communication strategies which could aid in informing the approach that the UK should take. One of the specific aims of the Expert Panel for Communication is to examine what is known not only about communication of physical activity guidelines, but also about the communication of physical activity messages for health more broadly [12]. Despite there being recent scoping reviews into both physical activity messaging [13] and physical activity guideline communication [14], to our knowledge no formal synthesis and description of worldwide national approaches to communicate physical activity guidelines or physical activity promotion has been undertaken. This knowledge would support the Expert Panel for Communication and help inform any future strategies on how the UK disseminates the new CMOs' physical activity guidelines. Therefore, the aim of this rapid review was to appraise all other countries with respect to whether they have physical activity guidelines (including a summary of their content), who they target, and how the guidelines and the promotion of physical activity more broadly are communicated, and the extent to which they had been evaluated and evidence of effectiveness been demonstrated. A summary of recommendations for practice will be provided at the end of this review.

METHOD

As this was a rapid review, the most time efficient method of collecting this data was needed [15]. Elements of the Health-enhancing physical activity (HEPA) policy audit tool (PAT) created by the WHO were used [16]. Using this tool, the most relevant sections to the present aim were completed for each country. These were:

1. Whether there were current physical activity / sedentary behaviour guidelines and who produced them – what is included in the guidelines?
2. Populations for delivery – who do the guidelines refer to?
3. How the guidelines/physical activity generally are communicated, their media, their settings, whether or not there has been a national communication strategy and if there are examples of this and/or evaluations of their effectiveness– how do they communicate the guidelines?

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One-hundred and ninety-five countries were included in the review (all countries worldwide including the UK; current strategies used in the UK are presented) and the review used primarily grey literature i.e. materials and research produced by organisations outside of the traditional commercial or academic publishing and distribution channels. This approach was adopted mainly for expediency, as much of the required information is readily available on the individual countries government's website, or the WHO website. Researchers searched each countries government website and the WHO website first, before moving onto different sources of grey literature if needed. One reviewer (EBS) searched and identified all information and then a second reviewer (JS) did the same for a randomly generated sample of 20 countries (~10%). Any disagreements in identification of sources, data extraction, and results synthesis were discussed between the reviewers and then updates made to these 20 countries and other relevant countries (e.g. African countries including those not reviewed by JS were updated to note that they are listed on the WHO Regional Office for Africa website, and therefore utilise the WHO guidelines). Lastly, the existing knowledge of the members of the Expert Panel for Communication was utilised to include any sources that were knowingly missed in our searches.

RESULTS

Of the 195 countries reviewed, a total of 77 countries had their own guidelines with a further 53 countries adopting the WHO guidelines which includes 47 African countries that follow the WHO guidelines provided by the WHO Regional Office for Africa. Guidelines could not be found for 65 countries.

Overall, there were seven main subgroups of demographics found in the review, and thus these became the demographics used in this research (under 5's, young people, adults, older adults, pregnant/postpartum, those with chronic diseases and people with disability), with specific recommendations identified within the different physical activity guidelines. Only twelve countries included recommendations for all of these demographic groups; these were the USA, Sweden, Latvia, Germany, France, Italy, Greece, Croatia, Poland, Romania, Austria, and Finland. There were also four types of activities included in the physical activity recommendations (aerobic physical activity, muscle and bone strengthening, sleep and sedentary time) that were included within different countries guidelines, and only three countries included recommendations for all four types of activity; these were New Zealand, Australia, and Canada.

For the communication of either physical activity promotion, or physical activity guidelines, these were categorised into those countries that used infographics (n=27), had government policies/policy documents (n=56, of which 47 were the WHO Regional Office for Africa recommendations), and those that had previously employed a mass media campaign (n=11). Twelve countries used a combination of the above, and in total there were only 6 countries for which an evaluation of the effectiveness of these methods of communications were found. These included the UK, in addition to the USA, Australia, Canada, Finland, and Switzerland. The supplementary file (<https://osf.io/u8e29/>) provides links to all of the communication methods found for each country.

Table 1 illustrates the findings from each country for *who* the recommendations are for, *what* the recommendations are, and *how* they, along with physical activity more generally, were communicated.

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Table 1: Summary of information																		
Country	POPULATION "who"							ACTIVITY "what"							Communication "how"			
	Under 5's	Young people	Adults	Elderly	Pregnant/postpartum	Disabled	Long term health conditions	WHO guidelines	Countries own guidelines	No guidelines found	Aerobic	Muscle and Bone	Sleep	Sedentary	Infographics	Policies/ Policy document	Mass Media Campaign	Evaluation of strategy
EUROPE																		
Russia		X	X					X			X	X		X				
Germany	X	X	X	X	X	X	X		X		X	X				X	X	
United Kingdom	X	X	X	X	X	X			X		X	X		X	X	X	X	X
France	X	X	X	X	X	X	X		X		X	X				X	X	
Italy	X	X	X	X	X	X	X		X		X							
Spain	X	X	X	X	X	X			X		X							
Ukraine										X								
Poland	X	X	X	X	X	X	X	X			X	X	X	X				
Romania	X	X	X	X	X	X	X	X			X	X	X	X				
Netherlands		X	X	X					X		X	X		X				
Czech Republic	X	X	X	X					X		X							
Greece	X	X	X	X	X	X	X		X		X							
Portugal										X								
Sweden	X	X	X	X	X	X	X		X		X	X		X		X		
Hungary	X	X	X						X		X	X						
Belarus										X								
Austria		X	X	X		X			X		X							
Serbia										X								
Switzerland		X	X	X					X		X				X	X		X
Bulgaria										X								
Denmark	X	X	X	X	X				X		X	X				X	X	
Finland	X	X	X	X	X	X	X		X		X	X		X		X	X	X
Slovakia		X	X	X					X		X							
Norway		X	X	X					X		X							
Ireland	X	X	X	X		X			X		X	X				X	X	
Croatia	X	X	X	X	X	X	X	X			X	X	X	X			X	

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Moldova										X								
Bosnia and Herzkovinian			X						X		X							
Albania		X	X	X					X		X							
Lithuania		X	X	X	X				X		X				X			
North Macedonia										X								
Slovenia		X	X	X					X		X							
Latvia	X	X	X	X	X	X	X		X		X	X	X		X			
Estonia		X	X	X					X		X	X	X		X			
Montenegro										X								
Luxemburg	X	X	X	X	X		X		X		X							
Malta										X								
Iceland										X								
Andorra										X								
Monaco										X								
Liechtenstein										X								
San Marino										X								
Holy See										X								
Percentage for continent	38.6%	61.4%	63.6%	56.8%	34.1%	31.2%	25%	9.1%	54.6%	34.1%	63.4%	34.1%	9.1%	20.4%	4.6%	22.7%	15.9%	6.8%
NORTH AMERICA																		
United States of America	X	X	X	X	X	X	X		X		X	X			X	X	X	X
Mexico			X						X		X					X		
Canada	X	X	X	X	X	X			X		X	X	X	X	X		X	X
Guatemala		X	X	X					X		X				X			
Cuba									X		X							
Haiti										X								
Dominican Republic		X	X	X					X		X				X			
Honduras		X	X	X					X		X				X			
Nicaragua										X								
El Salvador		X	X	X					X		X				X			
Costa Rica		X	X	X					X		X							
Panama		X	X	X					X		X				X			
Jamaica	X	X	X	X					X		X	X			X			
Trinidad and Tobago		X	X	X					X		X	X		X				
Belize			X						X		X							
Bahamas		X	X	X					X		X				X			
Barbados		X	X	X					X		X				X			
Saint Lucia										X								
Grenada		X	X	X					X		X				X			
St Vincent and Grenadines		X	X	X					X		X				X			

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Antigua and Barbuda		X	X	X					X		X				X			
Dominica		X	X	X					X		X				X			
Saint Kitts and Nevis		X	X	X					X		X				X			
<i>Percentage for continent</i>	<i>12.5%</i>	<i>70.8%</i>	<i>79.2%</i>	<i>70.3%</i>	<i>8.3%</i>	<i>8.3%</i>	<i>4.2%</i>	<i>0%</i>	<i>83.3%</i>	<i>12.5%</i>	<i>83.3%</i>	<i>16.7%</i>	<i>4.2%</i>	<i>8.3%</i>	<i>62.5%</i>	<i>8.3%</i>	<i>8.3%</i>	<i>8.3%</i>
SOUTH AMERICA																		
Brazil								X										
Columbia		X	X	X					X		X	X		X				
Argentina		X	X	X					X		X							
Peru			X						X		X							
Venezuela		X	X	X					X		X							
Chile		X	X	X					X		X			X				
Ecuador		X	X	X					X		X				X			
Bolivia										X								
Paraguay		X	X	X					X		X				X			
Uruguay			X						X		X			X				
Guyana		X	X	X					X		X				X			
Suriname										X								
<i>Percentage for continent</i>	<i>0%</i>	<i>58.3%</i>	<i>75%</i>	<i>58.3%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>8.3%</i>	<i>75%</i>	<i>16.7%</i>	<i>75%</i>	<i>8.3%</i>	<i>0%</i>	<i>25%</i>	<i>25%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>
ASIA																		
China								X										
India								X										
Indonesia	X	X	X	X					X		X							
Pakistan										X								
Bangladesh										X								
Japan			X	X					X		X							
Philippines		X	X	X					X		X	X		X				
Vietnam			X						X		X	X		X				
Turkey			X						X		X			X	X			
Iran										X								
Thailand										X								
Myanmar		X	X	X				X			X	X						
South Korea										X								
Iraq										X								
Afghanistan	X	X	X	X	X				X		X							
Saudi Arabia										X								
Uzbekistan										X								
Malaysia										X								
Yemen										X								
Nepal										X								
North Korea			X						X		X				X			

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Sri Lanka		X	X	X	X				X		X	X		X				
Kazakhstan									X									
Syria									X									
Cambodia									X									
Jordan									X									
Azerbaijan									X									
United Arab Emirates									X									
Tajikistan									X									
Israel		X	X	X				X						X				
Laos							X				X							
Lebanon		X	X	X				X		X				X				
Kyrgyzstan									X									
Turkmenistan									X									
Singapore		X	X	X				X		X	X		X					
Oman									X									
State of Palestine									X									
Kuwait									X									
Georgia			X					X		X								
Mongolia								X										
Armenia									X									
Qatar	X	X	X	X			X	X		X	X		X					
Bahrain									X									
Timor-Leste									X									
Cyprus		X	X	X				X										
Bhutan									X									
Maldives		X	X	X			X											
Brunei		X	X	X	X			X										
Percentage for continent	6.3%	25%	35.4%	27.1%	6.3%	0%	2.1%	10.4%	33.3%	56.3%	29.2%	12.5%	0%	12.5%	8.3%	0%	0%	0%
OCEANIA																		
Australia	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X
Papua New Guinea									X									
New Zealand	X	X	X	X					X		X	X	X	X				
Fiji		X	X	X					X		X							
Solomon Islands			X						X		X							
Micronesia										X								
Vanuatu										X								
Samoa										X								
Kiribati										X								
Tonga										X								
Marshall Islands										X								

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Palau										X									
Tuvalu										X									
Nauru										X									
Percentage for continent	14.3%	21.4%	28.6%	21.4%	7.1%	7.1%	7.1%	0%	28.6%	71.4%	28.6%	14.3%	14.3%	14.3%	7.1%	7.1%	7.1%	7.1%	
AFRICA																			
Nigeria		X	X	X				X			X	X							
Ethiopia		X	X	X				X			X	X					X		
Egypt										X									
Democratic Republic of Congo		X	X	X				X			X	X					X		
United Republic of Tanzania		X	X	X				X			X	X					X		
South Africa		X	X	X				X			X			X	X	X			
Kenya	X	X	X	X					X		X	X					X		
Uganda			X					X			X						X		
Algeria		X	X	X				X			X	X					X		
Sudan										X									
Morocco										X									
Angola		X	X	X				X			X	X					X		
Mozambique		X	X	X				X			X	X					X		
Ghana		X	X	X	X	X	X		X		X	X							
Madagascar		X	X	X				X			X	X					X		
Cameroon		X	X	X				X			X	X					X		
Cote d'ivoire		X	X	X				X			X	X					X		
Niger		X	X	X				X			X	X					X		
Burkina Faso		X	X	X	X			X			X	X					X		
Mali		X	X	X				X			X	X					X		
Malawi		X	X	X				X			X	X					X		
Zambia		X	X	X				X			X	X					X		
Senegal		X	X	X				X			X	X					X		
Chad		X	X	X				X			X	X					X		
Somalia										X									
Zimbabwe		X	X	X				X			X	X					X		
Guinea		X	X	X				X			X	X					X		
Rwanda		X	X	X				X			X	X					X		
Benin		X	X	X				X			X	X					X		
Burundi		X	X	X				X			X	X					X		
Tunisia										X									
South Sudan		X	X	X				X			X	X					X		
Togo		X	X	X				X			X	X					X		
Sierra Leone			X						X		X				X				
Libya										X									
Congo		X	X	X				X			X	X					X		
Liberia		X	X	X				X			X	X					X		

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Central African Republic		X	X	X		X		X			X	X				X		
Mauritania		X	X	X				X			X	X				X		
Eritrea		X	X	X				X			X	X				X		
Namibia		X	X	X				X			X	X				X		
Gambia		X	X	X				X			X	X				X		
Botswana		X	X	X				X			X	X				X		
Gabon		X	X	X				X			X	X				X		
Lesotho		X	X	X				X			X	X				X		
Guinea-Bissau		X	X	X				X			X	X				X		
Equatorial Guinea		X	X	X				X			X	X				X		
Mauritius		X	X	X				X			X	X				X		
Eswatini		X	X	X				X			X	X				X		
Djibouti										X								
Comoros		X	X	X				X			X	X				X		
Cabo Verde		X	X	X				X			X	X				X		
Sao Tome and Principe		X	X	X				X			X	X				X		
Seychelles		X	X	X				X			X	X				X		
Percentage for continent	1.9%	83.3%	87%	38.3%	3.7%	3.7%	1.9%	81.5%	5.6%	13%	87%	81.5%	0%	1.9%	3.7%	81.5%	0%	0%

DISCUSSION

Overview of principle findings

This rapid review found that a majority of countries have explicit guidelines for physical activity, although many rely on those of the WHO, with only ~39% of countries having developed their own. This is similar to the proportions reported in European countries by Kahlmeier et al. (2015) [17]. In the current review only eight countries had specific recommendations for all demographic groups (the 7 groups as reported in the results section). Further, the content of guidelines varied across countries and only three countries included all four activity types in their recommendations (the 4 types as reported in the results section).

Seventy-nine countries promoted the guidelines or physical activity generally in some way; though most (n=47) of these came from the default use of the WHO's materials through the WHO Regional Office for Africa. The most popular media for communication was through government policy documents (n=56), then using infographics (n=27), and finally mass media campaigns (n=11). Thus, it can be stated that relatively few countries engaged in their own communications approaches for the guidelines, or in physical activity promotion, and for the minority that did there was a relative lack of evidence regarding evaluation of the effectiveness of their implemented strategies and approaches; evaluations were identified for only 3% of countries that used a communication approach. We suggest that any future

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communication strategies should consider early development and embedding of methods for evaluating their effectiveness, and ideally prior to their implementation. Despite the general lack of direct evidence for effectiveness, some approaches appeared to be fairly consistently implemented suggesting at least a *perceived* effectiveness by policy makers internationally. Thus, we discuss these with reference to wider evidence and speculate upon insights they may provide into potentially effective communication strategies.

Types of physical activity guidelines – daily vs weekly messages?

As noted, guidelines existed for all four types of activity (aerobic, muscle and bone, sleep and sedentary) for only three countries, and these were presented in the form of 24-hour guidelines. The approach taken by these countries is not to recommend what people should be doing with some of their time across the week; but rather they recommend how people should use all of their time by splitting up the whole day. An example of this is the Canadian 24-Hour Movement Guidelines for Children and Youth which is an integration of physical activity, sedentary behaviour, and sleep [18]. They provide specific recommendations on the amount of time over a typical 24-hour day that children and youth aged 5 to 17 should spend in moderate-to-vigorous physical activity (at least 60 minutes), recreational screen time (no more than 2 hours), and sleep (9 to 11 hours for 5- to 13-year-olds; 8 to 10 hours for 14- to 17-year-olds). Australia and New Zealand also adopt this approach for some of their guidelines [19, 20]. Not only does it outline the minimum levels of physical activity required to gain health benefits but it also incorporates these into the wider context of everyday life – potentially enabling individuals to better understand how to fit these various recommendations into their lives. It could be said that adopting a 24-hour approach, similar to that of Canada, is a more holistic way of promoting physical activity and a healthier lifestyle as it shows the relationship between the different aspects needed to make up the day. There has been consideration by experts in the UK regarding adopting a 24-hour approach and this could represent a positive step towards more effective communication of the physical activity guidelines.

Communication – to who?

This review of the countries revealed a number of specific methods currently being employed to either disseminate physical activity guidelines, or more generally to promote physical activity. Interestingly there are variations in the aims of different countries' guidelines, and which specific population group they target. Table 2 shows the aims of the guidelines that were found for those countries that both had guidelines and included their aims (links to each countries guidelines and communication approaches can be found in the supplementary material). This table clearly highlights that these guidelines are focused at health professionals and that they are expected to "take over" at this stage. For example, the Finish aim is "to encourage local authorities to make physical activity a strategic choice", similar to in Sweden where their aim is focused towards "all who work in promoting physical activity". This may suggest that the focus is on communicating the guidelines to stakeholders and health professionals, and that separate communication strategies need to come at a later stage, when these stakeholder then use the information to communicate physical activity more generally to the public.

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Table 2: Example aims

Country	Guidelines Aim
Finland	Aim to encourage local authorities to make physical activity a strategic choice
Germany	Aimed at the whole professional stakeholders and organizations in the fields of physical activity promotion.
Ireland	Useful to everyone involved in promoting health and physical activity in Ireland
Sweden	All who work in promoting physical activity, but also as a textbook for various educational programs
UK	Guidance to help health professionals, policy makers and others working to promote physical activity, sport and exercise for health benefits
USA	An essential resource for health professionals and policy makers

This point also raises a key differentiation that needs to be acknowledged - the difference between the promotion of the guidelines (i.e., presenting and communicating the knowledge of what needs to be done), and the promotion of the action required (i.e., promoting ways to be physically active). Perhaps the guidelines need not to be promoted as such (at least not to the general public), but only communicated to the health professionals. It is at this point that separate communication strategies come into play, when health professionals and other stakeholders use them as a guiding tool to promote physical activity to the general population.

This approach can be seen in the US dissemination of the guidelines and physical activity promotion. In the US they have provided separate communication to their health professionals and for the general public. These were done in different formats; a policy document was created for the health professionals and a social marketing campaign was developed for the public. This shows how the information was presented and outlined to the health professionals and stakeholders, and then they translated it for the general public. Their campaign Move Your Way was developed to share key recommendations from the guidelines to the public to spread the word; this was done through factsheets, videos, posters, interactive tools, web badges, and widgets [21]. Figure 1 illustrates one of these factsheets which was created specifically for children and presents the information through infographics in a child friendly manner. Although the information presented to the general public does include the need to complete 60 minutes of physical activity every day (this particular infographic is aimed at children), the main emphasis is on providing information on the benefits of engaging in physical activity, and suggestions on ways in which to meet the guidelines e.g., walking to school and playing at play time.

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Figure 1: USA Move Your Way Campaign

This however could represent a point where the communication approach needs improvement, a recent review on physical activity messaging highlighted the key attributes of messages for each target population [13]. For children it was said that the emphasis needs to be on positively framing it, including messages such as “physical activity is fun”. As such, the US infographic emphasizing the benefits and examples may not be the best approach for this particular target audience.

Communication guidelines for stakeholders/health professionals

As seen in table 2, many countries state their aims are focused at providing health professionals and stakeholders the key information, for them to communicate to the general public. However very few of these guidelines are accompanied with support on how to do this; clear communication strategies to accompany the publication of physical activity guidelines has not been usual practice [22]. However, a limited number of studies have published guidelines on how to promote physical activity alongside their physical activity guidelines. This suggests, as the emphasis here is on promoting physical activity rather than the guidelines, that many countries feel that it is the role of the health professionals and stakeholders to use the information provided to promote physical activity more generally to the population, rather than have a focus on promoting the specific guidelines.

This can be seen in Switzerland’s policy document where alongside their physical activity guidelines they also provide some *guiding principles* for physical activity promotion. These include promoting physical activity as an easy choice, addressing different determinants of physical activity, providing resources for physical activity, and being evidence based [23]. This was similar to what was suggested in Norway’s physical activity communication guidelines in their action plan on physical activity which states that it is important to emphasise that being physically active may in fact be extremely simple, and that little effort is required to obtain positive health benefits [24]. In the Irish physical activity promotion this was again the case, with key messages being provided for physical promotion, these being to stress the benefits, promote self-belief, promote social support and suggest ways to fit physical activity into daily

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life [25].

In the German policy documentation, there was an importance given to an evidence-based approach, which was the first of four criteria for developing and structuring the recommendations. These were: 1) scientific proof of the effectiveness of the intervention, 2) effectiveness in terms of promoting public health, 3) being cost effective, and 4) the quality of the design, implementation, and evaluation [26]. In their policy document it is stated that the active involvement of stakeholders and organizations from the respective contexts is fundamental for the dissemination of the guidelines and for them reaching the target audiences. This perhaps is the only communication strategy that accompanied the countries guidelines that focused on the communication of the guidelines, as opposed to physical activity more generally. However, they did also include in the document that mass media campaigns are an effective way of promoting physical activity, in addition to point of decision prompts, and targeting environmental approaches (e.g. geographical proximity, traffic calming, sport and leisure facilities, and infrastructure for promoting cycling and walking). This again supports the notion that communication approaches need to be employed both to the stakeholders and health professionals, and to the general public. For the latter, the emphasis is not on communicating the guidelines directly, but on the health professionals and stakeholders communicating the messages included in these guidelines to the general public. Policy documents can communicate the specific physical activity guidelines messages to the stakeholders and health professionals, at which point they communicate specific physical activity messages to the general public, which align to these guidelines.

Using infographics as a communication approach

One way in which the information can be communicated from the stakeholders and health professionals to the general public is through infographics; indeed, based on this review infographics are a popular approach to illustrate the information. A clear example of this can be seen in figure 2 which presents the physical activity recommendations from Switzerland's guidelines [23]. Infographics are an effective way to present complex data in a visual format that is compelling, provides rapidly available information, and is directly useful for decision-making purposes [27]. Indeed, in the UK they have often been developed with supporting formative research [28,29]. As figure 2 illustrates they can also have a cultural emphasis; in the Swiss policy document it states that Switzerland has a very favorable environment and offers many traditional activities including physical activity, exercise, and sport [23]. These include hiking and walking; hence the inclusion of suitable footwear for these activities in the infographics. Similar to the brochures and factsheets presented by Australia and the USA, it also includes both the necessary information on how much physical activity is needed, and recommendations on how to meet the guidelines. These again are also specific to each population, for example the inclusion of skipping and skateboarding in the children's infographic, and skiing and walking in the adults and older adults infographic.

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Figure 2: Switzerland's Infographics

Twenty-two countries using infographics interestingly included both the nutritional and physical activity guidelines. Although this review is primarily considering communication of physical activity guidelines, there are some important feature of these figures that are worth noting. Firstly, similar to the Swiss infographics, there are a number of cultural references in displaying the information, including native instruments as seen in the Bahamas infographic shown in Figure 3 [30]. This is a theme that runs throughout many countries' presentation of infographics and at the least suggests there is a perceived effectiveness in this approach by communications strategists in these countries; although the limited evidence that has tested the use of culturally sensitive frames for physical activity have not supported its effectiveness [31]. Furthermore, it suggests the inclusion of physical activity with nutrition messages may reflect their national priorities for obesity. Similar to the Swiss infographic of the physical activity guidelines, numerous infographics here include examples of *how* to complete the recommendations. Figure 4 is the infographic from Guyana; it depicts a bowl, and while the inside is demonstrating nutritional recommendations the outside of the bowl depicts many ways in which people can be active, including swimming and walking [32]. Again, all include suggestions of how to meet the recommendations, demonstrating how infographics are not limited to only presenting the guidelines themselves but can also include suggestions and act towards wider physical activity promotion. It may be prudent to use physical activity message communication research here to guide what and how gets communicated via this method [13]. This would at least provide a theoretical base for the information incorporated, even if there still is a lack of research on the communication method. As there is currently a lack of evaluations of the effectiveness of infographics as a behaviour change strategy, we further stress the need to incorporate an evaluation into the implementation of any new communication strategy.

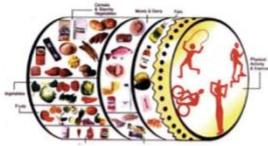


Figure 3: Bahama's infographics



Figure 4: Guyana's infographics

The infographics that are currently being used in the UK were developed for use by healthcare professionals and the intention was for them to *display* these in healthcare settings and to communicate their messages to patients. Indeed, in the UK the CMOs' physical activity guidelines are actually intended for "professionals, practitioners, and policymakers"; in fact, this was part of the rationale for forming the Expert Panel for Communication and to consider communication of their messages to wider public audiences. As explained above, the USA also state that their guidelines were written for professionals and not a public audience; that they need to be *translated* into actionable customer messages to help people achieve the recommendations. This is why their Move Your Way campaign was created, to communicate the recommendations in plain language, to promote the health benefits and provide helpful tips. This is an example of a mass media campaign.

Using mass media campaigns as a communication approach

A further communication approach that stakeholders and health professionals could adopt is that of a mass media campaign. In this review there were 11 countries that adopted mass media campaigns to communicate either the physical activity guidelines, or physical activity more generally. These campaigns are widely used to expose high proportions of large populations to messages through routine uses of existing media, such as television, radio, and newspapers [33]. An example was Canada's participACTION, which was one of the few communication strategies that has been evaluated [31]. When the campaign was relaunched in 2007 one focus was to inform parents of elementary school children about the risks of physical inactivity for children and youth [31]. To assess the effectiveness, they measured awareness of campaign messages; a quarter of responders showed unprompted awareness, and promoted awareness was 57%, and indeed awareness was associated with leisure-time physical activity [34]. In an evaluation of the Australian "Find your 30 every day" mass media campaign, awareness was one of three outcome variables used, in addition to intention to partake in physical activity and actual levels of physical activity [35]. They implemented cross sectional surveys pre and post a two-year intervention period and reported that all three measures had been positively impacted by the mass media campaign. Another intervention that has been successful is the American VERB™ campaign which was launched in 2002 and used social marketing principles in an effort to increase the physical activity levels of children aged 9 to 13 years old [36]. The intention behind the campaign was to become the children's brand for physical activity, effecting behavioural norms by positioning physical activity as a highly appealing and easy choice [36]. Survey based evaluations of VERB™ found it to be successful in its initial launch at increasing awareness [37] which was sustained up to 2 years after [37, 38], and appeared to positively influence children's physical activity behaviours over this period [37, 38]. Indeed, its success has led to exploration of its adaptation for wider diverse audiences [39].

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Not only do these evaluations demonstrate the positive impact that mass media campaigns can have on physical activity, they also illustrate a number of methods that can be employed to evaluate the intervention. However as noted, the majority of approaches implemented by countries are lacking in direct evaluation of their success. The UK does have its own social marketing campaign, Change4Life, which was established in 2009 as part of a national ambition set out in the governments healthy weight, healthy lives plan [40], in addition to those aimed at specific groups such as This Girl Can and We Are Undefeatable [41, 42]. Considering the apparent success of campaigns in other countries, social marketing campaigns employed through mass media seem to be an effective way to promote physical activity guidelines and promote physical activity more generally due to their ability to reach a large audience.

Although some evidence suggests these UK campaigns are effective at raising awareness [43], research investigating their impact upon knowledge and physical activity behaviours is less promising [44]. Linking back to the German recommendations it is important to design and embed the evaluation of any strategies prior to their implementation, and methods of evaluating a strategy needs to be careful considered.

Summary of recommendations for practice

- Infographics are a popular way to display the information despite the lack of evidence to support their effects on behaviour change. However, if implemented and evaluated they may be an effective way to display both how much physical activity is needed and how to meet these guidelines. Furthermore, incorporating culturally appropriate imagery and colours is also a popular strategy to include with this type of communication; though this also requires further evaluation.
- There is a decision to make between what specifically to communicate; the physical activity guidelines or physical activity more generally. The research suggests that promotion of both is common and perhaps this will be more effective than one alone. However, this also requires empirical evaluation.
- The information given to stakeholders likely needs to be different to that given to the general public. If the stakeholders are targeted then they need to translate the guidelines into a more public friendly communication method.
- Any new communication strategies should have a method of evaluation built in, and before any new communication strategies are implemented. These should be tailored to the specific outcomes which the strategies are aimed at and will likely include awareness, knowledge, intentions, and behaviours.
- Consider the benefits of mass media, specifically those that employ social marketing strategies as these stand out as the only approaches that have been previously evaluated and can be said to be beneficial in leading to behaviour change.

CONCLUSION

Improving our understanding of how to best communicate physical activity guidelines may play a role in improving population physical activity levels. This review provides a summary of physical activity communication approaches across 195 countries, for both physical activity guidelines and physical activity promotion. We also provide recommendations for new communication strategies, building on and supporting many of the examples included in this review. Though there are consistencies in many of

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the approaches taken between countries suggesting a perceived consensus on what is effective, there is a general lack of evaluation of specific approaches upon key outcomes including awareness, knowledge, intentions, and behaviours. For example, though infographics are popular their effectiveness for influencing physical activity behaviour change has not been evaluated. Also, though it seems intuitive that approaches such as physical activity guidelines using the 24hr approach might inherently support their ease of communication, or culturally sensitive framing to help deliver the message, more research is needed to understand whether these approaches are effective. Approaches with the strongest evidence appear to be those mass media campaigns, some of which adopt social marketing principles. Social marketing strategies in particular should be employed due to their ability to reach and engage a large target audience. It also clear that these broad methods can be employed successfully for different audiences (e.g. children and adults) with tailoring of delivery (e.g. Budzynski-Seymour et al., 2020 [45]) There is evidence from countries around the world that social marketing strategies and mass media campaigns can be an effective strategy, and these are at least being employed within the UK. However, in relation to those previously and currently used in the UK, evaluation is needed to directly ascertain their effectiveness, strengths, and weaknesses as this is an area currently lacking in research.

Also, there is a need to decide whether it is better to promote the physical activity guidelines themselves or physical activity more generally. Do people need to know how much physical activity they need to be doing, or do they just need to be prompted to be physically active along with knowledge of how to do so? Perhaps both combined is the optimal approach to facilitate wide scale behaviour change. Whatever is ultimately chosen, we argue that any newly developed and implemented communications strategies should consider a priori the design and embedding of appropriate evaluation strategies for the intended primary outcomes of these approaches; in particular identifying ahead of implementation what would be deemed 'success' (e.g. how much of a change in awareness, knowledge, intentions, or behaviours would be considered to be enough to matter). Considering the current lack of evaluation of effectiveness for many approaches identified in this rapid review, we view this as a fundamental requirement and obligation for policy makers. Finally, it is key to identify and consider the target audience of the communicated message, the communication needs to be tailored carefully to appropriately meet each target groups needs for optimal delivery.

DATA AND SUPPLEMENTARY MATERIAL ACCESSIBILITY

Supplementary files are available at the project page on the Open Science Framework:
<https://osf.io/wvz2a/>

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Muscle-strengthening activities to improve health outcomes: what the evidence supports

Katherine Rose Marino ,¹ Dane Vishnubala,^{2,3} Pekka Oja⁴

Evidence for the benefits of regular physical activity is irrefutable. Physical activity guidelines often include a mix of aerobic and muscle-strengthening activities. Muscle strengthening activities can also be referred to as strength, weights or resistance exercise and are defined as a voluntary activity that includes the use of weight machines, exercise bands, hand-held weights or own-body weight.⁴ Recent data suggest that only 10%–30% of adults meet the muscle-strengthening activity recommendations.^{2,3} While focus has previously been placed on musculoskeletal benefits, research has also found muscle-strengthening activities are independently associated with a variety of improved health outcomes including decreases in all-cause mortality, and improvements in cardiometabolic and mental health.⁶

HISTORIC LACK OF EMPHASIS ON MUSCLE-STRENGTHENING ACTIVITIES

While physical activity recommendations that include aerobic activity have been available since the 1970s, muscle-strengthening activities were first included in the WHO's physical activity recommendations in 2010.⁷ The inclusion of muscle-strengthening activities was further highlighted in the 2020 WHO physical activity recommendations which state that adults should do muscle-strengthening activities at moderate or greater intensity involving all major muscle groups on 2 or more days a week.⁸

Muscle-strengthening activity is now included in many national public health guidelines.⁶ Despite this, in comparison to physical activity guidance on aerobic activity, there is a lack of emphasis and guidance on muscle-strengthening exercises throughout public health policy.^{3,4} It has been reported that muscle-strengthening activities are the 'forgotten' or 'neglected'

guideline.^{4,9} This may have influenced the 2019 UK Chief Medical Officer's physical activity infographic, which increased the focus on muscle-strengthening activities by incorporating it into the centre of the recommendations.

A SYSTEMATIC REVIEW PROVIDING USEFUL GUIDELINES

BJSM recently published a paper by Momma *et al*: 'Muscle-strengthening activities are associated with lower risk and mortality in major non-communicable diseases: a systematic review and meta-analysis of cohort studies'.¹⁰ The review found muscle-strengthening activities were associated with a 10%–17% lower risk of all-cause mortality, cardiovascular disease (CVD), total cancer, diabetes and lung cancer. The authors highlight how some countries are still debating whether muscle-strengthening activities should be included in national physical activity guidelines. The paper strongly supports the inclusion of muscle-strengthening activities in national physical activity guidelines, with emphasis on their important health benefits.

Momma *et al* conduct a useful evidence synthesis to inform the optimal duration of muscle-strengthening that should be recommended. They found the maximum risk reduction for all-cause mortality, CVD, diabetes and total cancer was obtained at approximately 30–60 min per week of muscle-strengthening activities.¹⁰ The dose-response curve demonstrated a declining risk reduction when engaging in more than 30–60 min per week of muscle-strengthening activities, suggesting there may be limited benefits of doing more than 30–60 min per week of muscle-strengthening activities. In addition, findings suggest that doing beyond 130–140 min per week of muscle-strengthening activities becomes a hazard with a risk reduction of more than 1.0.

NEXT STEPS

Limitations of this review include the low certainty of evidence and search

of only two databases resulting in a relatively low number of records. However, this is the most up-to-date systematic review of the available evidence and further emphasises the inverse association between muscle-strengthening activities with all-cause mortality and major noncommunicable diseases. It is imperative that governing bodies include muscle-strengthening activity in physical activity policies and guidelines, promote public health initiatives that emphasise the health benefits of muscle-strengthening activities, and facilitate comfortable and easily accessible methods to perform these activities. It is also important to highlight that the majority of included studies in this review were conducted in the USA. Research should be undertaken on populations outside of the USA and future studies should include data on underrepresented groups in sport and exercise medicine research such as women, ethnic minorities, older adults and people living with disabilities.

Given the dose-response relationships identified, it is reasonable to recommend performing muscle-strengthening activities at least twice a week. The health impact of higher volumes remains unclear, but evidence suggests the benefits may diminish beyond 60 min/week for the general population. Further large-scale studies to better quantify the optimal dose of muscle-strengthening activities to inform national physical activity guidelines are needed. Ideally, studies should measure duration, frequency, intensity and type of muscle-strengthening activities.

As self-reported measures are currently used for the assessment of muscle-strengthening activities, a standardised assessment of muscle-strengthening activities would be beneficial to enable enhanced comparisons between studies and assist in accurate monitoring of muscle-strengthening activity. Integrating standardised muscle-strengthening activity assessment methods into existing health surveillance systems will aid in collecting improved data on current levels of engagement.^{2,6} This also provides clinicians an opportunity to discuss with patients the role of muscle-strengthening in their physical activity routines and reinforce the message that 'muscle-strengthening matters'.

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The use of single dose intra-articular local anaesthetics in the United Kingdom: A cross-sectional survey of sport and exercise medicine and musculoskeletal professionals

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KEYWORDS

degenerative joint condition, knee, musculoskeletal, therapy

1 | INTRODUCTION

Degenerative joint disease, such as osteoarthritis, cause significant issues with pain, mobility, and declining quality of life (Newberry et al., 2017). Intra-articular joint injections are used by healthcare professionals to relieve symptoms and aid diagnosis of degenerative joint disease (Jayaram et al., 2019; Xie et al., 2015). The knee is one of the most common joints affected by degenerative joint disease, and intra-articular injections of the knee is a common procedure performed by Sport and Exercise Medicine (SEM) and musculoskeletal (MSK) clinicians (Hirsch et al., 2017; Zuber, 2002). A single-dose injection of local anaesthetic (LA) is often used for intra-articular injections, and there are several different LA agents that have differing characteristics such as onset of action, half-life, and side effects (Eng et al., 2014).

Recent studies have shown a controversial observation linking intra-articular LA with chondrotoxicity. A systematic review that included *in vitro* and *in vivo* animal studies highlighted that even a single-dose of commonly used LA can have a cytotoxic risk to articular tissue by impeding chondrocyte metabolism, resulting in chondrocyte death (Kreuz et al., 2018). SEM professionals are specialists in managing MSK issues and should be demonstrating leadership in highlighting best practice (FSEM, 2014). This study aims to assess the current use of LA in intra-articular knee injections in the United

Kingdom (UK) by SEM and MSK clinicians, explore reasons behind why individuals do or don't use LA, and explore if the use of LA by SEM physicians is different to non-SEM professionals.

2 | METHOD

A questionnaire was designed Craig Zalecki and Manoj Sivan to explore current usage of LA in intra-articular knee injections (Table 1). This was distributed online (via the organisation) to the members of the Faculty of Sports and Exercise Medicine, British Association of Sport and Exercise Medicine, Royal College of General Practitioners, Royal College of Physicians and Primary Care Rheumatology Society. The survey was closed to responses after 6 months. Participants had to be performing intra-articular knee injections to be eligible to take part. No pilot study was conducted.

For most of the questions participants selected from a list of choices. Free text boxes were used when participants were asked for justification of which LA they use, and what concentration and volume they use. The questionnaire took 10 min to complete. Consent was assumed by completion of the questionnaire. No identifiable information was obtained. Data was screened and cleaned by the research team and incomplete responses were removed (van den Broeck et al., 2005). Where appropriate, data was divided into

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Questions	
1	What type of clinician are you? Options: Physiotherapist, ESP, GP, orthopaedic surgeon, rheumatologist, SEM physician, rehabilitation physician, radiologist, orthopaedic practitioner, or other
2	Do you perform intra-articular knee injections? (Options: Yes or No) (asked to confirm eligibility for the study)
3	Do you use intra articular local anaesthetic when performing intra-articular knee injections? Options: Yes or No
4	If you answered yes to the previous question, which local anaesthetic do you use? Options: Lidocaine, bupivacaine, mepivacaine, ropivacaine, or other
5	Is there a particular reason for why you don't use LA? Or is there a particular reason why do you use that particular LA?
6	What concentration of your chosen local anaesthetic do you use?
7	What volume of local anaesthetic do you use?

TABLE 1 Questions included in the questionnaire (ESP: Extended Scope Physiotherapist; LA: local anaesthetics)

subgroups depending on their occupation to allow for comparison between SEM physicians (SEM registrars and consultants) and non-SEM professionals. Descriptive analysis of the questionnaire data was used and differences between subgroups were analysed using Statistical Package for the Social Sciences, version 25.0 (IBM Corp, Armonk, NY). Nominal data was analysed using chi-squared test. Statistical significance was set at $p < 0.05$.

3 | RESULTS

3.1 | Demographic information

A total of 219 responses were received, most commonly from GPs ($n = 80$) and SEM physicians ($n = 63$). Participants' occupations are outlined in Figure 1. Two percent of participants stated 'other' as their occupation (registered nurse [$n = 1$], an emergency physician [$n = 1$] and radiologist [$n = 3$]). When those that use LA for intra-articular knee injections were asked what volume and concentration they use, 10 respondents (6%) either did not specify the concentration or the volume of LA they use, and these specific responses were excluded.

3.2 | The use of local anaesthetics for intra-articular knee injections

Most participants (82% $n = 180$) stated they do use LA when performing intra-articular knee injections, with 18% stating that they do not. The split was similar between SEM physicians and non-SEM professionals, with 84% of SEM physicians and 81% of non-SEM professionals using LA. The difference was not statistically significant.

Of those that do use LA, 80% use lidocaine ($n = 145$), 18% use bupivacaine ($n = 32$), 2% use ropivacaine ($n = 3$), and none use mepivacaine (Figure 2). SEM physicians and non-SEM professionals demonstrated similar choice of LA with 79% of SEM physicians using

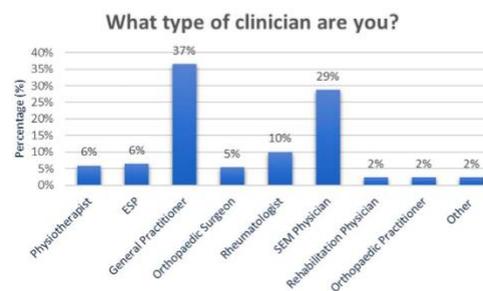


FIGURE 1 The occupations of the individuals that responded to the questionnaire (ESP: Extended Scope Physiotherapist)

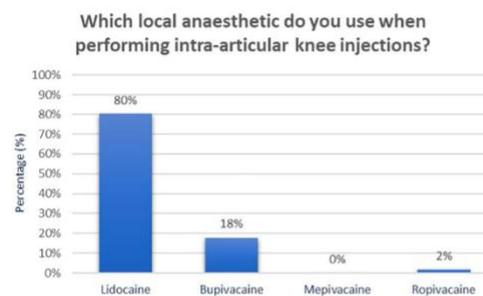


FIGURE 2 Preferred choice of local anaesthetics to use when performing intra-articular knee injections

lidocaine, 19% using bupivacaine and 2% using ropivacaine, compared to 81% of non-SEM professionals using lidocaine, 17% using bupivacaine and 2% using ropivacaine. The difference in choice of LA between SEM physicians and non-SEM professionals is not statistically significant.

3.3 | Justification for which type of local anaesthetics is used

Most individuals (80%) gave reasons as to why they prefer a particular LA or why they chose not to use LA, meaning 20% did not give a reason for their practice. The reasons that were given are outlined in Table 2. The most common justification for choosing a specific LA was availability, followed by habit. In total, 10% ($n = 22$) of participants mentioned chondrotoxicity as a factor in their decision making. Of note, 11 of these 22 individuals still chose to use the more chondrotoxic LAs (lidocaine and bupivacaine). Only 4% of respondents ($n = 8/219$) stated they do not use LA for intra-articular injections due to the chondrotoxic risk associated with them.

When comparing SEM physicians to non-SEM professionals, 21% ($n = 13/63$) of SEM physicians mentioned chondrotoxic risk in their justification for using a specific LA or not using LA at all, compared to 6% ($n = 9/147$) of non-SEM professionals. This difference is statistically significant ($p = 0.001$).

3.4 | Concentration and volume of local anaesthetics

For those individuals who use lidocaine, 94% ($n = 131$) use volumes between 1–5 mls, and 6% ($n = 8$) use between 6–10 mls. In terms of concentration used, for those who use 1–5 mls, 81% ($n = 106$) of them use 1% lidocaine, 12% ($n = 16$) use 2% lidocaine, and 7% ($n = 9$)

use either 1% or 2% lidocaine. Of those who use 5–10 mls of lidocaine, 63% ($n = 5$) use 1%, 13% ($n = 1$) use 2%, and 25% ($n = 25$) use either 1%–2%.

For individuals using bupivacaine, 54% ($n = 15$) use 1–5 mls and 46% ($n = 13$) use 6–10 mls. Of those that use 1–5 mls, 47% ($n = 7$) use 0.25% and 53% ($n = 8$) use 0.5%. Individuals that use 6–10 mls, 69% ($n = 9$) use 0.25%, 15% ($n = 2$) use 0.5%, 16% ($n = 2$) use 1%–3%. For ropivacaine, either 1% in 5–10 mls is used (33% $n = 1$), or 0.5% in 1–2 mls is used (67% $n = 2$).

4 | DISCUSSION

The key finding of this study is that most participants do use LA when performing intra-articular knee injections, with the vast majority using lidocaine or bupivacaine. To our knowledge, this is the first study to investigate practice of using LA for intra-articular injections among UK SEM and MSK professionals, while taking a focus on awareness of chondrotoxicity risk.

5 | MITIGATING THE POTENTIAL RISK OF LOCAL ANAESTHETICS

Numerous studies have shown that LA causes chondral damage, including one study specifically focussing on the knee joint (Hansen et al., 2007; Matsen & Papadonikolakis, 2013; Noyes et al., 2012).

TABLE 2 The justifications given for preferring a particular LA, or for not using LA, for intra-articular knee injections

Justification of LA use			
Justifications from individuals using lidocaine for intra-articular knee injections ($n = 145$)			
Availability	23% ($n = 34$)	Following local protocol	6% ($n = 9$)
Habit	19% ($n = 28$)	Analgesic effect	4% ($n = 6$)
No justification given	19% ($n = 28$)	Safe	4% ($n = 6$)
Taught to use lidocaine	14% ($n = 20$)	Less chondrotoxic	4% ($n = 6$)
Quick acting	10% ($n = 15$)	Colleagues use lidocaine	2% ($n = 3$)
Cost	8% ($n = 12$)		
Justifications from individuals using bupivacaine for intra-articular knee injections ($n = 32$)			
Long acting	47% ($n = 15$)	Availability	9% ($n = 3$)
Less chondrotoxic	16% ($n = 5$)	Taught to use bupivacaine	6% ($n = 2$)
No justification given	13% ($n = 4$)	Colleagues use bupivacaine	3% ($n = 1$)
Habit	13% ($n = 4$)	Short acting	3% ($n = 1$)
Justifications from individuals using ropivacaine for intra-articular knee injections ($n = 3$)			
Less chondrotoxic	100% ($n = 3$)	Availability	33% ($n = 1$)
Justifications from individuals not using LA for intra-articular knee injections ($n = 39$)			
No justification given	28% ($n = 11$)	LA not required	18% ($n = 7$)
Chondrotoxicity	20% ($n = 8$)	Clinical experience	10% ($n = 4$)
No meaningful, long term benefit	18% ($n = 7$)	LA reduces long term anaesthetic effect of steroid	3% ($n = 1$)

Abbreviation: LA, local anaesthetics.

Recent systematic reviews have found that, although no LA was completely safe, lidocaine and bupivacaine should be avoided as they demonstrate the highest levels of chondrotoxicity, and clinicians should preferably use mepivacaine and ropivacaine (Jayaram et al., 2019; Kreuz et al., 2018). However, most data collected in the studies used had been from in vitro, or in vivo animal studies. While we certainly need better data in human trials, until this data is collected the emerging data on the chondrotoxic risks of LA needs to be acknowledged. Given the additional concern of chondrotoxicity of intra-articular steroid injections, and that LA in combination with steroid may exacerbate chondrotoxic effects, we recommend that intraarticular injections are avoided where possible, with a stronger focus on alternative pain management such as weight loss and physiotherapy (Gupta et al., 2017; Morris et al., 2011; Nilsen et al., 2012).

6 | INCONSISTENT PRACTICE DESPITE AWARENESS OF CHONDROTOXICITY RISK

A higher proportion of SEM physicians were aware of the chondrotoxic risk of LA, yet this had no effect on their use of LA. Also, several individuals mentioned chondrotoxicity risk in their justifications despite using LA with higher chondrotoxic risk. The reasons for these inconsistencies are unclear and need further investigation. This may be due to lack of clarity over which LAs have been shown to be more chondrotoxic, or perhaps clinicians are not altering their practice due to the lack of research in human trials. It may be that most clinicians are used to injecting the more chondrotoxic LAs and habits can be difficult to change, or that more chondrotoxic LAs tend to be stocked (Bayliss et al., 2017).

Changing clinical practice and previous habits has proven to be a difficult process. The lag time between emerging evidence and its impact on practice and behaviours has been demonstrated previously (Breu et al., 2013; NICE, 2014).

7 | SEM PHYSICIANS MORE CAUTIOUS WITH LOCAL ANAESTHETICS USE

The need to optimise non-surgical management options of degenerative joint disease has been highlighted previously and is supported by National Institute for Clinical Excellence guidelines (Green et al., 1980; Yanamadala et al., 2013). Given that osteoarthritic cartilage is more at risk of cytotoxic damage than healthy cartilage, LA for intra-articular joint injections in the management of degenerative joint disease could result in poor long-term outcomes (Syed et al., 2011).

SEM physicians should be leading the way in championing and practicing the best possible conservative management options available (FSEM, 2014). Therefore, we need to ensure SEM physicians are practicing using the most up-to-date, evidence-based

information regarding intra-articular joint injections, and promoting this practice to others.

8 | NEXT STEPS

Clinicians should be educated on the emerging risk associated with LA and chondrotoxicity and the implications for patient's long-term outcomes and informed consent. Furthermore, it is essential for in vivo human studies to be carried out to confirm chondrotoxic effects of intra-articular LA. Changing clinical practice has shown to be more effectively implemented through the creation of guidelines, and this should be considered once we have adequate data from human studies (Law et al., 2015).

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Not applicable.

CONFLICT OF INTERESTS

None.

ETHICS STATEMENT

None.

AUTHOR CONTRIBUTION

Concept: Craig Zalecki. Design: Craig Zalecki, Manoj Sivan. Data collection: Craig Zalecki. Analysis: Craig Zalecki, Dane Vishnubala, Katie Marino. Draft and review of manuscript: Craig Zalecki, Manoj Sivan, Dane Vishnubala, Katie Marino, Camilla Nykjaer.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Creating a Sport and Exercise Medicine Masters syllabus for doctors: a Delphi study

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ABSTRACT

Objective Sport and Exercise Medicine (SEM) Masters curricula vary. This Delphi study is aimed to create a consensus curriculum for doctors undertaking SEM Masters courses.

Methods A modified Delphi survey was used. An expert panel was established of individuals deemed to have adequate knowledge of the field. The research group developed the initial draft of the curriculum by collating and reviewing previously published UK-based postgraduate SEM-related curricula. There were two phases. In phase 1 the expert group either accepted, rejected or modified each learning objective (LO). During phase 2 the expert group were asked to accept or reject each LO that did not get accepted outright previously. The research group analysed the levels of agreements and the comments given by the expert panel after each phase.

Results The expert panel consisted of 45 individuals, with 35 completing phase 2 (78% retention rate). Of the 136 LOs initially collated: 71 (52%) were accepted outright, 60 (44%) were altered in some way and reincluded in phase 2, and 5 (4%) were removed after phase 1. The research group added 2 (1%) new LOs on reflection over comments made by the expert panel. The final curriculum contained 133 LOs, divided into 11 subthemes.

Conclusions The findings will better inform educators when developing SEM Masters curricula and inform students what they should look for when considering an SEM Masters. This consensus curriculum is an important step in standardising postgraduate SEM education.

INTRODUCTION

Sports and Exercise Medicine (SEM) became established as a specialty in 2005 in the UK and this has driven increasing demand for education on its core components.¹ SEM postgraduate education varies throughout the world. Some countries offer postgraduate courses in SEM, such as Masters of Science or Postgraduate Diplomas.² Within the UK, there is currently no consensus on what learning objectives (LOs) should be included within both SEM Masters and Diploma courses. Consequently, students undertaking postgraduate SEM qualifications at different

key messages

What are the new findings

- This Delphi study has produced an up-to-date consensus on what skills and knowledge are expected of an individual with a Masters in Sport and Exercise Medicine (SEM) in the UK.
- Practical skills such as ultrasound, joint and soft tissue injections and compartment pressure testing were deemed too specialised to be included in SEM Masters curricula.
- How to develop and deliver exercise medicine services and musculoskeletal services were also deemed inappropriate to include on SEM Masters curricula.

What is already known

- An important aspect in the ongoing evolution of SEM is ensuring adequate SEM skills and knowledge in individuals working as SEM clinicians.
- There is currently no standardisation of SEM Masters courses in the UK.

universities will develop different skills, leading to less standardisation of clinicians employed in SEM posts.

Increased integration of SEM into the National Health Service (NHS) could provide significant benefits.³ An important aspect for the evolution of SEM in the UK is ensuring the development of SEM curriculum for every level of training. Many SEM jobs in the UK require having an SEM Masters in their eligibility criteria. However, there is limited previous research looking into what a Masters course in SEM should include. A study in 2005 in the UK developed LOs for an ideal SEM Masters course, although how the findings influenced or were implemented into curricula is unknown.² This Delphi study aims to develop an up-to-date consensus on what skills and knowledge are expected of an individual with a Masters in SEM in the UK. This will aid in creating a unified and standardised SEM Masters education by universities

throughout the UK. It will also ensure students can appreciate whether their SEM Masters education has provided the necessary skills and objectives to work as a competent SEM clinician.

This study has focused specifically on what LOs doctors undertaking an SEM Masters should hope to achieve. It should be noted that other healthcare professionals also undertake Masters degrees in SEM, and the LOs for these groups are likely to be different due to their role within the multidisciplinary team.

METHODS

Study design

A modified Delphi survey was used to seek consensus on a postgraduate SEM Masters curriculum for doctors. Expert contributions to the study remained anonymous to the research group, in keeping with the principles of Delphi methodology.⁴

Establishing the research group

The research group included the authors DV, KRM, PB, CN, AP and GF. The research group were selected due to their experience in medical education. DV, CN and AP have experience in the exercise medicine sector. DV and CN have experience in delivering SEM education. DV and KRM have undertaken a Masters in SEM. GF and PB have experience in Delphi methodology. DV and KRM have experience in the education of early career SEM professionals through British Association of Sport and Exercise Medicine (BASEM) and roles within UK Universities. Content decisions were finalised by the research group.

Expert Delphi panel

Experts are defined as individuals with knowledge and experience. For this study, they must have adequate knowledge in postgraduate SEM education.^{5,6} Invitations to express interest in being on the expert panel were emailed to all members of the BASEM and the Faculty of Sport and Exercise Medicine (FSEM) via their mailing lists. In addition, members of the research group shared invitations to submit interest in being on the expert panel via social media.

In their expressions of interest individuals were asked demographic information and questions selected by the research panel to determine eligibility. The following eligibility criteria were used:

- ▶ Doctors that have completed their Foundation Training.
- ▶ Hold a higher qualification in SEM: specifically either an SEM Masters degree or diploma. Alternatively, they could have membership or fellowship of the FSEM (MFSEM/FFSEM)
- ▶ Have been a doctor for more than 5 years
- ▶ Working in the UK at the time of the study.

The research group reviewed the responses and removed those that did not match the eligibility criteria. Regarding the size of the expert panel, a panel size of



Figure 1 Bloom's taxonomy wheel. Level 1 is knowledge, level 6 is evaluation. Image used within rules of license (creative commons attribution—sharealike license). Taken from: <https://www.wylio.com/credits/flickr/4100721032#>.

more than 30 is not considered to improve the quality of the study.^{4,7}

Development of the initial curriculum

The research group developed the initial curriculum draft by collating and combining previously published LOs from UK-based SEM specialty training curriculums and a previous paper exploring the LOs required for an ideal SEM Masters curriculum published in 2006.^{2,8,9} This approach was used to ensure no potential relevant LOs were omitted. The LOs taken from the pre-existing curricula were grouped into suitable themes by the research group using themes previously published. All LOs were reviewed by the research group and edited, if needed, using Bloom's taxonomy wheel (figure 1) to make them suitable for postgraduate level.¹⁰

Procedure

The initial survey to express interest in joining the expert panel was made using Google Forms (Google). Demographic information was obtained through this form. For the Delphi itself, electronic surveys were created using Qualtrics software and a link to it was emailed to all eligible members of the expert panel.¹¹ The participant information sheet was attached to the email, along with contact details of the research group. Consent was gained via a mandatory question given before starting the Delphi. The instructions clearly stated that experts should consider the curriculum to be relevant for doctors undertaking a Masters in SEM, not considering other professions that may also undertake a Masters in SEM.

Engagement from the expert panel is crucial for any Delphi study and the aim was for the response rate to not fall below 70%.¹² Experts were given 12 days to complete each phase of the Delphi. Non-responders after 8 and 10 days received a system-generated reminder. Text reminders were also sent to the expert panel if no response had been received on day 11. Only experts that completed phase 1 of the Delphi were invited to participate in phase 2. The data were collected between October and November 2020.

Phase 1: review of the draft curriculum

During phase 1, panel members reviewed the curriculum and were asked to accept, reject or modify each item. Participants were given the option of providing an anonymous comment after each decision. The percentages of agreement for each LO were calculated and, along with all comments, were read through and discussed by the research group. The response to each LO was discussed regardless of the level of agreement from the expert panel. After the collected data were reviewed, the research group agreed to either accept, reject or alter each LO to create a second version of the proposed curriculum. LOs with levels of agreement above 75% with no comments were accepted. The research group reviewed all comments on LOs that had been accepted and the LOs were amended accordingly and included in phase 2. LOs with levels of agreement below 75% without comments were rejected. For those with comments, these were reviewed by the research group, and where it was felt appropriate a modified LO was added for further review in phase 2.

Phase 2: second review of proposed curriculum (accept or reject)

A link to the second version of the curriculum was sent to all expert panel members that completed phase 1. For this phase, they were only provided with the option to accept or reject each LO. As reported by Keeney *et al*, a consensus was defined by 75% agreement.¹⁵ Previous literature reports varied levels appropriate for consensus, ranging from 70% to 100%.⁶ There was an optional open comments box at the end of each theme for further comments. The LOs accepted outright after phase 1 and did not require further input were included for reference. Again, the percentage of agreement was calculated, the research group reviewed all comments and a consensus was reached to either accept or reject each LO. Phase 2 would be repeated until a final consensus on the syllabus was reached.

RESULTS

The initial proposed curriculum

There were 136 LOs collated from prior SEM syllabi. The research group divided these across 11 distinct themes.

The expert panel

Of the 94 people interested in being on the expert panel, 48% (45/94) met the eligibility criteria. The reasons for non-eligibility included having worked as a doctor for less than 5 years (n=19), not holding an SEM Masters/Diploma/FFSEM/MFSEM (n=17) and not being based in the UK

Table 1 The reasons for alterations to LOs after phase 1

Reasons for alteration	Number of learning objectives (LOs) altered
Spelling and grammar (including re-wording)	44 (32%)
Alteration to Bloom taxonomy level	34 (25%)
Objective made more specific	10 (7%)
Objective made more broad	2 (1%)

The percentage of LOs altered for each reason is also provided.

(n=13). The expert panel consisted of 20 SEM consultants, 4 orthopaedic consultants, 1 rheumatology consultant, 17 general practitioners, 11 SEM registrars and 14 doctors that did not specify their training or job role but did confirm that they had been a doctor for more than 5 years. All the 14 doctors that did not specify their training/job role had completed a SEM MSc or Diploma and 57% had been a doctor for 13 years or more. Twenty-one individuals on the expert panel (47%) had experience teaching SEM Masters and Diploma courses.

Phase 1

In phase 1 of the study there was a 100% (45/45) response rate from the expert panel. Fifty-two per cent (71/136) of the LOs were accepted without the need for alteration, and 44% (60/136) were altered. The reasons for alterations are given in [table 1](#). Thirty LOs were altered for more than one reason. Regarding the alterations made to the Bloom taxonomy level, 44% (n=15) were moved to a higher taxonomy level, 41% (n=14) were moved to a lower taxonomy level and for the final 15% (n=5) the wording was altered but the LO was kept within the same taxonomy level.

Five LOs (4%) were rejected and all were removed due to being deemed too high level for postgraduate SEM Masters. The objectives removed for being too high level are given in [table 2](#), alongside comments given by the expert panel that contributed to the research group deciding on their removal. The first two LOs listed in [table 2](#) regarding developing, leading and delivering exercise medicine services and MSK services received an agreement of 78% and 80%, respectively. Despite being above the approval threshold, the research group discussed these objectives at length, taking on board comments given by the expert panel, and determined these LOs were too high a level for a Masters level.

On reviewing the comments given by the expert panel, the research team added the following two LOs to the proposed curriculum:

1. Discuss a range of common ethical issues in a team sport environment (added to 'sports team and event management' subtheme)
2. Recognise the key medico-legal requirements and considerations in team medicine (added to 'sports team and event management' subtheme).

Table 2 The LOs removed after phase 1 and comments given by the expert panel which contributed to justifying the removal of the LO

Learning objective (LO) removed	Expert panel quotes supporting the removal
1. Develop, lead and deliver both paediatric and adult exercise medicine services	<i>Be able to contribute to the delivery of - Reduce the taxonomy order (Participant 41)</i>
2. Develop, lead and deliver both paediatric and adult musculoskeletal services	<i>Demonstrate awareness of - Not all MSc courses offer the chance for delivery (Participant 39)</i>
3. Perform a targeted ultrasound examination of a peripheral musculoskeletal problem	<i>Does not need to be part of SEM MSc - needs to be a separate course (participant 21) Reject as this is an additional skill that isn't going to be taught as part of MSc (participant 30)</i>
4. Inject a variety of joints and soft tissues with radiological guidance	<i>Does not need to be part of SEM MSc - needs to be a separate course (participant 21) I don't feel this is mandatory for MSc level (participant 42)</i>
5. Perform compartment pressure testing	<i>Not sure this is an essential component- would be done in Secondary Care (participant 33) Reject as advanced skill? beyond this level - know how it is done (participant 28)</i>

SEM, Sport and Exercise Medicine.

These were both added due to comments made by members of the expert panel at the end of the survey when asked if they had any final thoughts. The first was added due to a participant stating: 'I would also add a section on Ethics and how this may impact the SEM physician' (participant 31). The second was added due to a member of the expert panel stating: 'Medico-legal issues in sports' (participant 18). On discussing these within the research group the value of both comments were noted, and it was therefore deemed important to add related LOs.

Phase 2

Of the 45 that completed phase 1, 78% (35/45) of these individuals also completed phase 2. All LOs (100%) were accepted in phase 2 of the study, with all objectives achieving over 85% agreement. No alterations were made to any LOs. Therefore, no further phases were required. The final curriculum consisted of 11 subthemes (outlined in table 3) and 133 LOs. The full version of the final curriculum can be found in the online supplemental information.

DISCUSSION

Summary of findings

An expert panel of 45 (100% of those eligible) completed phase 1 of this modified Delphi study, with 35 also completing phase 2 (78% retention rate). One hundred and thirty-six LOs were reviewed, with five removed during phase 1 after being deemed too high level for an SEM Masters degree. Two additional LOs were added, resulting in a final curriculum of 133 LOs, all of which were accepted by the expert panel during phase 2.

The importance of a standardised SEM Masters curriculum for doctors

Obtaining a high-quality and relevant education in SEM should be a critical goal for all physicians working in SEM.¹⁴ Although there is no specific data on this, anecdotally, the research group is aware that a large proportion of doctors working in the field of Sport and Exercise Medicine are not SEM consultants or on SEM specialty training programmes. For this group, their SEM knowledge and experience will be heavily influenced through the completion of an SEM Masters. It is reasonable to assume physicians will want their SEM Masters to be as relevant as possible to being an SEM physician, particularly given the cost and time-commitment of undertaking a Masters degree.

Table 3 The finalised subthemes and number of learning objectives within each subtheme

Subtheme	Number of objectives in subtheme
1. Physical activity and human health	13
2. Medical issues related to exercise	16
3. Injuries related to SEM	22
4. Basic science in SEM	18
5. Clinical pharmacology	6
6. Antidoping	4
7. Sports team and event management	28
8. Physical activity in challenging environments	1
9. Specific groups in SEM	11
10. Intrinsic skills of an SEM clinician	3
11. Extrinsic skills of an SEM clinician	11
Total	133

As a relatively new specialty SEM is continuing to find its place within the UK healthcare system; many fellow healthcare professionals have limited knowledge of the specialty and the skills SEM physicians possess.^{15,16} As a specialty we need to demonstrate we can stand alongside conventional specialties by being prepared to methodically examine our practice, ensure physicians practising within SEM are sufficiently capable and ensure they are working at a high level consistent throughout the UK.¹⁷ It is becoming increasingly common for SEM posts to include having an SEM Masters in their desirable or essential job criteria. The need to standardise SEM Masters curricula is therefore becoming increasingly important. It will be beneficial to the professionalism of the specialty to ensure individuals working in SEM posts that require an SEM Masters possess similar, consistent skills and knowledge.

Aspects too specialist for SEM Masters level

The expert panel rejected the practical LOs around performing ultrasound, joint and soft tissue injections and compartment pressure testing, with comments implying that they are too high level for SEM Masters courses. Ultrasound imaging is increasingly used in SEM to diagnose and monitor injuries; diagnostic ultrasound has previously been described as the 'sports physicians stethoscope'.¹⁸ A 2017 International Consensus statement outlining a generic syllabus for SEM specialty training includes an 'advanced skill' of 'targeted ultrasound examination of a peripheral musculoskeletal problem'.⁹ How best to provide ultrasound training to SEM clinicians, or a consensus decision as to whether it is needed, remains a controversial issue.¹⁸ The research group anecdotally acknowledges that many SEM clinicians choose to self-fund ultrasound training courses and equipment. The findings of this study indicate that ultrasound training should not be included in SEM Masters' teaching.

LOs focused on developing and delivering exercise medicine services and musculoskeletal services were also not deemed appropriate to include in this curriculum, with several expert panel members commenting on issues with SEM Masters including these LOs. The research group discussed these objectives at length and deemed that these objectives would be more suitable for SEM consultant level or specialist SEM trainees. FSEM have created resources to aid SEM doctors in setting up SEM clinics and services, such as 'Sport and Exercise Medicine: A Fresh Approach in Practice' published in 2014.¹⁹ Interestingly, the 2017 International Consensus syllabus for SEM specialist training does not include learning how to set up an SEM service, nor does the most recent UK SEM specialist training programme curriculum.^{8,9} With increasing interest in how SEM can best be integrated into the NHS given the benefits SEM services can provide, it would be of great interest for further research be done to determine how the SEM specialty can most effectively increase the number of SEM services offered in the UK.³

Catering to all SEM Masters students

Doctors at any stage in training can undertake a Masters in SEM, and doctors at different stages in training may require different outcomes from a Masters course. It is also important to acknowledge that other healthcare professionals undertake an SEM Masters degree, such as physiotherapists, osteopaths and sports therapists. While there will be overlap, the outcomes these professionals wish to achieve from an SEM Masters are likely to be different to the LOs for doctors. Future research may consider exploring an appropriate SEM Masters curriculum for other healthcare professionals; it would be interesting to compare and contrast these with this curriculum.

Strengths

A modified Delphi was conducted thoroughly, following the appropriate methodology.⁴ The expert panel consisted of highly qualified individuals from relevant professional backgrounds. A high level of engagement and response rate was achieved. Many, often detailed, comments were received from expert panel members to justify responses. The research group contains individuals with a wide range in level of training. A high level of acceptance was achieved for each of the LOs included in the final curriculum. As no repeats to phase 1 or phase 2 were required, there were only two rounds of the Delphi before the finalised curriculum being created. Less than three rounds are recommended to reduce participation fatigue.^{13,20,21}

Limitations

Although demographic data was removed, due to the nature of the questions asked to deem eligibility criteria, the research group may have been able to deduce who expert panel members were, resulting in bias. In addition, despite Masters degrees being primarily academic degrees, the only mention of research in the final proposed curriculum is in one LO listing research as a skill commonly used in practice by SEM physicians that the learner should be able to demonstrate. This is likely due to vocational-based curriculums being used to create the initial proposed list of LOs developed by the research group. It may be appropriate for educators creating curricula for SEM Masters to consider including additional research-related LOs. Given the nature of a Delphi study, the study is limited by the research group members and expert panel. The study methodology is by design opinion-based and open to researcher and participant bias. In addition, it would have been beneficial to know the specific training/job role of the 14 doctors on the expert panel that did not provide this information. However, all of these doctors had an MSc or Diploma in SEM and had all been a doctor for 5 years or more, with the majority having been a doctor for over 10 years.

CONCLUSION

The findings of this study will better inform educators involved in developing SEM Masters curricula, and inform students as to what they should look for when considering undertaking a Masters in SEM. This consensus curriculum is an important step in the standardisation of postgraduate SEM education. The next step will be to ascertain views of the finalised consensus curriculum from individuals involved in delivering, teaching and examining SEM masters content in the UK.

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Syllabus for doctors on Postgraduate SEM Masters courses

1. Physical Activity and Human Health	
	Demonstrate an understanding of the role of physical activity in the prevention and treatment of common long-term health conditions
	Advise on and promote population health through physical activity
	Make use of physical activity guidelines and recommendations in practice
	Analyse current UK screening programmes to promote health
	Analyse key national and international physical activity resources available to patients and clinicians
	Discuss how to overcome the following barriers to physical activity: environmental, social, physical, cultural, religious and psychological
	Demonstrate the ability to prescribe physical activity in healthy individuals and also individuals with disease
	Critically apply physical activity guidelines in both the prevention and management of chronic disease
	Design a physical activity programme for a variety of special populations (e.g. older adults, pregnancy, disability, children)
	Analyse and overcome factors that may impact physical activity prescribing
	Recognise the importance of communicating the physical activity message beyond the individual
	Demonstrate an understanding of public health policy development and implementation in relation to physical activity and health
	Understand and promote integrated sport and physical activity opportunities for school aged children and adolescents in order to promote a lifelong relationship with physical activity
2. Medical Issues Related to Exercise	
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Neurological conditions
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Respiratory conditions including: Asthma - Chronic Obstructive Pulmonary Disease - Exercise Induced Laryngeal Obstruction - Exercise Induced Bronchospasm
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common infectious diseases
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Cardiovascular conditions including: HOCM and other cardiomyopathies – Structural abnormalities – Arrhythmias – Valvular disease – Hypercholesterolaemia – Hypertension – Ischaemic heart disease - Heart failure - Inherited channelopathies - Congenital disease
	Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common gastrointestinal conditions

Syllabus for doctors on Postgraduate SEM Masters courses

Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common renal and urogenital conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Metabolic conditions including: Diabetes – Thyroid disease – Obesity
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common ENT conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common immunological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common haematological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Common dermatological conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Rheumatological conditions including: Inflammatory and seronegative arthritis, Osteoarthritis, Fibromyalgia and chronic pain, Connective tissue disorders, Hypermobility syndromes, Osteoporosis
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Psychological and mental health conditions including: Eating and body perception disorders in the developing athlete - Anxiety - Depression – Stress - Trauma
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Adult musculoskeletal conditions including: Acute pain - Acute musculoskeletal conditions - Chronic pain - Chronic musculoskeletal conditions
Discuss aspects of the following including aetiology, epidemiology, clinical features, investigation, management and prognosis in relation to physical activity: Paediatric musculoskeletal conditions including: Fractures - Ligamentous injuries and complications - Apophyseal injuries -

Syllabus for doctors on Postgraduate SEM Masters courses

	Overuse injuries - Growth plate stress - Osteochondritis dissecans - Snapping hip - Shoulder instability - Patella instability - SUFE - Perthes - Scoliosis - Talipes - Flexible pes planus - Chest wall deformities - Timings of growth plate closure
	Demonstrate the ability to deliver age appropriate injury rehabilitation programmes illustrating understanding of the biomechanical principles underpinning the individuals' chosen activity
3. Injuries Related to SEM	
	Apply the principles of prevention, diagnosis, and treatment of injuries related to sports and physical activity
	Analyse management plans for optimal treatment of patients across the spectrum of musculoskeletal problems in accordance with latest guidelines and best practice, and involving other allied health professionals where appropriate
	Apply knowledge of the pathophysiology of tissue injury and subsequent clinical symptoms and presentations of musculoskeletal disease to the management and rehabilitations of a range of common presentations
	Analyse the evidence-based management of common head and neck injuries
	Analyse the evidence-based management of common upper limb injuries
	Analyse the evidence-based management of common trunk, abdominal and thoracic spinal injuries
	Analyse the evidence-based management of common lumbar spine and pelvic injuries
	Analyse the evidence-based management of common lower limb injuries including: Tendinopathies - Ligament injuries - Avulsion injuries - Dislocation - Fracture management Other common soft tissue injuries
	Recognise red flags which may indicate malignancy or infection
	Interpret the findings of radiological and other relevant investigations to determine differential diagnoses
	Apply the principles of biomechanics to different sporting and physical activities and in the context of injury
	Recognise the role of physical activity in rehabilitation
	Devise a rehabilitation programme in relation to common sports injuries
	Analyse the role of surgery in the management of common sports injuries
	Analyse rehabilitation progression and return to activity factors when managing common musculoskeletal conditions
	Be able to interpret human movement analysis - basic kinematics and kinetics
	Explain the role of biomechanical analysis of sport specific techniques in the management of sports related injuries
	Analyse the effects of variations in biomechanics and the influence of posture on common musculoskeletal presentations
	Analyse the role of orthotics in the management of common sports injuries
	Recognise the role of splinting, bracing and taping techniques
	Apply an understanding of level 3 safeguarding knowledge to a range of hypothetical or retrospective cases
	Discuss the relevance of common radiological investigations including the suitability of each modality for a range of contexts
4. Basic Science in SEM	
	Analyse the principles of exercise physiology including: types of physical activity, effects of physical activity and maximising adaptations to sport and physical activity

Syllabus for doctors on Postgraduate SEM Masters courses

Discuss the principles of body morphology in the context of sport and physical activity
Apply the key principles of sports psychology to sport and physical activity
Analyse the impact of common diseases and medications on normal exercise physiology
Describe clinically relevant regional anatomy including normal variations
Describe the anatomy of joints and musculo-tendinous units
Describe the characteristics of bone, tendon, ligament, articular cartilage and muscle
Apply anatomical knowledge to history taking, physical examination and imaging
Describe cellular metabolism and biomechanical pathways of energy production
Apply the principles of strength and conditioning to formulate a basic plan
Undertake appropriate assessments of fitness
Discuss energy release from various sources including fats, carbohydrates, proteins
Discuss physiological responses and adaptations to exercise
Discuss the role of genetics in sport and physical activity
Discuss the role of macro and micronutrients
Discuss the key principles of hydration in sport and physical activity
Discuss the benefits and risks of nutritional supplements in sport and physical activity
Discuss the effects of alcohol on performance
5. Clinical Pharmacology
Discuss the issues of medication abuse in elite athletes
Discuss the influence of medications used in the treatment of disease on physical activity capacity
Discuss medication and exercise interactions which may cause or worsen disease
Prescribe safely by considering, contraindications, side effects, drug interactions and dosage of commonly used drugs in sport and physical activity
Discuss the regulations regarding travelling with medicines
Discuss the governance of medicine storage and management systems
6. Antidoping
Apply knowledge of the WADA prohibited list in both practice and hypothetical scenarios
Understand the WADA therapeutic use exemption process
Detail the consequences of doping: health risks, sanctions and responsibilities
Recognise suitable resources and tools to support athletes and clinicians regarding medications and anti-doping
7. Sports Team and Event Management
Describe the roles of the SEM physician in the team environment
Describe the features of good team dynamics
Describe the role of the main organisations of sport, sports medicine and health promotion at a national and international level
Discuss the relevant medical codes on the ethical treatment of athletes (e.g. Olympic code, FSEM code)
Analyse the components and processes of pre-participation screening for athletes and event participants
Discuss the key components of preseason and pre event medical organisation
Analyse the recognition and management of disordered eating and RED-S

Syllabus for doctors on Postgraduate SEM Masters courses

Discuss the equipment, medical supplies and facilities required for team and event care
Perform risk assessments of training and competition venues
Discuss common match and event day medical issues
Demonstrate the on-field assessment and management of sports injuries and medical conditions
Discuss the psychological aspects of motivation, arousal and performance
Discuss a range of common ethical issues in a team sport environment
Recognise the key medicolegal requirements and considerations in team medicine
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Cardiorespiratory arrest
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Sudden death in sport, both cardiac and traumatic causes
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Concussion and head injury
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Acute musculoskeletal and soft tissue injuries
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Basic management of fracture and dislocations
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
The acutely unwell patient
Discuss aspects including aetiology, epidemiology, clinical features, investigation, management and prognosis of the following in relation to sport and physical activity:
Eye and ENT emergencies
Apply the principles of pre-hospital care to a range of common sport and physical activity emergencies
Demonstrate simple skin closure and suturing and have an awareness of the indications for each
Demonstrate basic airway management and deliver effective resuscitation
Demonstrate defibrillation and cardiorespiratory resuscitation
Advise on screening programmes to detect those at risk of sudden death in sport

Syllabus for doctors on Postgraduate SEM Masters courses

	Discuss the findings of any abnormalities raised during screening with athletes, family members and carers
	Demonstrate prompt assessment of the acutely deteriorating patient, including those who are shocked or unconscious, and deliver appropriate, evidence-based care
8. Physical Activity in Challenging Environments	
	Be able to manage common issues in SEM relating to physical activity in extreme environments including: cold environments, hot environments and altitude (
9. Specific Groups in SEM	
	Be able to manage issues in SEM relating to specific groups of athletes in sport including: paediatric, female, ageing, adventure sports and athletes with a disability
	Apply the effects of the ageing process when providing physical activity advice
	Apply knowledge of the physiological changes during and after pregnancy when providing physical activity advice to pregnant and post-partum individuals
	Demonstrate the ability to advise women on undertaking safe exercise throughout the lifespan including advising on energy balance, bone health and hormonal influences
	Discuss the management of common issues affecting disabled athletes and exercisers in relation to sports and physical activity
	Discuss physical problems experienced by amputees and wheelchair users with everyday living and with respect to sport
	Discuss contraception options in athletes
	Demonstrates an awareness of the unique needs of patients with disabilities, the barriers faced in participating in physical exercise and the ability to advise those with disabilities how to undertake safe exercise
	Understanding the social, psychological religious and cultural factors that influence physical activity participation and demonstrate initiatives to overcome these
	Demonstrates knowledge of the anatomical, physiological, psychosocial, sexual and educational development of children and adolescents in the management of musculoskeletal conditions
	Demonstrates knowledge of the aspects that enhance care during the transition and transfer between paediatric and adult services across healthcare
10. Intrinsic Skills of a SEM Clinician	
	Demonstrate the following skills commonly used in practice by SEM physicians: Communication - Collaboration - Leadership and management - Health advocacy - Safety - Research - Teaching - Learning - Professionalism -Consideration of ethics, cultural religious and LGBTQ awareness
	Demonstrate the ability to work within a multidisciplinary team
	Demonstrate the need to coordinate care across multiple agencies to address physical, psychological and social needs in community, secondary care, recreational and elite sporting environments
11. Extrinsic Skills of a SEM Clinician	
	Perform a comprehensive examination of the musculoskeletal and neurological systems and interpret the findings sufficiently to develop a clinically reasoned diagnosis and management plan
	Perform a sport-specific medical and musculoskeletal screening examination

Syllabus for doctors on Postgraduate SEM Masters courses

Provide safe and effective immediate medical care for on-field injuries and medical events
Perform concussion screening examinations, baseline and postinjury, and interpret the results
Recognise the indications of a range of radiological and other investigations relating to sport and physical activity
Analyse ECG findings in an athlete and recognise the indications for onward referral
Discuss the indications, benefits and risks of a variety of common joint and soft tissue injections
Have an understanding of the role of a range of commonly used protective braces
Recognise the indications for taping joints, tendons and muscles and its role in injury prevention and treatment
Interpret simple video analysis of a variety of sporting skills including running gait
Analyse the indications for and findings of resting and exercise lung function tests



Article

UK Doctors Delivering Physical Activity Advice: What Are the Challenges and Possible Solutions? A Qualitative Study

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Abstract: Despite strategies to enable Health Care Professionals (HCPs) to give physical activity (PA) advice to patients, this appears to be rarely done in consultations. The aims of the present study were to gain an understanding of doctors' awareness of current PA guidelines and to explore their opinions on barriers and solutions. A qualitative approach using semi-structured interviews was adopted. This study included 15 doctors currently working in the UK's National Health Service (NHS). A thematic analysis approach was used to analyse the transcripts. Four themes and twelve sub-themes were deciphered. Intrinsic factors limiting the delivery of PA advice included a lack of knowledge of PA guidelines and PA being an afterthought. Barriers to delivering PA guidance included a lack of PA education, time pressures, and patient engagement. Solutions included staff training, incorporating PA into undergraduate training, and encouraging staff to be physically active. Methods to optimise PA guidance included individualised PA advice, local exercise services and schemes, utilising online and visual resources, and motivational interviewing. This study provides an updated insight into doctors' opinions on barriers and solutions to discussing PA with patients. It is clear that further work is needed to ensure greater awareness of PA guidelines amongst clinicians.

Keywords: physical activity; adults; medical education

1. Introduction

Despite significant evidence that physical activity (PA) has numerous benefits on physical and mental health and well-being, levels of physical inactivity are increasing [1,2]. In the United Kingdom (UK), the Chief Medical Officer (CMO) recommends that adults aged 19–64 years should complete at least 150 min of moderate activity, or 75 min of vigorous activity, each week, as well as muscle-strengthening activities at least twice per week [3]. Despite the well-documented benefits of PA, most adults globally fail to reach these recommendations [2]. According to the most recent Active Lives Adult Survey, between November 2020 and 2021 in the UK, 61% of adults were receiving at least 150 min of PA per week, with 27% classed as inactive, meaning they engaged in less than 30 min of moderate PA per week [4]. In recent years, physical inactivity and sedentary behaviour have been under increased focus as they have been found to be independent risk factors for mortality and non-communicable diseases [5,6]. With the COVID-19 pandemic and subsequent lockdowns, researchers have found that PA levels in the UK have decreased

further, associated with reduced physical function and increased mental ill-health [7,8]. It is, therefore, of increasing importance to optimise strategies to increase engagement with PA.

The UK CMO highlighted the importance of healthcare professionals (HCPs) in promoting PA to patients in their updated guidance released in 2019 [3]. There have been schemes to engage HCPs in discussing PA with patients, such as Make Every Contact Count (MECC), which aims to improve confident discussions of PA with patients through HCP training [9]. Despite this, a recent study of 839 UK-based GPs found that only 36% were “somewhat familiar” with the PA guidelines [10].

The aims of the present study were to gain an updated, in-depth understanding of doctors’ awareness of current PA guidelines and explore their opinions of any potential barriers and solutions for doctors engaging in PA discussions with their patients.

2. Materials and Methods

2.1. Design

A qualitative approach was taken, utilising semi-structured interviews [11]. Ethics approval was given by the Faculty of Biological Sciences at the University of Leeds (27 July 2020/BIOSCI 19-039).

2.2. Participants and Procedures

The inclusion criteria for this study included UK-based doctors currently working in the National Health Service (NHS), including doctors working in hospitals and primary care. Participants were excluded from the study if their medical degree was not from a UK University or if they were currently not practising medicine. The participant recruitment process for this study involved advertising through a range of channels, including social media (Twitter and LinkedIn) and by word of mouth. Recruitment was aimed at clinicians who are patient-facing but working across primary and secondary care. This was intentionally broad to reflect the opinions of all those participants who would normally be expected to provide PA guidance. Guidance on PA concerns almost all clinicians working within healthcare. Participants that expressed interest in these channels were sent a copy of the participant information sheet and consent forms, which were signed electronically and returned. Participants were contacted to arrange an interview either in person or online via Zoom. At the start of each interview, participants confirmed they had read the participant information sheet and gave verbal consent to be included in the study. Recruitment and interviews continued until data saturation was reached; this is the point at which no new emerging themes were identified [12].

2.3. Data Collection

Data were collected using semi-structured interviews to gather in-depth and informative responses [13]. This interview method was chosen as the research design as it enabled the interviewer to clarify statements and enquire about further information [11]. The interview guide contained 20 questions and is provided in the Appendix A. The questions promoted open dialogue between the interviewer and participant to elicit maximal information [13], and probing was used when appropriate if initial responses were limited [14]. The last question of the interview enquired whether the participants had any other comments to make to allow for new information and ideas [15]. Several questions were specifically included in the interview to gain an understanding of the participant’s awareness of PA guidelines, including asking if they meet the current UK guidelines for PA themselves, awareness of the PA guidelines, awareness of the CMO PA guidance and awareness of the Moving Medicine resource, an online PA resource for HCPs (<https://movingmedicine.ac.uk/>).

DV, AI, RB, and SW were all involved in data collection. DV provided training to AI, RB, and SW and observed one interview per interviewer to ensure consistency. Interviews were conducted via Zoom between March 2021 and May 2021; only audio was recorded for all interviews. Any identifiable information on the recordings was removed. It was made

clear that data would remain anonymous and confidential, and participation was entirely optional. Participants were informed that they could withdraw from the interview at any stage. Unique codes were used throughout the study to preserve participants' identities. Recordings were transcribed verbatim.

2.4. Data Analysis

Thematic analysis was used to analyse the transcripts [16], which enables a rich and detailed account of the data to be obtained [17]. The six-step process is used to extract meaning and concepts from data to identify patterns and ultimately generate themes [18]. Refinements to the themes and subthemes continued until nothing substantial was added. A recursive process was used in the analysis, moving back and forth between transcripts and themes as needed [16]. Themes were reviewed regularly until there was a distinct and coherent meaning for each. Transcripts were analysed by KM and DV separately. A reflective journal was utilised to evidence the extent to which thoughts and observations were data-driven and without researcher influence, in turn reducing the likelihood of researcher bias. Together, themes and sub-themes were discussed and agreed upon. NVIVO 11 software was utilised to manage extracts from the interviews and illustrate themes. Example quotes from transcripts were presented in tables for each theme and sub-theme. Signs of data saturation were first seen at 10 participants, and no new themes were identified following participants 12 to 15, signifying complete data saturation and that enough information was gained to ensure repeatability [19]. Microsoft Excel was used to collate and summarise qualitative data, which included demographic information of participants (years of experience, current primary healthcare setting, job role and location of work), and frequencies and proportions of responses to questions asked about participant understanding and awareness of PA guidelines.

3. Results

3.1. Participant Characteristics

Fifteen participants expressed interest in participating in the study. As all were eligible, a total of 15 participants were included in the study. Interviews varied in length between 20 min and 45 min, with an average of 29 min. Data saturation was reached at participant 15; at this point, no more emerging themes or new responses were found. Due to data saturation being reached, no further participants were recruited.

Participant characteristics can be found in Table 1 below. The majority of participants (73%) had 6–10 years of experience working as a doctor. The job role of participants varied widely across different specialities, from foundation year 1 doctors to qualified General Practitioners and one Sport and Exercise Medicine Consultant. The majority of participants were located in either northwest England (60%) or Yorkshire and Humber (27%). While the majority of participants were physically active and meeting the CMO PA guidelines (80%), only 27% of participants were aware of the CMO PA Guidelines, and only 33% were aware of Moving Medicine as a resource.

Table 1. Participant characteristics.

Characteristic	Category	N (%)
Years of experience	0–5	3 (20%)
	6–10	11 (73%)
	15+	1 (7%)
Current primary healthcare setting	Inpatients	4 (27%)
	Outpatients	2 (13%)
	Inpatients and outpatients	2 (13%)
	Primary Care	6 (40%)
	Academic or leadership role	1 (7%)

Table 1. Cont.

Characteristic	Category	N (%)
Job role	Foundation Year 1	3 (20%)
	Medical Registrar	1 (7%)
	Psychiatry Registrar	1 (7%)
	Paediatric registrar	1 (7%)
	General Practitioner registrar	3 (20%)
	Qualified General Practitioner	3 (20%)
	SEM registrar	2 (13%)
	SEM Consultant	1 (7%)
UK region	West Midlands	0
	East Midlands	1 (7%)
	Yorkshire and Humber	4 (27%)
Meeting CMO's PA guidelines for aerobic exercise	Northwest	9 (60%)
	London	1 (7%)
Meeting CMO's PA guidelines for aerobic exercise	Yes	12 (80%)
	No	3 (20%)
Aware of CMO's PA guidelines	Yes	4 (27%)
	No	11 (73%)
Aware of Moving Medicine	Yes	5 (33%)
	No	9 (67%)

CMO, Chief Medical Officer; N, number; PA, physical activity; SEM, sport and exercise medicine; UK, United Kingdom.

3.2. Themes and Sub-Themes

A total of 122 codes were generated from the 15 transcripts. Connections between these codes were found to coalesce into 4 themes and 12 sub-themes, summarised in Table 2. Themes and subthemes are listed in order of when they were deciphered from the data; the order does not signify importance. Next to the participant quote is the assigned identification number for the participant in brackets.

Table 2. Themes and sub-themes.

Theme	Sub-Themes
Intrinsic factors limiting delivery of PA advice	Lack of knowledge of PA guidelines PA is often an afterthought
Barriers to delivering PA guidance	Lack of PA education Time pressures Patient engagement
Solutions to increase staff awareness and successful implementation of PA guidelines	Staff training Incorporating PA into undergraduate training Encouraging staff to be active themselves
Methods to optimise PA advice	Individualised PA advice Local exercise services and schemes Utilising online & visual resources

3.3. Theme 1—Intrinsic Factors Limiting Delivery of PA Advice

3.3.1. Lack of Knowledge of PA Guidelines

A lack of knowledge and awareness of the PA guidelines was mentioned in the majority of interviews. There was a broad lack of awareness of PA guidelines amongst the interviewees. Similar comments were made by several interviewees when asked about their knowledge of PA, with one stating: 'I wouldn't say I [I am] confident to be honest' (2) and another commenting: 'I think I've looked at them many years ago, but they don't come to mind particularly often' (6). Going a step beyond the knowledge of PA guidelines to giving advice and prescribing exercise, one interviewee stated: 'I feel confident in prescribing medication. I feel less confident in giving exercise advice' (15).

3.3.2. PA Is Often an Afterthought

Many interviewees emphasised that PA is often not a top priority for medical professionals during consultations, with one interviewee stating: 'It's tricky because it's often not the top thing that you talk about' (11). Several interviewees asserted that it would be advantageous to incorporate PA into the taught consultation structure: 'If it becomes part of our natural history taking and we're looking at them as a whole ... you could then capture a lot of factors that can then change in the future' (14).

3.4. Theme 2—Barriers to Delivering PA Guidance

3.4.1. Lack of PA Education

A lack of PA education during undergraduate and postgraduate training was highlighted during the interviews. One interviewee stated when asked if they had received any PA education: 'Nothing formal from my recollection' (9), and another stated 'I wouldn't say I received formal education with regards to delivering physical activity advice. It's been a more informal and implicit kind of education mostly during my time on placement during medical school' (1). Another interviewee added to this: 'a lot of it does stem from the neglect from medical school regarding physical activity teaching' (3).

3.4.2. Time Pressures

Time constraints were mentioned in most interviews and by all those working in primary care settings. Regarding giving PA advice in practice, one interviewee said: 'with their time constraints of a GP 10 min consultations you're less likely to achieve it' (5). Another added a similar comment: 'I know GPs are hard-pressed; they've got so much pressure to deal with so many issues coming in within 10 min. That is just not possible to give effective PA advice that patients can take in and understand' (2). However, several interviewees did express altering views, with one interviewee stating: 'it doesn't take that much time to add [physical activity] into what you're speaking about' (4).

3.4.3. Patient Engagement

It was mentioned in multiple interviews that the patients themselves, understandably, play a large role in whether PA advice will be successful in creating behavioural change. One interviewee explained: 'It's very patient-dependent. He wants to lose weight and he's keen to get [PA advice] it's easier to talk to them' (12). Self-motivation was highlighted as an important factor, with the same interviewee stating: 'it's more like empowering them to do it themselves as well' (12). Another added: 'If they're not ready to engage, there's no point in me saying "you should run half an hour, five times a week" because they're just going to go on deaf ears and I'm going to lose that rapport with them' (15).

3.5. Theme 3—Solutions to Increasing Staff Awareness and Successful Implementation of PA Guidelines

3.5.1. Staff Training

Increased education and teaching of PA for medical staff was a common theme throughout the transcripts. One interviewee stated: 'I think a baseline would be useful for us all because it's so beneficial and pretty much for every single patient, especially with chronic disease' (8). Regarding staff training, the importance of including up-to-date research and statistics in PA education was mentioned by interviewees, with one stating: 'have those comparison tables, comparison charts that show statistics even if the number needed to treat' (4). Another interviewee commented: 'obviously evidence-based medicine is such an important part of delivering safe and high-quality patient care' (1), and another added: 'if you empower them, give them the knowledge that it is not just 'oh it might be useful' but actually clinically it's been shown the evidence is there and the evidence is strong' (5).

3.5.2. Incorporating PA into Undergraduate Training

Incorporating more PA into undergraduate curricula was mentioned by many interviewees as a method of increasing knowledge among medical professionals. One interviewee stated: 'I think that's really important to do, yes 100%' (12). Another interviewee commented: 'it needs to be better integrated within medical school and linking it in towards the earlier years of your career as well because that's where you start developing your practice in action' (1).

3.5.3. Encouraging Staff to Be Active Themselves

The concept of encouraging staff to be physically active was mentioned by several interviewees, with one commenting: 'I suppose if you're more active yourself, it's probably easier to give tailored advice to people who live in the same city as you' (4). Another interviewee stated: 'it's a case of practice what you preach' (5).

3.6. Theme 4—Methods to Optimise PA Advice

3.6.1. Individualised PA Advice

Ensuring that PA advice is targeted individually was mentioned numerous times throughout the interviews, highlighting that it is beneficial to have a good knowledge and understanding of the person you are pitching the PA advice to. One interviewee stated: 'you have to know your patient and know how best to pitch the idea to them' (12). Another stated: 'I think finding out what they're interested in, some people prefer different forms of exercise' (14), and they added 'if you can work it into their daily routine, walk to school rather than drive to school sort of things can really make a difference in terms of like the whole family exercise' (14). Motivational interviewing was highlighted as an important aspect of optimising PA advice. One interviewee stated: 'I think having that motivational interviewing approach to the consultation has helped, I think bearing in mind physical activity when talking about different chronic or acute health conditions has helped, again, patient-led' (7). Another interviewee commented on how they have personally found motivational interviewing to be effective: 'I usually use now some motivational interviewing approach, starting with assessing via open questions, what they do at the moment, what they know about the possible benefits of exercise, whether they've contemplated—where they are on the state of change sequence from that point of view' (10).

3.6.2. Local Exercise Services and Schemes

Local exercise services, such as referring to an exercise programme, and schemes such as the couch-to-5k, were highlighted by several interviewees as useful methods to encourage patients to increase their PA levels. One interviewee said: 'people seem to really like that flexibility around it' (15). Another interviewee gave a specific example: 'one of them is a local football team and they've set up half-term fitness regimes and places that kids can go and learn about diet and exercise, so I have referred to them a couple of times' (14).

3.6.3. Utilising Online and Visual Resources

The use of visual and online resources was highlighted, with one interviewee stating: 'I like to give outpatient leaflets, especially if they've got an arthritic issue, for example, that has exercises on there that they can use' (15), and adding to this 'in recent time, you can text people with the website, so I'll text them with the website for the NHS and their guidance about a healthy lifestyle' (15). Another interviewee stated: 'I know there are resources online, where they have information for each chronic condition . . . I know there is specific kind of guidance of how to go about giving physical activity education to patients in those areas' (1).

Moving Medicine (an online PA resource for HCPs) was mentioned specifically by several of the interviewees, with one stating about the moving medicine website: 'I just have a flick-through on the conditions and then I can either print it out or just made a note on it and then relay that information to the patients' (1). However, only 33% (5/15) of

participants were aware of this resource, and no participants described using it regularly. Reasons for this were described as due to setting and lack of time or familiarity. In contrast, a few interviewees commented on the difficulties of finding the appropriate online or visual resources, with one stating: 'obviously there are some available but finding the right ones is usually quite tricky' (3). Only four participants (27%) were familiar with the UK CMO PA guidelines, and participants from either those aware or not aware felt that resources needed more promotion, as most HCPs would not be aware of them.

4. Discussion

The aims of this study were to explore the understanding of doctors in the UK of the PA guidelines and barriers and solutions to engaging in discussions on PA with patients. Thoughts and opinions were obtained from doctors in England in a variety of different specialties and at a variety of stages in training. This study found that some issues related to delivering PA advice include a lack of knowledge of the PA guidelines, a lack of priority for giving PA advice, time pressures, and patient engagement. Solutions given included staff training on PA, incorporating PA into the undergraduate curriculum, encouraging staff themselves to be active, providing individualised advice, utilising local exercise services and online or visual resources, and using motivational interviewing to facilitate the advice being given.

4.1. Improving Knowledge, Confidence, and the Priority Given to Providing PA Advice

Improving inactivity levels in society is a complex and multifactorial issue, demonstrated well by the fact that limited solutions have been developed to combat the rise in physical inactivity despite extensive evidence of the benefits of being active for health and quality of life. The findings of this study are in line with previous papers highlighting the lack of knowledge and confidence of HCPs in giving PA to patients [10,20–22]. Indeed, 10% of junior doctors felt they had been adequately trained in PA [23]. Improving this could lead to PA being discussed during more consultations. Indeed, improved training and education for doctors were highlighted as solutions from the findings of this research.

This study found that PA being an afterthought and not a priority is a reason why it may not be mentioned during consultations. A similar finding of lack of priority to PA advice during consultations was found amongst physiotherapists [22]. Interestingly, one study found that 98.9% of GPs believe that PA is important for health [10]. Therefore, while the benefits are well acknowledged by doctors, it continues to not be thought of as a priority during consultations. Potentially, this is due to PA not being highlighted throughout training as an important aspect to consider. It has been suggested that PA levels be considered a vital sign [24] and, given the wide-ranging impacts of PA on health, it would be prudent for discussion regarding PA to be taught at an early stage of medical training when students are developing and consolidating consultation skills and evaluating vital signs. This may help PA discussions become a natural part of consultations for doctors of the future. The findings of this study, therefore, support previous calls for PA to be better embedded into the training of medical staff and into undergraduate curricula [25,26]. Currently, in the UK, the medical curriculum, which is published by the General Medical Council and forms the framework for all UK medical schools, gives little priority to PA. In fact, there is only one outcome related to PA, and that is within the context of weight loss only [27]. Including PA in curricula at an early stage and throughout training may increase the priority given to discussing PA during consultations. The Office of Health Improvement and Disparities (OHID) currently runs the moving HCPs programme, which is a whole system educational approach to embedding PA into clinical practice [28].

4.2. Encouraging a More Physically Active Workforce

Encouraging doctors to be active as a way of encouraging the promotion of PA to patients is an interesting concept and finding of this study. However, this is not a novel concept, with a range of global research suggesting that doctors who are active are more

likely to give physical activity advice to their patients [29–31]. A study performed in Glasgow in 2019 found that 63.9% of 332 doctors met the recommended volume of aerobic activity, while only 23.5% achieved the recommended account of muscle-strengthening activities [21]. They concluded that their results indicated doctors are as active as the UK general public. Another recent study found that 58% of 245 UK doctors met the PA guidelines, again concluding no significant difference from levels in the general population [31]. Clearly, encouraging medical staff to be active is valuable in promoting health among the staff themselves and the individual benefits they will gain from this and in ensuring a healthy workforce. Previously there have been calls for the NHS to better encourage, support, and facilitate staff to engage in PA [31]. The moral debate of whether doctors need to, or should be, role models for patients regarding health behaviours [32] is beyond the scope of this article. However, the findings of this study support the concept that promoting PA among HCPs might result in PA being discussed more often with patients [33].

4.3. Utilising Resources

Time pressures are an issue throughout healthcare and have been highlighted numerous times throughout the literature as a reason why PA is not discussed with patients by HCPs [20,25,34,35]. This is supported by the findings of this study. A solution to this may be optimising the way in which PA can be delivered. Referring to local supported exercise services was highlighted during the interviews.

Utilising online and visual aids to promote PA to patients was also highlighted as a potential solution. Signposting to useful resources may also aid with the issue of having limited time during consultations. In addition, this study found that ensuring PA guidance is individualised is beneficial in optimising the PA advice given. With regard to online and visual aids, the importance of ensuring that they are specific for individual patients has been noted in recent years, with resources such as the CMO's PA guidance and Moving Medicine (an online aid for providing PA advice to patients) having targeted advice for specific population groups such as age groups and different chronic health conditions [36]. It should be kept in mind that resources that are online may perpetuate inequalities, as patients without the socioeconomic capacity to purchase technology or digital literacy may not be able to easily access these resources.

4.4. Limitations and Strengths

There is a risk of participant bias, as those who are more interested in PA may have been more likely to volunteer. However, based on the backgrounds of the doctors interviewed, the research team remained confident that the majority of participants were doctors without a specific PA interest or expertise. Most participants were based in Yorkshire and Humber and northwest England, and it would have been advantageous to gain a broader view from doctors based in other locations in the UK. There is potential for researcher bias and the reliability of interpretations of the interview data, although Braun and Clarke's six steps were used to reduce this. The data were also analysed independently by DV and KM, and the themes were discussed to reduce the potential for bias. Strengths of this research included in-depth qualitative accounts from doctors about the issues and challenges they faced when promoting PA, as well as possible areas that could be improved to help promote PA. The involvement of this group in shaping interventions is essential, given that HCPs have been identified as being key for promoting PA [3,25].

It should be acknowledged that this project specifically focused on PA guidelines for healthy adults. Alternative guidelines are recommended for specific population groups such as pregnant women, older adults, and those with chronic health conditions. It would be beneficial for future research to explore HCPs' thoughts and opinions on delivering PA advice for specific groups. It should also be noted that longer durations of higher intensity activity can actually be detrimental to certain health conditions such as chronic fatigue syndrome and long COVID-19 [37].

5. Conclusions

This paper provides an updated insight into doctors' views and opinions on barriers and solutions to discussing PA with patients. It is clear that further work needs to be done to ensure greater awareness of PA guidelines amongst clinicians so that they, in turn, can best advise their patients, improve the health of the nation, and reduce morbidity and mortality. Barriers to delivering PA advice included lack of PA education, time pressures, patient engagement, and limited staff training. Incorporating PA education in undergraduate training was highlighted as a possible solution, as was increasing awareness of resources to support clinicians. Increasing PA advice given to patients requires a multifaceted approach, including increasing education of HCPs, raising awareness of patient resources and awareness of local services, as well as wider healthcare system-wise change.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of the Faculty of Biological Sciences at the University of Leeds (27 July 2020/BIOSCI 19-039).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available to avoid the potential identification of interviewees based on comments made.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

UK doctors delivering physical activity advice: What are the challenges and possible solutions? A qualitative study.

INTERVIEW GUIDE

[Thank the participant for attending the interview.]

[Participant to have read the PIS and consent form and returned a completed copy of the consent to the researcher prior to the interview.]

[Researcher and participant to introduce themselves. Researcher to introduce the evaluation and the purpose of the interview.]

[Reiterate that the information participants provide will be anonymised and confidential. Check that the participant is comfortable with the interview being recorded.]

In this interview, I am interested in hearing about your experiences of delivering physical activity guidance to a patient and your opinion as a clinician on the barriers, challenges, and solutions to improving health care professionals given PA advice and views on current interventions/developments.

Please be assured that you will remain anonymous, and the research team will not share your comments with anyone else, so be as honest as you can. If there are any questions that you would prefer not to answer, you do not have to answer them. If at any point you do not understand what I am asking or need some clarification, please feel free to ask as we go along. You will be given an opportunity to say anything that we have not covered at the end of the interview

Do you have any questions about the interview before we begin?

Demographics

State your role, experience, and current location of work (primary or secondary care).

What is your speciality/discipline?

How many years of post-graduation experience do you have?

Which statement best describes your own PA:

1. Currently meeting the CMO PA guidelines of 150 min moderate/75 min vigorous or combination of both;
2. Currently doing some PA 30 min moderate physical activity (MPA), but not meeting CMO PA guidelines of 150 min moderate/75 min vigorous or combination of both;
3. Currently doing less than 30 min MPA.

Tell me about the education and training that you have received in relation to Physical Activity (PA):

Did it take.

Development;

How much time?

Knowledge of PA guidelines

[Feelings/confidence around delivering CMO PA guidance.]

[Why? Confidence? is it their role?]

If someone is diagnosed with a chronic disease that can be improved by PA, what do you currently do in terms of delivering PA guidance?

[Explore who delivers guidance, whether part of standard procedure or ad hoc, whether the content of guidance is general advice or adheres to guidelines;

Why this approach;

What they think of this approach;

What individuals/practices could do differently;

What works well and why?

What needs to change for this to happen;

Signposting, etc.]

What do you do differently for those who have a chronic disease and those who do not in terms of delivering PA guidance?

Given an Example.

What works well and why?

What works less well?

What would be your 'top tip' for promoting PA to your patients with chronic disease and those without?

[Explore what they do well and would share with their fellow colleagues as something that is exemplar practice.]

What would help you deliver the CMO PA guidelines to your patients?

Prompts here, time, resources, partnerships with providers, better training, other people I could refer to in-house, policy commitment for PA promotion.

What, in your opinion, are the challenges and barriers that prevent IICPs from giving physical activity advice?

Prompts here: Consider intrinsic and extrinsic

How do you engage or recruit hard-to-engage HCPs who are less enthusiastic or even anti-PA?

What works, why and how?

What works less well and why?

Should we not bother recruiting those HCPs who are less enthusiastic, yes or no and why?

Education

What IICP education do you feel is most effective at enabling IICPs to promote the guidelines?

Prompts:

The 2019 guidelines;

Infographics;

PA training;

Mentoring;

What works well and why?

How can we embed more physical activity into undergraduate and postgraduate curriculums?

Consider delivery type/method, scalability, assessment.
 What are the solutions to increase HCP physical activity advice?
 Consider policy, motivating practices, clinicians.
 Resources and Interventions;
 2019 Guidelines.
 Do you think the 2019 update has been helpful or not?
 Why is this?
 Have you seen the CMO PA infographics? If so, which ones?
 If yes—how do you use it?
 What else would you like to see in the guidelines?
 Prompts: 24 h message, inclusion of guidelines on sleep and PA, specific diseases,
 other groups?
 What other actions or resources should accompany the implementation of the CMO
 PA guidelines?
 Prompts: CMO PA Guidelines, communication strategy;
 A campaign with TV, radio, social media advertising;
 Better resourcing to support the campaign;
 Inclusion of communication experts on different platforms;
 Coordinated approach with other health issues.
 How do you feel about mandatory induction? Y/N? Timescale?
 Do you use any other PA-related guidelines?
 Yes/No? Why?
 Have some prompts.
 Moving Medicine:
 Do you know about MM?
 MM is an online suite of resources that provide time-specific consultations for HCP
 across 11 conditions.
 Do you currently use moving medicine resources?
 If you do use it, how do you use it?
 If you do not use it, why not?
 What works well and why?
 What does not work well and why?
 Content, coverage, access, style?
 In your opinion, what could be improved about moving medicine to make it more fit
 for your purpose as a clinician?
 Can you give an example of where you have done this?
 Is there anything else that you would like to add about delivering PA before we finish
 or anything you have not said?
 [Thank the participant and remind them of the contact details on the PIS should they
 have any questions, want to request a lay summary, etc.]

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Research

Educating the next generation in sport and exercise medicine: A cross sectional survey

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Abstract

Background: Sport and Exercise Medicine (SEM) is a relatively new specialty, and it is not well incorporated into undergraduate medical education. Previous studies have highlighted that medical students would benefit from increased teaching on SEM, and that students would like more SEM teaching. The aim of this project is to establish which SEM-related topics are deemed to be most important to incorporate into undergraduate medical education and confirm whether medical students would benefit from increased SEM exposure.

Methods: An online survey was distributed to all members of the British Association of Sport and Exercise Medicine (BASEM) via email, and it was shared on Twitter via BASEM and the research team.

Results: A total of 126 responses were analysed. The majority of respondents works in SEM, or were interested in pursuing a career in SEM. Musculoskeletal (MSK) examination skills, exercise to prevent and manage disease, and MSK injuries and conditions were deemed to be the most important SEM-related topics to teach medical students. Use of social media and pitch side case were deemed the least important. Respondents thought medical students do not receive enough SEM teaching at medical school and could benefit from increased SEM exposure.

Conclusion: This study supports the opinion that medical students would benefit from increased SEM exposure. This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. In response to this survey a Delphi study is being conducted in the UK to establish a consensus undergraduate SEM curriculum for medical students.

Keywords: Shoulder arthroscopy; glycine effect; electrolytes imbalance; complications; fluid overload;

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INTRODUCTION

Sports and Exercise Medicine (SEM) is a recognised specialty with its own higher specialist training programme and increasing numbers of SEM departments are becoming established in the National Health Service (NHS) [1]. In keeping with this increased opportunity for SEM in postgraduate training, there is increasing need to develop interest and knowledge among junior clinicians and students [2]. For students and junior clinicians interested in SEM there are limited options available to learn more about the specialty, with few resources aimed at this level of training [3]. There have been a number of research papers and editorials published in recent years calling for an increase in SEM in the undergraduate medical curriculum [3–8]. However, none report novel data to directly support their conclusions.

The primary objective of this study is to establish which SEM-related topics are deemed most important to be taught as part of undergraduate medical education in the United Kingdom (UK). Secondary objectives include determining how often SEM is taught at medical school and understanding thoughts on whether students would benefit from more SEM teaching.

METHODS

An online survey was created using Google Forms (Google Inc. USA). All members of the British Association of Sport and Exercise Medicine (BASEM) were emailed a link to the survey in June 2018. Participants responded over a three-month period. The survey was also shared via BASEM's twitter account and by the twitter accounts of the research team (KM and DF). Informed written consent was obtained via a compulsory question at the start of the questionnaire. This was an internal organization survey conducted with permission from said organization. Due to this, and no identifiable information being collected, ethical approval was not sought. This is in line with the Declaration of Helsinki on 'Ethical Principles for Medical Research Involving Human Subjects' created by The World Medical Association, Inc. [9–11].

Participants were eligible to complete the survey if they

were UK medical students or qualified doctors. The questionnaire aimed to explore several elements of SEM teaching to undergraduate level and is given in Appendix 1. Where appropriate, data were divided into 2 subgroups of juniors (medical students and pre-registrar doctors), and seniors (Consultants, General Practitioners and Registrars) for comparison between groups. In addition, where appropriate seniors were separated into those that worked or trained in SEM or not to establish differences of opinion. Statistical analysis was performed using Microsoft Excel. Where median values are given, they are reported as median and inter-quartile range. Where appropriate, data were assessed for normality using Shapiro-Wilcox and the Mann-Whitney U test was used to determine differences between groups. Statistical significance was set at $p < 0.05$.

RESULTS

The survey received 136 responses. Eight participants were not eligible due to not being a doctor or medical student. Incomplete surveys ($n = 2$) were removed, leaving 126 responses. Consultants made up 34% of participants, 25% were General Practitioners, 10% were registrars, 13% were pre-registrar level doctors, and 19% were medical students.

72% of senior clinicians were working or training in SEM. 69% of juniors were interested in pursuing a career in SEM. 66% of all respondents had an additional degree in SEM.

IMPORTANCE OF SEM RELATED TOPICS

Participants were asked to rank how important it is that various SEM-related topics are included in undergraduate medical education. There were statistical differences between responses from juniors compared with seniors for the topics of nutrition, exercise physiology, working as a team doctor, and pitch side care. In each case, juniors deemed them to be more important than seniors. The results are given in Table 1

Table.1 Participants were asked to rank how important it is that each topic is included in undergraduate education. 1 = not important at all, 10 = very important. P value given for comparing responses from juniors, with responses from seniors. Statistically significant p values are in bold.

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Topic	Median (IQR)	Median (IQR) for juniors	Median (IQR) for seniors	P value
Musculoskeletal Examination Skills	10 (10 - 9)	10 (10 - 9)	10 (10 - 9)	0.934
Exercise to prevent and manage disease	10 (10-9)	10 (10 - 9)	10 (10 - 9)	0.465
MSK injuries and conditions	9 (10 - 8)	8 (10 - 8)	9 (10 - 8)	0.516
Nutrition's	8 (9 - 6)	8 (10 - 6)	7 (9 - 6)	0.024
Rehabilitation	8 (9 - 6)	8 (9 - 6)	7 (9 - 6)	0.126
Exercise Physiology	7 (8 - 6)	8 (9 - 6)	7 (8 - 5)	0.005
SEM in specialist groups (eg disability, women, older athletes, children's)	7 (8 - 5)	7 (8 - 5)	7 (8 - 5)	0.151
Biomechanics	6 (8 - 5)	7 (8 - 4)	6 (8 - 5)	0.624
Drugs in sport	5 (7 - 4)	6 (8 - 4)	5 (7 - 3)	0.346
Sport Psychology	5 (7 - 3)	6 (8 - 4)	5 (6 - 3)	0.065
Working as a team doctor	5 (7 - 2)	6 (8 - 3)	4 (6 - 2)	0.004
Sports Ethics and law	5 (6 - 3)	5 (7 - 3)	5 (6 - 2)	0.338
Pitch side care	5 (6-2.25)	5.5 (8 - 3)	5 (6 - 2)	0.016
Use of social Media	5 (6 - 2)	5 (6 - 2)	4.5 (6 - 1)	0.181

THOUGHTS ON AMOUNT OF SEM TEACHING

All juniors were asked how often they had been exposed to SEM during medical school. The majority had either never been exposed to SEM during medical school (60%) or had been exposed to it 1-2 times a year (37%). The remaining 3% were exposed to SEM 1-2 times a month (Figure 1).

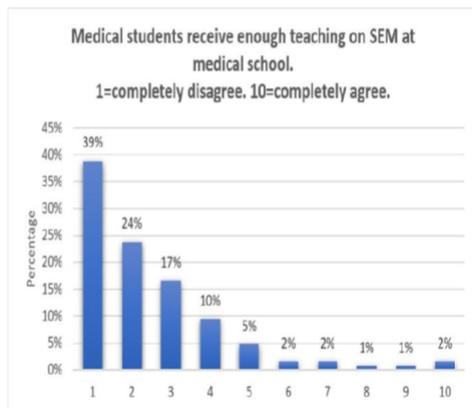


Fig.1 Responses when participants were asked if they agree or disagree with the statement 'Medical students receive enough teaching on SEM at medical school' 17(12) 2022

In this figure the results given when participants were asked whether medical students receive enough teaching on SEM. The median score for seniors was 2(3 - 1) and for juniors was 1(2 - 1). There was a statistically significant difference between the two groups (p = 0.004). There was no statistically significant difference between those seniors working or training in SEM and those that are not (p > 0.05) (Figure 2).

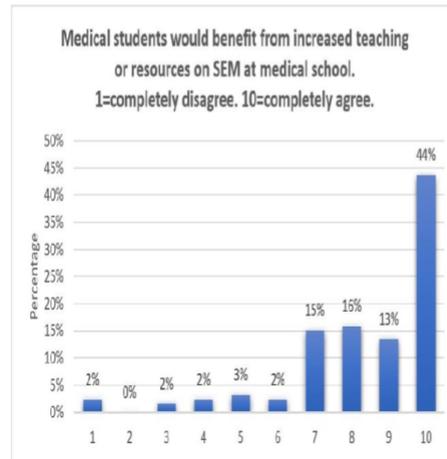


Fig 2. Responses when participants were asked if they agree or disagree with the statement 'Medical students would benefit from increased teaching or resources on SEM at medical school'

Figure 2 shows that participants think students would benefit from increased teaching or resources on SEM at medical school. There was no statistically significant difference in opinion between juniors and seniors (p = 0.908). Senior clinicians thought it was important for all medical students to have increased teaching or resources on SEM (median of 9 (7-10)), as well as those specific medical students interested in pursuing SEM (median of 10 (8-10)). There was a statistically significant difference between those seniors working or training in SEM and those that are not, with those working in SEM believing more strongly that medical students would benefit from increased SEM teaching or resources. The median for SEM professionals was 9(10 - 8) and the median for non-SEM professionals was 8(10 - 7) (p = 0.005).

DISCUSSION

THE MOST RELEVANT SEM RELATED TOPICS

The key findings of this study are that MSK examination THE JOURNAL OF ORTHOPAEDICS TRAUMA SURGERY AND RELATED RESEARCH

skills, exercise to prevent and manage disease, and MSK injuries and conditions are deemed to be the most important SEM-related topics to teach to undergraduates. Social media use and pitch side care were deemed the least important. This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. The findings of this study are important because they will determine how best we move forward in terms of the education we provide to undergraduate level. The majority of research thus far around incorporating SEM into medical curricula has been focused on exercise medicine [12]. Aside from exercise medicine, as far as the research team is aware, there are no SEM-focused resources aimed at the level of medical students. In addition, there is no SEM syllabus for medical students and new clinicians outlining what SEM they should know for their level in training.

BEING AN SEM DOCTOR- MORE THAN BEING PITCHSIDE

The difference of opinion between juniors and senior clinicians in the topics of working as a team doctor and pitch side care is of particular interest. It is a controversial topic within the SEM community that SEM doctors only work with elite athletes and sports teams, and the importance of highlighting that SEM is much broader than this has been highlighted previously [13]. Anecdotally, the authors acknowledge that the MSK medicine and exercise medicine aspects of SEM are often over-looked by those with limited experience of the specialty. Arguably these are the aspects of SEM that can best be utilized in a number of different specialties throughout the NHS. It may therefore be valuable for students and new clinicians to have some knowledge of SEM that will be valuable in a variety of different clinical settings.

THE BENEFITS OF MORE SEM EDUCATION

The survey findings suggest that students and clinicians of all grades are of the opinion that medical students would benefit from having more exposure to SEM during medical school, an opinion expressed previously [14–16]. However, there is limited data supporting this theory, which is an important finding of this study. In addition, this study found that seniors believe increased

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SEM teaching would be beneficial for all students, not just those interested in pursuing a career in SEM. There are potentially several reasons for this. Firstly, the lack of exposure to SEM results in a lack of awareness of what is involved in SEM, including its place in health service provision [17]. A lack of awareness of the specialty of SEM has been demonstrated among the medical profession [18, 19]. This may mean that SEM NHS services are not being utilized due to lack of awareness of these services existing, resulting in patients not benefitting from referrals to SEM departments.

Secondly, inactivity is a significant risk factor for disability and death and to combat this as a society promoting physical activity as a form of medicine is of paramount importance [20]. If we are encouraging more people to be active, it follows that more people will suffer from sports-related injuries. We need our doctors of the future to be prepared and confident to deal with the MSK injuries that will potentially increase as a result of this. Furthermore, aspects of the SEM curriculum are applicable in many parts of medicine [21]. For example, both exercise and musculoskeletal medicine are relevant in General Practice, whilst exercise physiology is important in Anesthetics.

STRENGTH AND LIMITATIONS

This survey is the first to determine how important it is that specific SEM-related topics are taught to medical students. Views were collated from individuals in a variety of stages in their career in order to compare differences between sub-groups.

A limitation of this study is that most participants have an existing interest in SEM. The majority of participants were working in, or interested in working in, SEM and therefore are potentially biased towards feeling more SEM exposure would be of benefit. Further research should aim to gain opinions of non-SEM doctors, and students and juniors not interested in pursuing SEM, to establish how applicable SEM skills and knowledge is to the wider medical profession. Furthermore, as the survey was shared on social media, a response rate cannot be calculated.

CONCLUSION

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This study has found that MSK examination skills, exercise to prevent and manage disease, and MSK injuries and conditions were deemed the most important SEM-related topics to include in medical student education. Use of social media, pitchside case, sports ethics and law, and working as a team doctor were deemed the least important SEM-related topics for undergraduate education. Respondents thought medical students do not receive enough SEM teaching at medical school and could benefit from increased SEM teaching/resources, which supports previous research findings. In response to the findings of this survey, a Delphi study is being undertaken to further clarify an SEM undergraduate syllabus. In addition, educational SEM & musculoskeletal resources have been created specifically aimed for the level of medical students and junior clinicians.

DECLARATIONS

Ethics approval and consent to participate: This was an internal organisation survey conducted with permission

from said organisation. Due to this, and no identifiable information being collected, ethical approval was not sought. This is in line with the Declaration of Helsinki on 'Ethical Principles for Medical Research Involving Human Subjects' created by The World Medical Association, Inc. Informed written consent was obtained via a compulsory question at the start of the questionnaire, and all participants were over the age of 18. All methods were carried out in accordance with relevant guidelines and regulations.

ABBREVIATION

KM and DF conceived the design of the study, contributed to the collection of the data, KM, DV and DF performed statistical analysis of the data. All authors (KM, DF and DV) contributed to the manuscript writing and approved the final version applicable

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RESEARCH

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Creating a sport and exercise medicine undergraduate syllabus: a delphi study

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Abstract

Background Sport and Exercise Medicine (SEM) is a growing speciality in the United Kingdom (UK). This growth has not been replicated in SEM teaching at an undergraduate level and SEM-related topics in schools of medicine in the UK are under-represented. As SEM continues to develop as a specialty it is important to consider how it is embedded at all levels of training. The aim of this project was to establish a consensus on SEM-related skills and knowledge relevant for undergraduate medical students in the UK, ultimately creating a curriculum of learning objectives (LOs).

Methods A modified Delphi survey was utilised to seek consensus on LOs suitable for incorporation into UK medical school curricula. An expert panel with adequate knowledge in the field was recruited. The initial curriculum was created by the research team using already established postgraduate SEM curricula. All learning objectives were sent to the expert panel for opinions in phases. Levels of agreement and comments made by the expert panel were reviewed after each phase until a consensus on each learning objective was made.

Results The expert panel was made up of 45 individuals, with 35 also completing phase 2 (78% retention rate). The initial curriculum contained 58 learning objectives separated into 9 themes. In phase 1 31% (18/58) were accepted outright, 48% (28/58) were altered and 19% (11/58) were rejected. Two additional learning objectives were added. Of the 49 LOs included in phase 2, 98% (48/49) were accepted. The final curriculum was made up of 9 sub-themes and 48 LOs.

Conclusion Sport and Exercise Medicine is a broad ranging and rapidly growing speciality. It is important to establish SEM education in all levels of medical education, including undergraduate level. This is the first published version of a Delphi SEM curriculum for undergraduate medical teaching.

Keywords Medical education, Sport and exercise medicine, Undergraduate

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Background

Sport and Exercise Medicine (SEM) is a growing medical speciality in the United Kingdom (UK) and worldwide. SEM is a medical speciality that includes team medicine, exercise medicine and musculoskeletal medicine. SEM could be an important medical speciality to improving the health status and quality of life of patients by both increasing and maintaining physical activity levels. Physical inactivity is a leading cause of disease burden and an important modifiable risk factor alongside smoking. [1] The past few years have seen position statements, the creation of multiple postgraduate SEM courses, and an international Delphi study to create a curriculum for SEM practitioners. [1–3] However, this growth has not been replicated in SEM teaching at an undergraduate level, and SEM-related topics in schools of medicine in the UK are under-represented. [4–6] The General Medical Council's "Outcomes for Graduates" and Health Education England's "Future Doctors" reference the growing need for doctors to be skilled in providing tailored exercise medicine advice to patients, and in demonstrating core musculoskeletal skills. [7,8] Most medical specialties currently have a syllabus to which they expect medical students to achieve outcomes by the end of their undergraduate career.

Worldwide, the integration of sport and exercise medicine teaching into undergraduate curricula is also an issue. In the USA, Asif et al. (2022) conducted a Delphi study for an exercise medicine core curriculum because medical trainees in the USA were found to receive relatively few hours of teaching [9]. This global training issue also affects the Middle East and Europe. [10,11]

As SEM continues to develop as a specialty it is important to consider how it is embedded at all levels of training. In the UK, it is common practice by the majority of royal colleges to produce an undergraduate curriculum. Creating and encouraging the use of that curriculum by medical schools could be useful to ensuring exposure and interest to the specialty. SEM is a relatively young specialty, having been formally established in 2005, and no equivalent undergraduate curriculum has been established to date. [12] With this in mind, the aim of this project was to establish a consensus on SEM-related skills and knowledge relevant for undergraduate medical students in the UK, ultimately creating a curriculum of learning objectives (LOs). This will act as a guide for the teaching of SEM at undergraduate level and standardise undergraduate SEM teaching throughout the UK. The majority of medical schools do not follow, nor need to follow published royal college undergraduate curriculums, their priority it to ensure they meet GMC outcomes for graduates. Specific learning outcomes are usually created by the medical school and for the majority of specialties this is entirely appropriate given they

are large specialties found in all areas. SEM however, is a small speciality with only 173 Consultant doctors on the GMC specialist register based in a narrow range of locations and with currently a limited but growing NHS presence. [13] It is therefore unlikely that all medical schools have access to Sport and Exercise Medicine Clinicians. It is hoped this consensus of LOs will encourage medical schools to increase the amount of SEM teaching incorporated into medical school curricula.

Methods

Study Design

A modified Delphi survey was utilised to seek consensus on LOs suitable for incorporation into UK medical school curricula. The original delphi method was developed by Dalkey and Helmer and is an iterative process designed to determine consensus through exposing the expert panel to multiple iterations of data, in this case learning outcomes. [14,15] There are a variety of observed ways of delivering a delphi however its overall distinct features including the use of an expert panel and a round based, iterative approach. Delphi methodology is used extensively in curriculum development. [16] This delphi was defined as modified and therefore variant methodology due to the creation of the draft curriculum by the research group rather than the use of the expert group to create the original curriculum. [15] This methodology was used to avoid multiple rounds and therefore the risk of poor response rates with progressive rounds. [17] This study involved the creation of the original draft curriculum by the research team, which was put through 2 rounds of review by the expert panel before being finalised by the research team. In keeping with the principles of Delphi methodology, contributions given by the expert panel were kept anonymous to the research group throughout the process. [18] The methodology used in this study was also used for a Delphi study conducted by members of the research team for postgraduate SEM curricula, the same expert panel was utilised for both studies. [19].

Establishing the research group

The research group was made up of DV, AI, KM, TP, DS, AP, CN, PB and GF. This group was formed to incorporate individuals with experience in a wide variety of related topics including medical education, delivering SEM education, experience undertaking and/or teaching on undergraduate medical degrees, SEM Masters courses and Delphi methodology. In addition, individuals were included due to their experience with the Undergraduate Sport and Exercise Medicine Society (USEMS) and their interest in the specialty of SEM. USEMS is a UK based, non-profit society aimed at promoting the specialty of SEM for undergraduates. [20] All decisions regarding

content were finalised by the research group such as reviewing and amending learning outcomes based on comments from the expert panel following the first round.

Expert Delphi Panel

Individuals suitable for joining the expert panels are defined as individuals with knowledge and experience in the subject area. [21,22] All members of the British Association of Sport and Exercise Medicine (BASEM) and the Faculty of Sport and Exercise Medicine (FSEM) were emailed invitations to express interest in joining this expert panel. Invitations to submit interest were also shared on Twitter by the research group.

Individuals expressing interest in joining the expert panel were asked demographic information and questions selected by the research panel to determine eligibility. The eligibility criteria were selected to ensure the expert panel was made up of individuals with adequate knowledge in the field of SEM. It was not determined whether the participants had prior experience of writing LOs.

The eligibility criteria used consisted of:

- Doctors that have completed their Foundation Training.
- Achieved a higher qualification in SEM: specifically, either a SEM masters degree/diploma, or membership/fellowship of the FSEM (MFSEM/FFSEM).
- Graduated more than 5 years prior to the start of the study.
- Working in the United Kingdom at the time of the study.

Individuals that did not meet the eligibility criteria were removed by the research group. A panel size of at least 30 was aimed for as the quality of a Delphi study has

previously not been found to be improved by a panel size greater than 30. [18,23]

Development of the initial curriculum

A documentary analysis was performed and LOs included in previously published UK-based SEM specialty training and SEM Masters curricula were combined by the research group. Each learning outcome was then discussed by the research group at a meeting. Learning outcomes that were duplicated or deemed inappropriate for an undergraduate medical student were either removed or amended based on research group consensus. Following the research group review and consensus an initial draft of the curriculum was created. [2,23,24,25] The LOs in these curricula were grouped into relevant themes as determined by the research group. All LOs were reviewed by the research group before being amended or removed if required. Bloom's taxonomy was used to establish an appropriate level for undergraduate medical students as agreed by the research group (Fig. 1). [26] Reducing the Bloom's taxonomy level was the main reason for amending a learning outcome at the draft curriculum phase by the research group. The Bloom's taxonomy levels used are given in Fig. 1.

Procedure

Google Forms (Google Inc. USA) was used to create the initial survey for those wishing to express interest in joining the expert group, and demographic information was collected via this form. Qualtrics software was used to create the electronic surveys for the Delphi. [27] This survey was emailed to all individuals deemed eligible to join the expert panel. Participant information sheets were emailed to all eligible individuals. Written informed consent to participation was gained by all members of the expert panel via a mandatory question asked at the start of the survey. The survey instructions stated clearly that experts should consider the relevance of individual LOs for medical student level when answering the survey.

Data were collected from October 2020 to November 2020. Members of the expert panel were given 12 days to respond to each phase of the Delphi. A system-generated email was sent after day 8 and day 10 to non-responders to act as reminders. In addition, members received a text message if no response had been received by day 10. The research group aimed for the response rate to not fall below 70% as expert panel engagement is vital for Delphi studies. [28].

Phase 1: First review of learning objectives.

Members of the expert panel were asked to either accept, reject or modify each LO in the proposed curriculum. To ensure standardisation of approach, the expert panel were asked to focus not only on the content or topic conveyed in the learning outcome but also on the level of

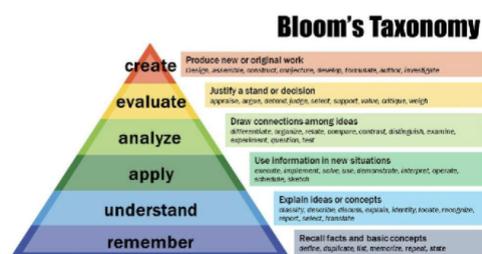


Fig. 1 Bloom's taxonomy. Level 1 is knowledge to level 6 which is creation. Image used within rules of license (creative commons attribution-sharealike license). Taken from: https://commons.wikimedia.org/wiki/File:Bloom%27s_Revised_Taxonomy.jpg

Table 1 Alterations. The reasons for alterations to learning objectives after phase 1. Eleven LOs (19%) were rejected and removed due to either lack of relevance to undergraduate level (n = 7) or overlap with other LOs in the curriculum (n = 4). The objectives removed for being too high level, and examples of quotes from the expert panel supporting their removal, are given in Table 2. The objectives removed due to overlap are given in Table 3 alongside the remaining LOs that they overlapped with

Reasons for alteration	Number of learning objectives altered
Spelling and grammar (including re-wording)	14
Alteration to Bloom taxonomy level	8
Objective made more specific	15

Bloom's taxonomy used. An explanation of Blooms taxonomy as well as links to further resources were provided to the expert panel. A consensus of opinion was defined by 75% agreement, as reported previously by Keeney et al. [18] Ranges from 70 to 100% have been reported in previous literature as appropriate for consensus. [19,29] Participants had the option of providing anonymous comments after reviewing each LO. For each LO the percentage of agreement was calculated and any anonymous comments regarding that LO were reviewed by the research group. All comments for all LOs were reviewed regardless of the level of agreement. The research group then accepted, rejected or altered each LO depending on the responses given to create a second draft of the curriculum. If a level of agreement of 75% or above was received with no comments given, the LO was accepted outright with no further need for review. If comments were given, the research group discussed the comments and, if appropriate, amended the LO and included it in the second draft of the curriculum for further review. If the level of agreement was below 75% and no comments were given, the LO was rejected. If comments were given, the research group reviewed the comments and, when appropriate, amended the LOs and included them again in the second draft of the curriculum for further review.

Phase 2: Second Review of learning objectives.

The second draft of the curriculum, based on responses given in phase 1, was sent via email only to members of the expert panel that had completed phase 1. In phase 2 members of the expert panel were asked to either accept or reject each LO and again there was the option to provide anonymous comments this time after review of each theme rather than each LO. The LOs accepted outright in phase 1 did not require a response but were included for reference. Again, percentages of agreements and comments were reviewed by the research team and decisions were made to accept or reject each LO. A level of agreement of 75% of above was again utilised. Phase 2 would be repeated until a final consensus on each LO was reached.

Results

The initial proposed curriculum

There were 58 LOs collated from prior SEM syllabi. These were grouped into 9 core themes by the research group.

Table 2 Removed LOs. The LOs removed after phase 1 and the comments given by the expert panel that were reviewed by the research group and justify the removal

Learning objective (LO) removed	Expert panel quotes supporting removal
Outline neurological issues in relation to exercise	<i>There is a limited time within which an understanding of all these issues isn't able to be achieved and is covered in the wider curriculum (Participant 21)</i>
Outline renal and urogenital issues in relation to exercise	<i>Not sure how this could tie in to an UG syllabus (Participant 37)</i>
Outline ENT issues in relation to exercise	<i>ENT is too niche (Participant 16)</i>
Outline basic biomechanics in relation to different sporting and exercise activities and in the context of injury	<i>Huge area - think unnecessary when need to cover the basics in medicine (Participant 21)</i>
Outline the role of WADA and UKAD	<i>Not sure this necessarily needs to be in curriculum at UG level as PG level (Participant 43)</i>
Describe the on-field and emergency assessment and management of sports injuries and medical conditions	<i>Pre-hospital care generally not taught at UG level (Participant 37)</i>
Discuss the following in relation to SEM: eye and ENT emergencies	<i>Relatively small topic and could be integrated with other topics (Participant 16)</i>

The Expert Panel

Of the 94 people who expressed interest in being on the expert panel, 48% (45/94) met the eligibility criteria. The reasons for non-eligibility included having worked as a doctor for less than 5 years (n = 19), not holding a SEM MSc/Postgraduate Diploma/FFSEM/MFSEM (n = 17) and not being based in the UK (n = 13). The expert panel was made up of 20 SEM consultants, 4 orthopaedic consultants, 1 rheumatology consultant, 17 GPs, 11 SEM registrars and 14 doctors that did not specify their training or job role but did confirm that they had been a doctor for more than 5 years. Thirty-eight individuals (82%) stated they had experience of teaching medical students.

Phase 1

In phase 1 of the study there was a 100% (45/45) response rate from the expert panel. 31% (18/58) of LOs were accepted without need for alteration and 48% (28/58) were altered in some way. The reasons for alterations are given in Table 1. Nine LOs were altered for more than one reason. Regarding the 8 alterations made to the

Table 3 Overlapping LOs. The LOs removed after phase 1 due to overlap with other learning objectives are given on the left. The related learning objective(s) that remained are on the right

Learning objective removed	Remaining learning objective(s) justifying removal
Describe general pathology of the musculoskeletal system.	Relate musculoskeletal anatomical knowledge to common conditions and presentations. Outline the principles of tissue injury and repair in the musculoskeletal system.
Describe the findings of common radiological investigations.	Recognise the indications for common radiological investigations.
Describe the findings of radiological and other relevant investigations.	Recognise the indications for common radiological investigations.
Discuss the following in relation to SEM: Cardiorespiratory arrest.	Recognise the role of pre-hospital care in sport and physical activity. Demonstrate basic life support in a simulated environment.

Bloom's taxonomy level, 6 (75%) were kept at the level but alterations were made to utilise a more appropriate

word from the same taxonomy level, and 2 (25%) were moved up one level.

After review and discussion by the research group 2 additional learning objectives were added: 'Outline the pharmacological management of acute pain in musculoskeletal conditions in sport and physical activity' and 'Identify common adult musculoskeletal conditions'. This was due to it being noted that chronic pain was mentioned in other learning objectives, but the management of acute pain was not covered by any learning objectives and there being no learning objectives specifically including adult musculoskeletal conditions. With the removal of 11 learning objectives and 2 learning objectives added, a total of 49 learning objectives were included in the curriculum for phase 2.

Phase 2

Of the 45 members of the expert panel that completed phase 1, 78% (35/45) also completed phase 2. 98% (48/49) of LOs were accepted in phase 2 of the study, with these objectives achieving over 75% acceptance. Table 4 gives the level of acceptance for each LO following phase 2. The LO that did not reach 75% agreement was 'Outline haematological changes and responses to physical activity'

		Theme								
		1	2	3	4	5	6	7	8	9
Learning Objective	a		100%	94%	97%			86%	94%	92%
	b	100%	100%		81%	94%			94%	
	c	100%	78%		97%			97%	89%	
	d	94%	97%		100%			89%		
	e		89%					97%		
	f		72%					100%		
	g		86%					94%		
	h		97%	97%				89%		
	i		94%							
	j		97%							
	k									

Table 4 Levels of acceptance. The percentage (%) level of acceptance for each learning objective after phase 2. Greyed out boxes indicate the learning objective was accepted outright in phase 1. The black box indicates that the learning objective that did not meet the acceptance criteria

(LO 2f in Table 3). Ten LOs needed to be altered but, as these were all minor grammar and spelling changes, it was felt that there was no need for any further phases. The final curriculum was made up of 9 sub-themes and 48 LOs. Table 5 shows the finalised sub-themes and number of objectives in each sub-theme. The full version of the agreed curriculum can be found in the [supplementary material](#). In the final curriculum, 54% (26/48) of the LOs were in level 1 (knowledge) of Bloom's taxonomy, 42% (20/48) were in level 2 and the remaining 4% (2/48) were in level 3.

The finalised curriculum can be found in the [supplementary material](#).

Discussion

This study has utilised Delphi methodology to create an SEM curriculum for undergraduate medical education. The Delphi panel consisted of a broad range of practitioners, with the majority having experience of teaching undergraduate medical student. The final curriculum was made up of 48 LOs.

Physical activity LOs in the proposed curriculum

The initial proposed curriculum contained 11 objectives relating to medical issues related to exercise, of which 10 were accepted by the expert panel. The one LO that was not accepted related to knowledge of haematological changes in response to exercise (72% acceptance). This was deemed too specific and not at the right level for undergraduate learners. Four LOs were also included in the separate category of physical activity and human health, covering LOs related to physical activity guidelines, common barriers to physical activity and recognising useful physical activity resources. Physical activity reduces the incidence of non-communicable disease (NCDs) such as diabetes mellitus, ischaemic heart disease, several cancer types, and has therapeutic effects in multiple conditions such as musculoskeletal pain,

risk of falls and chronic obstructive pulmonary disease (COPD). [30] Despite this, clinicians are often not confident in advising and prescribing exercise interventions. [31] Multiple barriers were found such as fear of exacerbating the condition, insufficient knowledge on which types of exercise are the most beneficial for their patient group, and contraindications. Recent evidence also suggests that medical students themselves appreciate that physical activity is important in preventing disease, but they do not feel confident in physical activity guidelines and would like more teaching on this topic. [11,32,33] There has been a push to better incorporate exercise medicine into undergraduate healthcare curricula, and research into how best to do this. [4,32,34] The findings of this study support the embedding of exercise medicine into undergraduate medical curricula and highlights key LOs that should be covered.

Global application

8 out of the 9 subthemes in the present study were also included in the medical specialty syllabus designed by the international syllabus in Sport and Exercise medicine Group (ISSEMG) [2]. This consensus included a total of 11 subthemes. The differences are likely explained by the undergraduate focus in this study. The USA and Middle Eastern studies also included many overlapping undergraduate themes including physical activity and human health, antidoping and specific groups in SEM. [9,10]

Ensuring suitability for undergraduate level

Of interest, many LOs were rejected in the first phase of the study due to being topics deemed too SEM-specific for undergraduate curricula, with comments made that they were more appropriate for postgraduate level. In addition, the vast majority of LOs accepted in the final curriculum were in either levels 1 or 2 of Bloom's taxonomy. This suggests that lower levels of Blooms taxonomy appear to be more appropriate for undergraduate level in sport and exercise medicine curricula.

Overlap between other specialties

SEM-related topics extend into numerous specialties already well established in the undergraduate medical curricula such as: orthopaedics, rheumatology, and public health. Many of the LOs included in the finalised curriculum produced by this study are likely already covered in medical curricula. For example, many of the 10 LOs in the injuries related to SEM category such as 'outline common upper limb injuries' and 'recognise the indications for common radiological investigations' are likely to overlap with orthopaedic and musculoskeletal modules already incorporated into medical school education. Similarly, the LOs in the intrinsic skills of an SEM physicians including demonstrating skills such as communication,

Table 5 Finalised curriculum subthemes. The finalised subthemes and number of objectives in each sub-theme

Sub-Theme	Number of objectives in sub-theme
1. Physical Activity and Human Health	4
2. Medical Issues Related to Exercise	10
3. Injuries Related to SEM	10
4. Basic Science in SEM	7
5. Clinical Pharmacology	2
6. Antidoping	1
7. Sport Team and Event Management	9
8. Specific Groups in SEM	3
9. Intrinsic Skills of a SEM Physician	2
Total	48

collaboration and describing the importance of a multi-disciplinary team approach are already covered in medical curriculum.

Implementation into established undergraduate medical curricula

Whilst this study attempts to map the components of SEM onto a curriculum, actually placing these onto existing curricula remains challenging. The General Medical Council (GMC), who set the core curriculum objectives for medical students to learn during their training, mention SEM-related topics in a number of LOs in "Outcomes for Graduates". [7] However, medical schools have relative autonomy on the timing and level of depth required for its graduates. Previous reviews of United Kingdom (UK) medical schools have suggested that a proportion of medical schools have not been able to demonstrate evidence of exercise medicine teaching across the core curricula. [5].

While the overlap with other specialties will make embedding this suggested curriculum easier, it is appreciated that there are barriers due to limited space in already crowded medical curricula. Following this study, suggested next steps are to discuss this curriculum with individuals involved in creating, implementing and teaching undergraduate medical curricula to identify feasibility and practical steps for adoption.

Strengths and Limitations

Our panel consisted of qualified and experienced professionals from relevant backgrounds. The majority of our panel were senior clinicians. In addition, between reviews there was a high response rate, representing a good internal validity. The retention rate between Phase 1 and Phase 2 was above 75%, which improves the reliability of the study. One main limitation was that, due to SEM being a relatively small, albeit growing, speciality, the vast majority of our panel were highly interested in SEM, thereby introducing potential selection bias.

Conclusion

Sport and Exercise Medicine is a broad ranging and rapidly growing speciality, with significant importance in tackling the burden against NCDs. It is important to establish SEM education in all levels of medical education, including undergraduate level. To our knowledge, this is the first published version of a Delphi SEM curriculum for undergraduate medical teaching. Future work should explore the opinions of individuals working in medical education, and those whose primary focus is not in SEM, to discuss opinions and how it could be best implemented into medical school curricula. In addition, it would be advantageous to compare this curriculum

with undergraduate SEM curriculums used in other countries around the world.

List of Abbreviations

SEM	Sports and Exercise Medicine
UK	United Kingdom
LOs	Learning objectives
USEMS	Undergraduate Sport and Exercise Medicine Society
BASEM	British Association of Sport and Exercise Medicine
FSEM	Faculty of Sport and Exercise Medicine
MFSEM	Membership of the FSEM
FFSEM	Fellowship of the FSEM

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-023-04139-x>.

Supplementary Material 1

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Authors' contributions

DV conceived the idea of creating a piece of work on this topic. DV, AI, and KM were involved in data collection. DV, AI, KM, TP, DS, AP, CN, PB, GF sat on the research group and analysed the data. All authors contributed to the critical revision and approval of the final editorial.

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Data Availability

The data for this study is stored on Hull York Medical School servers and is not publicly available. Data can be made available upon reasonable request to the corresponding author.

Declarations

Competing interests

The authors have no competing interests to declare.

Ethics approval and consent to participate

Ethics approval was granted by the Hull York Medical School ethics committee board. Ethics ID number: 17/08. Informed written consent to participation was gained by all members of the expert panel. The study was carried out according to the Helsinki Declaration.

Consent for publication

Not applicable.

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BMJ Open UK physiotherapists delivering physical activity advice: what are the challenges and possible solutions? A qualitative study

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ABSTRACT

Objectives Despite the known health benefits of physical activity (PA), PA levels are in decline. Healthcare professionals, including physiotherapists, have been identified as ideal conduits to promote PA, yet their knowledge and awareness of PA guidelines are poor. The aims of this study were to explore current knowledge of PA guidelines among UK physiotherapists and identify barriers and possible solutions to delivering PA advice.

Design A qualitative approach using semistructured interviews that took place between March and May 2021. Data were analysed with a thematic approach using Braun and Clarke's six steps.

Setting Various inpatient and outpatient clinical settings across six UK regions.

Participants Eighteen UK-based physiotherapists managing National Health Service patients were recruited through volunteer sampling in March 2021.

Results Five themes and 16 subthemes (shown in parenthesis) were identified as barriers and solutions to delivering PA advice: physiotherapist intrinsic barriers (knowledge, fear/confidence); a lack of emphasis and priority given to PA (time constraints, minimal educational and staff training); patient barriers (compliance, expectations and fear of doing PA); increasing awareness of the PA guidelines (staff training, signposting awareness, use of social media and television campaigns); and optimising delivery (use of visual resources, good communication and approaches involving being individualised and gradual for patients with chronic conditions).

Conclusions In this study, physiotherapist participants seemed to have limited awareness of the PA guidelines despite recent updates and were faced with similar barriers to those previously reported in the literature. The solutions suggested could guide strategies to support physiotherapists being able to deliver PA advice. Further research is needed to evaluate the efficiency of any implemented solutions supporting the delivery of PA advice.

INTRODUCTION

Physical activity (PA) has multiple health benefits including improving mental health, reducing risk factors leading to

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study identified physiotherapists' barriers to providing physical activity (PA) advice but also identified possible solutions informed by these key stakeholders.
- ⇒ The qualitative design and use of semistructured interviews enabled flexible discussions to capture the thoughts and opinions of the participants and to ensure responses could be explored further in future research.
- ⇒ The study findings cannot be generalised to all UK physiotherapists; however, they provide potentially useful insights into the participants' experiences in relation to barriers and possible solutions with respect to providing PA advice.

cardiometabolic diseases and improving physical health in cancer survivors.^{1,2} The advice of the Chief Medical Officers (CMOs) in the United Kingdom (UK) is that adults should complete 150 min of moderate activity, or 75 min of vigorous activity each week or a combination thereof, alongside strength training at least twice weekly.³ This is similar to the World Health Organisation (WHO) guidelines of at least 150–300 moderate intensity aerobic PA, or 75–150 vigorous intensity PA, with twice weekly strength training.⁴ Twenty-eight per cent of adults globally fail to reach the recommended aerobic PA guidelines.⁵ In the UK, this figure was slightly lower with 39% of the population failing to meet the aerobic PA guidelines between 2019 and 2020,⁶ 27% of which were classed as physically inactive meaning they did less than 30 min of moderate PA a week.⁶ Additionally, 43% of UK adults achieved the strength PA guidelines between 2020 and 2021, which was a 1.2% decrease from the previous year.⁶ While there are greater health benefits by reaching the recommended PA levels for most individuals, there are still

health benefits from completing even low amounts of light intensity PA for those who are inactive or limited by chronic health conditions and to then gradually increase intensity and duration over time.⁴ With physical inactivity leading to 1.6 million deaths annually, and non-communicable diseases (NCDs) increasing,⁷ global strategies promoting health and well-being need greater attention to ensure world health goals are achieved. In 2015, the United Nations agreed to promote healthy lives and well-being for all ages, as part of the Sustainable Development Goal 3, which has many health targets, including reducing premature mortality from NCDs by one-third.⁸ In accordance with this, the WHO launched the Global Action Plan on Physical Activity in 2018 to reduce physical inactivity by 15%.⁹ A major barrier to these goals being achieved was the COVID-19 global pandemic and associated restrictions, which led to more people working from home and to the temporary closure of gyms and sports facilities, further decreasing PA levels in the UK population.¹⁰ This has resulted in decreased physical and functional capacity, increased mental distress and an increased cardiovascular disease risk profile.¹¹ Therefore, now more than ever, public health policies and strategies to increase PA levels of the population safely, require urgent attention.¹⁰

The CMOs have identified healthcare professionals (HCPs) as key conduits in the promotion of PA.³ Physiotherapists are found across multiple clinical areas and are seen as experts in non-invasive management strategies; they are ideally placed to deliver PA guidance.¹² Physiotherapists reported that health promotion, especially PA, was within their scope of practice (SOP).¹³ Yet, in a 2016 survey of 514 UK physiotherapists only 16% knew all 3 components of the CMO PA guidelines despite 77% reporting that they discussed PA with patients.¹⁴ Of this sample, 12 completed follow-up interviews where reported barriers to PA promotion included patient complexity, work culture and a lack of time.¹⁵ The authors also reported some facilitators to health promotion such as having repeated appointments, collaborations with other services and building an alliance with the patient.¹⁵

Solutions to enable physiotherapists to successfully deliver PA guidance have yet to be explored in depth,^{15,16} particularly in the UK. Appropriate solutions are key for policy development, HCP awareness of PA guidelines and also behaviour change in physiotherapy management of patients. As knowledge of the PA guidelines has been previously identified as poor among UK physiotherapists prior to the updated CMO and WHO PA guidelines,¹⁴ it is yet unknown whether knowledge and awareness of the PA guidelines has improved.

The aims of this qualitative study were to explore the current knowledge physiotherapists have of the PA guidelines and promotion of PA, recognise common barriers experienced by physiotherapists when delivering PA advice and identify physiotherapists' perceptions of solutions to support successful delivery of PA guidance.

METHODS

Design

A qualitative research design was adopted in this study using semistructured interviews to explore the knowledge and perceptions towards providing PA advice to patients, among a range of UK-based physiotherapists. The research approach used in this study has previously been used by other authors and provided informative accounts for HCPs perceptions towards providing PA advice in healthcare.¹⁷ The standards for reporting qualitative research was followed throughout.¹⁸

Participants and procedures

The inclusion criteria for this study included UK-based physiotherapists who currently practised and managed National Health Service patients, from any clinical field. Participants were recruited through advertisement on the Musculoskeletal bulletin on the interactive Chartered Society of Physiotherapy portal as well as through LinkedIn and by word of mouth. The advertisement for this study informed prospective participants that it was exploring physiotherapists' knowledge and promotion of PA to patients. Willing participants followed a link to Microsoft Forms, where they viewed the participant information sheet and completed an eligibility survey that included questions on the inclusion criteria. Eligible participants were emailed the participant information sheet to keep, containing details of what the study involved and a consent form, which was signed by the participants and returned, then an interview date was arranged. Participants were informed that they could withdraw from this study at any point, and this was reiterated at the start and end of the interview. The recruitment and interview process continued until data saturation was reached, when there were no more emerging themes or new responses.¹⁹

Data collection

Interviews adopted a semistructured design, which is a common method in healthcare research,²⁰ to encourage open-ended responses that could be elaborated on with probing for the limited responses, which explores participants' thoughts and beliefs.²¹ The interview guide was created by Vishnubala *et al*.²² and adapted to make questions specific to physiotherapists (see online supplemental file). The guide included 30 interview questions, split into 5 sections: (1) demographics, (2) PA knowledge and education, (3) resources and interventions, (4) COVID-19 and (5) other, providing an opportunity for the participants to express any other thoughts or ideas that emerged during the interview. Not all data collected from the interview questions were analysed as they addressed aspects beyond the aims of this paper.²² All interviews were conducted through the Zoom meeting platform by the lead researcher AS. DV provided training to AS and a mock interview was performed to practice and refine the interview technique and reduce any researcher influence emerging in the delivery of the interview questions. Follow-up calls

between AS, DV and CN reflected on the data collection of the initial few interviews to make sure they captured rich and informative data and to review how the interviews had gone. The interviews took place from March 2021 to May 2021 and were audio recorded. Interviews were automatically transcribed verbatim the same day by the Zoom platform, checked for accuracy by the main researcher and stored securely on the University of Leeds OneDrive. Each participant was assigned a participant number, with any identifiable information anonymised.

Data analysis

A thematic analysis approach following Braun and Clarke's six steps was undertaken: data familiarisation, coding, theme identification, revision of themes, defining and naming themes, and writing up.²³ This method was chosen for its flexibility, while providing in-depth complex data.²⁴ In reflecting similar approaches used elsewhere in the literature,¹⁷ interviews were transcribed verbatim and then read through several times in order to become immersed in the data. Transcripts were analysed in order of occurrence, with interesting features of each individual interview transcript identified and assigned a code. All interesting features in the data or codes were subsequently collated from the semi-structured interviews in a separate document, and across the data set common themes were identified. To assure the credibility and trustworthiness of the data, these were reviewed for consistency by the lead researcher. Once the themes were initially established these were discussed with a second researcher (CN) for purposes of composition and consistency and to confirm interpretation of the themes. In a further effort to assure credibility and trustworthiness, prior to the main analyses of the data, a pilot analysis was undertaken separately by two members of the research team (AS and CN) on two interview transcripts in order to confirm consistency and agreement in the interpretation of codes and reflect on emerging themes and to ensure that transcriptions represented participant responses and to reduce the likelihood of researcher bias.^{24 25} At each step in the thematic analysis the lead researcher (AS) reviewed progress with members of the research team (CN and DV) as undertaken in other peer review research.¹⁷

Regarding demographic data, IBM SPSS statistics V.27 was used to describe participant characteristics, including gender, level of education, years of experience, healthcare setting and UK region, which were presented as proportions and frequencies. Number of years of work experience were categorised into 0–5 years, 6–10, 11–15, 16–20 and >21 years. Locations of work were grouped into UK regions. Example quotes from transcripts were presented in tables for each theme.

Patient and public involvement

None.

RESULTS

Participant characteristics

Twenty-one potential participants completed the eligibility survey, but one did not meet the inclusion criteria

Table 1 Participant characteristics (n=18)

Characteristic	Category	n (%)
Gender	Male	6 (33.3)
	Female	12 (66.7)
Level of education	BSc or equivalent	8 (44.4)
	BSc+postgraduate diploma	3 (16.7)
	BSc+MSc	7 (38.9)
Years of experience	0–5	9 (50)
	6–10	6 (33.3)
	11–15	0 (0.0)
	16–20	2 (11.1)
	21+	1 (5.6)
Healthcare setting	Inpatients	5 (27.8)
	Outpatients	11 (61.1)
	Both	2 (11.1)
UK region	West Midlands	3 (16.7)
	East Midlands	8 (44.4)
	Yorkshire and Humber	4 (22.2)
	North West	1 (5.6)
	London	1 (5.6)
	Scotland	1 (5.6)

BSc, bachelor of science; MSc, master of science.

and a further two failed to return the consent form. Data saturation was reached after 18 interviews and therefore no further participants were recruited. Interview length ranged from between 35 to 72 min. Demographic characteristics of the 18 physiotherapists who were interviewed are shown in table 1. The sample consisted of physiotherapists across 6 different UK regions, with 67% female and 61% working in outpatient settings. Fifty per cent of the sample had less than 5 years of experience and 56% had either a postgraduate diploma or a masters level qualification.

Themes from thematic analysis

Following thematic analysis of the data set, five themes were identified as barriers and solutions to promoting and delivering PA guidance: physiotherapist intrinsic barriers, lack of emphasis and priority given to PA, patient barriers to delivering PA, increasing awareness of the PA guidelines and optimising the delivery of PA. Among the 5 themes, 16 subthemes were also identified from the interview transcripts.

Theme 1: physiotherapist intrinsic barriers

In relation to the CMO PA guidelines, 22% of physiotherapists correctly stated the three components of the guidelines (150 min of moderate or 75 min of vigorous intensity aerobic activity and twice weekly strength training), while 39% did not know any of the components of the PA guidelines. Vigorous intensity PA was the most

Table 2 Subthemes for physiotherapist intrinsic barriers to delivering PA advice

Subtheme	Example quotes
Perceived lack of knowledge of the PA guidelines	<i>"I guess my lack of knowledge of the exact parameters that we should be advising. So, I think because I'm not 100% sure how many minutes I should be giving, I don't want to advise patients wrongly." P1</i> <i>"My lack of knowledge in terms of not being up to date with what needs to be done in certain cases. Like, if it's like chronic low back pain or diabetes, or some such diseases, I know what to do, but if there's something beyond this which I haven't read or talked about or it's a more complicated presentation, this is what kind of keeps me a bit apart for not giving that advice." P8</i>
Confidence/fear of giving PA advice	<i>"I think there is a bit of fear of giving the wrong advice and getting penalised for that and also kind of an anxiety is if you've given some advice and it hasn't helped, will you be held accountable?" P7</i> <i>"We know physiotherapy as an intervention doesn't have too many risks associated and certainly not severe ones like other interventions, but I think when we prescribe exercises that tends to be maybe one of the more risky things we do. And so yes, I'd probably say the fear associated with what if it goes wrong, and I think maybe a lack of support from, whether it's the company in terms of training or support." P18</i>

PA, physical activity.

incorrectly answered or unknown component, followed by the strength recommendations. Many of the physiotherapists admitted that they had a lack of knowledge of the PA guidelines, with some stating they had either not heard of or read the UK CMO PA guidelines, would not know where to find them and had also not seen any of the accompanying resources, such as infographics. Other emerging barriers were that the physiotherapists expressed low confidence and fear of giving PA advice, in case they gave incorrect advice, or something went wrong as a result of this dissemination (table 2).

Theme 2: lack of emphasis and priority given to PA

There were multiple barriers that focused on lack of emphasis and priority given to promoting PA, identified by the physiotherapists (table 3). These included many expressing that they received minimal training on PA, both at university and through continuing professional development (CPD) offered at work. Time was a common barrier and issue among those interviewed, often because of multiple tasks required within an appointment that were considered a greater priority. Staffing shortages,

Table 3 Subthemes for lack of emphasis and priority given to delivering PA advice

Subtheme	Example quotes
Lack of CPD training at work	<i>"We have not had any postgraduate or sort of say with, you know, in house extensive training around physical activity, just more something that we touch on. That is if we're looking at you know management of low back pain, we might then say, but physical activity, for example, walking, is important but there won't be much depth behind physical activity as a topic." P18</i> <i>"Since graduating, I don't think that I've had any specific further training on specific like recommendations for physical activity." P14</i> <i>"I wouldn't say I've had that much specifically about exercise while I've been working" P10</i>
Lack of emphasis through training at university level	<i>"So, I guess the university BSc course I did there was some sort of exercise prescription, strength and conditioning type tutoring, but I think it was one or two lectures and tutorials so it made up of a small part of kind of the course and our studies." P13</i> <i>"I think, would probably fairly minimal training undergrad because it was quite long ago I trained." P16</i> <i>"So we've obviously done a bit on health promotion and health activity in university. There was probably a lecture or two on it. There was also an optional module which I opted not to take." P9</i> <i>"In terms of my physiotherapy training specifically, I've not had much specific training on physical activity. I would say that my training around is probably very limited in terms of from university I don't think they touched on it that much he was on a very brief." P5</i>
Time pressures	<i>"If you have someone coming in to see you with a specific condition, so if it is pain or with an injury or whether it is acute or long term, you are going to have to go through that, assess it before your objective assessment, provide them with advice and specific exercises for that condition. Write the notes, get them booked in, write out the exercises, whatever it is. And if you want to give that advice on top of that, you just don't have time, so if you've got someone coming to a specific condition that's going to take priority over general lifestyle advice, even if we feel as though that they may really benefit from that, so time is a huge factor." P6</i> <i>"It also might be that you just don't have the time to do it and give that advice, because you're under so much pressure from your patient caseload and so time is definitely a barrier." P7</i>

CPD, continuing professional development; PA, physical activity.

Table 4 Subthemes for patient barriers to delivering PA

Subtheme	Example quotes
Patient compliance	<p>"Sometimes your patients just don't want to do it, they won't have any of it. I think there's a mixture of reasons that you can't really just pinpoint to on certain factors that affects just how you might deliver physical activity advice kind of thing, because sometimes patients are just not on board and with behaviour modification. With behaviour motivational interviewing, you definitely need them to have some sort of interest before actually trying to then even try doing anything really because if they are not on board, they are not going to do it when you tell them." P9</p> <p>"I guess sometimes maybe the compliance. Again, I'm just thinking about the demographic of some patients that I see, they may find it quite hard to change the amount of physical activity or find that it's not something that they're necessarily prioritising or too willing to do so maybe that behaviour change element." P18</p>
Patient fear of exercise	<p>"Kind of what I've experienced a lot recently is people that have come in with say like pain or you know, like crepitus in the knee. And quite fearful of movement and quite fearful of exercise and kind of have that fear avoidance." P4</p> <p>"Quite often, in regards of exercise as well, any physical activity is a fear avoidance, patients are just afraid to do and make things worse." P3</p>
Expectations of physiotherapy	<p>"Patient expectations of a physio appointment. So, if they're just wanting manual therapy, for example, and we're chewing their ear off about walking more and keeping themselves active and moving or trying to encourage them to pick up a new hobby if they are pretty sedentary, then that could be a barrier as well." P6</p> <p>"We see a lot of chronic pain patients who are looking for a quick fix. And they might turn towards medications or massage or other passive interventions, which actually I try and use the analogy to patients around chronic pain that it's not a machine that can be fixed or should be fixed, but instead of garden that we should try and tend to regularly and, and then that way we may have better success at keeping on top of chronic pain." P18</p>

PA, physical activity.

pressures for quick discharges and work cultures that deprioritises education and advice over other treatments such as manual therapy were other less common but important barriers mentioned by some participants.

Theme 3: patient barriers to delivering PA

Another commonly identified theme among physiotherapists was patient limitations to delivering PA advice (table 4). This included physiotherapists reporting that patients often had low compliance to home management, particularly with exercise. Patient fear of doing PA, in case of reinjury or exacerbation of symptoms, was also a reoccurring perception by physiotherapists, particularly for patients who had chronic conditions with low PA levels. Another common barrier was patient expectations of physiotherapy management, which would often not align with exercise or PA advice, with many reporting that patients would prefer quick fixes and passive treatments such as massage.

Solutions and successful approaches to managing patients with chronic and acute conditions were discussed in the interview, in addition to their opinions on the most efficient and effective ways to communicate the PA guidelines.

Theme 4: increasing awareness of the PA guidelines

A key theme identified from physiotherapists in response to successfully promoting PA to patients was to increase awareness of the PA guidelines to both patients and physiotherapists (table 5). Most responses included improving

staff training with some suggesting it should be a mandatory annual module and others proposing having more group discussions between staff on PA and its benefits. Awareness of local initiatives and exercise referral schemes (ERS) to enable signposting was also recommended as a solution, particularly for those with time constraints and to support the patients more long term. Social media was mentioned on multiple occasions as a solution to both increasing awareness of PA and PA opportunities for the general public and physiotherapists alike, such as Twitter or LinkedIn, by following influential people in the field and listening to podcasts. Social media was specifically recommended as a useful tool to raise awareness to the younger populations and those who regularly use technology, although for populations less suited to social media many physiotherapists suggested television advertisement to engage more people and spread awareness of the PA guidelines.

Theme 5: optimising the delivery of PA

Successful approaches were discussed in terms of delivering PA advice to patients with chronic and acute conditions and how promotion can be optimised (table 6). With patient barriers in mind, many participants suggested ensuring any PA prescription should be individualised, functional and based on what the patient enjoys. Many also reported communication as a key factor and that the language used should not be patronising, forceful or lack empathy, which echoed the advice physiotherapists would

Table 5 Subthemes for increasing awareness of the PA guidelines as a solution to delivering PA advice

Subtheme	Example quotes
Staff training	<p>"I think better ongoing potentially mandatory training or better kind of educational pieces that go out across the board." P2</p> <p>"If we do it as a yearly in-service training, just as a refresher, it makes it more accessible, because if someone's a bit embarrassed or they don't want to ask when they feel they should know, but they don't know where to know, if you do it as a training for the whole team then that's not targeting anyone, but it is very informative." P7</p>
Use of campaigns through television and advertising	<p>"I think TV ads would be quite useful. Often when I'm prescribing exercises to patients that are very sedentary, I use the advert break, as an example of when they could get up change their posture, move around. Do something, do their exercises if they so desire. So having an actual maybe government led advertisement, because the people that are going to see that are the ones that have sat all day in front of the TV." P1</p> <p>"Kind of just campaigning that everybody should be doing, you know even just like adverts on TV, you know, like so it's kind of in people's faces a bit more frequently and every day." P11</p>
Use of social media	<p>"If you want to get the younger ones you need to go social media, you need to get your TikTok influences, you need to get your instagrammers." P17</p> <p>"Social media is the only way forward I think at the minute and it's difficult because obviously you do want to target the older generation as well, however, like I said before, culture change takes such a long time that I think the main way to get it across to people nowadays is through social media and get that to filter down through the next generations" P12</p>
Signposting to other exercise services	<p>"I think we're quite lucky particularly in Sheffield in that we've got sort of for those patients who we know are safe and obviously are happy to do activity we've got a lot of referral schemes, so we've basically got like SPARS [Sheffield Physical Activity Scheme] access which has got physical activity guidance, and so we can actually send them through to health trainers. So they give again further guidance on exercise obviously dieting and things like that." P5</p> <p>"So, one of the ways I think was having further links with like community, like gyms or, like other outdoor spaces. They could yeah link in with that you can like continue the programme after it's like just a clinical referral and, like the six weeks, whatever and then after that the physical activity should carry on." P14</p>

PA, physical activity.

give towards encouraging less enthusiastic colleagues to promote PA. To facilitate discussions and support patients, visual resources, such as infographics, were advocated; some suggested giving them to patients after an appointment or displaying them in waiting rooms and toilets. Other visual resources, such as leaflets and handouts, were also mentioned.

DISCUSSION

The aims of this study were to provide a greater insight into UK physiotherapists' current levels of PA knowledge and identify the main barriers and solutions perceived to delivering PA guidance and we have used these terms as an organising framework to structure the discussion in the sections below. Among the study participants, few physiotherapists knew the UK CMO PA guidelines, despite these having been updated in 2019 and identifying HCPs, including physiotherapists, as key to their dissemination.³ Further, very few of the participants knew where to access the PA guidelines and associated infographics. Common barriers found included: lack of time, low confidence, limited PA training at university and through CPD once qualified, in addition to patient expectations, compliance and fear of exercise. Solutions, separated into increasing awareness of the PA guidelines and optimising delivery of

the PA guidelines, consisted of using television advertisement campaigns and social media to spread awareness; increased staff training; signposting to local services; following individualised and gradual approaches for patients with chronic conditions; having good communication; and use of visual resources, such as infographics, to facilitate the PA advice given by physiotherapists.

Barriers

Physiotherapist knowledge and intrinsic factors

Having knowledge and awareness of the PA guidelines is an important factor in being able to successfully promote PA. Around 22% of participants correctly identified moderate and vigorous intensity aerobic activity and strength recommendations in this study. This was only slightly higher than that found in previous research where 16% of 514 UK physiotherapists correctly identified all three components.¹⁴ While this study only had 18 participants, making true comparisons difficult, the findings might suggest that the 2019 updated CMO PA guidelines have had little impact on the knowledge or awareness of physiotherapists. However, it appears reduced knowledge of PA is not specific to UK physiotherapists, as Yona *et al* found that of 1062 Israeli physiotherapists who took part in a survey in 2018, 87% reported awareness of PA guidelines, yet only 6.8% correctly stated all three components

Table 6 Subthemes for optimising delivery of PA advice

Subtheme	Example quotes
Make PA individualised and functional	<p>"Get to know them as an individual, so ask them their current hobbies and the types of activities that they are interested in. So that I can tailor the activity to their needs and something that I think they are likely to do." P1</p> <p>"I think for anyone who's maybe going to increase their physical activity, I'd have given them advice to sort of take their time with it, just ease themselves in and find something they enjoy and that's regardless of chronic conditions and or anything really." P13</p>
Have gradual approach to introducing PA	<p>"If someone's got a long-term condition, it might be more of a structured manner, so I might start off really small and then, catch up with them, see how they responded to it and then incremental it up and just progress things on a lot slower." P6</p> <p>"If they have had pain a long time, I would probably want to at least begin at a low manageable intensity or volume, and then have that graded exposure to it, so gradually building things up as to, so they can not only build confidence, but they're able to manage it without having regular flare-ups." P18</p>
Supportive communication	<p>"I think appreciating where patients are. So, kind of sympathising with the fact that they're in pain, in particular for chronic patients with chronic problems. You know I hear a lot that people don't listen, believe me, they think I'm putting it on, or they think I should be able to do more and I think just understanding and empathising is a really good starting point, because I think once people feel listened to, then they're more likely to take on board the advice of education that you can offer them." P16</p> <p>"The biggest thing I've learned is to not ram it down their throat and try and come across you know better because, it just really pisses people off, but, in terms of trying to just say this is what you could be doing, how much of that do you think you could manage which sounds like it's doable for you and kind of go from there seems to work quite reasonably well." P15</p>
Use of visual resources	<p>"I'd say if I have to pick one, I would go for the government infographics just because they've got the information that you can print out and stick up. So, you've got everything you need and is not in depth and it's obviously patient friendly as well, so it is simple, for everyone, and everyone can understand it, so I'd probably say that's the best resource, in my opinion." P5</p> <p>"Infographics, so if you've got certain clinicians who are visual learners, let's say, using things like that they might be ones that they can print off, put up in their clinic rooms I've seen that before and facilitates that discussion with the patient." P18</p>
PA, physical activity.	

of the guidelines, with vigorous intensity PA and strength components being the least known,²⁶ similar to the present study. This could be due to physiotherapists possibly feeling more confident recommending light or moderate intensity PA to reduce likelihood of adverse effects, particularly for more complex patients typically with comorbidities such as cancer, heart or respiratory conditions and are therefore less aware of the other recommendations. Awareness of the guidelines and where to locate them were clear issues in this present study, with many not knowing where to find the CMO PA guidelines, which questions the effectiveness of the communication strategy when the guidelines were updated in 2019. Awareness of the CMO PA guidelines was also recently reported to be limited in a qualitative study of 15 general practitioners (GPs) by Vishnubala *et al.*²² Another larger study in 2016 of 1013 GPs found that 30% had never heard of the CMO PA guidelines and a further 50% had heard of them but were very unfamiliar.²⁷ Arguably, the lack of awareness of the CMO PA guidelines could be a result of HCPs using alternative PA guidelines, with some participants in this study reporting using the WHO guidelines. Nevertheless, the recommendations from the different guidelines are very similar and thus does not justify limited knowledge of the key components of the CMO PA guidelines.

Fears of litigation are prevalent in healthcare, which can prevent HCPs from delivering some treatments. De Vivo and Mills identified fear and a perception of vulnerability as a barrier experienced by 10 midwives who gave PA advice to pregnant patients,²⁸ which was also reported in another study of nurses and GPs who managed patients with diabetes, leading to disengagement in PA advice.¹⁷ This is especially important when patients can both benefit from increasing their PA and also present with a readiness to change their PA status. Further, Lowe *et al* highlighted that PA discussions were more difficult with complex patients.¹⁵ A survey of 7026 GPs in 2012, found that many would practise defensively, particularly for high-risk patients due to the impact of complaints.²⁹ This perceived risk could be attributed to lack of knowledge of how to adapt PA to the patient's needs leading to reduced confidence giving the advice. Yet, many physiotherapists in this present study were at least fairly confident giving PA advice, which may be due to physiotherapists seeing health promotion as part of their SOP and that they have the skills to engage the patients into changing their lifestyle by basing PA advice on experience rather than specific guidelines. Indeed, physiotherapists have at least confidence in providing basic PA advice, though are

possibly more fearful with complex patients due to the increased risks.

Lack of emphasis and priority

Lack of emphasis and priority placed on PA is another barrier faced by physiotherapists in this study. Although HCPs are identified as being key to PA promotion in the CMO guidelines, the time pressures during assessments are a frequent challenge for many physiotherapists, with time being the most cited barrier by 22 UK inpatient physiotherapists during focus groups.¹³ Time pressures during appointments have an impact on the ability to give advice, leading to prioritisation of tasks and mean significantly less lifestyle advice is provided.³⁰ Furthermore, perceptions that PA advice is a low priority needs to be changed. In part, this would require training and a greater emphasis on the dissemination of PA guidance by HCPs. A lack of training on PA by HCPs is not uncommon,¹⁷ despite over half of the physiotherapists in this study completing a postgraduate diploma or master's degree many reported inadequate training on PA, questioning the integration of health promotion in the curriculum. Yet, physiotherapy students who took part in focus groups, reported receiving academic public health training and reported completing public health qualifications while at university.³¹ This suggests that while public health topics are being taught at university, a possible lack of emphasis and importance placed on PA and how to promote PA effectively is leading to the knowledge not being sustained. A lack of emphasis on training on PA promotion seems to be an issue that continues post qualification with 55% of GPs reporting not receiving any CPD on PA since leaving university.²⁷ It also raises questions if training and education that has been provided through recent initiatives such as the Public Health England Clinical PA Champions programme has been accessed and subsequently used to the full effect.

Patient barriers

Patient barriers for taking up PA advice can heavily impact on clinical outcomes if not identified and addressed. The perception of low patient compliance was a re-emerging barrier in this study, which reflected previous findings where 24% of Australian physiotherapists agreed PA advice would not change a patient's behaviour.³² While this perception of low compliance may be warranted in some cases and based on experiences, it may also be that exercises and PA prescribed are not meeting the needs of the patient. Indeed, UK-based Pakistani women identified that exercise-based management did not meet cultural needs, leading to poor compliance.³³ Patient demographics can also influence compliance, with smokers and the elderly less likely to change their PA levels.³⁴ Moreover, this may feedback to low confidence of physiotherapists in modifying advice to tailor approaches that are socioculturally meaningful to individuals from diverse backgrounds. Additionally, patient expectations of physiotherapy can contribute to poor compliance,

with some patients more reliant on passive treatments such as massage compared with active treatments such as exercise,³⁵ which was highlighted as a barrier in this study. Regardless of expectations, patient fear can affect compliance, often as a result of exercise misconceptions, poor clinician communication or negative past experiences, leading to the perception that PA is harmful and causing fear avoidance.^{36 37} Fear avoidance of PA, particularly with chronic musculoskeletal conditions, can impact on clinical outcomes and rehabilitation if not addressed.³⁸ Patient barriers should not be overlooked when promoting PA, and therefore, strategies to optimise compliance, reduce fear and manage expectations are vital for succeeding in behaviour change.

Solutions

Increasing awareness of the PA guidelines

Increasing awareness of the PA guidelines to both patients and physiotherapists was one solution identified in this study. Indeed, with inadequate training reported, there is a need for improvements in university and staff training, an opinion also expressed by other HCPs.^{17 22} A possible explanation for this is that many physiotherapists often incorporate exercise prescription into a patient's management plan and so feel they already have the skills to deliver PA advice to some extent.¹⁶ Nevertheless, for those with more limited knowledge of the CMO PA guidelines, staff training would benefit physiotherapists giving them confidence in discussing PA with any patient. Awareness of local services and ERS available to facilitate signposting can also support physiotherapists who lack confidence providing specific PA guidance. In addition, the importance of having PA resources and information in one consolidated place is also important in this respect.¹⁷ To improve adherence, exercise professionals have suggested that HCPs should understand the schemes they signpost to, so that they are not used as a last resort and ensure the patient is motivated to participate.³⁹ Signposting appears to be an effective solution to PA promotion, though this requires the availability of schemes, and awareness and understanding for HCPs to appropriately refer patients to these services.¹⁷

Optimising delivery

Optimising the delivery of PA guidance is essential for patient understanding, compliance and subsequent clinical outcomes. Graded exposure to PA for those who are fearful or deconditioned was one of the proposed successful approaches to delivering PA guidance in this study and has previously been reported as an effective sustainable approach to prescribing exercise,³⁸ while still offsetting the adverse effects that being inactive can cause.⁴⁰ Making PA individualised, with consideration of patient preferences to build confidence is more favourable by patients.⁴¹ This person-centred approach, in addition to goal setting and self-monitoring, has been found to be an effective behavioural change technique leading to long-term change in PA levels.⁴² Moreover,

use of other behavioural therapies, such as acceptance and commitment therapies (ACT), which were developed from cognitive-behavioural therapy, can be used to direct development of interventions to sustain long-term behaviour change and compliance to PA.⁴³ Additionally, good communication has been found to be crucial to challenge the misconceptions leading to poor compliance, especially in patients with chronic conditions where pacing is advised,³⁶ whereas forceful or patronising language discouraged patients from communicating their concerns.⁴⁴ Furthermore, there are multiple factors that can influence a patient's response to PA advice, and therefore, the approach taken and language used is vital for successful changes in behaviour and thus needs to be carefully considered by HCPs.

To further facilitate discussions, visual resources, such as leaflets, have also been suggested to reinforce advice given to patients.²² HCPs have previously reported leaflets as a convenient concise way to help focus information during a consultation and more convenient than using websites.¹⁷ Freene *et al* found that 93% of an Australian physiotherapy sample also agreed that having resources would be useful for promoting PA.³² Leaflets have been found to improve patient satisfaction, communication and reduced the need for reassessments of the same pathology in French emergency departments.⁴⁵ Additionally, infographics have been found to be an effective visual way to convey complex information on PA, though the effectiveness of influencing health behaviour change is unknown.⁴⁶ In this study, some participants reported displaying the CMO PA infographics in waiting rooms and toilets, which increases exposure to the PA guidelines and may facilitate discussions. However, as the CMO PA infographics are aimed towards HCPs, consideration is needed to ensure displayed information is not too complex to meet the needs of patients.⁴⁷ Visual resources can assist physiotherapists in promoting PA and reinforce the message delivered during the appointment, though must involve patient friendly material.

Strengths and limitations

To the authors' knowledge, this is the first study to review UK physiotherapists' knowledge of the updated 2019 CMO PA guidelines and explore, in depth, physiotherapists' perceived solutions to address the barriers faced when delivering PA guidance. Virtual interviews conducted using online platforms enabled recruitment of physiotherapists from all over the country, increasing the representation across different geographical regions. Additionally, the sample contained a range of clinical expertise and years of experience. The interview questions enabled flexibility to responses and encouraged reflection of personal practices on delivering PA advice that could help improve the promotion of PA guidelines. Moreover, this study highlights the importance of holding dialogue with physiotherapists when identifying solutions for promoting the CMO

guidelines. Limitations include increased risk of bias due to having a volunteer sample, with those who are more enthusiastic about PA or have more knowledge on the topic being more likely to participate. Findings cannot be generalised to UK physiotherapists per-se, as qualitative data are heavily impacted by personal viewpoints and values; however, these findings provide valuable insights into physiotherapists' awareness and application of CMO PA guidelines and provides a foundation for future research. Moreover, this study also provides valuable insights that inform future intervention design aimed at supporting physiotherapists to give PA advice. Placing physiotherapists at the heart of these discussions is important in shaping workable solutions aimed at promoting the PA guidelines in routine care. Greater depth in the analysis of themes by comparing the different clinical fields of physiotherapy would have added value and enable more specific solutions to each clinical field. Finally, although efforts were made to reduce researcher bias by reviewing and discussing the themes to ensure reliability of interpretations, and reflection at each stage following Braun and Clarke's six steps, there was still a risk of bias when interpreting the results.

Clinical implications

Placing physiotherapists at the heart of discussions is important in shaping workable solutions aimed at promoting the PA guidelines in routine care and so ongoing dialogue is important in effective intervention design and delivery aimed at this group of HCPs; though, it is acknowledged that this does not consider the wider determinants of professional practice, such as workloads, remuneration, time pressures and priorities for both patients and physiotherapists. Nonetheless, as barriers and knowledge appear to be unchanged with time,^{14 15} action is needed both at university level and through CPD to increase knowledge and awareness of the PA guidelines. Physiotherapists should accept responsibility of their own development on PA knowledge and reflect on their current practices, comparing to the optimised approaches suggested in this study and adapt accordingly, especially for patients with different sociocultural backgrounds. Following this study, future research needs to explore any differences in the barriers and solutions to delivering PA advice between various clinical fields of physiotherapy. Action is needed to begin implementing the solutions raised, to challenge these persisting barriers and to evaluate the effectiveness of the solutions in supporting physiotherapists delivering PA advice. Consideration of behavioural change techniques and use of ACTs can help to guide development of interventions for either clinicians or patients to improve and sustain PA levels in the population. The continued involvement of physiotherapists started within this study is important in shaping such solutions.



CONCLUSION

Despite updates to the CMO PA guidelines and previous research highlighting barriers to physiotherapists delivering PA advice, the same barriers including time, inadequate training and low patient compliance remain. While physiotherapists have some confidence delivering PA advice, many felt their knowledge of the PA guidelines specifically was limited. Increasing awareness and optimising delivery of PA were identified as the main solutions to increasing PA promotion, with a greater emphasis needed on PA in training and specific approaches to increase the efficiency of giving PA advice being suggested. These findings can be used to help to facilitate implementation of the solutions and future research should then evaluate the effectiveness of the implemented strategies in supporting PA discussions, to increase the public's PA levels.

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Sport and exercise medicine in the UK: what lies beyond the crossroads?

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In 2009, Cullen published 'Crossroads or threshold? Sport and exercise medicine (SEM) as a specialty in the UK'.¹ The editorial describes a 'crossroads' created by establishing SEM registrar posts but a lack of SEM National Health Service (NHS) consultant posts. The 'threshold' relates to the potential opportunities of establishing adequate SEM consultant posts to service the general population in the UK. In this editorial, the authors will examine 'what lies beyond the crossroads' and explore how the medical specialty of SEM in the UK has developed, the current challenges faced and discuss the recent vote (May 2023) in favour of dissolving the two largest SEM UK organisations to combine and reform as a college of SEM.

STATE OF PLAY: SEM IN THE UK

The Faculty of Sport and Exercise Medicine (FSEM), along with the Joint Royal Colleges of Physicians Training Board, is responsible for the specialist SEM training programme. The British Association of Sport and Exercise Medicine (BASEM), whose formation dates back to 1952, provides SEM education to its multidisciplinary membership. SEM first became a medical specialty in the UK in 2005.¹ Since then there has been significant growth, now with 19 NHS trusts employing SEM Consultants and 180 physicians on the

SEM Specialist Register.^{2,3} This number continues to grow, with an average of 11 new SEM Registrar posts in England annually.⁴ Significant progress has undoubtedly been made. However, key challenges remain including creating NHS consultant posts, optimising SEM incorporation into the NHS and setting consistent standards for all professionals working in SEM.⁵

SEM AND THE NHS

The importance of incorporating SEM services into the NHS has been acknowledged since the inception of the SEM specialty.¹ How best to do this has been outlined in FSEM's recent workforce planning document.⁴ Figure 1, created by FSEM, highlights multidisciplinary team (MDT) members commonly providing community and hospital SEM care, and lists key services where SEM can add value to the NHS including a 'one stop shop' for integrated musculoskeletal (MSK) care.⁴ There is evidence demonstrating that SEM specialists leading NHS MSK services improve patient experiences, reduce variation of care, and are more cost-effective.⁶ Despite this, of 42 UK integrated care systems only 15 currently benefit from SEM services and expertise.⁴

Individuals working in MSK and physical activity (PA) medicine are from a diverse range of professional backgrounds. For example, general practitioners (GPs) and first contact physiotherapists are both front line in NHS MSK work. As workforce planning considers how best to incorporate SEM services into the NHS, it is vital to focus on the value SEM consultants add not only to individual patient cases, but also to the development and sustainability of the MDT working in SEM services. In particular, focus should include⁴:

- ▶ Educating and supporting GPs knowledge and confidence in treating MSK conditions.
- ▶ Working alongside all healthcare professionals (HCPs) to deliver effective care to patients through shared education, training, guidance and leadership.

- ▶ Supporting HCPs in routinely engaging in impactful conversations about PA.
- ▶ Supporting and developing continued clinical governance, standard setting, and accreditation of an MDT workforce.

The SEM workforce, although expanding, is not keeping pace with national demand either in MSK medicine or PA medicine. In addition, there remain significant inequalities within the SEM workforce which remains male-dominated.⁷ While this is improving, especially with women in multiple leadership roles nationally and internationally, a continued focus through leadership development and mentoring is important.⁷

SEM AND PA MEDICINE

SEM physicians work alongside public health colleagues to develop pathways to encourage PA. The national conversation around PA has evolved over the last 10 years through 'everybody active every day' and the Moving Healthcare Professionals Programme.⁸ The FSEM has been instrumental in delivering several aspects of this programme including 'Moving Medicine', a resource to help HCPs deliver PA as part of routine clinical practice, and the 'Active Hospital Project' which offers a toolkit to aid in embedding PA interventions into hospitals.^{9,10} Despite the increasing evidence of the benefits of incorporating PA into the NHS, there remains much work to be done to scale up PA intervention.

IMPORTANCE OF MDTs AND HOW A COLLEGE OF SEM WOULD BENEFIT ALL

SEM has always been at the forefront of multiprofessional working, with sporting bodies recruiting skilled and knowledgeable clinicians from many disciplines to work collaboratively. This non-hierarchical approach recognises the contribution of each profession. An MDT model improves understanding and respect among colleagues, improves communication, ensures consistent messages regarding management and enhances shared learning and decision making.

The formation of a college of SEM that is open to all professionals working in sport, PA and MSK medicine is a recognition that MDT collaboration should become standard practice. A single organisation will:

- ▶ Improve patient care and ensure the patient is seen by the right professional at the right time.

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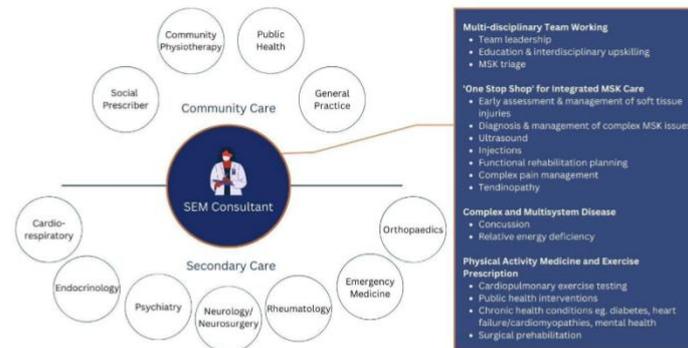


Figure 1 SEM services within the NHS integrated care systems in the UK, highlighting both commonly incorporated MDT professionals and key areas where SEM can add value to NHS. MDT, multidisciplinary team; MSK, musculoskeletal; NHS, National Health Service; SEM, sport and exercise medicine.

- Set consistent standards using exams, accreditation of professional portfolios and the establishment of guidance for patient care developed by all professions.
 - Ensure a consistent management plan for care is agreed on by all parties and delivered in an environment that permits review and reflection by all.
- For all HCPs working in the speciality, this provides an opportunity to be recognised as equals to medical colleagues with all groups having complementary skill sets to optimise patient and athlete care.

THE FUTURE OF SEM IN THE UK

The recent (May 2023) positive vote to merge FSEM and BASEM could be an important phase in the evolution of SEM in the UK. The new organisation would provide a single voice for SEM and traction for continued progress of the speciality. It will have a multidisciplinary membership inclusive of all those working within SEM and provide a progressive voice for the future. An ethos of inclusion, embracing diversity and importance of the MDT model will be at the heart of the new organisation. It is an exciting and progressive time for SEM in the UK.

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Physical Activity Clinical Champions: a peer-to-peer physical activity education programme in England

David Eastwood ¹, Justin Varney,² Andy Pringle,³ Dane Vishnubala^{1,4}

BACKGROUND

Physical inactivity is a key risk factor for morbidity and mortality worldwide.¹ Targeted interventions aim to increase activity participation, with healthcare professionals (HCPs) having a vital role in its promotion.^{2,3} The England-based Physical Activity Clinical Champion (PACC) Programme is a global example of a professional development programme designed to harness HCPs influence. This editorial reflects its history, with insights into the development, implementation and impact from some key individuals who shaped it.

DEVELOPMENT

The PACC programme is a peer-to-peer educational programme aimed at HCPs. It forms part of the moving healthcare professionals' programme, led by the Office for Health Improvement and Disparities (OHID) and funded by Sport England.⁴ Established in 2014, it aims to encourage and empower HCPs to integrate physical activity (PA) advice within clinical practice. It principally involves an 1–3-hour-length education session, using a standardised slide set, delivered to HCPs by a PACC (usually based in the region). The session is free to hosting institutions with champions paid per sessional delivery of training by OHID.

The programme includes a manager, two administrators and three clinical leads (one each for doctors, nurses and allied healthcare professionals). Champions undergo open recruitment and a structured, evidence-based training programme delivered by the clinical leads (figure 1). Once trained, a PACC will use contacts, working relationships and

external requests to provide peer-to-peer training to HCPs of various backgrounds. The training aims to increase the knowledge, capability and motivation of HCPs to dispense brief advice on PA to patients. Content includes PA recommendations, approach to behaviour change (using case studies and practical tips) and aims to reinforce the numerous health benefits on long-term conditions.^{1,5} This was developed by clinical leads with academic input from a university.

Dr Justin Varney, public health consultant and creator of the PACC programme

'The Clinical Champion programme was created because, fundamentally, medics gain more from each other than e-learning modules or textbooks. Many barriers to brief advice on PA in clinical practice are about confidence rather than knowledge; building confidence involves learning from those facing similar challenges who have made it work. Text-based learning is important for knowledge, but less helpful toward skills, which is why the champions are part of the matrix of the Moving Healthcare Professional programme, alongside e-learning, infographics and the spiral undergraduate curriculum. Working with the Champions has been a huge privilege: from a range of healthcare backgrounds, they brought practical experience and passion to sharing learning... making it 'real' for colleagues has been at the heart of the success of this programme'.

Challenges facing the PACC programme

Despite overwhelming evidence of the health benefits of PA, only 35.7% of GPs are at least 'somewhat familiar' with current PA guidance.⁶ This possibly stems from limited PA education in undergraduate and postgraduate training.⁷

Multiple national policy drivers highlight PA as an issue but a lack of cohesion between stakeholders is thought to be unhelpful in driving this change.⁸ PACCs can reach health professionals from various backgrounds and localities

to instigate a whole system response by spreading a consistent message.

Even with training, barriers such as limited consultation time and patients' attitudes to risk may stop HCPs from providing brief interventions.⁶ The programme tries to tackle this by signposting to the Moving Medicine resources, which provide consultation guides for 1 min conversations,⁹ and imparting practical suggestions on approaching barriers, such as reinforcing the safety of PA.

The pandemic brought more pressure for HCPs and prevented the traditional face-to-face delivery model of the PACC programme. Despite this, the programme has adapted and now provides remote teaching in a hybrid model.

Impact of the PACC programme

There are currently 58 active PACCs, 26 having been recently recruited. This includes 16 PACCs stationed within hospitals.

To date, more than 40 549 HCPs have been trained by PACCs. This includes 18 459 HCPs through phase 2 of the programme (August 2019–August 2022), despite the COVID-19 pandemic.

An independent evaluation of the PACC programme shows the positive impact of training, with 43% of attendees reporting improved knowledge of PA promotion. Forty-seven per cent report increased confidence and 40% increased skills.¹⁰ The attendees who did not report benefits were often those with pre-existing knowledge, skills and confidence prior to training, suggesting more advanced or tailored teaching could be appropriate. Having better knowledge, confidence and skills do not necessarily translate to a change in clinical practice and further follow-up with those that received training is needed to robustly evaluate the programme.

Dr Dane Vishnubala, consultant physician in sport and exercise medicine and lead doctor for the PACC programme

'Peer-to-peer education, on the scale of the PACC programme, is unique. Recruiting champions, who are passionate about PA, and who use their local network and knowledge to educate clinicians (including clinicians who are less accessible) is a strength of the PACC programme. Utilising local clinicians has also allowed tailoring of education to suit the local setting, allowing more insightful discussions around implementation. The PACC therefore understands the landscape,

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Physical Activity Clinical Champions (PACC)



Figure 1 Physical Activity Clinical Champion programme pathway. NHS, National Health Service.

challenges and, potentially, some possible solutions to providing PA advice to the local patient population. Anecdotally, I have seen a real paradigm shift, with clinicians keen to receive the education and agreeing that providing PA advice is a part of their role. This is a significant change from 8 years ago’.

Reflections and the future of the PACC programme

Peer-to-peer models of education delivered by clinicians is the core strength of the programme, providing recognisable clinical challenges and realistic practical solutions. This model demonstrates both that being a clinical peer educator has an impact for colleagues but is also a rewarding role. Further evaluation is required to capture the frequency of PA interventions and the subsequent effect on PA levels.

The PACC team hopes to continue its work in creating a sustainable programme, with proposals for a new delivery provider currently being negotiated in collaboration with Sport England, OHID, the Advanced Wellbeing Research Centre at Sheffield Hallam University, the Faculty of Sport and Exercise Medicine UK and Intelligent Health.

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Pregnancy and physical activity: facilitating change

Katherine Rose Marino ¹, Gráinne Donnelly,² Isabel S Moore ³,
Marlize De Vivo ^{2,4}, Dane Vishnubala^{5,6}

INTRODUCTION

There are several benefits of physical activity (PA) in pregnancy, yet engagement levels are low. Less than 30% of pregnant women worldwide meet PA recommendations, compared with 45%–55% of non-pregnant women in developed countries.¹ Benefits of PA in pregnancy include: reduced risk of hypertensive disorders and gestational diabetes and decreased gestational weight gain.^{1,2} Furthermore, PA can be used in pregnancy to treat medical conditions, such as improving glycaemic control in pregnant women with diabetes.³ However, less than half of healthcare professionals know the PA pregnancy guidelines and only one-third of pregnant women receive professional PA guidance.^{4,5} While PA pregnancy guidelines exist, the translation of these guidelines to the end user has not been effective. In this editorial, we discuss PA recommendations during pregnancy, how healthcare professionals can support and facilitate PA in pregnancy and explore future research opportunities.

THE RECOMMENDATIONS

In 2019, The chief medical officers (CMO) of the four countries comprising the UK recommended that pregnant women aim to accumulate 150 min of moderate intensity PA per week and engage in muscle strengthening activities 2 days a week.² Being active in pregnancy is safe for most women, but some may need to consult a healthcare professional before they begin or continue to be physically active. The Get Active Questionnaire for Pregnancy is a self-administered prescreening tool that can help identify women who need to consult with a healthcare professional before they begin or continue to be physically active. Additionally, the questionnaire can help healthy pregnant women

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overcome any concerns and fears they might have.⁶ Absolute contraindications to PA include: uncontrolled hypertension, restrictive lung disease, multiple pregnancies (three or more foetuses), persistent vaginal bleeding and severe anaemia.⁷ Activities with an increased risk of falling, sustaining high impact or contact injuries, or those that limit oxygenation (eg, high altitude training when not normally living at high altitude) are also best avoided.³ Vigorous activity is not recommended for women who were previously inactive while women who significantly exceed the recommended PA guidelines prior to becoming pregnant are advised to consult

with a healthcare provider specialised in managing this active population.^{2,3}

CHANGING THE MESSAGE: HOW HEALTHCARE PROFESSIONALS CAN SUPPORT PA IN PREGNANCY

Pregnant women face a variety of barriers and report many concerns when it comes to engaging with PA. For example, fear of harming their baby, pelvic floor dysfunction, nausea, fatigue and anxiety may lead to low levels of PA and/or reducing previous PA engagement.¹ Other constraints may play a role, such as a shortage of time or lack of support at home to allow women to engage with PA. Prior to encouraging PA, healthcare professionals should seek to understand a pregnant woman's current feelings towards PA and concerns and/or barriers they may have. Such a person-centred approach can facilitate meaningful discussions to tailor advice rather than using a 'one-size-fits-all' approach.

By using person-centred advice, based on individual intention and behaviour



Figure 1 The UK chief medical officers' infographic on physical activity in pregnant women.²

status, healthcare professionals can provide appropriate guidance. Four profile types potentially exist⁸: (1) regularly active women who intend to continue being active in pregnancy; (2) regularly active women pre-pregnancy who do not intend to continue in pregnancy; (3) inactive women who intend to be active in pregnancy and; (4) inactive women who do not intend to start being active. Strategies needed for each profile may differ.⁸ For example, those who fit profile one may require brief intervention and those who fit profile two may benefit from a goal-setting, person-centred approach. Profile three may benefit from motivational interviewing, and profile four may benefit from a PA counselling approach.⁸ However, further research on these different approaches based on profiles is needed.⁸

In addition to adopting different strategies and overcoming barriers or concerns, practical suggestions on how PA can be accumulated during the day are encouraged. Getting creative to fit PA around current life demands, such as taking the stairs or having active walking meetings, alongside identifying PA already undertaken such as housework and running errands, may help women feel confident in meeting PA guidelines. Additionally, breaking the PA time requirements down into daily requirements (eg, 22min) may appear more manageable for pregnant women with busy home and work lives.

Barriers to healthcare professionals discussing PA to pregnant women include a lack of training, confidence, time and resources.⁹ To aid professionals facilitate meaningful conversations with patients, the UK's CMO created an infographic outlining the PA guidelines in pregnancy (figure 1).² Further, to enable clinicians to integrate PA advice into consultations, the faculty of sport and exercise medicine created pregnancy-specific guidance on their Moving Medicine online platform.¹⁰

FUTURE RESEARCH

Pregnancy is a key life event that can act as a trigger for optimising and maintaining health. It is essential that healthcare

professionals feel empowered and knowledgeable to encourage pregnant women to begin, or continue being, physically active. Future research should involve assessing direct benefits of PA in pregnancy to the offspring (epigenetics), indirect benefits to children, families and communities, cost-effectiveness of PA in pregnancy and further research into specific groups such as those who exceed the current recommendations and twin/multiple pregnancies. The barriers healthcare professionals face in providing PA advice to pregnant women and their solutions should also be investigated. Finally, it is essential that future studies focus on pregnant women who are less likely to engage in PA and those currently under-represented in research (eg, ethnic minorities, lower socioeconomic groups) are adequately represented and acknowledged in both development and analysis.

Healthcare professionals are well-placed to change the message regarding PA in pregnancy, moving away from fear and misunderstanding, to promoting the benefits to our patients and communities. We have provided practical examples for healthcare professionals to approach the discussion, from starting the conversation, to tailoring their advice and making the PA recommendations appear more manageable. We hope this enables healthcare professionals to positively facilitate PA behaviour change in pregnant women to enable more pregnant women to reap the health benefits of PA engagement.

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