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Sheffield.

PERFORM:

**Performance Enhancing Routines for Optimising Readiness using
Metacognition
For the Management of Acutely Unwell Patients**

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SUMMARY

Negative emotions and behaviours experienced during stressful situations may influence junior doctors' capacity to manage clinical emergencies through compounding difficulties in synthesising information and decision-making. This may explain why newly qualified doctors frequently report under-preparedness to manage acute unwell patients. Until now, very little has been offered in the way of a solution to this problem.

Elite athletes are coached in the application of Performance Enhancing Routines (PERs) to minimise the impact of negative emotions and behaviours during high-stakes competition. Similar ideas trialled in healthcare, such as mental imagery, were found to enhance performance and decrease stress. However, the "one-size fits all" approach used in both these domains overlooks the importance of *when* and *how* individuals optimally apply PERs. To our knowledge this project is the first to design and evaluate an individualised, self-regulatory PER model to improve junior doctors' emotional and behavioural control during acutely unwell patient management.

The study contained Exploratory, Pilot and Full Intervention Phases. The latter was a dual-site multiple case study which used mixed-methods. The model was initially coached in simulation and successfully transferred to real clinical scenarios. Application of the model during an acutely unwell patient in situ simulation significantly improved self-efficacy of control over negative emotions and behaviours ($p=0.003$). Doctors agreed that the original model reflected its application in clinical practice and were able to individualise it through adaptation or creating new PERs. Feedback supported the wider use of PERFORM and recommended improvements.

This study supports previous findings that doctors do experience negative emotions and behaviours during the management of acutely unwell patients, which can affect clinical performance and that they currently lack strategies with which to manage them. Potential future work includes wider roll-out of the programme to newly qualified doctors; inter-disciplinary adaptation for other healthcare professionals and/or feedback into other professions, including sport.

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ABBREVIATIONS

ABCDE	Airway, Breathing, Circulation, Disability, Exposure
ACP	Advanced Clinical Practitioner
BNF	British National Formulary
CTH	Central Teaching Hospital
DGH	District General Hospital
ED	Emergency Department
F1 / FY1	Foundation Year 1 doctor
F2 / FY2	Foundation Year 2 doctor
GDPR	General Data Protection Regulation
GMC	General Medical Council
GP	General Practice or General Practitioner
HCP	Healthcare Professional
HRA	Health Research Authority
MMR	Mixed Methods Research
MRC	Medical Research Council
NEWS	National Early Warning Score
NHS	National Health Service
PER	Performance Enhancing Routine
PERFORM	Performance Enhancing Routines For Optimisation of Readiness using Metacognition
PPR	Pre-Performance Routine
SBAR	Situation, Background, Assessment, Recommendation
SE	Self-Efficacy
SMART	Student Management of Acute (illness) Recognition and Treatment
SRL	Self-Regulated Learning
SSI	Semi-Structured Interview
STH	Sheffield Teaching Hospitals
TA	Think Aloud
UK	United Kingdom of Great Britain and Northern Ireland

GLOSSARY

Consultant	A doctor who has completed all post-graduate training and examinations relevant to their chosen medical specialty.
Foundation Year 1 doctor	A doctor in their first year of post-graduate training (UK-based term).
Foundation Year 2 doctor	A doctor in their second year of post-graduate training (UK-based term).
Foundation Training	The UK-based post-graduate programme of medical training which commences immediately after graduation and lasts for 2 years (full time).
Junior doctor	A term used to describe any medical doctor who is not a Consultant or General Practitioner.
Metacognition	Psychological theory first described by Flavell (1979) as ‘thinking about thinking’
Mixed Methods	Research including both quantitative and qualitative data.
Primary Care	Community-based healthcare practice; synonymous with ‘General Practice’ in the UK.
Qualitative Data	Generally utilises non-numerical forms of data e.g. interviews and observations.
Quantitative Data	Generally utilises numerical forms of data e.g. raw numbers and statistical analysis.
Registrar	A (junior) doctor training to become a consultant. They have generally completed 4/5 years of post-graduation training (full time).
Secondary Care	Hospital-based healthcare practice.
Simulation	A strategy often used in medical education whereby tasks (clinical and non-clinical) are replicated to support knowledge/skill acquisition and development, generally in the absence of real patients.

Within the results sections, where direct quotations are taken from the doctors’ interview transcripts and presented in the results of Chapters 4-7, the following apply:

Symbol	Position in quotation	Meaning
...	Beginning of quotation	The beginning of the sentence has been omitted
...	Within the body of the quotation	A natural pause by the doctor during their speech
...(…)...	Within the body of the quotation	Part of the sentence has been omitted
(not italics)	Anywhere in the quotation	An addition by the researcher to clarify or contextualise the quotation e.g. “ <i>micro</i> (biology)”, or non-verbal communication, e.g. (laughs)
CAPITALISED	Anywhere in the quotation	Emphasized by doctor

Chapter 1. Introduction

This chapter introduces the research conducted in this thesis. It begins with an explanation of the researcher's clinical background and personal motivations for the study. The context and rationale for the study is then outlined, with a summary of the literature describing the current problem facing junior doctors in their preparedness to manage acutely unwell patients.

Next, a preliminary introduction to the theory of metacognition and its current use in Medical Education is offered to contextualise its subsequent application within the PERFORM model.

Finally, an overview of the organisation of the remainder of thesis is offered to guide and orientate the reader.

1.1. My Background

This research study was borne out of my personal interest into how emotions and behaviours in the workplace can affect clinical performance. Having completed medical school in 2010 I felt perhaps understandably nervous, but also excited to begin work as a junior doctor. Within my first five days of work I encountered a stressful event during the management of an acutely unwell patient. In that moment all my training, knowledge and skills evaded me, and I felt overwhelmed by the sense of helplessness and panic. Only after a few months did I discuss the event with my peers. It was then that I realised that mine was not a unique experience.

Two learning points arose from this situation. The first was that during that patient encounter I did not perform to the best of my ability. Retrospectively I felt confident that I *did* know what to do, but simply couldn't access that knowledge due to a clouding of my judgement from my heightened emotional reaction. If only I had been more prepared to deal with my own behaviour, the situation would have been very different. The second realisation was that many of my peers recalled similar experiences when managing acutely unwell patients and shared the discomfort of discussing them with others due to the fear of negative judgement.

After completing Foundation training I chose to continue my medical training in anaesthetics and critical care. From my own observations, the situation regarding the emotional preparedness of newly qualified doctors, especially in the domain of acute patient management, has not improved since I was a foundation doctor myself. In fact, I have been involved in supporting more junior trainees with emotional or behavioural workplace issues and am disappointed that more is not being done to better equip and support them.

This PhD has afforded me the opportunity to try to improve emotional preparedness for junior doctors and allow them to deliver the best care they can; this is beneficial for the patient, the doctor themselves and the wider healthcare system from the perspective of workforce retention. My pre-PhD understanding of how we educate medical students and junior doctors is that the 'non-technical' aspects of working in a complex clinical environment are often overlooked, and that more pro-active programmes should be introduced to better prepare doctors for their working lives. However, I must substantiate these claims initially through a literature review and then designing and evaluating such a programme, hence this PhD project.

Whilst I am the author of this thesis, I refer to myself in the thesis as 'the researcher'.

1.2. Rationale, Context and PERFORM Model Foundations

This subchapter gives a broad introduction to some of the key aspects of the PERFORM study. Firstly, the rationale for the study is explored pertaining to junior doctors' preparedness for acute patient management. The acute clinical environment is described to highlight the inherent complexities which must be navigated by junior doctors when providing patient care. The theory of metacognition is outlined both from a theoretical stand-point and in the context of its application within medical education. Finally, the way in which lessons from sport psychology might support the optimisation of acute patient management is introduced prior to its more detailed discussion in Chapter 3.

1.2.1. Preparedness For The Complex Clinical Environment

Over ten years has passed since Smith *et al.*'s (2007) review revealed that "undergraduates and junior physicians lack knowledge, confidence and competence in all aspects of acute care, including the basic task of recognition and management of the acutely unwell patient". Meanwhile there has been abundance of literature further highlighting junior doctors' lack of preparedness regarding the management of acutely unwell patients (Kelly, Noonan and Monagle, 2011; Tallentire *et al.*, 2011a; Illing *et al.*, 2013; Cleland *et al.*, 2016; Callaghan *et al.*, 2017).

Junior doctors are usually the first-responder to such patients who are increasingly complex to manage: acute-illness presentation has become more difficult to assess and treat due to underlying pre-existing co-morbidities (Massey, Aitken and Chaboyer, 2009) within an ageing population (Bion and Heffner, 2004). Furthermore, the context in which junior doctors work to deliver time-critical care compounds this complexity through challenging shift patterns (Massey, Aitken and Chaboyer, 2009; Quirke, Coombs and McEldowney, 2011), where frequent handovers increase the opportunity for tasks and important patient information to "slip through the net" and be inadvertently overlooked (NPSA, 2007) within an environment often lacking senior clinical support (Smith *et al.*, 2013).

The scoping review in the following chapter explores how medical students and junior doctors have been taught to manage acute unwell patients since Smith *et al.*'s (2007) review.

1.2.2. Clinical Performance

Given the complexity in which junior doctors work it might be too simplistic to consider that preparedness is synonymous with acquired knowledge and skills during undergraduate training. Rather, doctors must have the ability to apply these assets within changing and uncertain situations

(Church, Rumbold and Sandars, 2017) and this emphasis not only on *what* the doctor does, but also *how* they do it is better described as their clinical performance. When considering how to improve clinical performance, lessons may be gleaned from other industries that successfully optimise performance under pressurised situations. One such industry is sport, in which sport psychologists support the progress of their athletes through the coaching of performance enhancement routines (PERs) (Cotterill, 2010). More recently the sport psychology literature has highlighted that performance enhancement through the application PERs can be understood and improved through the application of metacognition (MacIntyre *et al.*, 2014).

1.2.3. Metacognition

Flavell (1979) first described metacognition as ‘thinking about thinking’ or “knowledge or cognition about cognitive phenomena”. There are many different explanations of metacognition but all share the features of self-monitoring performance and implementing adjustments to optimise performance. This is illustrated in Nelson and Narens’ (1990) model in which the individual constantly receives information about the progression of a task (*monitoring*) and changes their behavioural strategy (*control*) to reach the desired goal of the task. An important aspect is that training in the application of metacognition improves academic ability across a range of different tasks (e.g. reading, mathematics and problem solving), ages and cognitive abilities (Dignath, Buettner and Langfeldt, 2008; Dignath and Büttner, 2008).

1.2.3.1. Medicine and Metacognition

In addition to sport psychology, the application of metacognition has gained popularity in medical education in recent years: In General Practice, Atkinson, Ajjawi and Cooling (2011) encourage their trainees to use ‘diagnostic pauses’ to evaluate the progression of a consultation. These metacognitive-forcing strategies are embedded within a standardized event of a consultation (e.g. handwashing) and encourage the doctor to purposefully reflect on the consultation and instigate necessary changes in behaviour to achieve its desired outcomes, such as taking further patient history or undertaking specific examination.

Duffy *et al.* (2015) discussed the potential of metacognition in secondary (hospital-based) healthcare initiatives. Their observational study highlighted metacognition as a potential target to improve team-based training in the emergency department. Improved diagnostic reasoning (Croskerry, 2003) and communication (Falcone, Claxton and Marshall, 2014) have also been described in relation to the application of metacognition in hospital-based educational interventions.

Perhaps most relevant to this thesis Tallentire *et al.* (2011a), having recognized that newly qualified doctors often report under-preparedness in this domain, investigated the factors influencing junior doctors' behaviours when managing acutely unwell patients. They acknowledged the potential of metacognitive strategies to decrease medical error and improve situational awareness, the latter being considered an "essential precursor to safe decision making, particularly in time-pressured and high-stakes situations".

1.2.3.2. Metacognition: A Shared Interest

The similarities between medicine and sport (which will be discussed further in later chapters) and their shared interests in both performance enhancement and metacognition fuelled the development of a novel conceptual model, PERFORM (Performance Enhancing Routines for Optimisation of Readiness using Metacognition). The evaluation of this model in both simulation and real clinical practice forms the basis of the study described in this thesis.

1.3. Thesis Structure

The thesis is organised into eight chapters, the first of which is the current chapter, **Introduction**.

Chapter 2: Literature Review

This chapter introduces the justification for the research project through identifying the gaps in the current medical education literature surrounding how medical trainees are currently taught to manage acutely unwell patients.

Chapter 3: Methodology

This section outlines the methodological design of the study including the development of the PERFORM model. The organisation and timeline of the study's three phases and its overarching ethical considerations are presented. Finally, the strategies used to evaluate the quality of the study are introduced prior to their more detailed discussion in Chapter 7.

Chapter 4: Exploratory Phase

This is the first of three consecutive chapters which contain the methods and results of a single phase of the PERFORM study. Chapter 4 is dedicated to the Exploratory Phase which aimed to address the research questions through a scoping literature review and semi-structured interviews with junior doctors. The chapter concludes by outlining the impact of the Exploratory Phase results on the subsequent PERFORM study phases.

Chapter 5: Pilot Phase

Chapter 5 contains the methods and results of the Pilot Phase, which evaluated the feasibility of the simulations and PERFORM model coaching prior to their use in the final, Full Intervention Phase. The alterations made to the design of the Full Intervention Phase based upon the Pilot Phase results are outlined at the end of the chapter.

Chapter 6: Full Intervention Phase

The Full Intervention Phase was organised into three chronological Stages, and it is through these that the methods and results are presented in Chapter 6. Breadth of data is demonstrated through a cohort approach where results across all of the case studies will be presented. Depth of data is provided through highlighting and following the personal journey of a single case study. In addition, the results pertaining to the variables of year of training and study site are explored.

Chapter 7: Discussion

Chapter 7 begins by discussing the results of the three phases with reference to the medical education and sport psychology literature. Following this, the effect of participant variables (training level and study site) are then considered. The strengths and limitations of the study pertaining to its methods, data collection, analysis and interpretation are outlined here with reference to the Medical Research Council's (MRC) guidance on complex health interventions.

Chapter 8: Conclusions

This final chapter addresses the research questions, explores how this thesis adds to the current medical education and sport psychology literature and highlights areas of future potential work generated from study. A list of publications arising from this study is also offered.

1.4. Chapter Summary

In this first chapter the researcher's background and motivation for the study has been described. A short introduction to the theory of metacognition in the context of medical education and sport psychology has been offered to set the scene for its subsequent use in the PERFORM model and finally the thesis structure has been outlined. In the following chapter the results of a literature review detailing how under- and post-graduate medical trainees are currently taught to manage the acutely unwell patient are presented and their implications for the remainder of the thesis are discussed.

Chapter 2. Literature Review

This chapter contains the literature review which underpins the research described in this thesis.

Firstly, the rationale for both the subject and type literature review undertaken is explained.

Each of the five stages of the framework used to execute and present the findings of the literature review are described sequentially.

The results of the literature review are discussed in relation to how they will inform the research project described in this thesis.

Finally, the quality of the literature review is evaluated with respect to its strengths and limitations.

2.1. Introduction

The recently updated General Medical Council's *Outcomes for Graduates* report (GMC, 2018) highlights the requirement for medical students to be able to assess, diagnose and manage acute medical emergencies upon graduation. Once qualified, UK doctors must then satisfy the UK Foundation Programme syllabus, including the ability to recognise and manage acutely unwell patients, in order to progress into higher specialty training. Despite the consistent importance placed upon this domain of clinical practice, there are concerns from junior doctors and their clinical supervisors regarding their preparedness to face these clinical situations in the early stages of their careers (Tallentire *et al.*, 2011b; Miles, Kellett and Leinster, 2017; Monrouxe *et al.*, 2018).

It would appear that junior doctors have the knowledge and skills to treat acutely unwell patients in the context of medical school training, as evidenced by their successful transition through medical school and passing of final examinations, but perhaps lack the strategies to cope with the added complexities in the real-life context of work (Ford, Cleland and Thomas, 2016). The GMC considers management of complexity within the clinical environment, including the “personal challenges of coping with uncertainty”, an essential capability that “underpins professional medical practice” for all doctors across different specialties and stages of training (GMC, 2017). Perhaps there are gaps in the teaching strategies of the undergraduate and postgraduate curricula in acute medicine which fail to accommodate this complexity and could therefore explain the difficulty of transition from student to qualified doctor.

To address this hypothesis, a scoping literature review was undertaken to explore how medical students and junior doctors are currently taught to manage the acutely unwell patient. A scoping review is a rapid way to collect and share current evidence on a research topic to identify gaps in current knowledge (Arksey and O'Malley, 2005). A scoping review can be used as an initial exploration of a particular topic, allowing the depth and breadth of the existing literature to be appreciated before a more specific research question is developed, leading to a systematic review (Sharma *et al.*, 2015). In addition, scoping reviews, unlike systematic reviews, encourage more qualitative information about interventions to be gathered (Armstrong *et al.*, 2011), which are more useful in addressing these specific research questions. All interventions regarding management of the acutely unwell patient were explored, rather than narrowing down to one specific intervention, e.g. simulation. The participants within the interventions of this scoping review ranged in age, clinical experience and nationality, and therefore the review gathered a more holistic view than a population-specific literature search.

To uphold the values of a rigorous scoping review, the Arksey and O'Malley, (2005) 5-stage framework was adhered to:

2.2. Stage 1: Identifying the Research Question

To gain an understanding of how medical students and junior doctors are currently taught to manage the acutely unwell patient, the following questions were addressed:

1. What types of interventions have been used to teach medical students and junior doctors regarding management of the acutely unwell patient?
2. Are these interventions more frequently targeted at medical students or junior doctors?
3. What are the underlying educational theories behind the interventions?
4. Do any interventions offer strategies to manage the complexities of the real-life clinical environment?

2.3. Stage 2: Identifying Relevant Studies

The literature was searched to identify articles and conference abstracts that described interventions which were intended to improve the management of the acutely unwell patient for medical students and junior doctors. For the purposes of clarity, the acutely unwell patient is described as adult (over 16 years of age) who is experiencing an acute medical or surgical emergency. Many different terms can be used interchangeably to denote a 'junior doctor'. For example, in the UK 'foundation trainee' is the term for a first- or second-year qualified doctor, whereas in American and in many Asian countries, terms such as 'intern' is used to describe newly qualified doctors. In order to maximize the initial search for appropriate articles all doctors were included regardless of grade, and subsequently only interventions involving junior doctors were included in the review.

2.3.1. Journal Articles

Seven widely used literature databases were searched in an iterative way; initially, only words such as "acutely" and "acutely ill" were used to identify appropriate studies. However key papers already known to the researcher were being inadvertently overlooked. In the first instance, further terms, such as "deteriorating" were added to widen the search for appropriate papers. Further terms and phrases were identified from the yielded-articles' abstracts and added to the search terms, such as "acutely unwell" or "preparedness". In this way, the search terms for this topic evolved to become more holistic. Similar processes of broadening the key words also occurred for the other topics, to arrive at the search strategy shown in Table 2-1.

Table 2-1: Phase 1 Search: Number of articles yielded from initial search ^a

Database	Keywords					Number of articles
	Topic 1: Acute patient scenario	Topic 2: Patient management	Topic 3: Medical doctor	Topic 4: Educational intervention	Topic 5: Patient care	
Web of Science	"acutely unwell" OR "acutely ill" OR "deteriorating " OR "acute" OR "prepared for practice" OR "preparedness"	"manage" OR "management"	"doctor" OR "medic" OR "medical student" OR "medical"	train* OR teach* OR "education"	"patient" OR "patients"	2091
Medline	"acutely unwell" OR "acutely ill" OR "deteriorating" OR "acute" OR "prepared for practice" OR "preparedness"	"manage" OR "management"	"doctor" OR "medic" OR "medical student" OR "medical"	train* OR teach* OR "education"	"patient" OR "patients"	4721
Pubmed	"acutely unwell" OR "acutely ill" OR "deteriorating" OR "acute" OR "prepared for practice" OR "preparedness"	"manage" OR "management"	"doctor" OR "medic" OR "medical student" OR "medical"	MeSH Term medical education	"patient" OR "patients"	446
PsycInfo	"acutely unwell" OR "acutely ill" OR "deteriorating" OR "acute" OR "prepared for practice" OR "preparedness")	"manage" OR "management"	"doctor" OR "medic" OR "medical student" OR "medical"	medical education.mp OR exp. Medical Education AND train* OR teach* OR "education"	"patient" OR "patients"	553
ERIC	acute* OR "acutely ill" OR deteriorating OR "acutely unwell"	management OR manage	postgraduates OR doctor OR foundation	education OR "medical education" OR teach* OR learn* OR train* OR develop* OR strateg*	medical	28
Open Grey	acute*	manage*	train* OR teach* OR "education"		discipline: Medicine	16
British library e-thesis online service (EThOS)	acute OR prepared		doctor			133
TOTAL = 7988						

^a For each search database listed, Topics 1 through 5 were combined using the term "AND"

Where topic boxes are left blank adding search terms reduced the yield of papers significantly and were not employed.

" " denotes exact phrase search

* allows for truncation searching whereby different endings of a word are searched

exp = "explodes" controlled vocabulary term

.mp = combined search fields (default if no fields are specified)

'discipline': where a topic for thesis is chosen to concentrate field of study

Following this initially wide search, filters were applied to narrow down the focus of the search. A time-span of 10 years before the commencement of this PhD was chosen to highlight more current trends in teaching; hence 01/01/2005-21/03/2018 was the chosen inclusion period. Only articles written in English were included to avoid translation issues. Table 2-1 demonstrates the number of articles yielded at this stage.

2.3.2. Conferences Abstracts

To widen the scope of this review, grey literature was searched through purposeful selection of Medical Education conferences. Conference proceedings for the past four years were reviewed as, by now, it is reasonable to assume that abstracts featured in conferences prior to this would have now been further developed and published as full journal articles. The conference proceedings searched are shown in Table 2-2:

Table 2-2: Number of abstracts published for each conference

Conference	Number of abstracts in conference proceedings
AMEE 2014	Approximately 2000
AMEE 2015	Approximately 2000
DEMEC 2015 (Winning posters only)	10
AMEE 2016	Approximately 1600
AMEE 2017	Approximately 1600
DEMEC 2017 (Winning posters only)	19
Total	7229

2.4. Stage 3: Selecting the Studies

2.4.1. Journal Articles

To only include articles involving medical students or doctors concerning the acutely unwell adult experiencing a medical or surgical emergency, keywords were excluded from searches (using the function “AND NOT”). These covered the five clinical specialties of paediatrics, anaesthetics, palliative care, psychiatry and obstetrics; the specific terms excluded within each of the seven databases are shown in Table 2-3. Allied healthcare professional terms (e.g. nurse/nursing, physiotherapy etc.) were not excluded to ensure that multidisciplinary interventions were not inadvertently overlooked.

Table 2-3: Exclusion keywords for journal article literature search ^b

Database	Keywords used for exclusion of medical specialties					No. of articles remaining after exclusions
	Exclusion topic 1: Paediatrics	Exclusion topic 2: Anaesthetics	Exclusion topic 3: Palliative Care	Exclusion topic 4: Psychiatry	Exclusion topic 5: Obstetrics	
Web of Science	paediatr* OR pediatr* OR child*	anesthe* OR anaesthe*	palliat*	"psychiatry"	"obstetrics" OR pregnan*	1222
Medline	paediatr* OR pediatr* OR child*	anesthe* OR anaesthe*	palliat*	"psychiatry"	"obstetrics" OR pregnan*	2394
PubMed	pregnan* paediatr* OR pediatr* OR child*	anesthe* OR anaesthe*	palliat*	"psychiatry"	"obstetrics" OR pregnan*	216
PsychInfo	paediatr* or pediatr* or child*	anesthe* OR anaesthe*	palliat*	"psychiatry"	"obstetrics" OR pregnan*	105
ERIC	Titles manually screened as low numbers/no exclusion function possible					12
Open Grey	Titles manually screened as low numbers/no exclusion function possible					16
British library e-thesis online service (EThOS)	paediatric		palliative		psychiatry	97
Total = 4062						

The titles of the remaining articles were manually screened for those that included interventions or descriptions of training with the setting of the acutely unwell patient. Exclusion criteria at this stage included studies purely aimed at a different healthcare professional cohort and studies based on chronic disease or primary care conditions.

Following title-filtering, the associated abstracts were then read to further select the most appropriate papers. Excluded topics at this stage included personal view or observatory studies without an intervention and studies not based around management of acutely unwell patients. One further article was identified from a reference of an included paper, and an additional twelve papers already known to the researcher which did not have appropriate keywords but were relevant to acute care education, were added. This yielded articles 69 articles for full-text analysis.

Twenty-two articles were excluded due to several factors listed in Figure 2-1.

None of the final 47 studies included in the literature review specifically targeted senior doctors (e.g. Consultants); all included articles either specifically stated that junior doctors were involved in the study or did not state a specific grade, but implied that these doctors were not Consultants.

^b For each search database listed, Topics 1 through 5 were combined using the term "AND NOT"

Where topic boxes are left blank, adding search terms reduced the yield of papers significantly, such that they were not employed

" " denotes exact phrase search

* allows for truncation searching whereby different endings of a word are searched

The above steps within the first three framework stages pertaining to journal article identification are summarised in Figure 2-1.

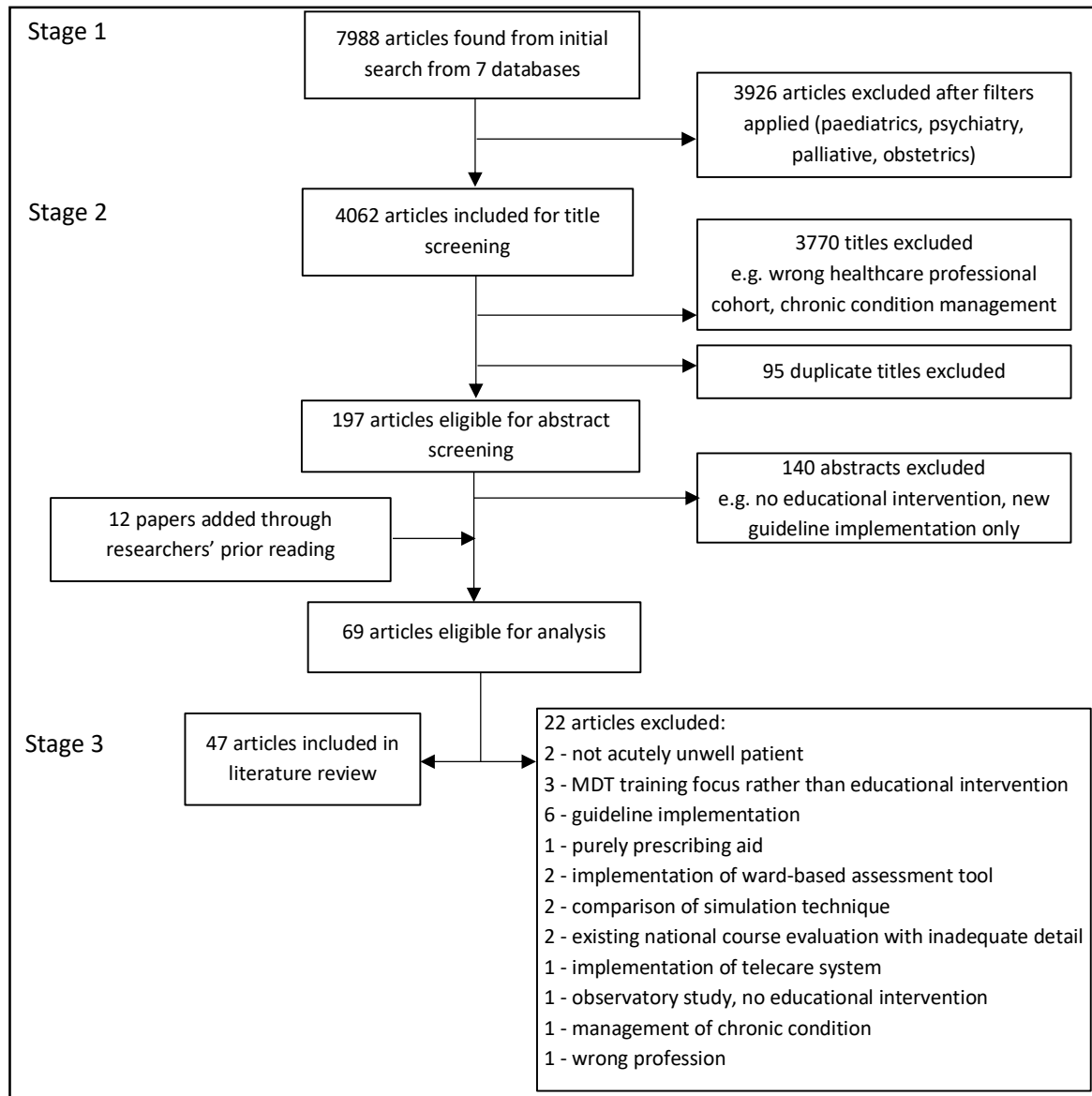


Figure 2-1: Flow diagram of data selection process

2.4.2. Conference Abstracts

To identify relevant abstracts, the chosen conference proceedings were electronically searched using the key words “acutely” and “unwell”. Identified abstracts were then read and selected using the same exclusion criteria regarding specialty (e.g. paediatrics, psychiatry) and target population that were used for the journal search. Fifteen abstracts were identified as relevant to the acute management of the adult patient.

The steps within the first three framework stages pertaining to conference abstract identification are summarised in Figure 2-2.

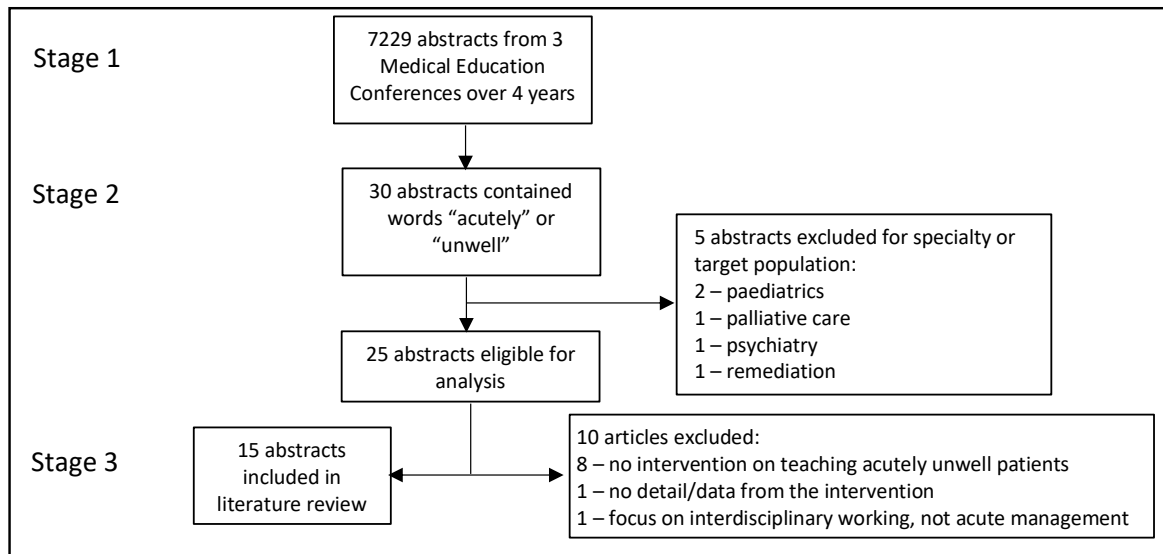


Figure 2-2: Data selection process for abstracts from Conference Proceedings

2.5. Stage 4: Charting the Data

Once all journal articles and conference abstracts had been identified, data extraction was guided by Armstrong *et al.*'s (2011) identification of themes during a scoping review and adapted TREND (Transparent Reporting of Evaluations with Non-randomised Designs) guidelines (Des Jarlais, Lyles and Crepaz, 2004). Fields of interest were mostly chosen prior to the analysis but were expanded iteratively if important additions became apparent during the process.

All data was collated on a Microsoft Excel spreadsheet, (Appendix 1) as suggested by Armstrong *et al.* (2011). Results were then synthesised to identify common trends and themes to address each of the research questions.

2.6. Stage 5: Collating, Summarising and Reporting the Results

The literature search identified 47 papers published in the past 13 years and 15 abstracts from conferences held in the past four years. The results of the variables of interest are presented below and unless stated include data from all 62 articles/abstracts.

Full citations for all abstracts and journal articles can be found in the References chapter towards the end of this thesis. However, for quick reference, Table 2-11 at the end of this chapter assigns a 'study number' to each of the included journal articles and abstracts.

2.6.1. Geographical, Population and Year of Publication Summary

Figures 3-6 summarise the geographical spread, the population studied, the number of participants and the year of journal/abstract publication, respectively.

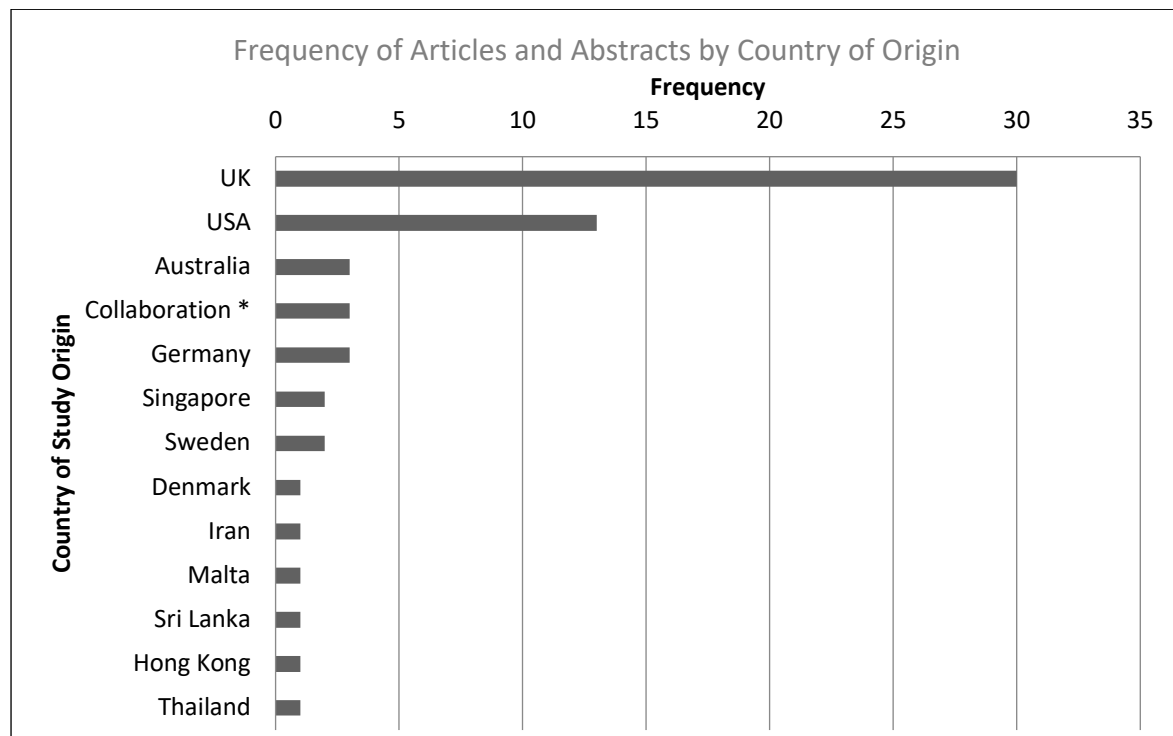


Figure 2-3: Bar chart of geographical spread of articles and abstracts ^c

2.6.2. Geographical Spread

Figure 2-3 demonstrates that the majority of journal papers/abstracts originated from the United Kingdom (studies 1 to 30). The USA contributed 13 studies to this literature search and Australia three (studies 44-46). There were seven studies from other European countries excluding the UK collectively (studies 47-53). One study was from Hong Kong (study 54), one from Iran (study 55), two from Singapore (studies 56 and 57), one from Sri Lanka (study 58) and one from Thailand (study 59). Studies 60-62 described collaborative studies from authors based in different countries and failed to state the specific location in which the research was carried out (studies 60-61) or undertook an international collaborative intervention (study 62).

^c * Collaboration: three articles cited researchers working in different countries

2.6.3. Population

Table 2-4 illustrates that the majority of identified studies included medical students either exclusively (studies 1, 3-6, 8-16, 18, 19, 21, 23, 25-27, 29, 30, 33, 35-37, 39, 40, 42, 44, 48-52, 54, 56 and 61) or in conjunction with other healthcare professionals (study 62). Compared to medical students, qualified doctors participated in a higher proportion of multidisciplinary studies, which mainly involved nurses (studies 43, 45, 47 and 59).

Table 2-4: Population targets for articles reviewed

Target Population	Single professional group ^d	Multi-professional group	Total
Doctors	16	5	21
Medical Students	40	1	41
Total	56	6	62

Thirty-one studies specifically targeted either final-year students or first-year doctors. Thirteen of these studies made specific reference to the transition between student and junior doctor or had ‘preparation for graduation’ in their title (study numbers 2, 9-13, 15, 16, 23, 35, 44, 57 and 58).

2.6.3.1. Participant Numbers

Participant numbers varied greatly in the studies included for this review (Figure 2-4), ranging from six (Eneje *et al.*, 2014) to 357 (Xu *et al.*, 2014). Seven of the articles or abstracts (numbers 2, 3, 8, 9, 15, 19 and 32) did not explicitly state actual numbers of participants involved in their studies, but did indicate their scale; for example Carling, (2010) stated that the entire year group took part.

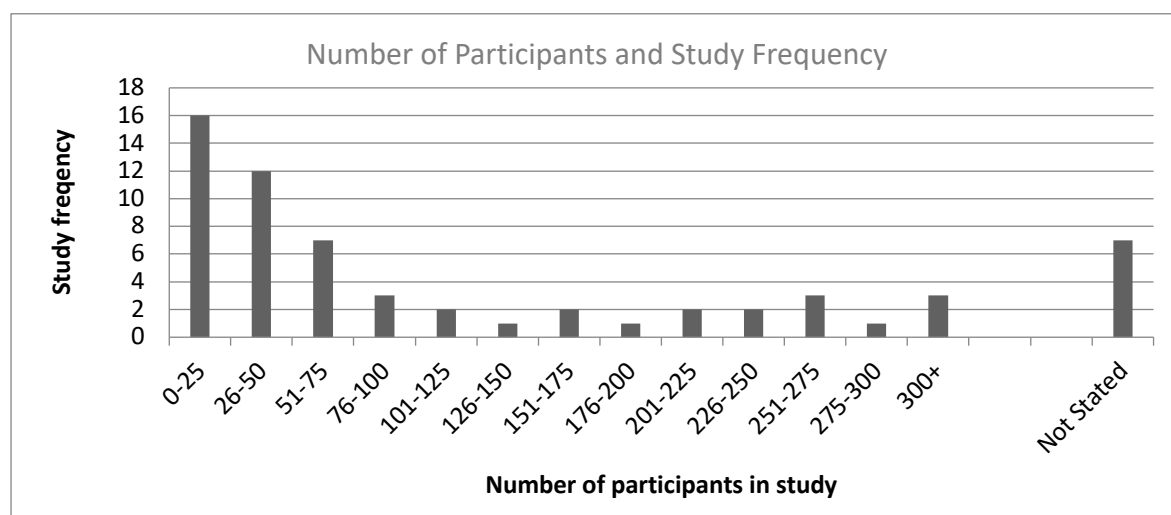


Figure 2-4: Histogram of number of participants within the studies reviewed

^d Where single professional group describes interventions including *only* doctors or medical students

Only two studies (Ruessler *et al.*, 2010; Thomas *et al.*, 2015) mentioned the power of their studies to be above 80%. The remainder did not qualify the sample sizes needed for power or significance.

Some authors reported large recruitment numbers but only achieved small retention rates at the conclusion of their study: Of the 248 final-year medical students in Hawkins *et al.*'s (2015) extended assistantship study, only 37, 62 and 13 students responded to pre-, post- and follow-up questionnaires, respectively. The final data collection point for this study yielded only a 5% response-rate and was dismissed by the authors, who deemed it inadequate for analysis. Conversely, the conference abstract by Rajani, (2014) only included 17 junior doctors but achieved a 100% follow-up response rate.

2.6.3.2. Year of Publication (Journal Articles Only)

Figure 2-5 demonstrates that publication of educational studies targeting the 'acutely unwell patient' peaked in 2015. All of the abstracts were purposefully sampled between 2014 and 2018, and therefore were excluded.

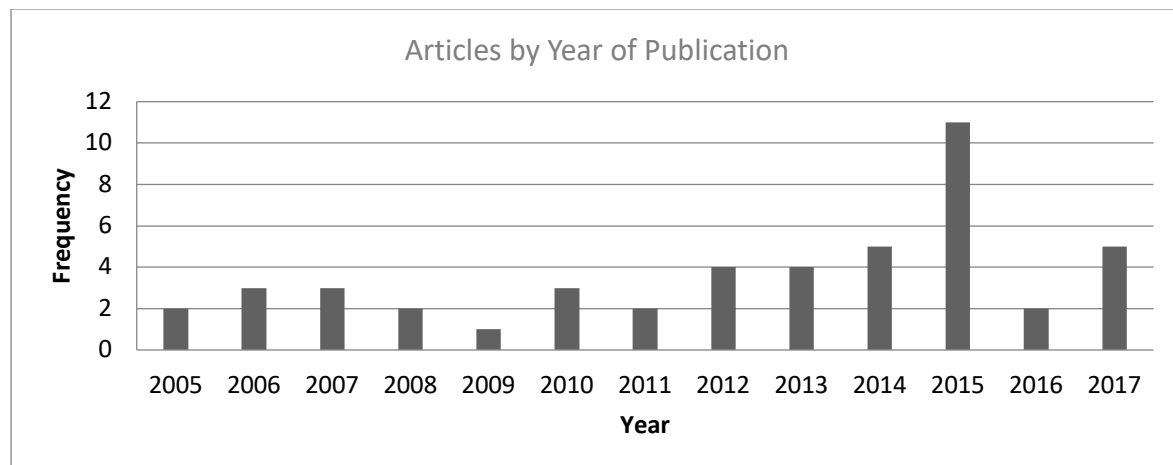


Figure 2-5: Histogram of publication year of articles reviewed^e

2.6.4. Study Classification

Cook *et al.* (2008) characterised medical education studies as descriptive, justification or clarification. Descriptive research is simply a recollection of the events that occurred and the outcome. There is no comparison made to other groups, e.g. control group, and no theoretical basis is outlined for the research. Justification studies include comparisons to address whether one intervention is more successful than another. Clarification takes the final step toward addressing all

^e Excluding conference abstracts

stages of a research project by explaining the underpinning theories behind the intervention. In this way, clarification studies are thought to be more complete as they allow the reader to interpret the intervention and its potential transferability to one's own educational environment. As Figure 2-6 shows, this category was the least populated from the identified literature (study numbers 3, 8, 11, 23, 30, 38, 40, 42-44, 46, 47, 52, 55, 58 and 61).

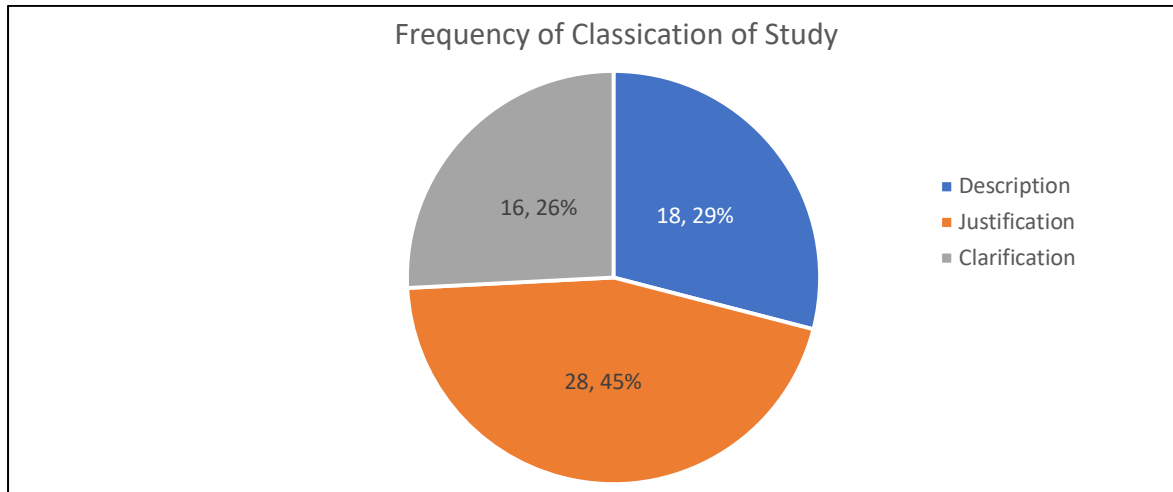


Figure 2-6: Pie chart of classification of Study as per Cook *et al.* (2008)

By plotting the study category over time, Figure 2-7 demonstrates an increase in justification-style studies since 2012. These tended to include comparison cohorts or a pre/post intervention measurement. More recently descriptive studies appear to have declined in popularity, giving way to more theory-based educational interventions. (Conference abstracts were omitted from this figure to avoid 2014-2015 bias as a consequence of purposeful sampling).

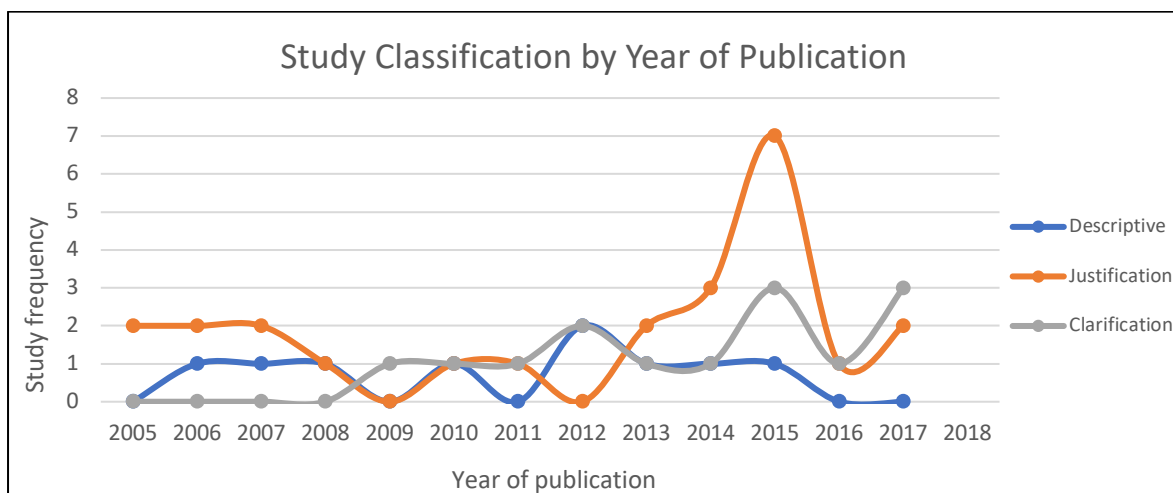


Figure 2-7: Line graph of classification of Study by Year of Publication^f

^f Excluding conference abstracts

2.6.4.1. Theoretical Concepts

Cook *et al.* (2008) highlighted that the underpinning theories in clarification studies encourages transferability of interventions amongst medical educators.

Table 2-5 lists the theories cited in the clarification studies:

Table 2-5: Theoretical concepts and frequency of use in reviewed articles

Theory	Frequency of studies citing theory
Adult learning	2
Activity theory	1
Constructivism	1
Contextual learning	2
Deliberate practice	2
Experiential learning, Kolb's cycle	3
Near-peer	2
Peer-learning	1
Problem-based learning	1
Realism	1
Reflective practice	1
Scaffolding	1
Self-efficacy	1

Despite experiential learning being a key underpinning theory of simulation-based education, it was only cited in three of the 46 studies in this literature review which utilised simulation as a teaching tool (study numbers 23, 44 and 47). Woods *et al.* (2016) and Cash *et al.* (2017) both used near-peer learning as an educational concept, whereby the teaching faculty are only slightly more senior than the students being taught, e.g. newly-qualified doctors teaching final-year medical students. Three papers stated multiple theories behind their educational interventions; Lu *et al.* (2010) cited problem-based learning (PBL), computer-supported collaborative learning (CSCL) and scaffolding, Wright *et al.* (2012) cited adult learning, contextualised theory and reflective practice, and Fuhrmann *et al.* (2009) cited experiential and adult learning.

Most of the authors justified why the chosen educational theory was applicable to their research. For example, Gregory *et al.* (2015) explained how they adopted a constructivist approach, building on the previous learning of the participant much like a spiral curriculum, and Meurling *et al.* (2013) defined self-efficacy before explaining its influence on goal setting and perseverance with the task at hand.

2.6.5. Type of Intervention

2.6.5.1. Simulation Interventions

Simulation is a person, device or environment which mimics an authentic task or scenario to encourage the participant to react as they would under natural circumstances (McGaghie, 1999). It allows the learner a safe environment in which to engage in deliberate practice, which involves the repetition of a skill with the additional scaffolding of evaluation and feedback, in order to achieve mastery standards (Motola *et al.*, 2013).

Simulation in medical education has been increasingly popular over the past 40 years, being deemed a beneficial way of learning through experience and encouraging a transfer of skills to clinical practice (McGaghie *et al.*, 2010). Unsurprisingly, simulation was used in 36 of the 47 full journal articles (study numbers 2-5, 7, 21, 22, 24, 26, 29, 30-40, 42, 43, 45-54, 60-62) and 10 of the 15 conference abstracts (study numbers 8, 11, 14-16, 18-20, 56, 57) from this literature review.

From their critical review of the literature, McGaghie *et al.* (2010) developed a twelve-component standard of best practice in simulation. These are feedback, deliberate practice, curriculum integration, outcome measurement, simulation fidelity, skill acquisition and maintenance, mastery learning, transfer to practice, team training, high-stakes testing, instructor training, and educational and professional context. Many of these elements are challenging or not readily applicable to some of the literature yielded in this review e.g. ‘team training’ might not specifically be a desired outcome of a particular educational programme. Likewise, within the confines of word-limited abstracts and papers, details pertaining to ‘instructor training’ might be foregone to allow more detailed results or conclusions. Table 2-6 demonstrates how the reviewed studies met two of the more easily identifiable (and generic) key standards identified by McGaghie *et al.* (2010).

Table 2-6: Number of simulation studies containing best practice features

	Post-simulation Debrief	Mixed Outcome Measurement
Number of studies compliant with best practice feature	27	11
Percentage of compliant studies (n=21)	75.0%	30.1%

Issenberg *et al.*, (2005) state that either feedback or debriefing is the most frequently cited aspect for promoting effective learning when referring to simulation. To quantify the number of studies in this literature review which complied with this first feature of best practice both ‘feedback’ and ‘debrief’ were included. A gold standard of debriefing is yet to be discovered, but many validated

guides do exist (McGaghie *et al.*, 2010). Only four of the 27 studies that used debriefing cited previously published frameworks in order to deliver structured feedback, including Gibb's cycle (Gregory, Hogg and Ker, 2015), Pendleton's guidelines (Fisher, Martin and Tate, 2014), SET-GO (Thomas *et al.*, 2015) and Raemer's framework (Christensen *et al.*, 2015).

It seems inherent that individuals in any profession will have personal learning needs which may differ from that of their peers. One criticism of group educational interventions, especially simulation, is that there can be fear of looking foolish or incompetent in front of peers (Jansen *et al.*, 2010), which could have a detrimental effect on learning engagement. Only two of the simulation studies mention the use of individualised feedback (Schwind *et al.*, 2011; Thomas *et al.*, 2015), which was not obvious from the other articles. Both of these studies were able to implement an individualised feedback system due to the design of their interventions being for single participants. The second of these studies planned to deliver group feedback as opposed to individualised feedback for future interventions, to ease the strain on financial and faculty input demands.

Each of the outcome measurements currently used for simulation are described by McGaghie *et al.* (2010) as imperfect. Therefore, using more than one outcome (e.g. subjective, objective or haptic sensors) could offer increased reliability. For the purpose of assessing this element of the best practice features, studies using more than one mode of outcome measurement qualify.

McGaghie *et al.* (2010) argue that the level of fidelity of the simulation must match the necessary outcomes. High fidelity manikins, i.e. those which are most akin to humans through their physiological and anatomical manifestations, are not always necessary for task-focused interventions, (e.g. learning to cannulate). Additionally manikins are not appropriate for practicing tasks such as history taking. Figure 2-8 demonstrates the proportion of simulation equipment used in the educational intervention in this literature review with the exception of the study by Gregory *et al.* (2015) (study number 3) which did not use any patient or healthcare professional simulator, but simply used the simulated ward environment for their intervention. Ten studies (study numbers 2, 8, 15, 16, 18-20, 24, 31, 56) did not describe any simulation equipment.

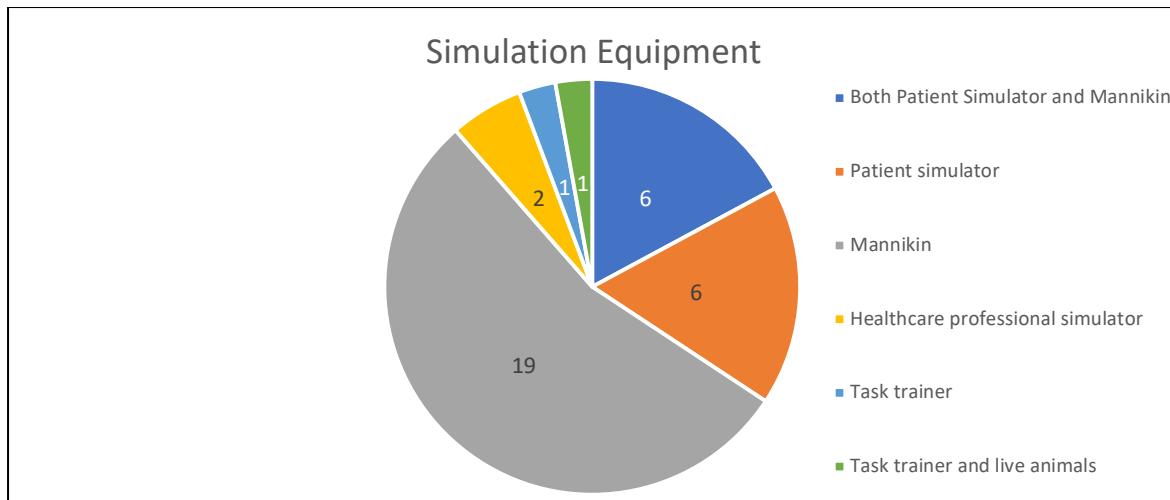


Figure 2-8: Pie chart of use of different simulation equipment

The majority of studies in this review that utilised simulation used manikins of varying fidelity. Six studies used a simulated patient (or actor) and a further six used both manikins and simulated patients. One study used both task trainers and live domesticated pigs during their surgical residents preparatory course (Brunt *et al.*, 2008).

2.6.5.2. Non-Simulation Interventions

Of the 16 studies in the review that did not use simulation as a training tool, five used clinical experience either in the community (study number 1) or on a ward (study numbers 6, 17, 23 and 44). One abstract did not mention any specifics of how the teaching intervention was conducted (study number 13). The remaining studies used didactic and/or interactive teaching methods such as lectures, small group discussions and e-learning (Figure 2-9).

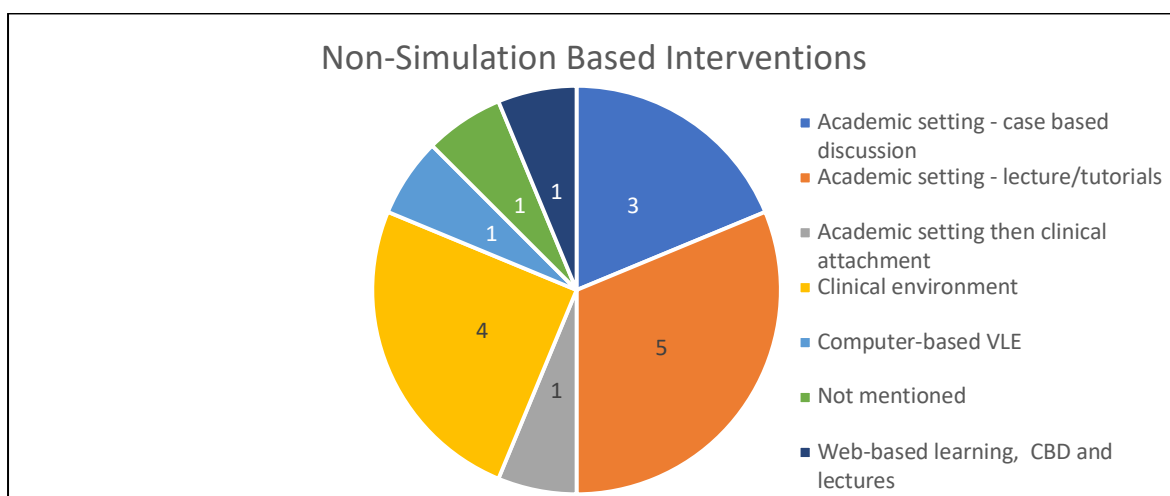


Figure 2-9: Pie chart of non-simulated teaching interventions

2.6.6. Outcomes

2.6.6.1. Data Type and Methods

Table 2-7 demonstrates the different proportions of outcome measurements for the 62 studies in the literature review.

Table 2-7: Subjective, objective and mixed data measurements

Measurement	Frequency of studies using this outcome measurement	Study numbers
Subjective	37	1-23, 25, 30, 32, 34, 37, 39, 41, 43, 44, 47, 48, 53, 56, 57
Objective	5	26, 33, 42, 60, 61
Both	20	24, 27-29, 31, 35, 36, 38, 40, 43, 45, 46, 48-50, 52, 55, 58, 59, 62

The majority of subjective data measurements were Likert scales and questionnaires. Objective measurements generally consisted of either performance observation (e.g. OSCE) or written/oral knowledge-based tests (e.g. MCQ). One study compared the pre-/post-interventional time to complete a skill (study number 35) and one study used multiple-source feedback (MSF) (study number 39).

Two studies recorded objective data but did not use this for analysis of their intervention; both McGlynn *et al.* (2012) (study number 21) and Shah *et al.* (2008) (study number 25) used objective data to feedback to trainees but failed to utilise it to demonstrate the effectiveness of their intervention.

2.6.6.2. Study Aims

All of the studies in this review had the subject matter of the 'acutely unwell patient' in common. However, as Table 2-8 demonstrates, the studies covered many different aims within this educational area:

Table 2-8: Frequency of studies using general versus specific outcome measurements ^g

Aim of Study	Frequency
Confidence in assessing/managing acutely unwell patient	35
Course evaluation as a learning event	21
Observed knowledge-based improvement	17
Communication around acutely unwell patient	5
Perceived skills/knowledge gained	4
Preparedness to manage acutely unwell patient	4
Team-working skills	3
Confidence in practical skills	2
Course evaluation as an enjoyable event	2
Educational motivation/sustained learning	2
Non-technical skills	1
Observed practical skills improvement	1
Patient care outcome	1
Curriculum development	1
Decreased error frequency	1

2.6.6.3. Statistical Significance

Statistical significance is one measure of the impact of an intervention. Of the 62 studies reviewed, 32 yielded statistically significant results ($p < 0.05$).

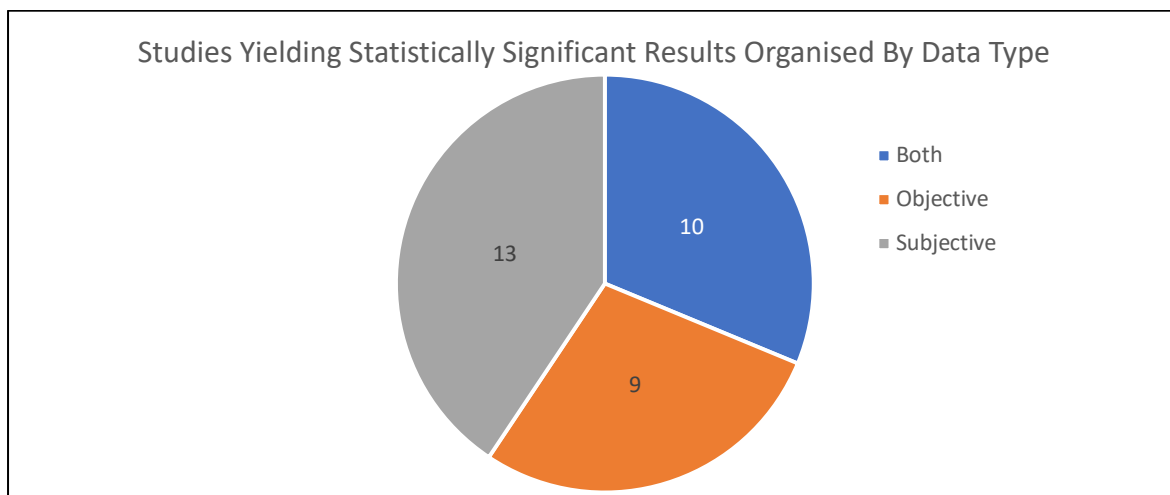


Figure 2-10: Pie chart of frequency of studies yielding statistically significant results

Figure 2-10 demonstrates the spread of significant results by type; objective, subjective or both. The majority of studies reporting statistically significant results are those which used subjective measurements, such as confidence scores or feelings of preparedness pre-/post-intervention.

^g Some studies listed multiple aims

2.6.7. Interventional Impact

Kirkpatrick's (1970) four-level hierarchy has been often used to evaluate medical education programmes: The first (lowest) level is *reaction* of the participants, i.e. whether they 'liked' or valued the programme; the next is whether *learning* occurred, usually measured through an assessment of knowledge, skill or attitude. The third addresses changes in *behaviour*, for example how new knowledge affected clinical performance with real patients and the fourth addresses how the environment itself is changed as a *result* of an individual's performance. For a study to evaluate impact at either of the two highest levels (*behaviour* or *result*), post-intervention data collection points must allow time for participants to implement their newly acquired knowledge in the clinical environment. Therefore, the studies were analysed for the length of time between intervention and final data collection point. Twenty-one of the studies did not specifically indicate a time-span for data collection, and therefore are not displayed in the histogram (

Figure 2-11).

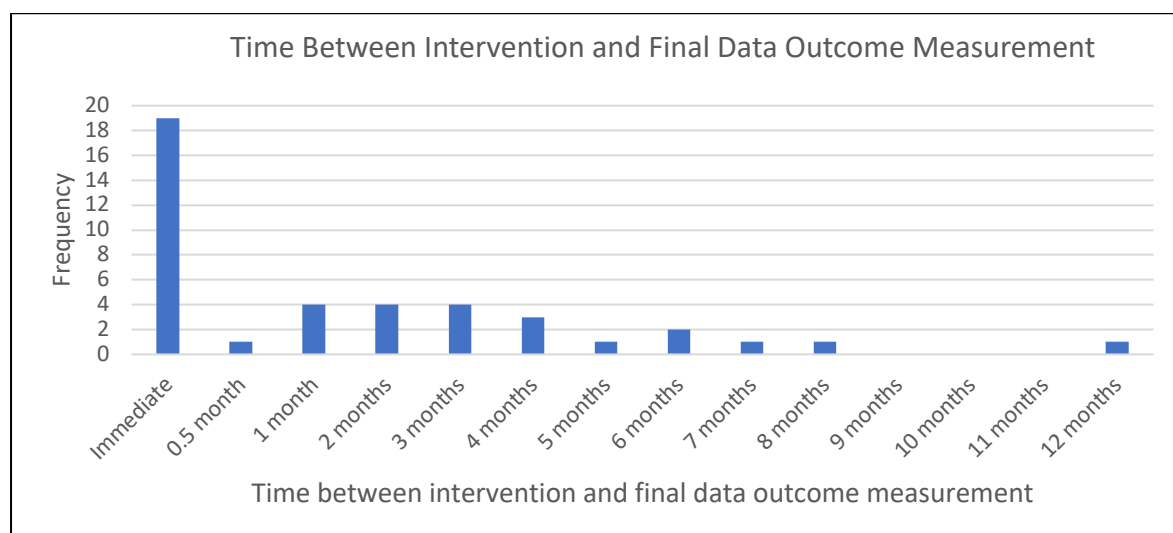


Figure 2-11: Histogram of time between intervention and data measurement ^h

As can be seen from

Figure 2-11, the vast majority of studies measured their outcomes immediately after the intervention.

^h Where a range of time was quoted, the upper limit was used

2.7. Summary Table of Results

Table 2-9 collates the most common features of the studies which reported educational programmes to improve acutely unwell patient management over the past 10 years.

Table 2-9: The main findings and common themes amongst studies in this review

Study Variable	Most common finding/theme	Number of studies ⁱ
Geographical origin	Conducted in the UK	30
Target population	Medical students	40
Target training point	Final year student/first 12 months qualified	31
Classification of Study	Justification	28
Participant Numbers	Less than/equal to 100 participants	38
Type of Intervention	Simulation	46
Simulator	Manikin	19 ^j
Data collection	ONLY subjective data	37
Statistical significance	Statistically significant results	32
Statistical significance	Subjective data	13 ^k
Time between intervention and data collection	Data collected immediately post-intervention	19 ^l

2.8. Discussion

This scoping review describes the published work regarding training interventions for medical students and doctors in managing the acutely unwell patient. Each of the research questions as set out in the introduction will now be addressed.

2.8.1. What types of intervention have been used to teach medical students and doctors about management of the acutely unwell patient?

Simulation has been shown to be a popular pedagogy for teaching the management of the acutely unwell patient, with 46 of the 62 studies involving simulation. Smith *et al.*'s (2007) review which includes literature up to 2005, included only a small number of studies that actually used simulation but predicted the growing use of simulation to teach acute care to undergraduates. Twelve years later, simulation now plays a dominant role in the teaching strategies of this area and this review highlights the success and breadth of this learning tool within this context.

Simulation seems particularly useful for educational programmes targeting acute patient management in the current context of the European Working Time Directive (EWTD), which has

ⁱ of 62 studies, unless stated otherwise

^j of 35 studies which declared equipment used

^k of 32 studies which yielded significant results

^l of 41 studies which declared intervention timespans

been reported to hinder trainees' abilities to gain all the necessary curriculum competencies (Patel and Sockalingam, 2013).

As evidenced by this review, a large proportion of medical education interventions are descriptive, (Cook, Bordage and Schmidt, 2008) and often use only student feedback or self-assessment rather than objective measurements to achieve very generalised outcomes. Objective measurements allow knowledge acquisition or behavioural change to be demonstrated, and therein lies the key to transferability to practice, as outlined by McGaghie *et al.* (2010) regarding best practice in simulation. Furthermore, there is a recognised disparity between self-assessment and objective ability (Kellett *et al.*, 2014) and therefore use of both subjective and objective data enhances the strength of the outcome measurement (McGaghie *et al.*, 2010). Less than one third of the studies in this review collected both subjective and objective data.

The majority of studies included a short time-period between intervention and outcome measurement. This potentially introduces a test re-test bias (Allen and Yen, 1979) where short-term knowledge is transferred from pre- to post-intervention, and any long-term knowledge is not tested for. Exclusively using immediate post-intervention data collection does not capture any transferability into the clinical context nor retention of knowledge, which is the optimum outcome for most medical educational interventions (Kirkpatrick, 1970).

2.8.2. Are these interventions more frequently targeted at medical students or doctors?

The majority of studies targeted medical students, as opposed doctors (66% versus 34%). However, 31 of the 62 studies included final-year medical students or first-year junior doctors; this transition period seems very popular for acute patient management interventions in parallel with other 'preparedness' interventions.

Despite the Foundation Training Programme Syllabus (Kessel, 2012; and 2016) stipulating the need for continued development of acute management skills by doctors less than one quarter of interventions targeted doctors after their first post-graduate year.

2.8.3. What are the underlying educational theories behind the interventions?

The theoretical underpinning of studies is not well established in this area of research. Two explanations for this are the lack of understanding of the theories within medical education and a lack of expectation to state them (Graham, Church and Murdoch - Eaton, 2017). Despite experiential learning being the cornerstone of simulation, only three of the 46 simulation-based studies explicitly

stated this theory. The majority of studies in this literature review used a justification-style. However, Figure 2-7 demonstrates a generalised incline in the clarification trend since 2013 and a similar decline in descriptive studies. This may signal a change in culture and academic expectation to explain 'how' and 'why' a successful intervention has been achieved, with particular reference to the theories underpinning it (Cook, Bordage and Schmidt, 2008).

The use of 'near-peer' learning was referenced in two studies, both of which were conducted in 2016, perhaps reflecting a current approach to the education around acutely unwell patients.

As mentioned previously, interest in the applications of metacognition to medical education has increased in recent years. From the literature review studies number 26 and 52 drew parallels with the principles of metacognition but failed to be explicit about the use of metacognitive theory. One of which measured self-efficacy, mental strain and concentration as outcome variables (Meurling *et al.*, 2013) but made no reference to metacognition.

2.8.4. Do any interventions offer strategies to manage the complexities of the real-life clinical environment?

Hawkins *et al.* (2015) and Rajani (2014) both utilised authentic clinical experience on the wards in an attempt to increase preparedness for the complex environment of clinical practice, but neither specifically taught mechanisms for dealing with these complexities; Instead, their interventions relied on deliberate practice and experiential learning to achieve better management of the acutely unwell patient. Similarly, Wu *et al.* (2017) described in their simulation-based study how the participants had to persevere with acute management skill acquisition by re-attempting the task in the face of failure. They commented that this better represented the realism of patient care, where individual failed tasks within a more complex simulation might be overlooked due to time-pressures or being viewed as lacking priority in the grander scheme of the scenario. However, despite being given the time to re-attempt the skill or task, no specific strategies to better cope with the undertaking of clinical skills within a pressured environment were offered.

The teaching of distraction management techniques to medical students by Thomas *et al.* (2015) was the only intervention to impart coping strategies to participants. This was the second paper which aligns with, but does not explicitly state the use of, the theory of metacognition in its use of cognitive control. Unfortunately, as this study was conducted exclusively in simulation the potential impact of these strategies in the real-life context (at the higher levels of Kirkpatrick hierarchy) were not evaluated.

Only five articles or abstracts incorporated the clinical environment into their studies: Without efforts to address transition to practice, studies risk being a purely academic exercise, potentially limiting their clinical applicability and value in the eyes of the participants.

2.9. Strengths and Limitations of the Review

The decision to include publications from 2005 onwards in this literature review was informed by Smith *et al.*'s (2007) previous review: This characterised the problem and potential solutions of teaching acute care management to medical students and searched for articles up to and including 2005. Therefore, this was used as an 'overlap year' from which to initiate this current review.

This scoping review provided a broad, rapid assessment of the literature. Many different search terms, which were iteratively constructed, were used across seven well-established databases in an attempt to yield all appropriate literature. An initial tutorial and later discussions with the university librarian aided this process and confirmed that the researcher undertook the correct process for each database search. A spreadsheet was used to support a systematic approach to data extraction: Themes were added iteratively throughout the process and papers were re-reviewed to ensure a comprehensive data set.

However, this was not a 'systematic review' and therefore despite these efforts to maximize the breadth of the literature search, it is possible that some studies were overlooked. Also, since only articles describing *interventions* were included in this review, other reports with interesting but as yet untested guides for educational programmes were exempt due to a lack of data. Despite not excluding healthcare professional search terms, exclusion of keywords pertaining to clinical specialities, e.g. palliative, could also have inadvertently excluded some specialty-overlapping studies which may have been of interest.

Overall, the review should be acknowledged as an indication of the types of teaching interventions for managing the acutely unwell patient for medical students and doctors, i.e. how the studies are conducted and the theoretical ideology behind them. According to Vivekananda-Schmidt and Sandars (2018) a scoping review, compared to a systematic review, considers both a wider range of evidence and qualitative and quantitative outcomes in equal weighting. This allows a more complete overview of the literature in this area to address not only 'what' or 'who' are taught, but equally importantly 'how' they are taught.

2.10. Conclusions

Managing the acutely unwell patient is very challenging and can evoke negative emotional responses in the newly qualified doctor. Clearly this global problem has been approached in many ways over the past 12 years, but gaps still remain which should be the focus of future research and innovation in this area of medical education, as demonstrated in Table 2-10:

Table 2-10: Summary of literature gaps and potential approaches to address them

Gaps from literature review	Potential Solution
Little known about long-term effects of interventions	Increase time between intervention and data collection to capture changed behaviour in clinical environment
Lack of objective data	Use both objective and subjective data to determine true preparedness
Lack of stated learning theories	Explain the underpinning theories behind intervention
Lack of use of metacognition	Add to success of metacognition in other clinical scenarios, perhaps incorporate with coping strategies in stressful situations
Lack of validated debriefing framework	Use known published structures for debriefing sessions e.g. Gibbs's cycle, Pendleton's guidelines
Lack of collaborative learning theories	No current collaboration between medical education and other similar fields in the area of the acutely unwell. Consider sports psychology as an established discipline in metacognition to improve preparedness
Lack of objective-data statistically significant results	Power calculations to identify necessary minimum participant numbers when designing study
Lack of clinical environment incorporation	Merging the academic/simulation learning environments with the clinical environment with use of self-reflective diaries, observation and in situ simulation
Lack of individualisation of education / feedback	If individual participant interventions can be accommodated, encourage identification of own educational needs and self-directed learning to support ongoing learning throughout the study

This review demonstrates that the majority of interventions in the area of acute care are aimed at medical students. Although this satisfied the need for more undergraduate-focused acute care education (Smith *et al.*, 2007) educational interventions after the first post-graduate year are perhaps now lacking. Perhaps it is assumed that once working, doctors gain adequate learning and maintain their skills through clinical encounters, although the opinion that clinical experience is limited due in part to the European Working Time Directive might suggest otherwise (Cullinane *et al.*, 2005; Amin and Cartledge, 2012).

Simulation is considered a pedagogy which supports transition of learning to practice. However, the studies in this review which used simulation generally failed to capitalise on this. Likewise, realism appeared to be limited to the use of high-fidelity manikins, which although considers authenticity from an *equipment* perspective, fails to acknowledge the importance of *environmental* and perhaps

psychological fidelity on learning (Rehmann, Mitman and Reynolds, 1995; in Ker and Bradley, 2014, p. 177).

Theoretically there have been attempts to underpin interventions in teaching surrounding the acutely unwell patient but the use of metacognition is a stone which remains largely unturned, particularly in conjunction with simulation. Motola *et al.* (2013) urged for the use of metacognition in post-simulation debriefing, in addition to the knowledge-based aspects of the scenario. Bond *et al.* (2004), which predates this literature review, instructed emergency medicine residents to use cognitive forcing strategies and demonstrated that metacognitive strategies can be taught to residents. Perhaps further exploration of metacognition alongside simulation is warranted, particularly within debriefing.

Could it be possible that metacognition, with the use of simulation to enhance transfer to practice, might unlock the potential of competent doctors who lack strategies to control their own cognitive processes, thus increasing their preparedness for practice? Such an intervention might be best placed to fill the void in early post-graduate education. Areas outside medicine might offer lessons in metacognition which can be transferred to optimise clinical performance. One such industry is sport, where elite runners' metacognitive processes were found to be linked to expert performance (Brick, MacIntyre and Campbell, 2015). This will be explored further in the following chapter.

Table 2-11 below summaries the journal and abstracts included in the literature review.

2.11. Chapter Summary

The scoping review has highlighted a lack of interventions targeting transfer of knowledge from medical school to the real-life clinical environment in the area of managing the acutely unwell patient; a likely contributor to junior doctors' lack of preparedness in this area (Carling, 2010). The complexities of the real-life clinical environment and increased responsibility felt after graduation, (Lundin *et al.*, 2018) appears to impede access to established clinical knowledge and skills (as confirmed through graduation examinations) when managing acute scenarios. Optimising clinical performance within the stressful, complex environment of hospital wards should be addressed with appropriate teaching strategies to allow junior doctors to manage such stressors and deliver the highest level of clinical care, (GMC, 2017). The PERFORM study aims to achieve this by gleaning insight from other industries who excel in the area of performance enhancement. This is discussed further as part of the methodological approach to the PERFORM study in the following chapter.

Table 2-11: Summary of journal articles and abstracts included in literature review

Study Number	Author	Title
1	Ellington, M and Campbell A (2014)	Resuscitating two birds with one stone: improving ambulance response times and enhancing medical student education of the acutely unwell patient
2	Carling, J (2010)	Are graduate doctors adequately prepared to manage acutely unwell patients?
3	Gregory, A <i>et al.</i> (2015)	Innovative teaching in situational awareness
4	Fisher J <i>et al.</i> (2014)	Hands on + hands free: simulated on-call interaction
5	Macdowall, J (2006)	The assessment and treatment of the acutely ill patient--the role of the patient simulator as a teaching tool in the undergraduate programme
6	Graham, P <i>et al.</i> (2011)	Shadowing a foundation-year doctor: a third-year medical student's perspective.
7	Lovell, B <i>et al.</i> (2013)	Simulation training for acute medical specialist trainees: a pilot
8	Woods A <i>et al.</i> (2016)	Inspiring confidence in future doctors : a tailored, near-peer led programme combining theory and simulation teaching for undergraduates
9	Boakes, E and Shah, N (2016)	Improving the transition from medical student to junior doctor: a one month course in the final year of medical school
10	Kelly, A (2017)	Managing the acutely ill patient upon graduation: a novel, interactive, case-based teaching programme aimed at improving confidence in acute care for final year medical students
11	Hoi Ka Wu, C <i>et al.</i> (2017)	Transition with simulation
12	Rowland, K <i>et al.</i> (2017)	Mind the gap: facilitating the transition between medical student and foundation doctor
13	Taylor, S <i>et al.</i> (2017)	Transforming the transition: medical student to junior doctor
14	Fadra, A <i>et al.</i> (2015)	A study of high fidelity simulation in pre-clinical to clinical transition in third year medical students
15	Broom, T (2015)	Does simulation training help to prepare final year medical students for their roles as junior doctors?
16	Hayes, C <i>et al.</i> (2015)	Simulation-based teaching in using acute ABCDE assessment: improved final year medical student clinical confidence in preparation for foundation years
17	Rajani, CK and Sabir, N (2014)	The effectiveness of a short HDU placement for foundation year 1 doctors in a district general hospital: a teaching evaluation project
18	Tuckwell, E <i>et al.</i> (2014)	Predicting the unpredictable: a pilot study demonstrating the use of simulation techniques in preparing medical students for the on-call shift
19	Hardy, E <i>et al.</i> (2014)	Novel uses of simulation for students learning the assessment and management of the acutely ill patient
20	Eneje, O <i>et al.</i> (2014)	CMT SIM: a pilot study using simulation training to prepare core medical trainees (CMT) to take on the role of "the medical registrar"; trainee's perspectives
21	McGlynn, MC. <i>et al.</i> (2012)	How we equip undergraduates with prioritisation skills using simulated teaching scenarios
22	Patel, P and Sockalingam, I (2013)	Acute care simulation for foundation doctors: the perceived impact in the workplace
23	Hawkins, A <i>et al.</i> (2015)	Extended assistantship for final year students
24	Green, R and Curry N. (2014)	Simulation training improves clinical knowledge of major haemorrhage management in foundation year doctors
25	Shah, I <i>et al.</i> (2008)	Acute medicine teaching in an undergraduate medical curriculum: a blended learning approach
26	Thomas, I <i>et al.</i> (2015)	Driven to distraction: a prospective controlled study of a simulated ward round experience to improve patient safety teaching for medical students
27	MacEwen, AW <i>et al.</i> (2016)	A "diabetes acute care day" for medical students increases their knowledge and confidence of diabetes care: a pilot study
28	Xu, G <i>et al.</i> (2014)	An educational approach to improve outcomes in acute kidney injury (AKI): report of a quality improvement project
29	Mughal, Z <i>et al.</i> (2015)	Development, evaluation, and delivery of an innovative national undergraduate surgical workshop: recognition and management of the acutely unwell surgical patient
30	Cash, T <i>et al.</i> (2017)	Near-peer medical student simulation training
31	Maddy, JK <i>et al.</i> (2014)	A comparison of simulation-based education versus lecture-based instruction for toxicology training in emergency medicine residents
32	Binstadt, E <i>et al.</i> (2007)	A comprehensive medical simulation education curriculum for emergency medicine residents
33	Schwartz LR, <i>et al.</i> (2007)	A randomized comparison trial of case-based learning versus human patient

		simulation in medical student education
34	Miyasaka, KW <i>et al.</i> (2015)	A simulation curriculum for management of trauma and surgical critical care patients
35	Brunt, LM <i>et al.</i> (2008)	Accelerated skills preparation and assessment for senior medical students entering surgical internship
36	Carter, M <i>et al.</i> (2005)	Didactic lecture versus instructional standardized patient interaction in the surgical clerkship
37	Kwan, B <i>et al.</i> (2017)	Exploring simulation in the internal medicine clerkship
38	Alsaad, A <i>et al.</i> (2017)	Assessing the performance and satisfaction of medical residents utilizing standardized patient versus mannequin-simulated training
39	Mollo, EA <i>et al.</i> (2012)	The simulated ward: ideal for training clinical clerks in an era of patient safety
40	Schwind, CJ <i>et al.</i> (2011)	Use of simulated pages to prepare medical students for internship and improve patient safety.
41	Reittinger, TM <i>et al.</i> (2006)	What effect does an educational intervention have on interns' confidence and knowledge regarding acute dyspnea management? A randomized controlled trial
42	DeWaay, DJ <i>et al.</i> (2014)	Simulation curriculum can improve medical student assessment and management of acute coronary syndrome during a clinical practice exam
43	Dworetzky, B <i>et al.</i> (2015)	Interprofessional simulation to improve safety in the epilepsy monitoring unit.
44	McKenzie, S and Mellis, C (2017)	Practically prepared? Pre-intern student views following an education package
45	Christensen, MD <i>et al.</i> (2015)	Remotely versus locally facilitated simulation-based training in management of the deteriorating patient by newly graduated health professionals
46	Wright, A <i>et al.</i> (2012)	Supporting international medical graduates in rural Australia: a mixed methods evaluation
47	Fuhrmann, L <i>et al.</i> (2009)	A multi-professional full-scale simulation course in the recognition and management of deteriorating hospital patients
48	Ruesseler, M <i>et al.</i> (2010)	Simulation training improves ability to manage medical emergencies
49	Beckers, S <i>et al.</i> (2005)	Evaluation of a new approach to implement structured, evidence-based emergency medical care in undergraduate medical education in Germany
50	Herbstreit, F <i>et al.</i> (2017)	Impact of standardized patients on the training of medical students to manage emergencies
51	Wallin, CJ <i>et al.</i> (2007)	Target-focused medical emergency team training using a human patient simulator
52	Meurling, L <i>et al.</i> (2013)	Leaders' and followers' individual experiences during the early phase of simulation-based team training
53	Cachia, M <i>et al.</i> (2015)	Simulation training for foundation doctors on the management of the acutely ill patient
54	Gruber, PC <i>et al.</i> (2007)	Teaching acute care: a course for undergraduates
55	Omrani, S <i>et al.</i> (2012)	Exploring an appropriate instructional design model for continuing medical education
56	Gan, E <i>et al.</i> (2017)	Preparing medical students for real life practice: a junior resident led OSCE workshop
57	Lo, FA <i>et al.</i> (2017)	Before taking the plunge: preparing our junior doctors for the chaotic clinical environment with the integrated resuscitation drill (IRD)
58	Beane, A <i>et al.</i> (2017)	Closing the theory to practice gap for newly qualified doctors: evaluation of a peer-delivered practical skills training course for newly qualified doctors in preparation for clinical practice.
59	Stanley, L. <i>et al.</i> (2015)	A tool to improve competence in the management of emergency patients by rural clinic health workers: a pilot assessment on the Thai-Myanmar border.
60	Arora, S <i>et al.</i> (2015)	Crisis management on surgical wards: a simulation-based approach to enhancing technical, teamwork, and patient interaction skills
61	Jingyan, L <i>et al.</i> (2010)	Scaffolding problem-based learning with CSCL tools
62	Bryne-Davis, L <i>et al.</i> (2014)	Efficacy and acceptability of an acute illness management course delivered to staff and students in Uganda by staff from the UK

Chapter 3. Methodology

This chapter begins with an organisational overview of the study described in this thesis to contextualise the details of the subsequent subchapters. The philosophical stance and methodological approach underpinning the design of the research study is then described, followed by the justification of the methods used to generate, collect and analyse the data. The development of the conceptual PERFORM model is explained in its role as a 'theoretical lens' through which the research will be viewed.

Following this the overarching research question of the PERFORM study, and the objectives through which this will be addressed, are stated.

The practicalities of ethical considerations, participant selection and study sites are described before the approaches to ensuring validity and reliability throughout all stages of the study are explained.

3.1. Introduction

Friedrich Nietzsche said “there are no facts, only interpretations” (Anderson, 2017). In the context of research, particularly where qualitative methods are employed, the researcher’s decisions at each stage of the study design, data collection, analysis and conclusions are coloured by their own interpretations of the world around them, i.e. their theoretical perspectives. Explaining the rationale behind these decisions will assist in the interpretation of the study’s conclusions and this chapter will describe the philosophy of the research methodology underpinning the PERFORM study.

3.2. Study Overview

An overview of the PERFORM study is offered here to demonstrate the organisation and timeline over which the study was conducted. Its introduction here is fundamental to lay the foundations for the details described in this and subsequent chapters regarding *how* the research was carried out and *what* data was collected and analysed.

The study was commenced at the beginning of the second year of the PhD. The first was spent undertaking the literature review, developing the conceptual PERFORM model and designing the study with which to evaluate the PERFORM model (including gaining ethical approval). The study was organised into three sequential phases, Exploratory, Pilot and Intervention (Figure 3-1), where data from the first and second phases directly informed and shaped the final intervention.

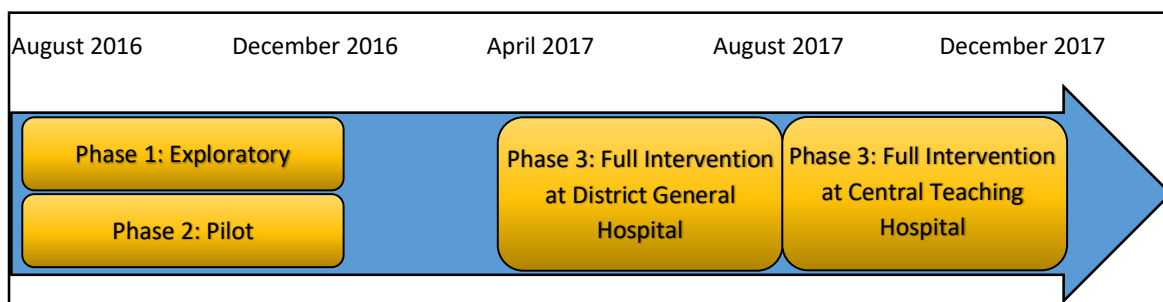


Figure 3-1: Overview of Study

The Exploratory Phase aimed to build upon and confirm the findings of the literature review. In this phase a better understanding was gained of current junior doctors’ perspectives on their management of acutely unwell patients and whether they used PERs in their clinical practice.

The Pilot Phase examined the feasibility of the techniques that were subsequently used in the final intervention. During this phase participant feedback was collected to capture their perspectives on

the key elements study. These, together with reflections from the researcher, informed the Full Intervention.

The Full Intervention Phase was informed by both previous phases and consisted of a dual-centre, multiple-case study design. The two research sites were run in series, each lasting 4 months. All data was collected by the end of December 2017.

3.3. A Four-Level Methodological Framework

Creswell and Plano Clark (2011, p. 38) advocate the use of Crotty’s (1998) conceptualisation to position philosophy within mixed-methods research (Figure 3-2). This four-level framework begins at the highest level with the researcher’s most generalised perspective of the world around them and contains the assumptions of ontology (the nature of reality) and epistemology (the nature of knowledge). These assumptions inform the theoretical stance taken by the researcher, which subsequently informs the methodology, which can be thought of as a “strategy” or a “research design”. The lowest level turns its focus to the methods by which data will be collected and analysed so that interpretations can be made.

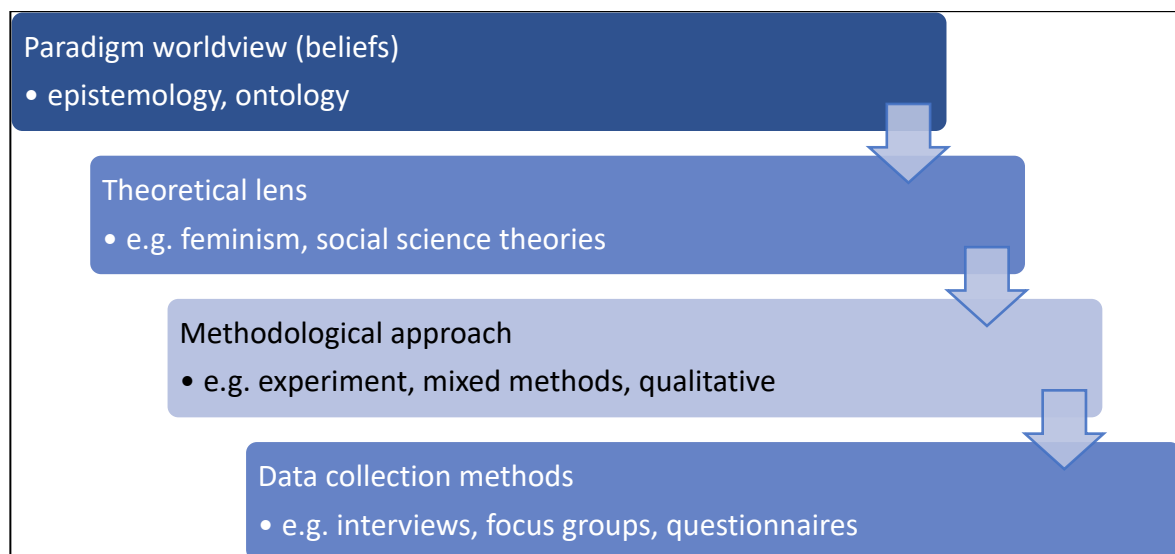


Figure 3-2: Four levels of developing a research study^m

Although the theoretical lens in Crotty’s (1998) framework is placed between worldview and methodology, it is more usual to discuss ontology, epistemology and methodology together (Creswell, 2013, pp. 24-25; Varpio *et al.*, 2017) because of their more direct relationships with the

^m Adapted from Crotty, (1998) in Creswell and Plano Clark, (2011)

overarching worldview. The theoretical lens of a study can be a more fluid choice and will be discussed later.

3.3.1. Level 1: Worldview Philosophy

The ‘paradigm worldview’ refers to a researcher’s “basic set of beliefs that guides action” (Guba, 1990, p. 17), also known as ‘paradigms’ or ‘interpretive frameworks’ (Lincoln, Lynham and Guba, 2011, pp. 97-98; Creswell, 2013, p. 22). According to Lincoln (2011, p. 98) two of the major worldview paradigms are postpositivism and constructivism. Although they are not “watertight compartments” (Crotty, 1998, p. 9; in Creswell and Plano Clark, 2011, p. 40), they do appear to have opposing assumptions (Table 3-1) and are often considered to be the two extremes of the worldview continuum.

Table 3-1: Paradigms and their philosophical assumptions ⁿ

Paradigm or “world view”	Ontology	Epistemology	Methodology
Postpositivism	A singular reality exists	Objectivity. Distance/ impartiality between researcher and subject)	Deductive, uses scientific method. Object of research is to create new knowledge.
Constructivism	Multiple realities exist (often demonstrated through quotes)	Subjectivity. Reality co-constructed between researcher and subject and shaped by individual experiences	Naturalistic (set in the natural work). Inductive, takes subjects’ views and builds “up” to identify patterns and theories.

Pragmatism is considered a more fluid worldview, abandoning “the forced-choice dichotomy between postpositivism and constructivism” (Creswell and Plano Clark, 2011, p. 44). Pragmatists contend that research questions should not only be asking whether something is *correct*, but whether it *works* (Cleland, 2015, p. 11). This shift in perspective encourages researchers to answer the research questions in the context of the ‘real world’ (Feilzer, 2010) . Pragmatism best aligns with the researcher’s understanding of how research can best capture the complexity of clinical practice and is therefore the underpinning worldview which informed all elements of the study.

3.3.1.1. Ontology

Pragmatism encourages the consideration that both singular and multiple realities exist (Creswell and Plano Clark, 2011, p. 42) which can be explored by the researcher to best describe their understanding of the data. This explains the ontological perspective which underpins this study, where each individual participant experiences their own multifaceted, complex and unique reality.

ⁿ Adapted from combination of Creswell, (2013) Lincoln *et al.*, (2011) and Creswell and Plano Clark, (2011)

However, there are likely to be some shared experiences between individuals which cluster around common themes within a single shared reality.

3.3.1.2. Epistemology

Epistemology explains how knowledge is gained, which includes the “relationship between the researcher (i.e. the knower) and the object or phenomenon of the study (i.e. that which is to be known)” (Varpio *et al.*, 2017). Postpositivist and constructivist researchers chose either to distance themselves from, or adopt a nearness to, their study subjects. And whilst a participatory worldview blurs the boundary between researcher and subject through collaboration, pragmatism offers the most fluid of all the researcher-subject relationships to achieve the primary focus of collecting the data which best addresses the research question (Creswell and Plano Clark, 2011, p. 42).

3.3.2. Level 2: Theoretical Lens

Crotty’s model (Figure 3-2) references the ‘theoretical lens’ as a narrower viewpoint than the worldview of Creswell and Plano (2011, p. 47).

A potential social sciences theory that might be applicable to this study is that of behavioural change, specifically changes in junior doctors’ responses to acute patient management. However, Creswell and Plano (2011, p. 47) explain that a theoretical foundation can be presented in many ways, including a conceptual model.

According to Miles and Huberman (1994, p. 18), a conceptual framework “explains, either graphically or in narrative form, the main things to be studied- the key factors, constructs or variables- and the presumed relationships among them” and it therefore seems appropriate that the PERFORM model (Figure 3-3) might be the best lens through which the study is viewed. Theories underpinning *how* the model might be applied by the study participants could be hypothesised. However, rather than making assumptions about these the researcher prefers to adopt an inductive, ground-up approach where the discussion of the results (Chapter 7) aim to inform this level of the philosophical model retrospectively.

3.3.2.1. Development of the PERFORM model

As the scoping review highlights, there are currently numerous different approaches to teach medical students and junior doctors how to manage the acutely unwell patient, but these do not transfer into readiness for practice. Perhaps the environmental pressures of the complex clinical environment inhibit junior doctors from achieving their best clinical performance. This is a problem

common to many other industries. Therefore when considering approaches to optimise junior doctors' clinical performances, industries with similar stressors may offer potential solutions.

3.3.2.2. *Gaining insights on Performance Enhancement from Other Industries*

Other industries which acknowledge the value of psychological training and employ different approaches to equip those working within stressful environments include law enforcement, teaching and the armed forces (Robertson *et al.*, 2015). To identify the most appropriate industry from which to glean insight and inspiration to apply to acute patient management we must explore which of these offers both a solid foundation of coping mechanism instruction and also has appropriate similarities or 'shared ground' with this study's area of interest.

3.3.2.2.1. Law Enforcement

A meta-analysis of stress management interventions for police officers (Patterson, Chung and Swan, 2014) found huge variety in the coping strategies ranging from very context-specific (e.g. stress inoculation training) to generic and broad-reaching (e.g. a stress reduction programme or circuit weight training). The meta-analysis, which included twelve studies published between 1984 and 2008, probed three main outcomes of stress management; psychological, physical and behavioural changes. All of these areas yielded small effect sizes and were deemed unlikely to be effective by the authors of the review.

More recent studies further explored police officers' responses to real threat-of-death situations using retrospective interviews. Harris *et al.* (2017) uncovered a huge range of coping strategies already used by police officers which were often context-dependent. Although insightful, no instructions were developed regarding how to best coach or teach such strategies. The authors simply advised police trainers to increase the scope of situational exposure, allowing officers to create their own mental models through experiential learning. Conversely, Arnetz *et al.* (2009) examined the coaching of police officers to use specific strategies, namely mental rehearsal and imagery. Officers using these strategies, compared to the control group, decreased the stress response and improved performance when called to a critical incident simulation. Although the results of this were encouraging, there was little opportunity for individualisation with the limited choice of strategies employed.

Despite the interest in promoting psychological strategies to manage stressful situations encountered during police work, there is little congruence in how they are applied and the huge variety of situations in which they might be required may seem counterintuitive to the concept of a

unified mental model. The *context* of police work appears to share some commonality with acute medicine, e.g. time pressure and the jeopardy of potential morbidity or mortality if the situation is not correctly managed. However, the *content* of the decision-making and problem solving in law enforcement (e.g. hostage negotiation, conflict resolution and physical restraint) does not align as well with that of caring for acutely unwell patients.

3.3.2.2.2. Armed Forces

In contrast to law enforcement, there is considerable overlap in the expectations and stressors experienced during delivery of acute clinical care and military action. Both include high pressured situations often in unfamiliar environments where multitasking, communication and innovative problem solving are key to optimal performance. Currently, the majority of the literature regarding psychological training within the area of military defence documents the development (and treatment) of post-traumatic stress disorder following emotionally challenging events (Thomassen *et al.*, 2018). Unsurprisingly, there has been a more recent shift in focus towards preventative strategies in mental health resilience. Carr *et al.* (2013) demonstrated the outcomes of a resilience training programme which developed, amongst other facets, individuals' problem-solving skills alongside self-regulation and emotional awareness. Unfortunately, initial improvements in resilient thinking and self-reported morale were not sustained, later showing a decline throughout the remainder of the deployment period.

The Tactical Human Optimisation, Rapid Rehabilitation and Reconditioning (THOR3) project, established in 2009 by the United States Army Special Operations Command (USASOC) aims to improve physical and mental performance, aid injury recovery, maintain health and thus optimise career longevity of soldiers (Loney, 2016). Its multifaceted approach includes interventions ranging from nutritional advice to sport psychology instruction, although the latter was only introduced in 2012. An independent assessment of THOR3 argued that "there are no well-defined assessment tools for cognitive capability, which makes measurements in this field problematic", and that given soldiers' pre-interventional high fitness levels, setting targets for significantly improved physical ability are "unrealistic" (Kelly *et al.*, 2013). Therefore, despite the military's encouragingly holistic approach towards performance enhancement and its commonalities with medicine regarding stressors, there currently there is very little evidence that military-based programmes improve performance at an individual level, and this perhaps decreases its appropriateness for this study.

3.3.2.2.3. Aviation

The aviation industry is renowned for its impressive safety record and has often been a source of inspiration regarding non-technical skills interventions (including 'human factors'), particularly in such medical specialties as anaesthesia (Toff, 2010) and acute medicine (Flin and Maran, 2004). However, the aviation-medicine comparison has been scrutinized across different acute care specialties, where common criticisms include the differences between pilots and medics in both leadership hierarchy (Buck, 2013) and training structure (Randell, 2003). Having produced a series of blogs outlining the ways in which emergency medicine differs to that of aviation, Buck (2013) highlights a key difference in control between the two professions: Whereas a pilot can avoid uncertain airplane take-offs or landings by delaying until conditions are optimized, the same cannot be said for doctors working in emergency medicine where "care must proceed regardless of staffing, skill mix, cubicle or equipment availability". This argument also extends to the working environment, where external stressors such as fatigue and environmental unfamiliarity are less prominent in aviation due to strict hours regulations, enforced breaks and regular working teams and aircraft design. Although aviation and medicine share similar levels of responsibility and certain non-technical skills, for example the requirement for good communication and team-working skills, it appears that this previously popular association is no longer perceived as a 'good fit', especially by those working within acute care.

3.3.2.2.4. Clinical Insights

Both nursing and surgery have embraced the use of mental rehearsal to optimise performance in different clinical contexts. This already established clinical application of performance enhancement strategies would appear to offer an easy transfer of such strategies into the context of acute care delivery by junior doctors.

Ignacio *et al.* (2016) investigated the use of mental rehearsal strategies for nursing students during a simulation of a deteriorating patient. Although this study demonstrated improved performance pre- and post-intervention, the physiological and psychological stress and anxiety metrics were unchanged. Given that both simulations were performed on the same day, a potential "carry-over" effect (Allen and Yen, 1979) may have contributed to the results; perhaps the strategies simply improved candidates' knowledge and familiarity of the scenario, giving the appearance of an improved performance. A subsequent study by Ignacio *et al.* (2017) compared the use of mental rehearsal to that of a mnemonic to manage stress during patient deterioration. Third year nursing students were randomised to use one strategy before completing a simulation involving simulated patients. There was no significant difference in either the performance or the stress/anxiety metrics

between groups. Interpretation of these two studies is challenging. Perhaps both mnemonic and mental rehearsal improve performance equally or neither improve performance beyond the influence of carry-over bias. Perhaps the lack of variety in such strategies and the prescribed, standardised way in which they are taught, limits their usability and subsequent efficacy. Finally, the application of these strategies purely in simulation limits the transferability of the results to the real clinical environment.

The use of mental rehearsal in surgical skill acquisition was referred to by Aoun *et al.* (2011) as the most “economical” form of simulation training. In their review, Cocks *et al.* (2014) demonstrated the range in surgical task complexity to which mental imagery has been applied; from closed, seemingly simple skills such as suturing (Jungmann *et al.*, 2011) and knot-tying (Sanders *et al.*, 2008) to composite performances such as laparoscopic cholecystectomy (Arora *et al.*, 2011). Although one paper in the review did highlight the improved coping skills and decreased stress response (Wetzel *et al.*, 2011), the review concluded that mental imagery has generally been applied to achieve specific skill acquisition rather than to optimise overall performance, and that these should be viewed as two separate entities of surgical training.

Current performance enhancement techniques from the aforementioned industries have both merits and flaws. Policing and aviation are perhaps not ideally aligned to the type of work undertaken in acute clinical environments and the clinical examples of nursing and surgery currently use a very limited range of strategies.

At the core of all of the strategies discussed, a single common theme emerged. Many if not all examples are taken directly from the sport psychology literature. Surgery (Cocks *et al.*, 2014), nursing (Ignacio *et al.*, 2017), the military (Loney, 2016) and even musical performance (Osborne, Greene and Immel, 2014), all explicitly reference insights from sport when designing their performance optimisation interventions. If the strategies used in these industries are viewed as subsidiaries of those grounded in sport psychology, sport psychology itself might offer the best foundation for an intervention to optimise junior doctors’ management of the acutely unwell patient.

3.3.2.2.5. Sport

Sporting professionals must optimise their performance under mounting pressure from themselves, coaches and their rivals. They cope with these pressures in order to deliver their best performance using many different performance enhancing strategies.

Sport and medicine both operate in busy, distraction-filled environments where focus and attention are paramount for successful task completion. As Gallucci (2014) explains there is rapid fluidity in information-load from one moment to the next within the context of sport, which is not dissimilar to that of assessing the acutely unwell patient in a clinical environment. Distractions in sport are rife; with team players' actions and movements, opponents' behaviours, audiences and coaches shouting from the side-lines: Compare this with the medical distractions of pagers, interruptions from colleagues and being called to an emergency situation whilst in the middle of a different task (Weigl *et al.*, 2011).

Focus and distraction management (Thomas *et al.*, 2015) and the ability to gain control over one's anxiety during occasions of intense pressure or stress (Hanton and Jones, 1999) are integral to professional interactions within the complex environments of both medicine (GMC, 2017) and sport (Hazell, Cotterill and Hill, 2014). Sport psychologists work with athletes to address such pressures through the development of tools called Pre-Performance Routines (Cotterill, 2010).

3.3.2.2.5.1. Pre-Performance Routines in Sport

Pre-Performance Routines (PPRs) are widely recognised as important contributors to successful performances during competition (Cotterill, 2011). A PPR is defined as a "sequence of task relevant thoughts and actions which an athlete engages in systematically prior to his or her performance of a specific sport skill" (Moran, 1996) and is thought to serve as a focussing technique, alleviating stress and/or 'choking' in a high-stakes situation, e.g. a penalty shoot-out (MacIntyre *et al.*, 2014).

Despite the plethora of studies supporting the use of PPRs across multiple sporting disciplines, the mechanism by which PPRs act has not been established (Hazell, Cotterill and Hill, 2014). In Cotterill's (2011) review on PPRs, Boutcher (1992) suggests that PPRs allow golfers to focus on their own task-relevant cues and overcome negative thoughts. These enable the golfer to more effectively concentrate on the task in hand, rather than being distracted by external factors or detrimental emotions. Other studies have proposed alternative explanations for the success of PPRs, including the improvement of specific beliefs or psychological states: Cotterill (2010) demonstrated an improvement in self-efficacy in golfers with the use of PPR, whereas Hazell *et al.* (2014) observed a statistically significant decrease in anxious feelings in semi-professional soccer players. Mesagno *et al.* (2015) found that PPRs improved ten-pin bowlers' attention, emotional stability and confidence and as a result, the overall perception of self-control was increased. The latter was also noted by Hill *et al.* (2011) during their longitudinal study of golfers.

3.3.2.2.5.2. *Metacognition in Sport*

PPRs are often used in closed, self-paced skills (Cotterill, 2010) where the skill is performed in a stable and predictable environment with a clear defined beginning and end, for example, basketball free throw shooting or golf putting (Wang *et al.*, 2013). However research in this area is beginning to shift focus from the application of PPRs in closed skills to more complex, open skills where the environment is more unpredictable and self-paced, such as Rugby Union (Cotterill, 2010). Transferring from closed to open skills, there is an additional requirement for athletes to select the best PPR to use, decide when it must be employed and evaluate whether it has worked successfully during a competition. This requires additional consideration for the athlete and a further challenge for their coaches to address. One approach to understanding and conceptualising the added complexity of PPRs in open skills is the application of metacognitive theory, which has been previously highlighted as a potential area of interest in elite sporting performance (MacIntyre *et al.*, 2014; Brick, MacIntyre and Campbell, 2015). The three facets of metacognition, as described by Efklides (2008), are as follows:

1. **Metacognitive knowledge** is the individual's declarative knowledge of one's own cognitive processes and encompasses multiple variables. Flavell (1979) originally described three of these variables, namely person, task and strategy. *Person* encompasses beliefs about one's own or others cognitive ability when undertaking a task. *Task* includes the undertaking of a critical analysis of the information available to complete a task and how this might affect the outcome. It also includes quantification of the level of challenge or difficulty that the task holds, and thereby infers the likelihood of successful completion of the task, or in other words 'self-efficacy'. Metacognitive knowledge of different *strategies* informs selection of the most appropriate method with which to tackle the challenge. Metacognitive knowledge can be thought of as a type of ever-evolving, long-term memory bank which can be activated to influence the course of the cognitive enterprise.

2. **Metacognitive experiences** are those experiences a person is aware of whilst actively engaged in performing a task (Efklides, 2006a). They include *metacognitive feelings*, which are the emotional responses to a task. These can be positive (e.g. familiarisation of a subject or confidence) or negative (e.g. difficulty within a task) but both have potential to bring about constructive strategic change by, for example, increasing cognitive effort to complete the task. *Metacognitive judgements* can be more analytical in assessing task progression, time-span required for completion and whether satisfactory outcomes will be met. Metacognitive experiences are influenced by, and add to,

existing metacognitive knowledge through feedback which refines the stored information by adding, deleting or revising what was previously believed (Flavell, 1979).

3. **Metacognitive skills** allow the deliberate control and coordination of cognitive strategies to achieve desired performance (Efklides, 2008). These “executive functions” as described by Brown (1987; in Efklides, 2008) include:

- a) Planning; appropriate selection of strategies and correct allocation of resources for task performance.
- b) Monitoring of the task requirements; one's awareness of task performance.
- c) Evaluation of the processing outcome; appraisal of the final product of a task and the efficiency with which the task was performed. This can include retrospectively evaluating strategies that were used.

Metacognition has a dual role during cognition; it monitors and controls. Metacognitive knowledge and experiences are responsible for monitoring how a task is being performed, whereas control is implemented through metacognitive skills (Efklides, 2006a).

MacIntyre (2014) *et al.* states that “metacognition may be fundamental to the refinement of pre-performance routines as well as their acquisition”. It would appear that metacognition might underpin the selection and application of PPRs and also evaluate their efficacy, leading to ineffective PPRs being revised or discarded. Brick *et al.*, (2015) offered a metacognitive framework (which included the facets of feelings and judgements) at the conclusion of their study in which they interviewed elite runners. However, once designed the model was not evaluated and was specific to the discipline of running. A more comprehensive and generalised explanation of how all the metacognitive facets relate to the application and adaptation of PERs has never been offered or evaluated.

It seems that sport and medicine share an interest in metacognition for performance optimisation: Within medicine, diagnostic errors were reduced after clinicians were taught how to select cognitive aids using metacognition to avoid bias (Croskerry, 2003). Also, on exploring newly-qualified doctor's behaviours during acute care, Tallentire (2011a) revealed that metacognitive theory resonated with junior doctors' behaviour when performing “cognitive challenges” such as diagnostic decision-making and transferring knowledge into practice, and therefore encouraged future curricula to consider metacognitive strategies to enhance preparedness for practice.

3.3.2.3. The PERFORM Model

There is a need for a solution to the difficulties faced by junior doctors in the complex healthcare environment when managing the acutely unwell patient. The literature in this area has not offered any strategies to overcome this and therefore the generation of new ideas is required to tackle this important issue. Hence, the PERFORM (Performance Enhancing Routines For Optimising Readiness using Metacognition) model, which was designed by the researcher as an amalgamation of sports psychology and metacognitive theory, is offered as such as solution:

Adaptation of Pre-Performance Routines (PPRs) from sport psychology into Performance Enhancing Routines (PERs) through the use of metacognitive regulatory processes is fundamental to this novel conceptual model. The PERFORM model forms the basis of the research described in this thesis, targeting junior doctors' management of acutely unwell patients and aiming to optimise their performance and improve their readiness for clinical practice. Figure 3-3 demonstrates the conceptual, generic version of PERFORM, outlining the interplay of metacognitive monitoring and control over the use of PERs. Figure 3-4 contextualises the model, demonstrating its use in the context of a task (shown as a central circle), surrounded by extenuating pressures (arrows) within the complex environment of healthcare (green background).

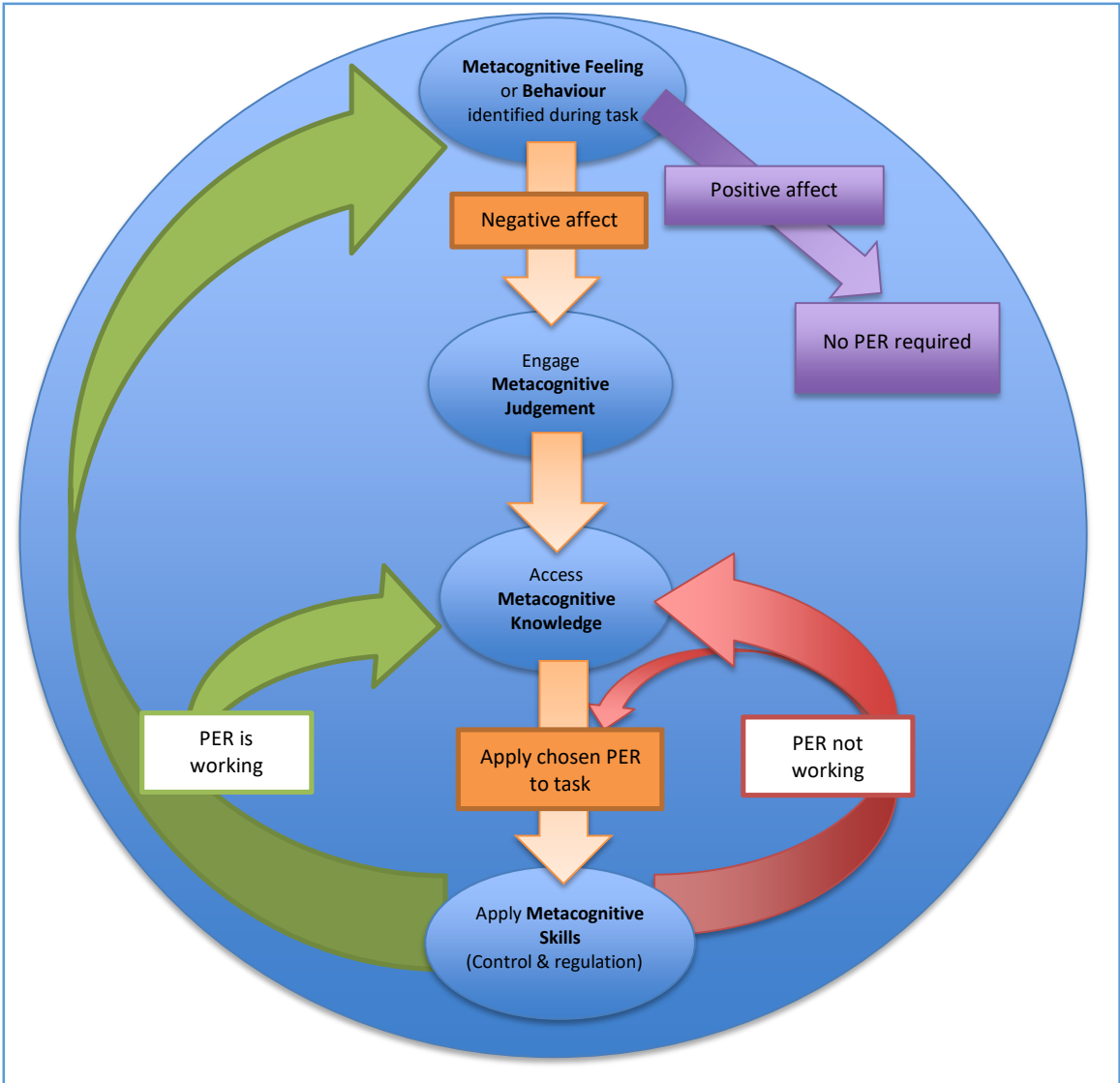


Figure 3-3: Conceptual PERFORM model

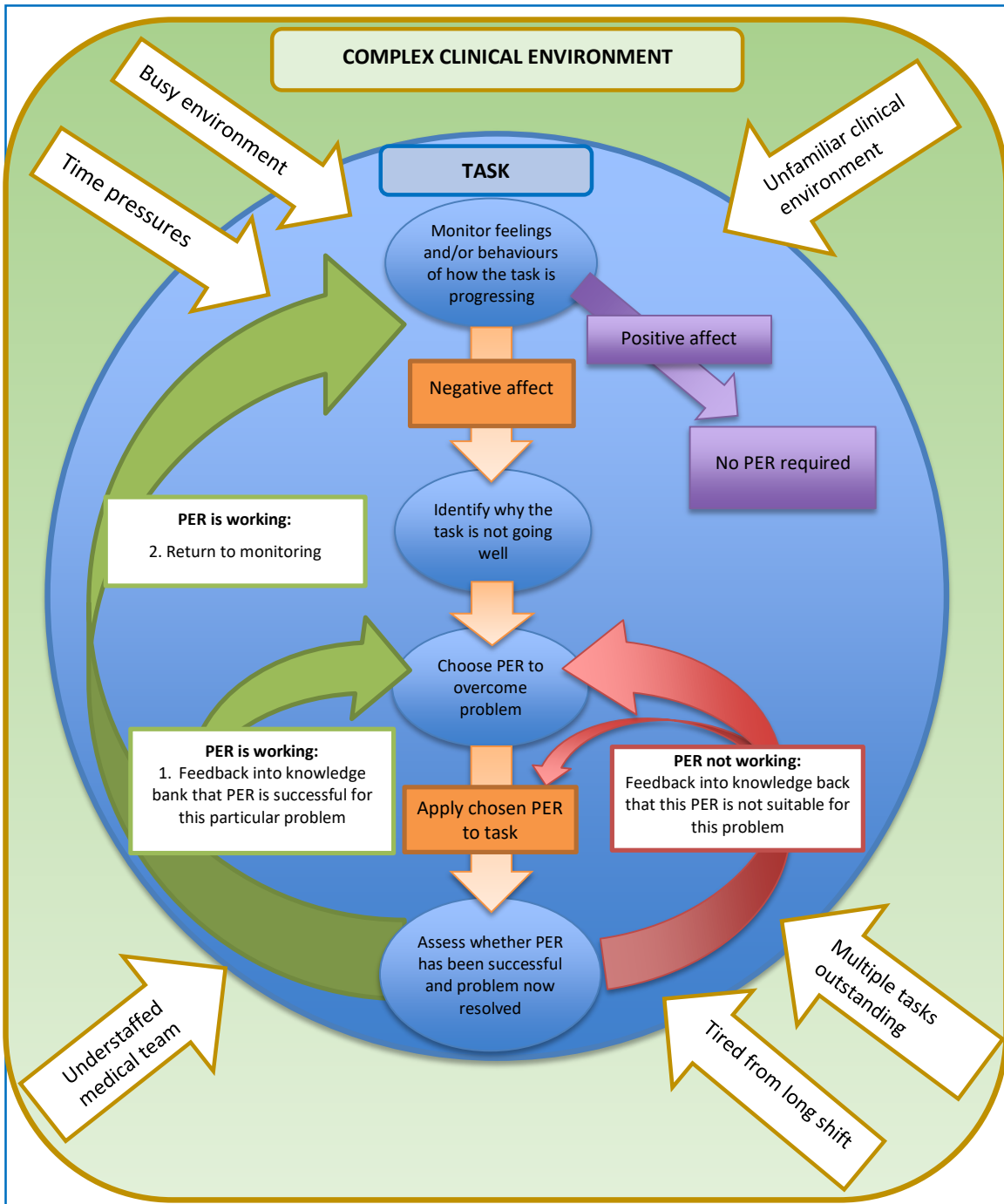


Figure 3-4: Contextual PERFORM model

The focus of the model is to optimise performance in real-life complex situations. It acknowledges the importance of metacognition, highlighted in both sport (MacIntyre *et al.*, 2014) and medicine (Croskerry, 2003), to monitor and refine one's actions to meet the specific task requirements.

Metacognition was first described by Flavell (1979), but since this time many new interpretations have been explored. Efklides' (2006a; 2008) work on metacognition aligns with the fundamental principles of monitoring and controlling one's behaviour to optimise task performance but examines the metacognitive components (or 'facets'), and the relationship between them, in more detail. Both of these psychologists, but of course more recently Efklides, are often cited in the sport psychology literature regarding the use of PPRs (MacIntyre *et al.*, 2014; Brick, MacIntyre and Campbell, 2015). It therefore seems appropriate to utilise this clear link between Efklides' more detailed description of metacognition and sport psychology to underpin the PERFORM conceptual model.

3.3.2.3.1.1. The PERFORM Model in Action

The first step in this conceptual model is the acknowledgement of a **metacognitive feeling**. This is affective, non-analytical and can be positive or negative, akin to a 'gut feeling' or instinct. Where positive, it is associated with a sense of confidence, familiarity or 'feeling of knowing', indicating that the individual feels capable and 'on-track' to complete the specific task and the use of a PER is not required (at this time).

However, when the feeling is negative it is more likely to be associated with difficulty (Efklides, 2008). Alternatively, a negative behaviour may become apparent, this could be a physiological response to stress (e.g. shaking hands, sweaty-palms) or a nervous physical routine (e.g. fidgeting). When a negative feeling or behaviour is identified, the individual should make **metacognitive judgements** to explain *why* these feelings are present. Such causations might include anxiety due to lack of familiarity of a situation, under-confidence as a consequence of previous failed attempts at a task or a decrease in focus secondary to being cognitively overwhelmed or distracted. Once the cause of the negative metacognitive feeling is identified through the use of metacognitive feelings and judgements (together known as **metacognitive experiences**) an appropriate strategy, in the form of a PER, can be chosen to help reduce the source of stress. In order to select the most appropriate PER, the individual can delve into their **metacognitive knowledge**. Here, declarative knowledge regarding tasks, strategies (including PER), cognitive functions (such as attention, memory) and the person/self can enable the individual to evaluate what they need to overcome this feeling of uncertainty, and select the most appropriate PER. Once selected, the PER is implemented

and evaluated for efficacy through the **metacognitive skills** of control and regulation of cognitive processing.

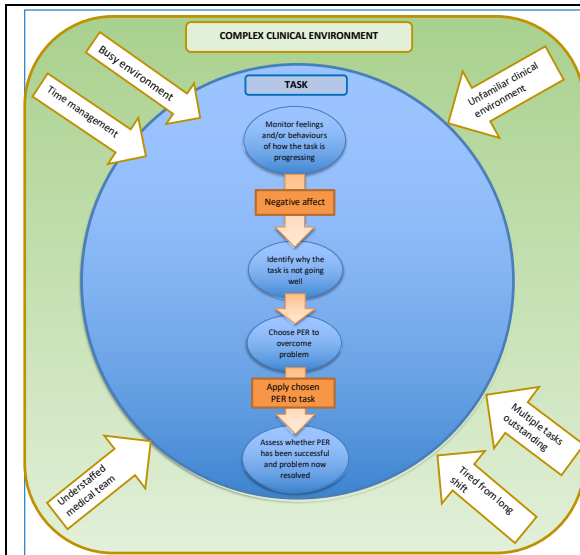
If the PER is not successful in combating the negative emotion or behaviour, two simultaneous pathways occur. Firstly, a feedback loop inputs this information into the **metacognitive knowledge** bank, where it informs and refines future decision-making processes regarding the selection of the most appropriate PER for specific contexts. Secondly, re-accessing one's metacognitive knowledge allows an alternative PER to be selected to re-address unresolved metacognitive feelings or behaviours. This feedback loop continues until a positive outcome, judged by evaluation through metacognitive skills, is reached. At this point, two feedback loops enable both:

1. the input of a positive PER experience into the metacognitive knowledge bank for future reference, and
2. the return to the entry point of the model, where the monitoring of metacognitive feelings continues throughout the remainder of the task.

In this way, metacognitive experiences refine the metacognitive knowledge bank by adding, deleting or revising the PERs and their instructional associations (Flavell, 1979). A cartoon-strip is presented in Table 3-2 to demonstrate the processes within the contextual PERFORM model sequentially.

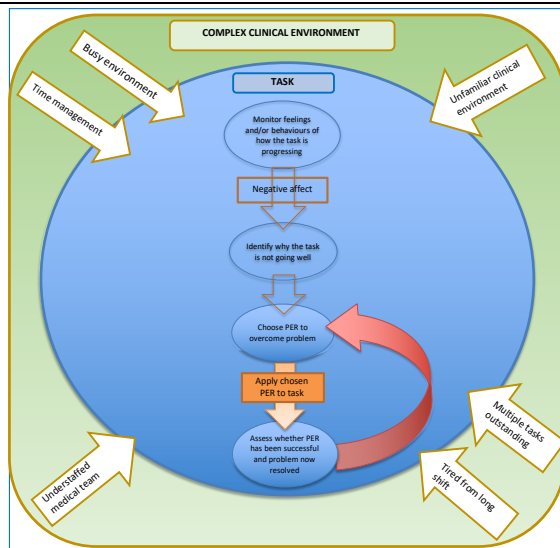
Table 3-2: PERFORM model detailed description

PERFORM Model Diagram	Explanation	Clinical Example
	<p>When an individual experiences positive metacognitive feelings, such as confidence, familiarity or ‘feeling of knowing’, they do not require the use of a PER.</p>	<p><i>“The patient needs clerking in for their surgery. I feel confident to do this as I’m familiar with the paperwork and have done this before.”</i></p>
	<p>However, a negative metacognitive feeling or behaviour (e.g. sweaty-palms, nervous twitch) prompts the individual to make metacognitive judgements to explain why they feel this way.</p>	<p><i>“This patient needs a cannula for their intravenous antibiotics. It’s really important that this patient has a cannula inserted quickly as they have already missed one dose of their medication.”</i></p> <p><i>“I hate doing cannulas, the last time I tried I couldn’t do it and my Registrar had to help me out. There’s no one else here to help at the moment so I have to at least try but I’m sure I will fail.”</i></p>
	<p>Once the cause of the negative metacognitive feeling is identified an appropriate strategy, (PER), can be chosen to help reduce the source of stress.</p> <p>PER’s are chosen from the metacognitive knowledge.</p>	<p><i>“Before I go to see the patient I will try to block the negative thoughts from my mind. I will try to stop reminding myself of the last cannulation attempt that I failed and just focus on what I’m doing now.”</i></p>



Once selected, the PER is implemented and evaluated using metacognitive skills.

"I have tried to block the negative thoughts from my mind...do I feel any better about putting in the cannula?"

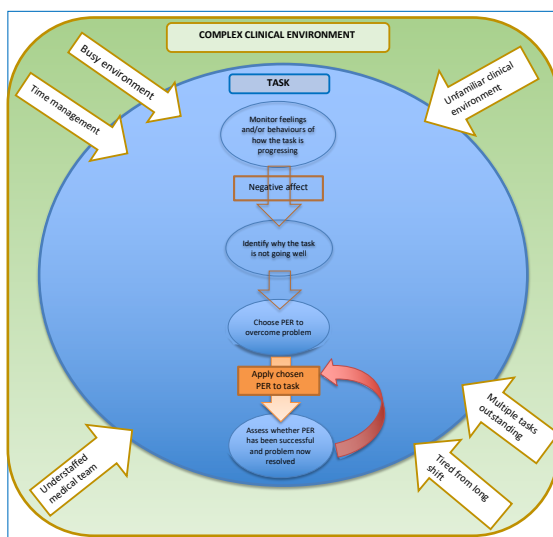


If the PER is *not* successful in combating the negative emotion or behaviour, two simultaneous pathways occur:

"No. I tried to block the negative thoughts from my mind but don't feel any more confident."

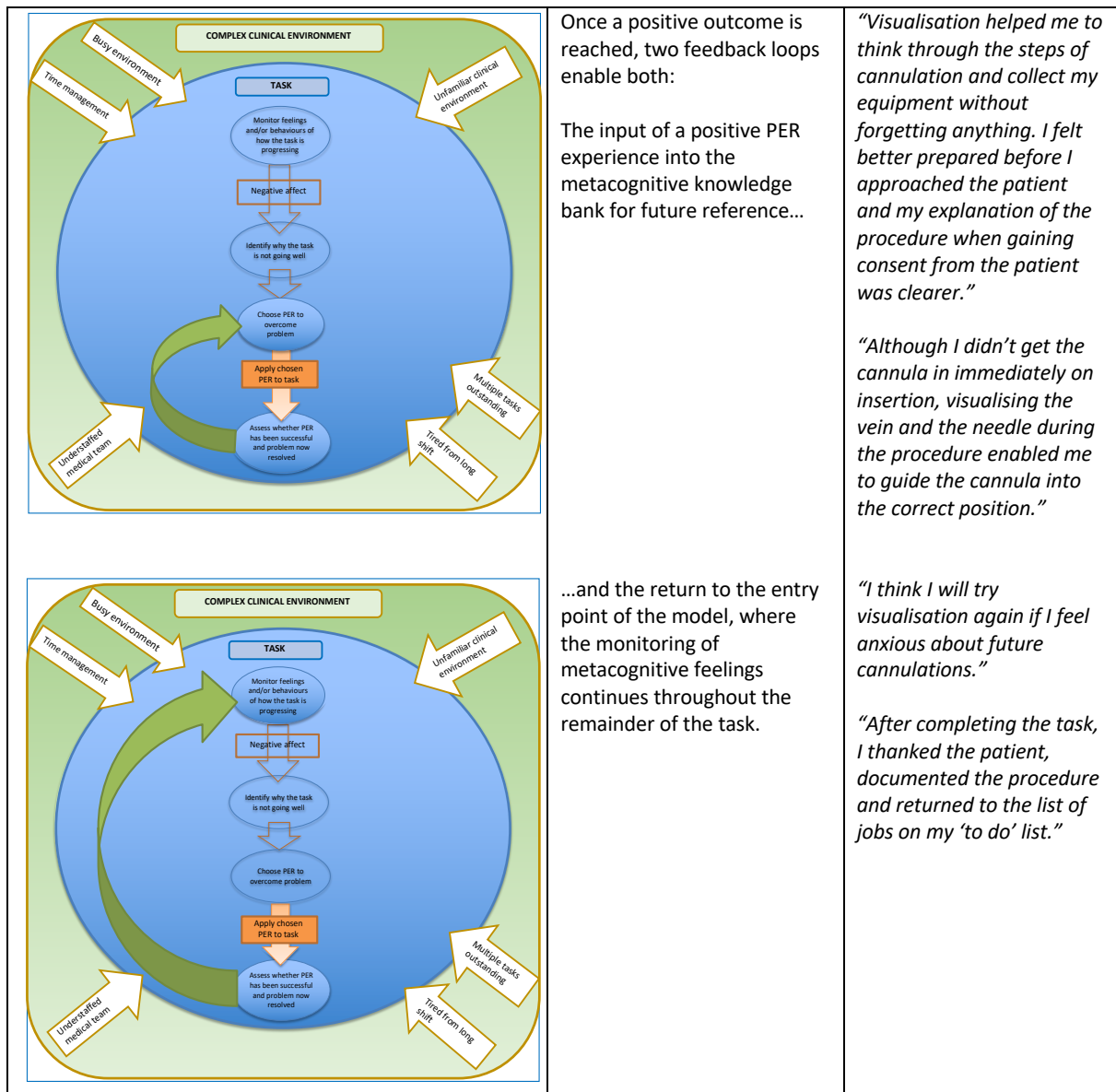
Firstly, a feedback loop inputs this information into the metacognitive knowledge bank, to inform future decision-making processes.

"The next time I feel underconfident with cannulation I probably won't try blocking negative thoughts again as it wasn't very helpful today."



Secondly, an alternative PER is selected. This feedback loop continues until a positive outcome, judged by evaluation through metacognitive skills, is reached.

"I will try another strategy...I will try to visualise how I am going to get the cannula into the patient's vein successfully."



3.3.3. Level 3: Methodology

The main methodological strategy used in the PERFORM study was case study. However, the influences of action research and educational design research are also outlined.

3.3.3.1. Case Study Design

The case study is a familiar “strategy of inquiry” (Denzin and Lincoln, 2011, p. 247) or methodology (Creswell, 2013, p. 97) to social scientists and clinicians, being the basis for patient-based care or in the context of medical education, ‘problem-based learning’ (Albanese and Dast, 2014). A ‘case’ may range widely in definition from individual, groups, organisation or cultures, (Miles and Huberman, 1994, p. 29), but must be bound by time or place. Although case studies were previously considered a ‘qualitative’ approach, the use of mixed methods is now more typical (Eisenhardt, 2002, p. 9), allowing the richness of individual experiences (or realities) to be better understood.

A multiple case study design (Cohen, Manion and Morrison, 2011, p. 291) was considered the optimum research design for the PERFORM study, which aimed to develop an “in-depth understanding” of the experiences of a small group of participants (Paradis, 2016), grounded in a real-life setting (Yin, 2014). Each case, an individual junior doctor, was bound by the duration of a single 4-month clinical placement within the first two years of their practice. Positioning the study within a single placement aimed to avoid potential effects of the recognised stressors and detrimental effects on performance caused by transition through different roles, medical departments and/or hospitals (Kilminster *et al.*, 2011).

Case study research designs align with a pragmatic worldview and allow exploration and better understanding of both single and multiple realities through between- and within-case analysis respectively and hence was used within the PERFORM study.

Finally, Eisenhardt (2002, pp. 5-32) explained that case studies can provide description, test theory or generate theory and this is often most applicable when little is known about the phenomenon that one is trying to understand. This resonates with the PERFORM study, where the initial literature review identified a ‘gap’ in the current teaching approaches to improve junior doctors’ acute clinical performance but failed to identify a previous study which coached the use of PERs.

3.3.3.2. Action Research

Whilst the PERFORM study adopts a multiple case study approach, it is also important to highlight the influence of action research design. Action research began in the 1940’s with roots in social change. However its use in health care research has steadily grown in popularity over the past few decades (Morton-Cooper, 2000). In this context, it is generally carried out by clinicians who become researchers with or without the association of a higher educational institution (Holloway and Galvin, 2016, p. 239). This is because action research aims to solve practical problems within a specific context, i.e. the clinical environment, and these are most often identified through working within, and observing, the environment first-hand (Morton-Cooper, 2000, p. 19). Also, the clinician/researcher’s insight into the problem and their pre-existing relationships within a hospital department may alleviate challenges with organisational engagement and participant recruitment.

Action research’s philosophical foundations are embedded within the pragmatism of such philosophers as John Dewey. Thus mixed methods are commonly utilised for their flexibility and practical approach to address research questions within busy clinical environments, (Levin and Greenwood, 2011, p. 29).

Action research acknowledges that through the researcher's reflection, a study may change its design or direction during its progression. Indeed, the undertaking of a literature review and subsequent pilot study are encouraged as initial steps in the 'trial and error' or iterative approach towards the optimum full intervention. Despite its flexibility, action research stipulates that study conclusions must adhere to rigorous justification processes (Morton-Cooper, 2000, p. 19).

Action Research suggests the use of collaboration between multiple researchers to share the work involved in data collection and analysis, to increase the pool of expertise and making considered decisions through reaching consensus of the group (Morton-Cooper, 2000, p. 84). However, this is not a pre-requisite for action research, and single researchers can undertake such studies so long as they have the "support (or at least the ear) of" experienced researchers, those who can grant access to the research environment and colleagues who share the researcher's enthusiasm for improving practice (Morton-Cooper, 2000, p. 26). The latter was certainly the case for the researcher, who utilised both her academic relationships (supervisors, wider research department colleagues) and clinical relationships at the two hospital sites to promote the study.

A sub-specialty of action research is Participatory Action Research, where the power relationship between researcher and subject is intentionally blurred. According to Baum *et al.*, (2006) the subjects "become partners in the whole research process: including selecting the research topic, data collection, and analysis and deciding what action should happen as a result of the research findings". The PERFORM study did not go to this extreme, but it could be argued that the collaboration with academic and clinical colleagues was also mirrored in the researcher-subject relationship. In Stage 2 of the Full Intervention the doctors undertook their own self-directed opportunities to apply the PERFORM model in the real clinical practice. This could be interpreted as them taking ownership of their own case study in a limited, but relevant context.

3.3.3.3. Educational Design Research

Educational Design Research (EDR) in many respects is similar to action research. Both are interventionalist (i.e. to bring about transformation in practice), collaborative and iterative (McKenney and Reeves, 2012, pp. 13-16). However, the main difference between the two is that action research "has a particular niche among professionals who want to use research to improve their own practices" (Plomp, 2013, p. 44). Contrastingly, EDR aims to contribute to both fundamental understanding by testing and generating theory in "naturalistic contexts" (Barab and Squire, 2004) and solving a problem in practice (McKenney and Reeves, 2012, p. 31).

The PERFORM study aims to do both by improving the practice of the doctors within the study and testing the conceptual model to drive theoretical understanding of PERs in realistic environments. It clearly sits comfortably within both research designs, but since the initiation of this study was borne out of the clinical experiences of the researcher, action research has a certain affinity, where the theoretical generation is accounted for by the use of a multiple case study design.

3.3.4. Level 4: Methods

According to Creswell and Plano (2011, p. 39), 'mixed methods' is largely a method. However, it is also considered a "strategy for conducting research, and therefore be assigned to Crotty's classification at the level of methodology". How the tools were used to generate, collect and analyse data will be described in more detail in Chapters 4-6, however it seems appropriate to introduce the concept of mixed methods here, which aligns with the researcher's methodological stance above.

In mixed methods research (MMR) both qualitative and quantitative data are collected (Teddle and Tashakkori, 2013, p. 146) to capture and understand both single and multiple realities and contend with the "complexity and messiness" of social research (Feilzer, 2010), where Denzin and Lincoln consider "no single method can grasp the subtle variations in ongoing human experiences" (2011, p. 12).

Quantitative data is useful in addressing descriptive (i.e. 'what?') research questions, whereas exploratory (i.e. 'why?' and 'how?') questions are better explored through qualitative tools, hence the need for both in this study. There are many ways in which qualitative and quantitative data can be used together within the study. For example, qualitative data can be converted into quantitative. This is known as 'conversion'. Alternatively, in a 'sequential' design one type of data analysis simply follows another and the two are interpreted independently. The PERFORM study utilised a concurrent mixed design in which each type of data (quantitative or qualitative) has its own independent 'strand' which runs throughout the data collection and analysis stages of the study. At the study's conclusion, data from either (or both) strand is selected to best address the research questions (Teddle and Tashakkori, 2006). This is also described as 'parallel convergent design' (Creswell and Plano Clark, 2011, p. 77).

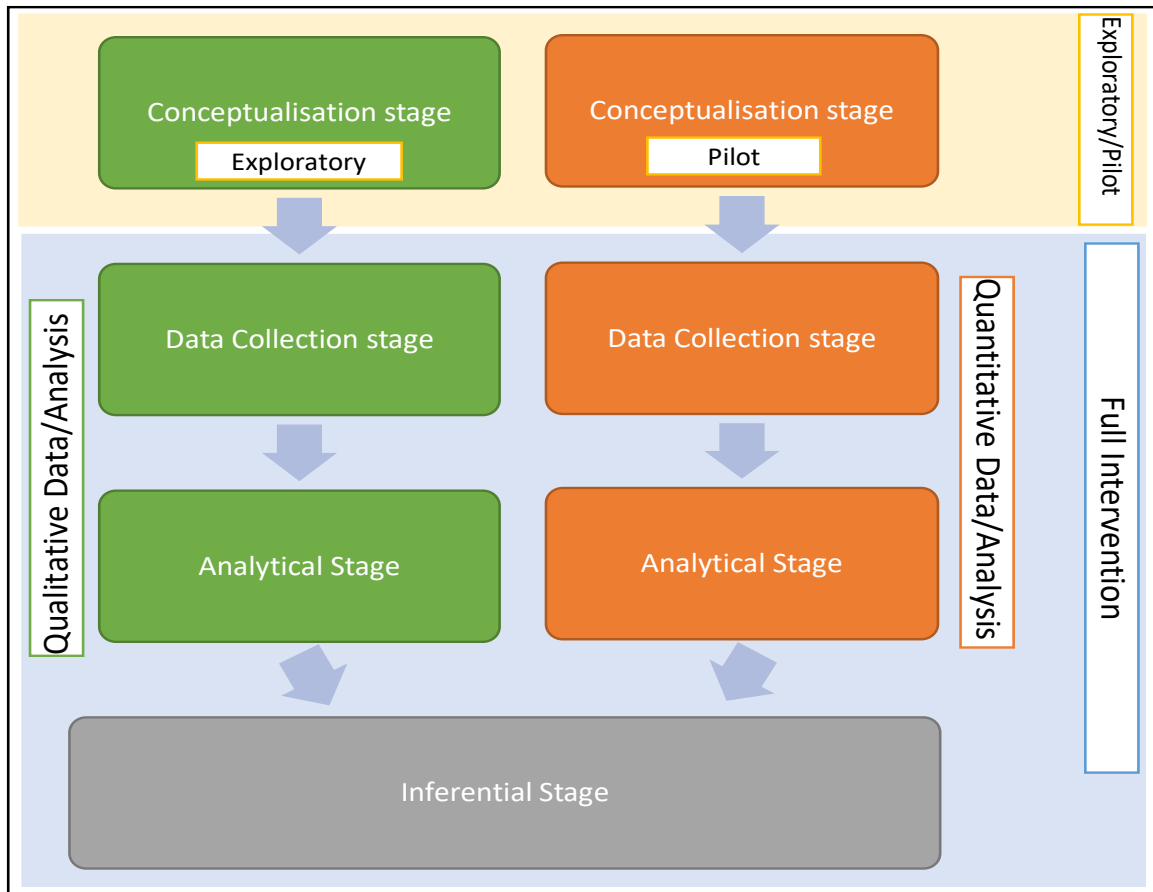


Figure 3-5: Mixed methods design; fully integrated °

The three phases of the PERFORM study were outlined chronologically in Figure 3-1. Figure 3-5 demonstrates the phases within a concurrent mixed methods design, having separated the qualitative and quantitative data into left and right columns respectively. The ‘conceptual stage’ represents the Exploratory and Pilot Phases (yellow background), which used mainly qualitative and quantitative data respectively, but both contributed their findings to the Full Intervention (blue background). Throughout the Full Intervention both quantitative and qualitative data were collected concurrently but analysed separately using methods traditionally associated with each data type (i.e. statistical methods for quantitative data, thematic analysis for qualitative data). Conclusions were drawn at the end of the study using an integration of results from both methods and was given preference purely on the data which best answered the specific research question. The rationale behind this design is to collect complimentary data on similar topics, and allow qualitative results to be compared and contrasted with quantitative statistics through the use of triangulation (Creswell and Plano Clark, 2011).

° Adapted from Teddlie and Tashakkori (2006)

Yin (2009, pp. 101-109; in Cohen, Manion and Morrison, 2011, p. 299) outlines six different types of data which, in combination, enrich understanding and contribute to the depth of knowledge required for successful case study. Two of these data types, archival records and physical artefacts, were not appropriate or necessary for this particular study. The multiple data collection and generation tools used in the PERFORM study are encompassed by the remaining four data types. The justification for each tool is outlined below:

3.3.4.1. Semi-Structured Interviews

Interviews are probably the most commonly used qualitative research data collection tool (Ng, Lingard and Kennedy, 2014, p. 375). They provide insights into personal perspectives and can be tailored to explore any topic. The semi-structured interview (SSI) strikes a happy-medium between the two extremes of a closed, quantitative interview and an informal conversational interview (Cohen, Manion and Morrison, 2011, pp. 412-413), being guided by a predetermined set of questions but allowing the researcher freedom to explore either the topic at greater depth or pursue a related line of inquiry. This was ideal for the PERFORM study, where predetermined topics in the SSI protocol generated data which could be compared between cases, whereas tailored questions enabled exploration of each case's unique interactions with the PERFORM model.

The questions within the initial SSI protocol were refined during the Exploratory Phase to ensure the phrasing was appropriate and yielded the data necessary to address the research questions (Creswell, 2013, p. 164). Although SSI mainly use open questions, the use of different question styles may also be used to extract the appropriate data (Cohen, Manion and Morrison, 2011, pp. 419-420). For example, closed questioning was used to confirm the researcher's understanding of what had been said or to drill deeper into a specific area of conversation that had arisen unexpectedly but was of interest. Furthermore, the use of a categorical response question was particularly helpful when gathering feedback on the perceived 'usefulness' of different elements within the study during the final interview.

3.3.4.2. Questionnaire

A questionnaire was used to capture Pilot Phase doctors' feedback to address specific feasibility objectives prior to the Full Intervention. As questionnaires are designed to be self-explanatory the doctors were able to complete them independently and anonymously, which aimed to encourage truthful responses. Two types of question were included in the questionnaire, 5-point Likert scale graded questions and white-box 'free text' responses.

3.3.4.2.1. Likert-Scale Questions

The Likert scale is frequently used in questionnaires, providing a range of responses to a closed question (Cohen, Manion and Morrison, 2011, pp. 386-387). As opposed to a dichotomous response format, a range enables the question to be answered with greater granularity (e.g. strongly agree/agree/neutral/disagree/strongly disagree). Evidence has shown that respondents can show biases towards the formatting of questionnaires. For example the left-hand side of a bipolar scale is used more frequently than the right (Friedman and Amoo, 1999) and therefore if the 'positive' to 'negative' response scale runs from left to right, this may introduce a positive skew in the results. To overcome this, Cohen *et al.*'s (2011, p. 388) advise to "mix the item scales" was implemented by adopting a left-to-right positive-to-negative scale and reversing three of the 15 Likert response questions by posing the question using a negative proposition, e.g. "I found it difficult to...".

3.3.4.2.2. White-Box Questions

The use of white-box questions aimed to capture the participant's personal view of the Pilot Phase. According to Cohen *et al.* (2011, p. 392) the comments within these white-box spaces contain 'gems' of information which would otherwise be lost between the closed scale questions.

3.3.4.3. Simulation

Although simulation was not used to collect data during the PERFORM study, it aided data generation through subsequent Think Aloud commentary and Self-efficacy scoring. Therefore, its justification is discussed here pertaining to its data-generation role.

In medical education, simulation is defined as "a technique which can be used to facilitate any learning, whether in the cognitive, psychomotor or affective domains" (Ker and Bradley, 2014, p. 175). Simulation has multiple applications, including but not limited to learning new skills, practicing complex situations and assessment. The use of simulation for the PERFORM study was guided by McGaghie *et al.*'s (2010) 'best principles' and Issenberg *et al.*'s BEME review (2005) on how simulation can support effective learning.

Deliberate Practice (Ericsson, 2004) supports new skill or knowledge acquisition through a well-defined learning objective or task, set at an appropriate level of difficulty with focused practice. There is evidence that in the context of acquiring new clinical skills, simulation can be more 'effective' than traditional (more clinically-based) medical education (McGaghie *et al.*, 2011) and in the context of the PERFORM study, practicing the application of PERs was key prior to their implementation in real clinical practice.

Issenberg *et al.*'s BEME review (2005) highlights simulation's ability to create an environment "where learners can make, detect and correct errors without adverse consequences". During initial PERFORM model coaching it was important to allow doctors to direct their attention to purposefully apply the model during a clinical simulation scenario without fear of patient safety concerns. Simulation-based medical education undertaken in the clinical skills laboratory/simulation suite can produce "downstream results" to the levels of patient care practices, patient outcomes and institutional effects such as "cost-savings, skill retention and systemic educational and patient care improvements" McGaghie *et al.* (2014). It was this feature of 'transfer to practice' that completed the transfer of the PERFORM model from clinical skills centre to real clinical environment.

The controlled environment of a simulation scenario can be designed to target specific objectives which would be difficult to recreate in clinical practice. The use of simulation in the PERFORM study allowed doctors to assume an active, autonomous role without risk of being 'side-lined' by other (perhaps more senior) team members into becoming a passive by-stander (Issenberg *et al.*, 2005). This active participation was fundamental to allow deliberate practice and transfer to clinical practice which in turn was necessary for the remainder of the study.

3.3.4.4. Think Aloud

Think Aloud is a research method in which "participants speak aloud any words in their mind as they complete a task" (Charters, 2003). Think Aloud commentary complements a case study design and, due to the large amount of data it generates, is most appropriately used in a study with a small number of participants (Rankin, 1988). Think Aloud is particularly useful to address research questions regarding not only *whether* something works, but also *how* it works. From a psychological research perspective, Efklides also (2006b) supports the use of Think Aloud, reporting that "metacognitive experiences are evident in spontaneous self-talk when solving a problem or in thinking aloud protocols" and further reports that Think Aloud increases reliability of measuring metacognitive facets when used in combination with other tools.

3.3.4.5. Self-efficacy

Negative emotions during a task are not solely induced by a *lack* of knowledge or skill. In fact, increased knowledge of a subject can induce anxiety or reduce confidence due to a greater awareness of what one doesn't know or what might go wrong (Maggiore *et al.*, 2014). Even experts in their own field are not immune to negative emotional and behavioural responses in certain situations and therefore simply diminishing these feelings is not a realistic or useful target for the PERFORM study. Hence in sport, PERs are used by athletes to *manage* their negative affect so that it

does not diminish optimum performance (Hazell, Cotterill and Hill, 2014). One way to quantify this sense of control was to consider the concept of 'self-efficacy', which Flavell (1979) originally described as integral facet metacognitive knowledge.

Self-efficacy (SE) is defined as "the individual's judgement about this or her ability to carry out a specific task or activity and to produce certain attainments" (Kauffman and Mann, 2014, pp. 10-11). This explanation illustrates the flexibility of SE as a concept that can be applied to different modalities, be that practical, cognitive or psychological, but does require the target to be *specific*. In the PERFORM study, doctors were asked to score their perceived ability to manage their target emotion or behaviour during the scenario, i.e. their self-efficacy to control their emotions or behaviours using a 0-100 self-efficacy scale.

3.3.4.6. Reflective Logs from Participants

During the Full Intervention, doctors applied and adapted the PERFORM model in real clinical practice (details in Methods Stage 2: Refining the PER). This stage encouraged doctors to engage with self-regulated learning and self-reflection. According to Bandura (1986; in Kauffman and Mann, 2014, p. 10) these two educational theories are both highlighted as underpinning learning in all situations and are especially relevant in medical education. Self-reflection is considered by cognitive psychologists an extension of metacognitive capability (Kauffman and Mann, 2014, p. 10).

The participant's retrospective reflection, often referred to as *reflection-on-action* (Schön, 1983), not only served to record its existence (as a 'data point' within their case study) but also reinforced their analysis of the encounter, re-iterated their decisions (i.e. which PER they applied, whether it was successful etc.) and reinforced their metacognitive feedback for use in future scenarios, i.e. 'knowing in action' (Kauffman and Mann, 2014, pp. 12-13).

3.3.4.7. Reflective Accounts from Researcher

Within the Pilot Phase, the researcher had the unique vantage point to evaluate the organisational aspects (e.g. running the simulations, scheduling and time-keeping) of which the doctors were neither in control nor perhaps aware. These reflections resulted in confirmation of, or alterations to, the methods used in the subsequent Full Intervention.

3.4. Research Questions

In order to evaluate the PERFORM model in the clinical context an intervention must explore its use. Therefore, the main research question to be explored in the 'PERFORM study' is:

“Can an intervention based on the PERFORM conceptual model improve the clinical performance of junior doctors when managing the simulated acutely unwell patient?”

Since this overarching research question is very broad, specific objectives are offered to enable the question to be answered in a systematic way:

1. Do junior doctors experience negative emotions and behaviours during acute patient care?
 - a. Do they possess coping strategies?
 - b. If so, what are these?
2. Does the use of the PERFORM model improve performance when managing acutely unwell patients?
 - a. Does self-efficacy of controlling target behaviours improve?
3. How does the application of the PERFORM model by participants align with the (original) conceptual PERFORM model?
4. What are the perceptions of the participants using the PERFORM model?
 - a. Which are the most useful elements of the complex intervention?
 - b. When would be its optimal timing for implementation within training?
 - c. How could the study/coaching programme be improved?

3.5. Participant Selection

Miles and Huberman (1994, p. 30) explain that sampling involves decisions not only about *who* to recruit but also *which* events to observe.

Qualitative studies usually include “small samples of people, nested in their context and studied in-depth” (Miles and Huberman, 1994, p. 27), and these often lean towards the use of ‘non-probability’ sampling strategies whereby the objective of wider generalisability is waived in favour of deeper appreciation of a topic relevant to a more specific population, (Cohen, Manion and Morrison, 2011, p. 155). Two types of non-probability sampling used in the PERFORM study, purposive and convenience.

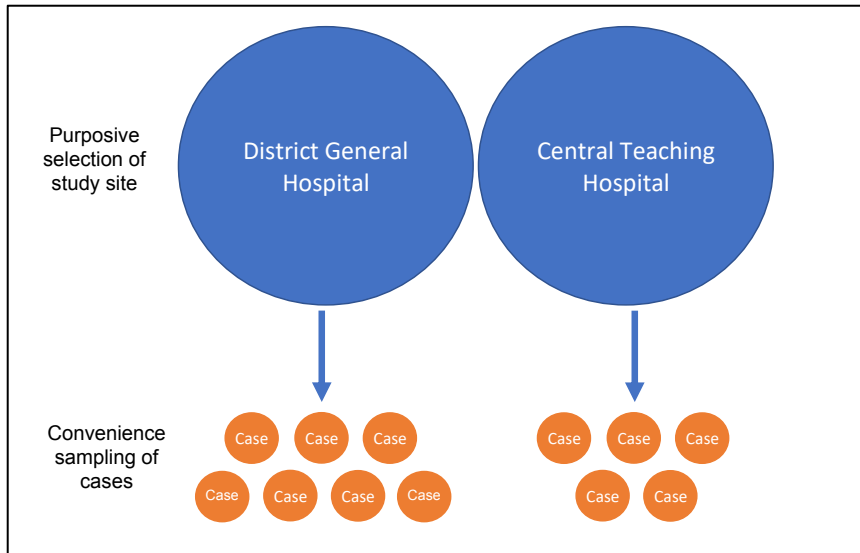


Figure 3-6: Sampling strategy

The two study sites were purposefully chosen (Figure 3-6) to be “theoretically useful” (Eisenhardt, 2002) in comparing doctor’s engagement with the PERFORM model in a teaching hospital versus a district general hospital. However, recruitment within each site was done through convenience sampling (Cohen, Manion and Morrison, 2011, p. 155) to maximise the number of participants, i.e. cases, in the context of doctors’ limited availability due to busy work schedules. Although convenience sampling is not truly representative of a particular population, it is often used for multiple case study research which does not aim to achieve generalisability.

3.5.1. Sample Size

Miles and Huberman (1994, pp. 29-30) contest that the number of cases within a multiple case study cannot be approached on a statistical basis, but researchers must instead consider how the balance between quality and quantity can offer confidence in the study’s findings. Creswell (2013, p. 99) argues that a single participant can be studied in a ‘single instrumental case study’, where one explores a particular topic with an individual to its fullest depth. In multiple case studies this investigation is replicated with more than one participant to gain different perspectives on the same topics, but at the potential cost of depth of understanding within each case (Creswell, 2013, p. 100). Since the study aimed to evaluate the PERFORM model’s application in a wide variety of contexts, the latter approach was deemed most appropriate.

Each case recruited to the study had a unique configuration of three main sampling variables (stage of training, current clinical placement and location of work) (Miles and Huberman, 1994, p. 30).

Since no two cases were the same, their interactions and experiences of using the model were unique.

A maximum number of cases set by the researcher was 15, based on the advice from Miles and Huberman (1994, p. 30) that above this a study can become “unwieldy” and the volume of data becomes overwhelming.

3.5.2. Within-Case and Between-Case Sampling

Miles and Huberman (1994, p. 29) explain the need for careful consideration of *what* and *when* to sample (i.e. what data to collect) for each case. Glaser and Strauss (1999) advise that, just as case selection is theoretically driven, so too is the data sampling itself. In this instance, the main purpose of data sampling was to collect experiences of applying the conceptual PERFORM model in simulation or clinical practice. Investigating these experiences within different contexts for each case offered *within-case* variation in understanding how the model adapted to different scenarios, i.e. different shifts, wards, patient cases. Replication of the same procedures and data collection points across multiple cases provided *between-case* variation and afforded more confidence to the study findings (Miles and Huberman, 1994, p. 29). However, this confidence does not assume generalisability. Although “patterns” (Creswell, 2013, p. 199) between cases may be formed based on the underlying theory, purposeful sampling strategies inherently fail to represent the wider population and therefore limit findings to the population being studied.

3.5.3. Selecting Cases for PERFORM

Having established that a multiple-case study design with a maximum of 15 cases was the study design of choice, the first step in deciding *who* the cases would be to best address the research questions deferred to results of the literature review. It identified that most educational interventions targeting the ‘acutely unwell patient’ were taught to final-year medical students or doctors within their first year of work. Further consideration of the target population compared the following differences between the under- and post-graduate trainees:

Personal objectives: Final-year medical students on clinical placement may understandably prioritise their efforts on forthcoming examinations and placement-specific targets such as clinical skills acquisition. Therefore, enrolling in an additional clinically-orientated intervention may be perceived as unhelpful for their immediate future. Alternatively, newly-qualified junior doctors are likely to be more motivated to learn strategies to improve their clinical competency given their recently-increased responsibility for patient care.

Clinical exposure: Junior doctors have more autonomy regarding acutely unwell patients and less immediate supervision compared to medical students. In addition, the shifts undertaken by junior doctors reflect the differing time and staffing stressors inherent in clinical practice (McGowan *et al.*, 2013), from which medical students are generally more protected.

Study length: Medical student placements vary in length from a few days to a few weeks. However, within this time they are required to attend certain clinical events such as clinics, operating theatres, ward rounds and educational sessions. Pressures of placement time and content would undoubtedly restrict medical student's abilities to implement the PERFORM model on real patients, even without the additional factors already mentioned. All foundation doctors in the UK have four-month rotations on a given specialty which, in the context of the Full Intervention, offers reasonable time for all three stages to be conducted within one single placement. Furthermore, the sports people in Cotterill's (2011) PER development programme (on which PERFORM is based) reported satisfactory integration of PERs into practice/competition after six weeks. Therefore, Stage 2 of the Full Intervention where doctors practiced and refined the PERFORM model prior to its evaluation lasted a minimum of six weeks.

Given the above factors, junior doctors were considered the more appropriate study population. The literature review findings showed that post-graduate trainees targeted for acutely unwell patient management intervention were mostly commonly within their first year after graduation. However, many junior doctors have limited exposure to acutely unwell adult patients within their first year rotations, (Amin and Cartledge, 2012) and therefore the recruitment pool was extended to include both Foundation Years 1 and 2.

For all three phases of the study Foundation Year 1 and 2 doctors enrolled on a voluntary basis and were not compensated in any way for their involvement (other than a certificate of involvement for their portfolio). For the Exploratory and Pilot Phases, foundation doctors in any specialty were invited to take part and given that phases 1 and 2 were held simultaneously, doctors took part in one or both phases. Doctors in the Full Intervention were required to have opportunities to manage acutely unwell adults to enable their application of the PERFORM model in clinical practice. Thus, doctors working in Medicine, Surgery, Critical Care and Accident and Emergency were invited to take part, but those in Psychiatry, Paediatrics and community placements were not. In addition, doctors

who had taken part in either the Exploratory or Pilot Phases were excluded from the Full Intervention to avoid carry-over bias (Allen and Yen, 1979).

3.6. Study Sites

The contrast between teaching hospitals and district general hospitals has been previously explored regarding junior doctors' training experiences (Kendall, Hesketh and Macpherson, 2005; Brown, Chapman and Graham, 2007). Therefore, in addition to the *between-case* variable of trainee level (Foundation Year 1 or 2), the incorporation of a two-site study allowed the comparison of the application of the PERFORM model between two different types of hospital.

3.7. Ethical Considerations

Ethical considerations run throughout every stage of a study and are considered continuously as it progresses and evolves. Prior to the study commencing, ethical and Health Research Authority approval was sought, where these applications included details of the study design, timeline and data collection tools as described above.

3.7.1. Ethics approval

Following ethics approval by the University of Sheffield Ethics Committee for all three phases (Appendix 24 and Appendix 26) Health Research Authority (HRA) permission was granted to commence the study (Appendix 25 and Appendix 27). The latter was necessary due to the involvement of employees, doctors as participants and property, i.e. hospital and clinical skills buildings of the NHS. As no data was collected directly from patients NHS ethics was not required. The University of Sheffield acted as the sponsor for the study (Appendix 28).

The applications for both ethical and HRA approval included details of the data handling with regards to the data protection responsibilities of the researcher and the university as the study's sponsor. These details are outlined below.

3.7.1.1. Participant Data Protection and Anonymity

It was stressed to the doctors that their involvement was voluntary and that they were free to leave the study at any point. It was also made clear that if the researcher wished to report data which might threaten the participant's anonymity she would require a separate signed consent form (Appendix 10) detailing the specific circumstances under which the data was to be used, e.g. publication, oral presentation etc.

A code was allocated to each recruited doctor and their data, e.g. recordings, transcripts etc., was allocated to this code. It was explained to the doctors that the thesis and any potential publications would only refer to cases by their code or non-identifiable demographic data. Any names mentioned during recordings were redacted during transcription. The identity and contact details of each doctor were stored in a password protected spreadsheet, which was only accessible to the researcher. During the study, doctors were not introduced or mentioned by name to each other. However, the researcher was made aware that two doctors that knew each other had discovered that they were both involved in the study. The researcher did not exchange information about, and between, the two doctors.

All data was saved on the researcher's personal computer and backed up on her personal online drive, both of which were password-protected. Data will be destroyed after a maximum of five years in accordance with the approved research protocol.

The risks and benefits of participation were outlined in the Participant Information Sheet (Appendix 4 and Appendix 8). The risks included misconduct on a personal or clinical level by the doctor during simulation and psychological distress to the doctor during interview. Patient safety and doctor wellbeing were prioritised above the interests of the study. To protect these interests, the ethical application and Participant Information Sheets outlined the only circumstances under which the doctor's confidentiality would be broken due to the need for involvement of people external to the study, e.g. Clinical Supervisors.

During the study any deviations from the original research protocol on which ethical/HRA approval had been granted were submitted as amendments and only acted upon once subsequent approval had been granted (Appendix 29).

Permission to conduct the study was granted locally by both the Clinical Supervisors and/or Clinical Directors of the departments in which doctors worked (Appendix 2 and Appendix 6) and the hospital research departments (Appendix 30 and Appendix 31).

For Stage 3 of the Full Intervention, to ensure patient safety, the in situ simulation was scheduled so that the doctor taking part would not be 'on-call'. In the event that the doctor was called away from an unwell patient to attend the simulation, they would be immediately sent back to the unwell

patient. Every effort was made to contact each doctor's Clinical Supervisor to alert them to the scheduled in situ simulation.

Following the completion of data collection the General Data Protection Regulation (GDPR) was introduced. The impact of this on the study was explained to the doctors in accordance with the University of Sheffield and HRA guidance (Appendix 33).

A specific ethical consideration for the PERFORM study was the potential and appropriateness to involve real patients, which is discussed below.

3.7.2. Study Fidelity: Patient Involvement and Realism

This study investigated the use of PERs in the context of the management of acutely unwell patients. Initially it was considered that real patients could be involved in the study. This would have created many challenges including a lack of replicability and predictability between cases. The actual observation of acutely unwell patients for the purposes of research was the most fundamental challenge. This led to the decision to use high-fidelity manikins instead of real patients.

Morse (2013, pp. 396-397) highlights that observing acutely unwell patients has inherent issues. Due to low levels of consciousness patients might be unable to consent to being observed/filmed. Without recordings of their patient management, the doctors would not be able to undertake subsequent Think Aloud commentaries. In addition, asking patients for consent to be recorded during their acute illness may cause additional distress to both themselves and their families which would be both unnecessary and insensitive.

If the issues regarding patient consent had been overcome, there would have been an additional problem regarding how the patient encounters were recorded. If the recording was carried out by the researcher there would have been both logistical issues of capturing a real acutely unwell patient encounter and legal and ethical issues due to the researcher's clinical duty to intervene if the patient was being harmed or not receiving adequate care by the doctor being observed. This would place the researcher in a compromised position and negate the data collection. The alternatives of using either a third party or wall-mounted ward cameras to record the patient encounters was discounted due to study funding. Additionally, the potential to record patients and staff not involved in the study may have led to serious ethical and legal implications for the researcher and the NHS trust. Finally, a body-mounted camera worn by the doctors was discounted because this might have interfered with doctor-patient rapport.

3.8. Approach to Ensuring Validity and Reliability

The quality and reliability of the PERFORM study were considered throughout its design, methodology, data collection and analysis. Previous chapters have described the rationale and practicalities of the methods used to collect and analyse data. The additional strategies used to ensure rigor in these methods will now be described.

Reliability pertains to the consistency and replicability of a study across researchers and methods (Miles and Huberman, 1994, p. 278; Cohen, Manion and Morrison, 2011, p. 199). The guidelines around this are much clearer for quantitative studies, but the use of the term 'reliable' in qualitative contexts has been contested in favour of terms such as 'dependability', coined by Lincoln and Guba (1985) in Cohen (2011, p. 202).

Validity, or "legitimation" as it is referred to in mixed-methods research by Onwuegbuzie and Johnson (2006) in Cohen *et al.*, (2011, p. 198), ensures that results are credible, plausible and trustworthy.

Cohen *et al.*, (2011, pp. 198-199) offer lists of advice which pertain to the design, data collection and analysis stages of studies incorporating qualitative methods which can be used to minimise threats to validity, many of which were used in the PERFORM study (Table 3-3).

Table 3-3: Validity initiatives within the PERFORM study

Stage	Item to support validity	Evidence with PERFORM study (subchapter number in brackets)
Design stage	Appropriate timescale	See Selecting Cases for PERFORM (3.5.3)
	Ensuring adequate resources	See Data Generation Methods (4.4, 5.4 and 6.4)
	Appropriate methodology for the research questions	See Methodology (3.3 and 3.4)
	Appropriate instrumentation for collecting data	See Data Collection Methods (4.5 5.5 and 6.5)
	Appropriate sample	See Selecting Cases for PERFORM (3.5.3)
	Internal validity (accuracy of description of the data)	See Triangulation (3.8.1), Member-checking (3.8.2) and Peer-debriefing (3.8.3)
	External validity (translatability of results to other settings)	<ul style="list-style-type: none"> Multi-site study design (dual centre) Generalisability was not the target of this study due to case study design (see 3.5. Participant Selection above)
	Content validity (how data collection tools sample the domain of interest – i.e. sufficient and relevant)	<ul style="list-style-type: none"> Participant feedback and researcher’s reflections on the Pilot Phase, during which SSI protocols, Think Alouds and simulations were trailed, and feedback gained on the hypothetical use of the Prompt card
	Construct validity (how data collection tools measure what they intend to measure)	<ul style="list-style-type: none"> Use of well recognised tools within similar/same domain for similar purpose, e.g. simulation and Think Alouds Mapping design to 5-step established programme of developing PERs in sport (Cotterill, 2011)
Data collection	Devising and using appropriate instruments (e.g. appropriate instructions in questionnaires, avoiding leading questions)	<ul style="list-style-type: none"> Pilot Phase as a ‘feasibility’ test for the materials used in the Full Intervention Qualitative Methods course undertaken by researcher to learn about best practice for interview design
	Minimising participants acting differently in new situations	One-to-one interviews and Think Alouds after simulation ensuring privacy to allow doctors to speak freely
	Avoiding drop-outs amongst participants	All doctors completed the study
	Prolonged engagement in the field	<ul style="list-style-type: none"> All doctors in contact with the same researcher at multiple points throughout the 4-month rotation Doctors had continual access to the researcher via email, text messages, telephone calls and face-to-face meetings
	Appropriate time intervals between pre-/post-tests	Pre-/post-self-efficacy scores taken immediately before/after the use of a PER in a simulation or clinical scenario
	Standardised procedures for gathering data	<ul style="list-style-type: none"> Same coaching and data collection materials were used for each case All cases in Full Intervention undertook the same simulation scenarios in the same order over the same time period
	Researcher standardisation	All doctors had contact with the same researcher throughout the study
Analysis/ reporting	Respondent validation	See Member-checking (3.8.2)
	Reducing the ‘halo’ effect (i.e. allowing the analysis of one case to affect another)	<ul style="list-style-type: none"> Analysis was undertaken within- and between-cases for each stage of the Full Intervention Audit trail of analyses through use of written notes/diagrams prior to final report
	Statistical appropriateness	Researcher completed Statistical Analysis course and confirmed the analysis for the study data with statistics tutor
	Ensuring good-quality coding of data	<ul style="list-style-type: none"> Coding process outlined in Methods (4.6.1.1.2) See Peer-debriefing (3.8.2)
	Avoiding over-generalisability claims	<ul style="list-style-type: none"> Explanation above of constraints of case studies
	Avoiding overreach of correlation vs cause	<ul style="list-style-type: none"> See Implementation: Strengths and Limitations of the PERFORM study (7.6)
	Avoiding selective use of data	See Attending to Negative Cases (3.8.4) and Data Analysis Methods (4.6, 5.6, 6.6)

Strategies to ensure validity that are aligned to mixed-methods research include triangulation, peer-debriefing and member-checking, as mentioned in Table 3-3, as well as attending to negative cases and reflexivity.

3.8.1. Triangulation

Triangulation addresses aspects of internal validation through the use of “more than one method of data collection to answer the research question” (Barbour, 2001). One might assume that convergence of data (Creswell and Miller, 2000) is the only acceptable outcome. However, Barbour argues that opposite findings from different sources may be valid. The reason for this is that each tool should be thought of as looking at different views of the same issue and inherently each tool enables a partial and potentially different view of the whole. Perhaps a more pragmatic and multifaceted view of triangulation is that of ‘crystallisation’ as described by Richardson and St Pierre (2008, p. 478). Here comprehensiveness in description of the data is deemed more appropriate than simply ‘lining up the dots’ (Varpio *et al.*, 2017), especially when different forms of data, even when both are qualitative, are not easily directly compared (Barbour, 2001).

Triangulation was used during PERFORM to refine findings by observing two different data collection methods. The Self-efficacy scores reported by the doctors allowed quantification of the perceived change in emotional or behavioural control. This was in addition to the more descriptive post-simulation Think Aloud or reflective logs and follow-up interviews. The Self-efficacy scores allowed the researcher to:

- a) *Corroborate* if the PER had improved emotional/behavioural control by whether the Self-efficacy score had increased or decreased following the use of PER and
- b) *Establish the extent* to which the doctor *valued* this change by calculating the increase or decrease in Self-efficacy score.

3.8.2. Member-Checking

Respondent validation involves cross-checking interim research findings with participants (Barbour, 2001). Mays and Pope (2000) highlight that the researcher and participant have different concerns and discrepancies between the two accounts may lead to the researcher to limit their findings to a more descriptive, rather than interpretative account (Varpio *et al.*, 2017).

Although member-checking is now commonly undertaken ‘post-hoc’ to cross-check final interpretations, it was used in the PERFORM study as originally described, i.e. as a continuous process during analysis (Lewis, 2009; in Varpio *et al.*, 2017). An example of this was when the

researcher asked questions to explore or confirm her understanding of the doctor's Think Aloud commentary.

In another example of member-checking, discussion between the doctor and researcher during the final SSI allowed the researcher to confirm their understanding of the participant's personalised PERFORM model so that it accurately reflected the participant's perspective.

3.8.3. Peer-Debriefing

Peer-debriefing involves a "review of the data and research process by someone who is familiar with the research or the phenomenon being explored" (Creswell and Miller, 2000). This is particularly helpful in analyses involving a single coder, as in this case. According to Creswell and Miller (2000), incorporating the views of others increases the credibility of a study's conclusions because offers objectivity to the qualitative data, which is inherently difficult, or even impossible, for the coder to achieve independently.

During the PERFORM data analysis two stages of peer-debrief were used, general and specific. At a more general level, peers within the researcher's academic department acted as 'sounding boards' prior to formal analysis. Here, the researcher discussed plans for analysis and gained insight into how the process could be improved through her peers' experiences of conducting research. Once analysis was underway, the researcher's supervisor (Professor Murdoch-Eaton) played a more targeted role. Weekly/fortnightly meetings were held where the researcher presented her initial interpretations and her supervisor either expanded on these or offered a different perspective, challenging assumptions. This debriefing strategy continued into the writing process, where the supervisor offered a more holistic view of whether the discussions held previously had been articulated clearly in the thesis.

3.8.4. Attending to Negative Cases

Mays and Pope (2000) explain that a "long established tactic" to ensure quality in qualitative studies is "to search for, and discuss, elements in the data that contradict, or seem to contradict, the emerging explanation of the phenomena under study". In this way the researcher not only demonstrates that they are not biased towards only selecting data that supports their hypothesis but also discusses the potential reasons for negative cases.

In the context of this multiple case study attending to negative cases was paramount in understanding the variety of ways in which the PERFORM model was used, and adapted, in practice.

In this sense, there is no negative case as the variation between doctors' outcomes were all valid and between-case differences in themselves were of interest to the researcher.

3.8.5. Reflexivity

Reflexivity is the "process that enables researchers to consider their position and influence during a study" (Varpio *et al.*, 2017). The researcher will affect not only the data that is collected but also the construction of its meaning (Ng, Lingard and Kennedy, 2014, p. 379). Researchers must consider their context within the study including their views of themselves and others. In addition, hierarchical bias can be introduced when the researcher is in a position of seniority compared to the participants, who alter their behaviour to please the researcher (Ng, Lingard and Kennedy, 2014, p. 379).

Reflexivity is not an attempt to eliminate subjectivity, but to support researchers to navigate through their own personal lenses at a conscious level (Mann and MacLeod, 2015, p. 61). It is important to acknowledge the relationship that I, as the researcher, had with the area in which the research was carried out. For example, memories of my own transition from medical student to foundation doctor from 2010-2012 are still relatively fresh and my desire to pursue this topic is strongly underpinned by them. However, I realise that my views are not shared by all and every effort was made to neutralise my assumptions and not transpose my own experiences onto the doctors' accounts. This was aided by the doctors' and my own experiences being separated by both time and foundation programme organisational changes. At a more individual level, the multitude of variables colouring personal experiences of work are so vast that despite shared locations, e.g. working at the same place or organisational aspects, e.g. year of training/post-graduate deanery, no two sets of experiences are the same. Furthermore, since different researchers have different philosophical positions the same can be argued for each participant. Therefore, different perceptions of different experiences result in unique participant stories. The handling of each doctor's story as a case study respected their individualised perspective.

The researcher was an anaesthetist and critical care doctor at one of the participating sites but had no contact with any of the doctors in a clinical capacity prior to, or during, the study. The researcher was mindful to neutralise potential seniority hierarchy between herself and each of the doctors both academically and clinically. This included using first names, not wearing clinical uniform, unless acting in a 'role' for simulation, and undertaking interviews in neutral or shared spaces whilst providing privacy. The researcher explained her position of being a PhD candidate with a clinical background. In an attempt to alleviate the pressure for doctors to report only successful uses of the

PERFORM model, the researcher frequently reiterated that each doctor was their own case study, their study journey was unique and there were no 'right or wrong' answers.

The Hawthorne effect is where participants' observed behaviour changes to favour the outcome for the researcher. This effect was minimised by ensuring that both the recording equipment and researcher were located out of the doctors' direct vision (Ng, Lingard and Kennedy, 2014, p. 380). Also, in some of the final interviews any conscious change in behaviour for the researcher's benefit during the in situ simulation was discussed explicitly with the doctors.

3.8.6. Study Evaluation

In addition to the specific tools to ensure validity and reliability mentioned above, a process evaluation framework will be presented in the Discussion chapter based upon the Medical Research Council's (MRC) guidance on complex health interventions. This framework considers broad research quality concepts such as how a study is implemented, its mechanism(s) of action and its interaction with its context (Moore *et al.*, 2015, p. 222).

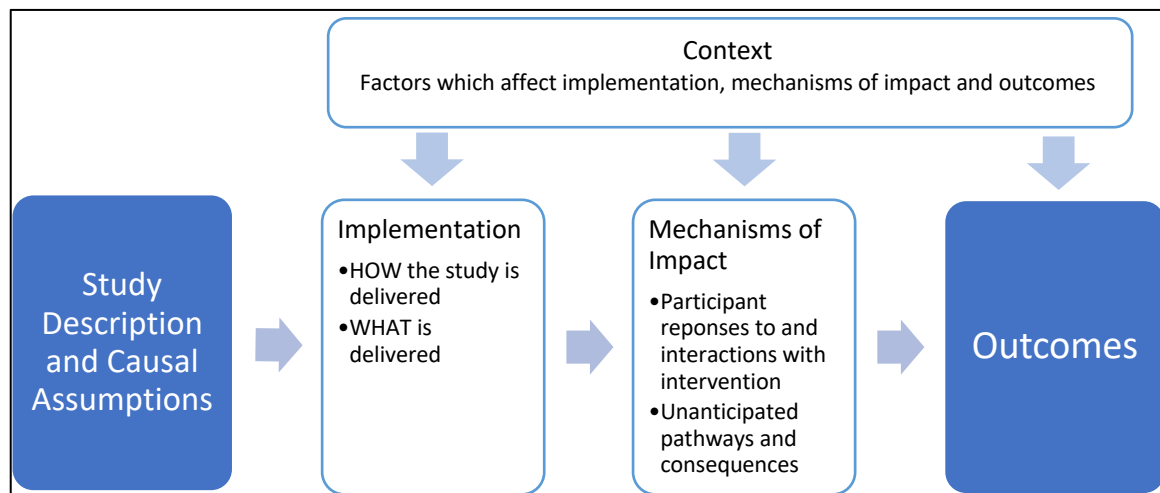


Figure 3-7: Process evaluation (adapted from MRC model, (Moore *et al.*, 2015, p. 223))

Figure 3-7 illustrates a simplified version of the MRC evaluation model (Moore *et al.*, 2015, p. 223). Each of the evaluation elements shown in the white boxes will form a subchapter within the Discussion chapter.

3.9. Chapter Summary

This chapter outlined the researcher's approach to the PERFORM study from a philosophical, theoretical and methodological stance including the development of the PERFORM model. The model demonstrates how metacognitive theory can extend the use of *Pre-Performance Routines*, most often used for closed skills in sport, to those which can be applied at any stage of a task, i.e. **Performance Enhancing Routines** (PERs). In its conceptual form, the model could theoretically be applied in either sports or medicine to achieve excellence. However, as explained above, the PERFORM study aims to evaluate its use to improve junior doctors' management of the acutely unwell patient. The data-generation tools required for this evaluation have been justified in this chapter, whereas details regarding their specific application and interpretation will follow.

Ethical considerations and permissions from the appropriate regulatory bodies have been outlined and the decision not to involve real patients in the study was justified through weighing the arguments for realism against the legal, clinical and ethical responsibilities of the research. Finally, the strategies used to ensure rigor and quality at each stage of the study were highlighted.

The following three chapters describe the combined methods and results of each phase of the study. Particular reference is made to the impact of these results on subsequent phase(s) to highlight the iterative nature of action research employed in the study.

Chapter 4. Phase 1: Exploratory Phase

This chapter begins with a description of the objectives of this first phase of the study.

The methods by which doctors were recruited from each of the study sites to the Exploratory Phase are described. This is followed by an explanation of each data generation, collection and analysis tool employed in this phase.

The results of the Exploratory Phase are described and then discussed in relation to both the initial scoping review and their impact on the subsequent phases of the PERFORM study.

4.1. Introduction

This chapter contains the details of the Exploratory Phase. This phase aimed to confirm that the findings from the literature review regarding junior doctor stressors and their lack of coping strategies were aligned with the experiences of real junior doctors. In order to achieve this aim, specific research objectives were designed and are outlined below. Considering these objectives, the chosen data collection methods, described in the previous chapter, are revisited and their use described in more detail. The data generated from these tools is then analysed, summarised and discussed regarding their impact on the subsequent phases of the study.

4.2. Objectives of the Exploratory Phase

The objectives of this phase were to answer the following research questions:

1. Are junior doctors already aware of their behaviours, e.g. anxiety during acute clinical scenarios?
2. Do they feel that such behaviours affect their performance, and if so, how?
3. Do they recognise metacognitive feelings, e.g. feeling of not knowing during acute clinical scenarios?
4. Do they employ strategies or PERs to cope with their behaviours, and if so, what are these strategies?

4.3. Recruitment and Study Sites

4.3.1. Recruitment

An initial invitatory email was sent to the Foundation trainees' administrators at both study sites. As the first two phases of the PERFORM study ran simultaneously, the email contained details pertaining to both the Exploratory and Pilot Phases (Appendix 3), with a dual Participant Information Sheet (Appendix 4) and Consent Form (Appendix 5) attached. The administrators forwarded this email to all of the Foundation doctors in their hospital. This ensured that the researcher only had access to doctors' names or personal resulting from expressions of interest. In addition, the researcher also attended one of the weekly mandatory training sessions for the foundation doctors at each hospital in order to recruit those who may not have received/read their administrator's email.

4.3.2. Study Sites

To identify the effect of the workplace on the research outcomes, junior doctors were recruited from two contrasting study sites. All three phases of the study were hosted at both institutions. The district general hospital (DGH) serves a total population of over 400,000 patients (*Chesterfield Royal*

Hospital NHS Foundation Trust Website). The central teaching hospital (CTH) encompasses many sites including a dedicated obstetrics and gynaecology hospital and children's hospital. The doctors from the CTH worked at one of the two sites which cater for acutely unwell adults comprising either 850 or 1100 inpatient beds (*Sheffield Teaching Hospitals NHS Foundation Trust*).

The study content and time-lines were identical over both sites but ran in series rather than in parallel due to the constraints of being a single researcher study and the time allowance for formal ethics and HRA approval to be granted (Figure 3-1).

4.4. Data Generation Methods

To address research questions, data must be generated, collected, organised and finally analysed before results are produced. To generate the data required to address the Exploratory Phase objectives each participant underwent the following:

4.4.1. Semi-Structured Interview

Participants underwent an SSI (Appendix 12) which aimed to identify awareness of their behaviours and what (if any) strategies they employed to control such behaviours during the management of the acutely unwell patient.

A protocol guided the discussion and field notes were taken either to record prompts for further questioning on a particular topic or to assist subsequent analysis, for example regarding the context of the conversation, e.g. location, body language, tone of voice etc.

At the beginning of each interview, the researcher confirmed the participant's verbal consent to be interviewed and summarised the topics to be covered as per the interview protocol. At the conclusion of each interview, the doctor was encouraged to make any final comments. This provided them with an opportunity to unburden themselves of all data, regardless of whether they felt it was relevant to the specific questions posed.

4.4.2. Simulated Scenario of Acutely Unwell Patient

The participant took part in a simulated scenario of an acutely unwell patient in order to demonstrate any emotions and behaviours and/or coping strategies during patient management.

Four different simulation scenarios of a similar level of difficulty were devised (Appendices 17-20) and were used on a rotational basis throughout the Exploratory Phase. Each scenario was derived

from previous simulation teaching on managing the acutely unwell patient courtesy of Dr Alastair Graham, Montague Simulation Centre co-Director and were based on scenarios originally developed for Core trainees, that is, doctors in their third or fourth post-graduate year. Scenarios targeted at doctors of a slightly higher training level to the foundation doctors in the study aimed to challenge them and induce negative emotions/behaviours. Additional elements of distraction, e.g. telephone call from a nurse requesting help for another patient, were added into each scenario in response to the findings of the literature review to increase complexity and replicate authenticity (Thomas *et al.*, 2015). Physiological parameters were very similar for each of the four scenarios and deteriorated, e.g. heart rate increased, blood pressure decreased, etc., at a similar rate if the patient was not appropriately managed (Appendices 17-20).

Immediately prior to their simulation scenario, the doctors were pre-briefed on the clinical situation and advised to act at their current level of training, treating the patient as they would in a real clinical scenario. Questions asked by the doctor of the 'patient', a high-fidelity human manikin, were responded to by the researcher in the character of the patient. A 'nurse', either a clinical skills tutor or volunteer with a clinical background, was present and assisted with tasks appropriate to their role, e.g. administering medications and locating equipment. The doctors could examine and instigate investigations/management as they wished. They were able to make telephone calls, in which advice was offered by the researcher acting as the requested clinician. Requests for senior input were acknowledged but no additional personnel participated in the simulation at any point. Appropriate medical devices and equipment, e.g. intravenous cannulae, and results from investigations with short processing times which would reasonably be accessible in a clinical situation were available to doctors on request. The simulation scenario lasted approximately 15 minutes but was concluded earlier if the doctor reached the limitations of, or delivered definitive, management sooner.

The simulated scenario lasted approximately 15 minutes and was filmed using integrated clinical skills recording equipment. Figure 4-1 shows the typical set up of the simulation and recording equipment involved in the scenario.

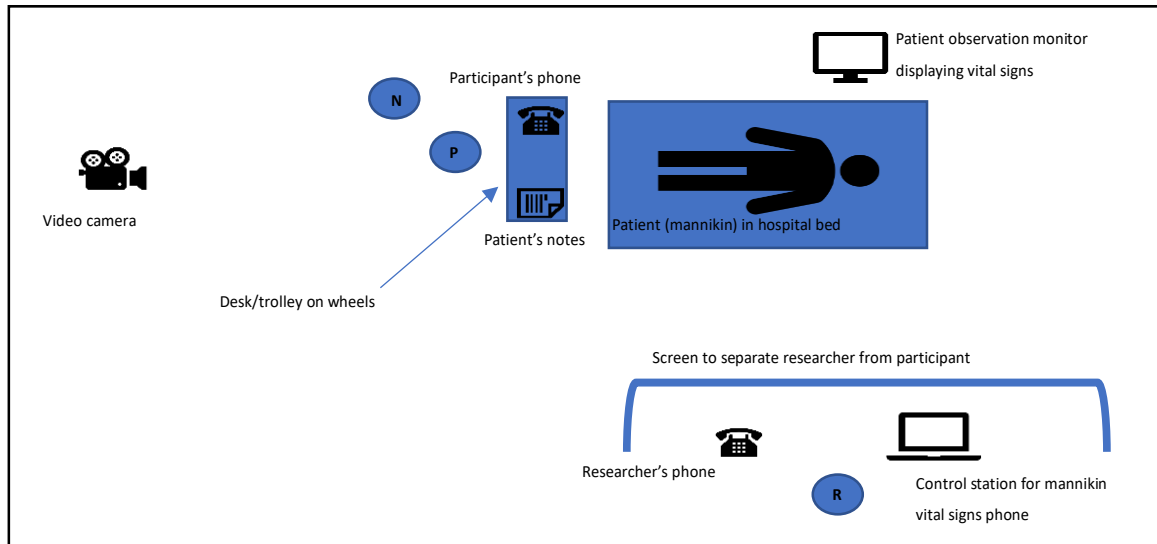


Figure 4-1: Schematic showing typical set-up of simulation in clinical skills centre ^P

4.4.3. Think Aloud Commentary

Metacognitive feelings are often experienced but go unnoticed. To address the underlying source driving the negative affect, it was necessary to bring these feelings into the doctor's consciousness and deconstruct them using Think Aloud commentary. This "stimulated recall" technique, originally described by Bloom (1953) involved the doctor narrating over the video recording of their simulation, focussing particularly on their affect and regulation of the scenario to engage their metacognitive feelings and highlight the use of any pre-existing Performance Enhancing Routines. Participants engaging in Think Aloud commentary should not be coached but should speak spontaneously (Charters, 2003). To encourage the natural flow of thoughts and minimise the influence of the coach, the doctors were instructed to talk as much as they were able about their feelings and thoughts and the researcher used only non-verbal gestures, e.g. nodding of head etc. as encouragement. However, if the doctors struggled with self-narration over the video they were intermittently prompted by the researcher (Charters, 2003) using open-phrases such as "*Can you tell me what's going on here?*" or "*How are you feeling at this point in the scenario?*". The Think Aloud commentaries were conducted only in the presence of the researcher to enable the doctors to explore their negative feelings around patient management without fear of peer judgement.

Think Aloud has been successfully integrated into areas of medical education research to gain "insight into the cognitive processes" of students and junior doctors when evaluating an initiative to improve confidence with diabetes-related prescribing (Kelly, Brandom and Mattick, 2015) and during

^P Circle denotes position of a person in the simulation scenario where R= researcher, P=participant and N = nurse assistant

clinical decision-making (Lundgrén-Laine and Salanterä, 2010). These examples all used ‘real-time’ Think Aloud *during* a paper- or computer-based task. However, the use of real-time Think Aloud in sports for the purpose of building PERs was deemed disruptive, adding to cognitive load (Cotterill, 2011). The parallels between the practical nature of sports and the clinical simulations appeared stronger than those akin to paper-based tasks which do not suffer as much from interruption of thought. In addition, asking the doctors to talk through their thoughts during a clinical scenario seemed counterintuitive when trying to promote their realistic behaviours during patient encounters. Therefore, Think Alouds were undertaken by the doctors retrospectively, aided by the video recording of their simulation to re-introduce their actions and feelings during the simulation back into their current working memory.

4.5. Data Collection Methods

All of the aforementioned methods generated data during the Exploratory Phase. However, not all of this data was useful to address the phase objectives and was therefore not collected for subsequent analysis. For example, the simulation scenarios (and their recordings) were completed to allow the participants to undertake a Think Aloud commentary and were not *themselves* directly assessed or analysed, indicated in Table 4-1 by a bracketed tick (✓).

Table 4-1: Methods used to generate and collect data at each stage of study ^a

Data Generating Method	Phase 1: Exploration
Semi-structured interview	✓
Questionnaire	
Simulation (video recorded)	(✓)
Think Aloud	✓
Reflective logs from participant	
Reflective accounts from researcher	

The methods that did generate data which was used to address the phase objectives (indicated by an un-bracketed ‘tick’ ✓ in Table 4-1) are discussed below in relation to the details of their collection and analysis.

4.5.1. Semi-structured interviews (SSIs)

Each interview was recorded using a Dictaphone which was backed up as soon as possible. The researcher transcribed all of the audio recordings verbatim with the addition of descriptive elements

^a ✓ = data generated collected

(✓) = data generated but not collected for analysis

embedded within the transcriptions such as tone of voice, pauses, interruptions and intonation (e.g. emphasis) to preserve the interview’s context and complexity (Cohen, Manion and Morrison, 2011, pp. 426-427). The field notes made during the interview were also reviewed to aid contextualisation. Where speech was unclear every effort was taken to understand what was being said using different playback speeds. However, if speech was indecipherable it was transcribed as “inaudible” rather than being interpreted or guessed by the researcher. All transcripts were subsequently proofread and cross-checked by the researcher whilst listening to the original audio recordings.

4.5.2. Think Aloud Commentary

The Think Aloud commentaries were recorded and transcribed verbatim by the researcher in the same way as the SSIs. Subsequent proof-reading was also undertaken as per the SSIs.

4.6. Data Analysis Methods

As shown in Figure 4-2, the data collected in the Exploratory Phase was purely qualitative. Therefore, qualitative approaches of thematic analysis were used to analyse the data and address the phase objectives.

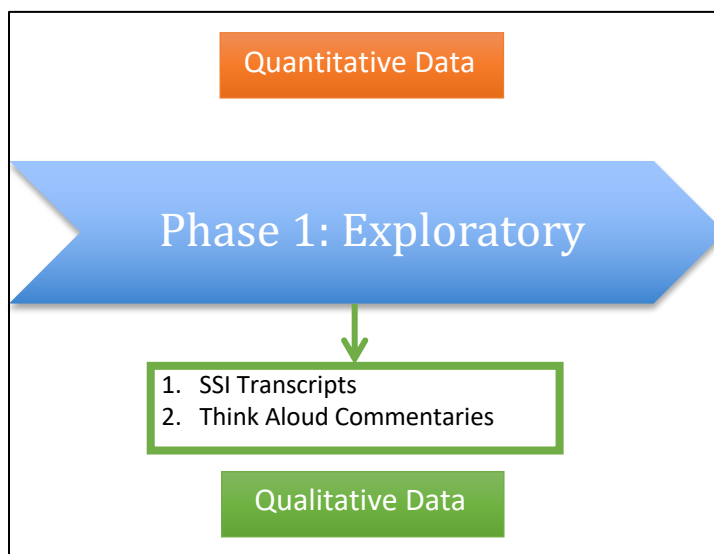


Figure 4-2: Type of data collected in Exploratory Phase

4.6.1.1. Thematic Analysis

Thematic analysis of the qualitative data from the SSIs and Think Alouds in the Exploratory Phase was guided by the stages set out by Braun and Clarke (2006) (Figure 4-3).

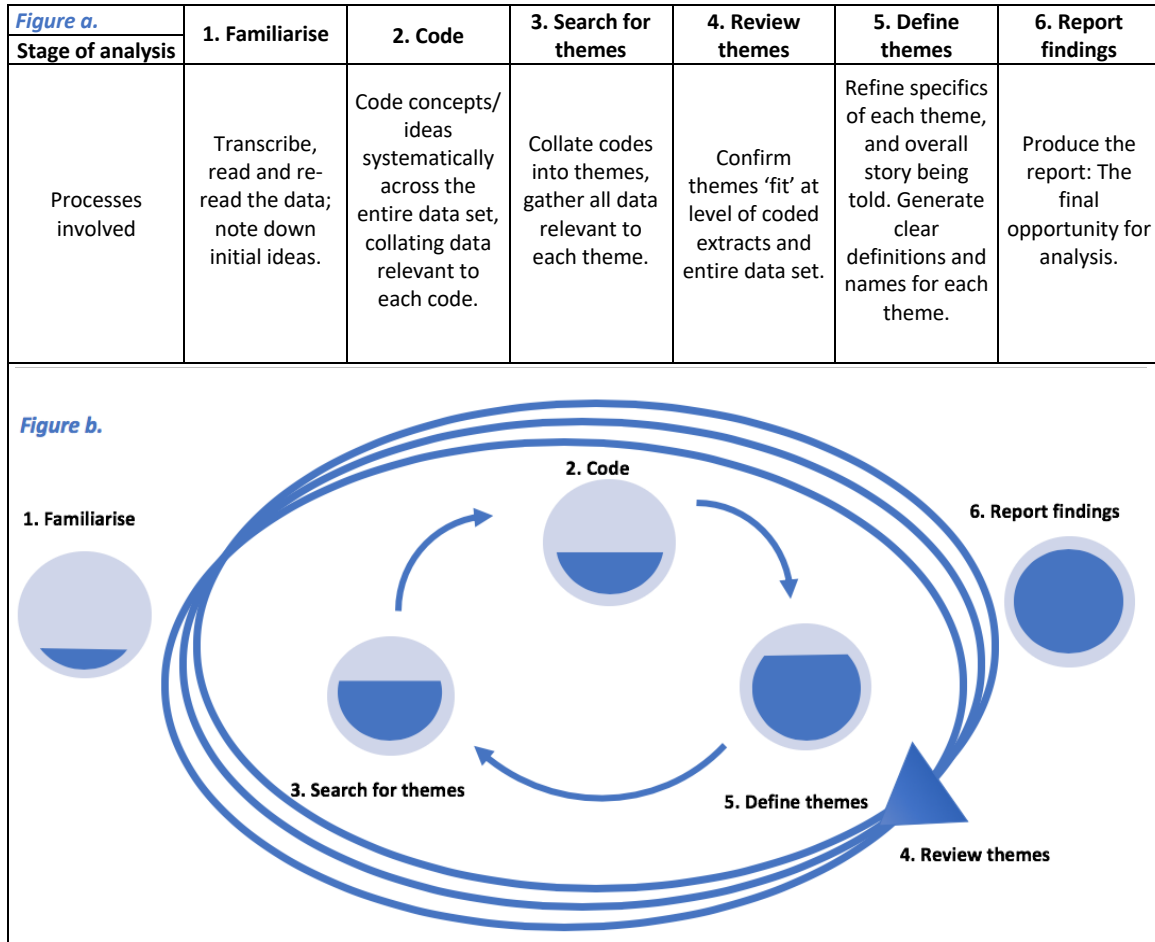


Figure 4-3: a) Thematic analysis phases (Braun and Clarke (2006)); b) Order of phases used in PERFORM data analysis.

Figure 4-3a demonstrates the thematic analysis approach in a linear arrangement where each of the six stages are discrete from one another. In reality, the analysis of the data was more fluid whereby stages merged and overlapped, as shown in Figure 4-3b. After initial familiarisation two 'layers' of analysis were established. The first layer coded, searched and defined data themes in a cyclical manner. The second layer organised and refined these themes using constant comparison. Moving between these two layers established an overall spiralling process (Creswell, 2013, pp. 182-183). Topical coding gave way to more analytical coding (Richards and Morse, 2012, pp. 117-120) until a final thematic matrix was reached.

4.6.1.1.1. Stage 1: Familiarise

Immersion in the data was through a three-step process. Firstly, all interviews were transcribed by the researcher verbatim. Secondly, the reflexive notes made during and/or immediately after each interview were reviewed by the researcher to contextualise the interview transcripts. Finally, transcripts were both listened to and read simultaneously whilst free-form spider-diagrams were drawn, containing early topic codes and memos. An example of this is given in Appendix 32.

4.6.1.1.2. Stages 2 and 3: Coding and Searching for Themes

Once fully immersed in the contents of all of the doctors' interviews, the transcripts were transferred to NVivo (version 12, QSR) for more formal topical and initial analytical coding. Hierarchical coding began to develop using axial coding to explore variables within a specific topic, e.g. absence of strategy vs presence of strategy. The end of the first cycle of formal coding resulted in an initial coding list.

4.6.1.1.3. Stages 4 and 5: Reviewing and Defining Themes

Through the spiralling analytical process coding hierarchies and themes were developed, adapted and refined, leading to the final unified thematic matrix.

4.6.1.1.4. Stage 6: Reporting the Findings

In subchapter 4.7.2 the data from the interviews and Think Aloud commentaries is presented as a final coding matrix with subsequent discussion of each main theme.

4.7. Results

The results section includes details of both the participants and the data collected from the SSIs and Think Aloud commentaries.

4.7.1. Participants

Table 4-2 contains the details of the five doctors recruited to the Exploratory Phase. They were all either Foundation year 1 or 2 trainees and worked in either a district general hospital (DGH) or central teaching hospital (CTH). They were each engaged in one 4-month-long rotation throughout their study activities and had all completed their medical training in the UK.

Table 4-2: Doctors enrolled in Exploratory Phase^r

Doctor Code	Place of Work	Gender (Male or Female)	Foundation 1 or 2 Trainee	Current clinical placement	Enrolled in Exploratory, Pilot or Both
EP01	CTH	F	1	Care of the Elderly	Both
EP02	CTH	M	1	Psychiatry	Both
EP03	CTH	M	2	Neurology	Both
EP04	CTH	F	1	Urology	Both
E06	DGH	F	1	Care of the Elderly	Exploratory

Doctors were recruited to the Exploratory and Pilot Phases simultaneously, and hence were coded according to the phase(s) in which they were enrolled (E=Exploratory Phase, EP=Both Exploratory and Pilot Phases) and in numerical order of recruitment to the study. For anonymity purposes they will be referred to by their code throughout the thesis.

Each doctor had their data collected during a single meeting with the researcher which lasted between 1 and 2 hours, depending on their involvement with one or both of the phases.

4.7.2. Results of Semi-Structured Interview and Think Aloud Commentaries

The exploratory SSI and Think Aloud commentaries were thematically analysed to produce a final list of themes (Table 4-3). The doctor's individual responses, including direct quotations, were also tabulated to make between- and within-case comparisons (Appendix 34).

^r Participant number 5 was only enrolled in the Pilot Phase and therefore not included in the table

Table 4-3: Coding List Phase 1: Semi-structured Interview/Think Aloud Commentaries

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>
Supporting strategies	Practice tools	Coping strategies	ABCDE
			Checking information
	No coping strategy		
	Specific strategy		
	What the strategy does		
Colleagues	Skills/Knowledge that others offer	Getting help /support	
		Handover and Communication	
Self-perception	Perception of self professionally	Normalising against predecessors and colleagues	
		Perception and comparison of colleagues	
		Role	
		Colleagues' perception of you	
		Confidence vs competency	
		Patient's perception of you	
		Responsibility /Duty	
	Perception of self personally	Self-perception	Layperson vs professional
			Personal attributes affecting their practice
Experience and Training	Knowledge/ formal training	Progression	
		Gaps in Knowledge	
		Training	
	Experiential learning	Feedback and learning cycles	
		Familiarity	
	Unfamiliarity		
Consequences	Physical manifestations of emotions		
	Professional consequences	Affecting clinical performance	
	Personal consequences	Affecting interviewee personally	
	Psychological manifestations of emotions	Emotions	Preceding emotions
			General emotional responses
			Assessing emotions
		Gut feelings	
		Awareness of emotions	Awareness of emotions
	Haven't considered reasons for emotions before		
		Reasons for emotions	
Job satisfaction	Satisfaction		
	Dissatisfaction		
	Enjoyment		
Fundamental elements of clinical practice	Fundamental elements of clinical practice		

4.8. Discussion

The results pertaining to each objective of the Exploratory Phase are now discussed:

4.8.1. Objective 1: Are junior doctors already aware of their emotions and behaviours, e.g. anxiety during acutely unwell patient scenarios?

All of the doctors were aware of their emotions and behaviours during their management of acutely unwell patients. These included both emotions, e.g. frustration, anxiety, apprehension, and physiological symptoms, e.g. palpitations, sweating.

4.8.2. Objective 2: Do they feel that such emotions and behaviours affect their performance, and if so, how?

The doctors reported that their emotions and behaviours during a scenario affected their patient management. For example not being able to think logically or their emotions and behaviours clouded their consciousness and were more likely to forget to complete certain tasks, e.g. writing up patients' notes. One doctor recalled spending time after a scenario dwelling on her actions, which she perceived as wasted time. Another doctor commented that experiencing feelings of panic or anxiety during a shift subsequently made him feel much more tired than usual. They also commented that friends and family would suffer the manifestations of their tiredness.

Alternatively, some doctors felt that feelings of uncertainty could be beneficial to their patient management as they encouraged the subsequent checking of uncertainties with sources of information, e.g. seniors or guidelines.

One doctor expressed concern that displays of anxiety would negatively alter patients' and colleagues' perceptions of them.

4.8.3. Objective 3: Do they recognise metacognitive feelings, e.g. feeling of not knowing during acutely unwell patient scenarios?

All of the doctors reported experiences of metacognitive feelings during clinical scenarios, and some also during events in their personal lives. These feelings ranged from being specific, e.g. 'in control' of the situation, to more general, e.g. being 'unhappy' with how a task was progressing. One doctor articulated that negative feelings were more readily recognisable than positive ones. When negative feelings were experienced, they were generally either ignored or prompted the doctor to ask for senior help.

Many doctors had never explored what these feelings meant, and others were unsure whether to trust these so-called 'gut feelings'. Two doctors explained that they made judgements about *why* they had experienced their metacognitive feelings by asking themselves whether they had missed something during patient management or by checking their management with guidelines and asking for senior help.

4.8.4. Objective 4: Do they employ strategies or PERs to cope with their emotions and behaviours, and if so, what are these?

The most common 'strategy' that the doctors demonstrated and/or described was the 'ABCDE' structure for managing the acutely unwell patient. This was generally used as a cognitive aid but occasionally also decreased their feelings of panic. One doctor expressed difficulty in remembering all of the elements within each section of the ABCDE aid. During both the SSI and Think Aloud doctors explained that ABCDE was not a universal strategy for all stressful events, i.e. it did not control negative emotions experienced during telephone conversations or the undertaking of difficult clinical skills. Despite its inflexibility, ABCDE was often the only strategy expressed/demonstrated by the doctor.

Other strategies explained and/or demonstrated by the doctors included 'taking a step back' or a variation of this method, checking handbooks/guidelines and escalating to seniors early in their patient management. These appeared to be mainly cognitive aids or strategies implemented when the doctors did not know what to do. One doctor recalled the use of diaphragmatic breathing to invoke calmness in situations outside of work. However, this strategy had not been applied in clinical practice due to a lack of consideration and/or opportunity for implementation. The remainder of the doctors reported a lack of strategies to overcome feelings of anxiety, panic or low confidence during clinical scenarios, but one doctor recalled attempts to hide these feelings rather than manage them.

4.9. Conclusions

In conclusion, the results of the Exploratory Phase support the findings of the literature review. The doctors interviewed do experience negative emotions and behaviours during acutely unwell patient management and report that these experiences may affect their ability to manage the patient optimally. The doctors described that they often used the ABCDE approach to manage acutely unwell patients, but this had a varied effect on their emotions and behaviours and was considered not applicable to every clinical situation. The doctors had little or no knowledge of other strategies

which could be used to decrease the effect of negative emotions or behaviours in the clinical environment.

These results reflect the descriptions of the interventions described in the scoping review regarding how doctors are taught to manage the acutely unwell patient. In generalised terms it seems that the doctors' training has focussed on their acquisition of *what* clinical knowledge is required but with little consideration of *how* to apply it within the complex clinical environment. The doctors confirmed that without appropriate strategies to moderate the effects of their negative emotions and behaviours their clinical performance can be, as for some has been, sub-optimal.

4.10. Chapter Summary

The Exploratory Phase confirmed the findings of the scoping review and furthermore provided real clinical examples of foundation doctors' emotional and behavioural experiences during their management of acutely unwell patients. This supports the continuation of the PERFORM study beyond this first phase. The theory of metacognition may not have been familiar to all of the doctors in the Exploratory Phase but the description of a 'metacognitive feeling' did resonate with each of them, indicating that they were already familiar with the first step of the PERFORM model. Perhaps metacognitive feelings are a common experience amongst medical trainees. If so, the inclusion of metacognitive feelings in the PERFORM model would likely aid doctors' understanding and application of the PERFORM model in clinical practice. This potential link requires further enquiry in the Pilot Phase.

Despite the universal understanding of metacognitive feelings, there was inconsistent evidence that metacognitive judgement was subsequently employed in association with coping strategies. This demonstrates an opportunity for the PERFORM model to introduce metacognitive judgement (and other facets) to junior doctors so that it can inform and potentially enhance their coping strategy implementation. The Exploratory Phase revealed that the coping strategies used by the doctors was mainly limited to the ABCDE approach, which was more useful as a cognitive aid than an emotional or behavioural moderator. Other coping strategies identified were generally either not used in clinical practice or were applied in an unregulated or inconsistent way. Clearly there is a need for a wider variety of coping strategies and a structured approach to evaluating their use; the current PERFORM model incorporates both of these aspects and therefore will not be modified prior its use in the subsequent Pilot Phase.

Chapter 5. Phase 2: Pilot Phase

This chapter begins with a description of the objectives of this phase of the study.

The methods by which doctors were recruited from each of the study sites to the Pilot Phase are described. This is followed by the data generation, collection and analysis tools employed in this phase.

The results of the Pilot Phase are described, and their discussion relate the findings to both the previous Exploratory Phase and their impact on the final Full Intervention Phase of the PERFORM study.

5.1. Introduction

The first stage of the Full Intervention requires the PERFORM model to be introduced to the doctors participating in the study. To optimise this introduction prior the Full Intervention, the Pilot Phase aimed to evaluate the feasibility of the coaching, facilitation, equipment and settings employed. The specific objectives through which this evaluation was considered are described below. Following this, the methods and results from the Pilot Phase of the PERFORM study are described and discussed in relation to their impact on the final phase.

Piloting of Stages 2 and 3 of the Full Intervention was not deemed necessary. Stage 2 was self-directed, and the subsequent follow-up SSIs in response to reflections submitted by the doctor were individualised and so not possible to pilot appropriately. Stage 3 involved an in situ simulation, the scenario, but not the setting, for which was trialled during this Pilot Phase. The setting for the in situ simulations could only be confirmed nearer the time due to the required co-ordination of the doctors' rotas, clinical skills input (both personnel and equipment) and availability of an appropriate clinical location and therefore could not be piloted prior to the Full Intervention.

5.2. Objectives of the Pilot Phase

Taking guidance from Feeley and Cossette (2015) on pilot and feasibility studies in complex health interventions, the objectives evaluated in this phase were:

1. The researcher's ability to coach participants in the use of PERs in simulation for later application in clinical practice.
2. Content and practicalities of the simulation scenario i.e. use of software to control the manikin's vital signs, e.g. blood pressure, heart rate and identification of additional investigation material requested by the doctor that wasn't anticipated by the researcher.
3. Facilitation of the Think Aloud, to ensure that the doctor reported the required data, i.e. focussed on their feelings and behaviours rather than the details of their medical management.
4. The setting, including clinical equipment and materials, used to support the intervention, i.e. video recording, computer/tablet on which to view the video, handout sheet used to explain the PERFORM model (Figure 3-3) and Prompt Card (Appendix 21).
5. The timings of each element (simulation, Think Aloud) to inform future booking of rooms/equipment and accurate participant guidance regarding time away from clinical practice for the intervention phase.

5.3. Recruitment and Study Sites

5.3.1. Recruitment

The recruitment strategy for the Pilot Phase was identical to that of the Exploratory Phase (described in subchapter 4.3.1) through email and face-to-face communication.

5.3.2. Study Sites

The same two study sites were included as for the Exploratory Phase (described in subchapter 4.3.2).

5.4. Data Generation Methods

To address the objectives of the Pilot Phase, data was generated to capture both the participants' and researcher's interactions with the PERFORM model coaching strategy. This strategy used the elements originally described in Cotterill's (2011) approach to building PPRs in sport. For its instruction in the PERFORM study, its original sporting content was adapted to reflect the research focus of acutely unwell patient management (Figure 5-1). The feedback questionnaire (orange box, Figure 5-1) was a data generation method specifically introduced for the Pilot evaluation, and was not featured in Cotterill's (2011) original description.

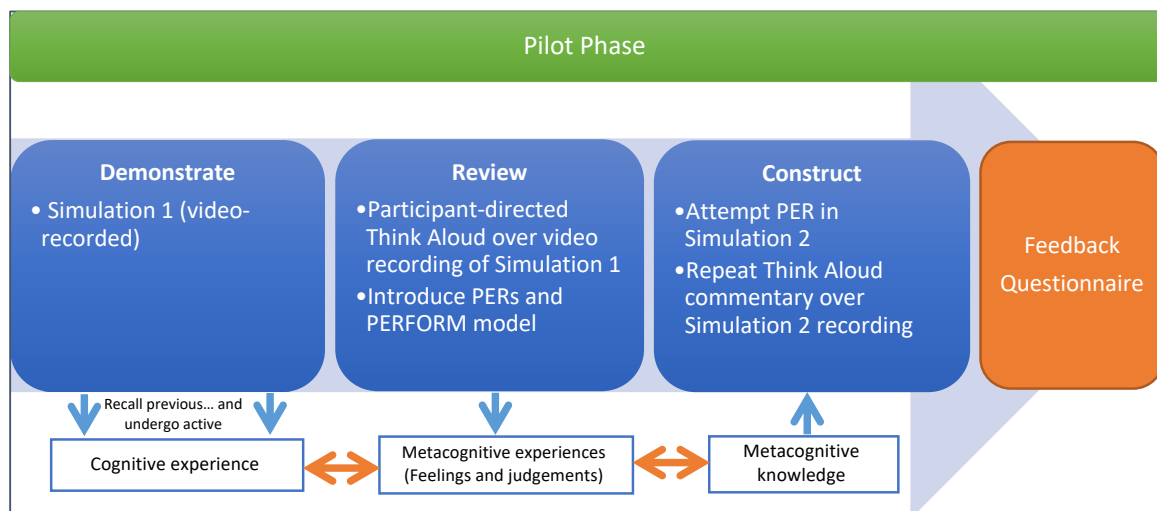


Figure 5-1: Pilot Phase Overview

Reflecting Cotterill's (2011) original description, the collaborative relationship between the researcher and participant during this process was one of coaching, rather than mentoring, due to the specific, targeted nature of the acquisition of new skills (Connor and Pokora, 2007): The 'coach' aided the participant to navigate the different elements in a structured way and helped to identify specific areas for improvement. The *Demonstrate*, *Review* and *Construct* elements adapted from Cotterill's (2011) PPR construction are now described in more detail.

5.4.1. Demonstrate

5.4.1.1. Simulation Scenario of an Acutely Unwell Patient

Similarly to the Exploratory Phase, the doctors in the Pilot Phase undertook one of the four simulated acutely unwell patient scenarios designed by the researcher (Appendices 17-20) to induce negative emotions or behaviours within an as-authentic environment as possible (McGaghie *et al.*, 2010).

5.4.1.1.1. Coaching using simulation

A recent literature review by Lovell (2018) highlighted that there is wide use of coaching in medical education for the acquisition of technical skills. However, there is only weak/medium strength evidence to support coaching for the improvement of doctor well-being and non-technical skills and concluded that this required further investigation. Therefore, the coaching strategy used to introduce PERs to the doctors was grounded in the evidence-based process to develop PERs in sport used by Cotterill, (2011), as demonstrated in Figure 5-1.

5.4.2. Review

5.4.2.1. Think Aloud Commentary

The first part of the *Review* process involved the doctors undertaking a Think Aloud commentary in a similar way to that used in the Exploratory Phase. This mirrored Cotterill's (2011) construction of PPRs with elite cricket players.

In the Exploratory Phase, the Think Aloud commentary was used simply to highlight potentially negative emotions and behaviours. However, Pilot Phase participants were encouraged to choose a specific negative emotion and/or behaviour (metacognitive feeling, e.g. lack of focus, anxiety or negative thoughts) which they perceived as detrimental to their optimal clinical performance. Then, using metacognitive judgements, they considered the emotion/behaviour's underlying cause, e.g. unfamiliar task or previous failed attempts. Highlighting the participant's personal objectives in this way prepared them for the following introduction to the PERFORM model by both demonstrating the first two metacognitive facets of the model and providing a tangible, personal example with which to contextualise its explanation. In an effort to triangulate the participant's level of control over the effect of negative emotions and behaviours on their clinical performance, the concept of self-efficacy was introduced.

5.4.2.2. Self-Efficacy Scale

When measuring self-efficacy of inter-collegiate athletes, Shelangoski *et al.* (2014) heeded Bandura's (2005) warning that using a scale with too few intervals would lack sensitivity and reliability. Often subjects avoid the extremes of scales and merge towards a central point. If there are too few central points, differentiation between subjects is lost. Therefore Shelangoski *et al.* (2014) used the scale 0-100 and this same range was adopted for the PERFORM study (Figure 5-2).

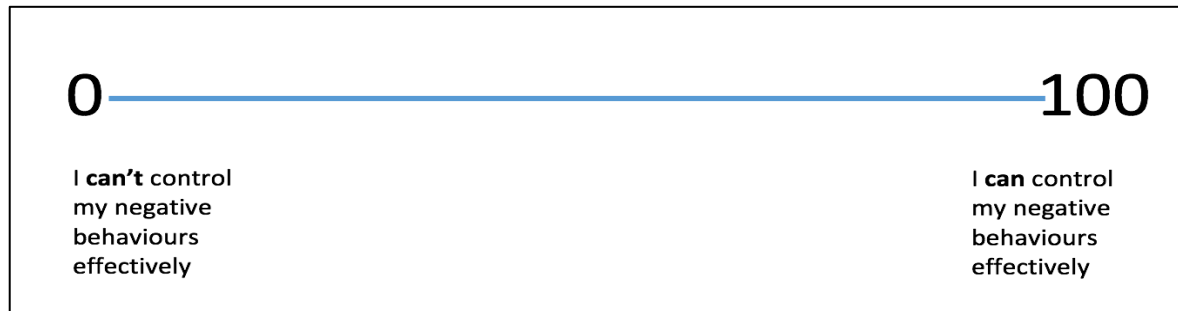


Figure 5-2: Self-efficacy scale

After the simulation scenario the doctor scored their perceived ability to manage their negative emotion or behaviour during the scenario, i.e. their self-efficacy to control their negative emotion or behaviour out of 100 (Figure 5-2).

5.4.2.3. Introduction of PERFORM model and PERs

MacIntyre *et al.* (2014) expressed that elite athletes who use PERs are experts in metacognition. Considering this, as the doctors were coached through the PERFORM model particular attention was paid to explore and differentiate the metacognitive facets and demonstrate how they contribute to the PERFORM model. A two-stage process was used to aid understanding. First, the PERFORM model was explained using a non-clinical example of reading a book, adapted from Flavell (1979) (Figure 3-3).



Imagine that you are reading a book. You reach the end of a chapter but **feel like something doesn't make sense**; you feel like you have missed something. You realise that **a character in the final paragraph of the chapter is unfamiliar** to you, and therefore a part of the story doesn't make sense.

In an attempt to rectify this, you re-read the final page to search for an earlier reference to this character. However, after re-reading the final page you are **still not satisfied that you know who this character is**. You then decide to flip to the beginning of the chapter and skim through it to identify the character's name. You notice the name, read a few sentences around it, and suddenly something 'clicks' into place; **the book makes sense again**. You then continue to move onto the next chapter.

This example is transposed onto the PERFORM model above: The reader follows the negative affect route down the centre of the model, first adhering to PER 1. When this is not successful the reader loops round to choose PER 2. Once resolved, the reader returns to the top of the model, continuing to monitor metacognitive feelings until another negative affect is felt, and once again the cycle is repeated (albeit under different circumstances).

Figure 5-3: Illustration of PERFORM model during reading (adapted from Flavell (1979))

Secondly, a handout of the contextual PERFORM model (Figure 3-4) was used to describe a clinical example, either:

- a) being called to assess an acutely unwell patient, and using the time to reach the ward to implement a PER to combat anxieties experienced, or
- b) using a PER to combat negative emotions when asked to perform a clinical skill in which the doctor was under confident (similar to the description in Table 3-2).

The example used was tailored to resonate with the issues highlighted by the doctor in their previous Think Aloud commentary in an attempt to align with their personal objectives.

During the explanation of the model in the clinical context, the PERs taken from sport psychology literature were introduced to the doctors. This was initially highlighted on reaching the *Metacognitive Knowledge* box during the clinical example of the model and then each PER was discussed in more detail once the entire model had been demonstrated. The PERs illustrated to the doctors were taken directly from sport psychology literature. They were evidence-based, used in different domains of sport and offered application variety, e.g. psychological, physical, physiological and verbal, to appeal to doctors with different PER preferences. The PERs presented to the junior doctors included:

- Positive self-talk including trigger words (Moran (2004) in Cotterill, (2011))
- Visualisation (De Francesco and Burke (1997) in Gallucci, (2014))
- Deep breathing (Gallucci, (2014))
- Temporal consistency techniques, e.g. 5 second count down (Mesagno and Mullane-Grant, 2010)
- Centering (Nideffer, (1993) in Gallucci, (2014))

It was stressed that this list was not exhaustive, and the doctors were encouraged to create their own PER if they wished.

The Think Aloud and discussion around the underlying cause(s) of negative affect lasted between 20 and 30 minutes.

5.4.3. Construct

Following the explanation of the PERFORM model the doctors were given the opportunity to construct and apply the model during an acutely unwell patient simulation and reflect on its use during a subsequent Think Aloud commentary and self-efficacy score.

5.4.3.1. Simulation Scenario of an Acutely Unwell Patient

To allow the doctor to put a PER into practice they undertook another acutely unwell patient simulation scenario. Although the difficulty and length of the second simulated task was similar to the first, a different scenario was chosen from the four designed by the researcher (Appendices 17-20) to avoid 'carry-over' bias explained by test-retest theory, described by Allen and Yen (1979) in Thomas *et al.* (2014).

This opportunity to 'trial run' the application of a PER in simulation:

1. heralded the initial integration of the routine into the subject's metacognitive knowledge bank,
2. allowed the doctor to demonstrate the PERFORM model in action for themselves and watch this back via video recording, and
3. allowed the participants to consider how well/whether this would lay the foundations for future application of the PERFORM model in clinical practice as part of the Full Intervention (Phase 3).

5.4.3.2. Think Aloud Commentary

Following completion of the second simulated scenario, a Think Aloud commentary was undertaken by the doctor whilst reviewing the video footage. In addition to verbalising their thoughts, feelings and behaviours experienced during the simulated scenario, the doctors were asked to highlight use of any PERs and/or the PERFORM model facets during their task. If a PER had been implemented, the researcher asked questions around the context of how, why and which PER had been used to gain insight into the participant's understanding.

5.4.3.3. Self-Efficacy Scale

At the conclusion of the Think Aloud Commentary the doctor again scored their perceived ability to manage their negative emotion or behaviour during that scenario, i.e. their self-efficacy to control their negative emotion or behaviour out of 100 (Figure 5-2). The two self-efficacy scores, one following each simulation, could be compared to demonstrate any change in feelings of control over negative emotions and behaviours.

5.4.4. Feedback Questionnaire

Pilot Phase participant feedback was generated through a paper-based questionnaire (Appendix 13) which included both Likert and white-box responses. Prior to its use in the study, the questionnaire was 'road-tested' by a medical registrar and a mixed-methods researcher to ensure clarity of language and appropriate questionnaire design. Refinements to the questions and formatting were made based on this feedback.

The questionnaire asked the participants for feedback regarding the elements of the Pilot Phase, including the coaching methods used to explain the PERFORM model and the appropriateness of the simulation scenarios. The questionnaire also captured the participant’s feedback regarding the potential use of a ‘Prompt Card’ (Appendix 21), which the researcher explained was to be given to the Full Intervention (Phase 3) participants.

The Prompt Card shown to the Pilot participants was the size of a standard identity card and fit into a card holder worn by doctors, allowing it to be kept with them at all times during work. On one side of the Prompt Card was a series of questions designed to aid and structure reflections on the use of the PERFORM model in clinical scenarios. On the other side was a copy of the PERFORM model (Figure 3-3). The Pilot participants were given time to look at the Prompt Card prior to completing the feedback questionnaire.

5.5. Data Collection Methods

The objectives of the Pilot Phase were addressed using a combination of the results from the questionnaire and researcher’s reflective accounts, as shown in Table 5-1. As per the notation used in the previous similar table in Chapter 4 pertaining to the Exploratory Phase (Table 4-1), methods that generated data which was used to address the phase objectives are indicated by an unbracketed ‘tick’ ✓. Conversely, methods which generated data that was not required to address the objectives, and therefore not collected and analysed, are denoted by a bracketed ‘tick’ (✓).

Table 5-1: Methods used to generate and collect data at each stage of study ^s

Data Generating Method	Phase 1: Exploration	Phase 2: Pilot
Semi-structured interview	✓	
Questionnaire		✓
Simulation (video recorded)	(✓)	(✓)
Think Aloud	✓	(✓)
Reflective logs from participant		
Reflective accounts from researcher		✓

5.5.1. Questionnaire

Participant feedback from the Pilot Phase was collected using a paper-based questionnaire (Appendix 13) and the anonymised responses were entered into a spreadsheet prior to analysis.

^s ✓ = data generated collected

(✓) = data generated but not collected for analysis

5.5.2. Researcher's reflective accounts

During each Pilot session the researcher generated field notes pertaining to elements of the coaching and simulation stages which required adjustment prior to their use in the subsequent Full Intervention. These field notes were organised and compared between the doctors' encounters, removing any duplicated ideas/comments.

5.6. Data Analysis Methods

As shown in Figure 5-4, the data collected in the Pilot Phase was both qualitative and quantitative. Therefore, mixed method approaches of statistical and open-ended question analysis were used to address the phase objectives.

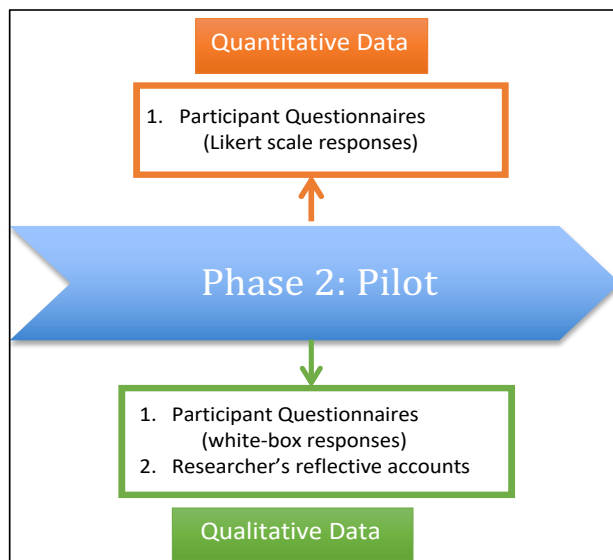


Figure 5-4: Type of data collected in Pilot Phase

5.6.1. Statistical Analysis

The data generated from the Likert response questions were entered into a spreadsheet, counted and displayed as a histogram.

5.6.2. Open-Ended Question Analysis

All white-boxes responses were entered into a spreadsheet. Analysing open-ended questions is problematic according to Cohen *et al.*, (2011, p. 382) as the potential breadth of topics in these responses means that "data cannot be easily compared" and the responses are "difficult to code and classify". Due to the lack of instruction on open-ended question analysis, a pragmatic approach to white-box responses was taken: Positive comments relating to a specific study element were interpreted as supporting their use in the future Full Intervention, whereas negative comments were

interpreted as not supporting their use. Positive and negative comments regarding the same study element were given equal weighting when considering their use in the Future Intervention.

The researcher’s personal reflections from the Pilot Phase were considered in a similar way to the questionnaire white-boxes responses and were given equal weighting with those of each participant.

5.7. Results

The results section includes details of both the participants and the data collected from the questionnaires and researcher’s reflections.

5.7.1. Participants

Table 5-2 contains the details of the five doctors recruited to the Pilot Phase. They were all either Foundation year 1 or 2 trainees and worked in either a district general hospital (DGH) or central teaching hospital (CTH). They were each engaged in one 4-month-long rotation throughout their study activities and had all completed their medical training in the UK.

Table 5-2: Doctors enrolled in Pilot Phase

Doctor Code	Place of Work	Gender (Male or Female)	Foundation 1 or 2 Trainee	Current clinical placement	Enrolled in Exploratory, Pilot or Both
EP01	CTH	F	1	Care of the Elderly	Both
EP02	CTH	M	1	Psychiatry	Both
EP03	CTH	M	2	Neurology	Both
EP04	CTH	F	1	Urology	Both
P05	DGH	M	2	Respiratory	Pilot

Doctors were recruited to the Exploratory and Pilot Phases simultaneously, and hence were coded according to the phase(s) in which they were enrolled (E=Exploratory Phase, EP=Both Exploratory and Pilot Phases) and in numerical order of recruitment to the study. For anonymity purposes they will be referred to by their code throughout the thesis.

Each doctor had their data collected during a single meeting with the researcher which lasted between 1 and 2 hours, depending on their involvement with one or both of the phases.

5.7.2. Results of Questionnaire

The bar chart in Figure 5-5 demonstrates the responses to the Likert-style questions answered by the five doctors in the Pilot Phase and Appendix 35 contains the white-box question responses.



Figure 5-5: Feedback from Questionnaire on Pilot Phase [†]

[†] REVERSE means reverse scoring applies to this question

5.7.3. Results of Researcher's Reflections on the Pilot

Appendix 36 contains a summary of the researcher's reflections for each of the Pilot cases. These reflections were either focussed on the organisation or logistical aspects of running the Pilot sessions or were issues raised through observing the doctor during the session. The majority of these problems were easily rectified or addressed in real-time or between sessions, such as changing manikin physiological parameters or sound effects, whilst others lead to larger changes to the future Full Intervention. These will be outlined during the discussion and conclusion sub-chapters.

On conclusion of the Exploratory Phase, it became apparent that the doctors all shared an understanding of a metacognitive feeling, despite not perhaps being familiar with metacognition as an overarching theory. It was considered that this might aid introduction and understanding of the PERFORM model but required further investigation in the Pilot Phase. The researcher's observations and reflections confirmed that the doctor's familiarity with the description of a metacognitive feeling was helpful not only during the explanation of the PERFORM model, but also when asking the doctors to identify an example from their simulation to which they could apply the model.

5.8. Discussion

The results regarding the objectives of the Pilot Phase are now discussed in turn.

5.8.1. Objective 1: The researcher's ability to coach the doctors in the use of PERs in simulation for later application in clinical practice

The feedback from the doctors (Figure 5-5) indicates that the instructions on *what* PERs are and *how* to use them in both simulation and clinical practice were clear. It is the researcher's understanding that the doctor's prior familiarity with a metacognitive feeling aided the discussion and explanation of the PERFORM model. White-box responses (Appendix 35) highlighted that the book-reading example was particularly useful. The doctors were all able to implement at least one PER in their simulation scenario.

During the Think Aloud discussions in both the Exploration and Pilot Phases the doctors were asked to score their self-efficacy between 0 and 100 to reflect how well they felt able to control their negative emotions and behaviours during the simulation. Although the doctors all understood the concept of self-efficacy and were able to score their scenario, it became apparent that some doctors wished to target specific tasks, such as clinical skills or making telephone calls to seniors, rather than viewing the scenario as a whole.

5.8.2. Objective 2: The content and practicalities of the simulation scenario

The feasibility testing of the content and practicalities of the simulation scenarios addressed the following:

1. Appropriateness of simulation scenarios for the doctors' stage of training
2. Communication in the simulation scenario
3. Changing the vital signs of the manikin in response to the doctor's management
4. Time management
5. Additional investigation materials requested by the doctor

5.8.2.1. Appropriateness of Simulation Scenarios for the Doctors' Stage of Training

On the questionnaire all the doctors indicated that the simulation scenarios were appropriate for their stage of training.

All four clinical scenarios ran well and were deemed appropriate for the Full Intervention Phase. For the anaphylaxis scenario, having a way of mimicking a rash on the patient would allow the doctor to discover this unprompted, rather than being guided by the nurse.

5.8.2.2. Communication in the Simulation Scenario

Three different approaches for simulated telephone communication were trialled during the pilot:

1. The researcher, who was also playing the role of the staff nurse, moved into a room adjacent to the one in which the simulation scenario was taking place. The adjoining door was propped open so that the doctor could be heard, and in turn could hear the researcher. Issues with this were that on taking a telephone call the researcher was both unable to play the role of the nurse and also could not access the simulation control station.
2. A walkie-talkie was given to the doctor and another was taken by the researcher into an adjacent room for communication through a closed door. Issues with this system were battery/power failure and if the doctor did not release the 'talk' button they would not be able to hear the researcher on the other end.
3. A corded telephone system was set up using two battery-powered telephone handsets linked by a long telephone cable. This allowed the two handsets to be separated by a screen and both handsets could make and receive calls.

5.8.2.3. Changing the vital signs of the manikin in response to the doctor's management

Four of the five pilot studies were held without an assistant and therefore the researcher had to play the role of the nurse in the scenario. As such, there was little scope to be reactive to the doctor's management with regard to changing the patient's vital signs. Therefore, the manikin was programmed to become increasingly unwell throughout the 10-minute scenario, unless a definitive treatment was given by the doctor. At this point, the researcher changed the appropriate physiological parameters and promptly returned to the scenario as the role of the nurse.

For doctor P05's simulations, an assistant was available to help. They took control of the physiological parameters whilst the researcher continued to play the role of the nurse in the simulation. The assistant used the same programme as for previous scenarios which ran automatically but was able to override the set trends if the doctor instigated physiologically-altering treatments. Guidance on the physiological parameters was set out in the simulation protocol for each scenario.

The assistant was also able to take/receive simulated telephone calls during the scenario. This allowed the researcher to continue their role of the nurse and not leave the room to act out a different role. Telephone calls made to the doctor in the scenario by the assistant were more authentic as they were less predictable, whereas when the researcher was multi-tasking the doctor was likely to anticipate an impending telephone call when the researcher left the room.

5.8.2.4. Time management

The Pilot Phase for each of the doctors took longer than the allotted hour. This was partially due to the overrunning of the simulation scenarios which then caused a subsequent elongation of the relevant Think Aloud commentary. In addition, the time taken to reset the simulation props for the next scenario was not accounted for in the original schedule. A number of doctors were late to arrive for their scheduled time-slot, ranging from a few minutes to half an hour, which also caused time pressures for their own and subsequent sessions.

In the original time schedule, 10 minutes had been allocated to talk through the PERFORM model and PERs but in practice this lasted between 12 and 19 minutes. In addition, the time allocated to instruct the participant on Stage 2 of the Full Intervention Phase, where doctors would apply the model in real clinical scenarios and keep a reflective log, was insufficient.

The pilot scenarios where an assistant ran the simulation controls overran the most, probably due to the researcher's failure to effectively communicate the need for strict time-keeping.

5.8.2.5. Additional investigation materials requested by the participant

The doctors did not highlight or request any additional material relating to clinical investigations which was not already available in the simulation.

5.8.3. Objective 3: The Facilitation of the Think Aloud

During the Think Aloud commentaries the doctors commented on both their clinical management and their thoughts and feelings during the scenario. All five doctors agreed that watching their video recording helped recall their feelings, which would have been more difficult the recording. Some prompting was required to encourage the doctors to speak, using terms such as 'how did you feel?' and 'what were you thinking here?'.

5.8.4. Objective 4: The Setting, Clinical Equipment and Study Materials

The feasibility testing of the setting, clinical equipment and study materials addressed the following:

1. The setting and clinical equipment
2. The video recording and watching the recording back
3. The PERFORM model handout sheet and Prompt Card

5.8.4.1. Setting and Clinical Equipment

Overall feedback from the doctors regarding the availability of appropriate equipment was positive. One doctor identified that different sizes of intravenous cannulae and syringes were not available.

In addition, the following clinical aids were requested by the doctors but were unavailable:

- BNF
- Therapeutic low molecular weight heparin chart for the pulmonary embolism scenario.

5.8.4.2. Video recording and watching the recording back

The clinical skills centre at the CTH had remote-controlled ceiling-mounted cameras. Immediately post-simulation, a laptop was used to view the simulation recording to facilitate the Think Aloud commentary.

The DGH clinical skills centre used a mobile video camera mounted on wheels. The recordings were accessed through a personal computer located within the clinical skills centre and allowed the

images to be projected onto a large over-head projector screen. Both the scenario recording and the corresponding observation monitor could be projected simultaneously.

5.8.4.3. PERFORM Model Handout Sheet and Prompt Card

There was mixed feedback from the questionnaire regarding whether the doctors would find either a handout of the PERFORM model and/or a copy of their simulation video, which demonstrated them using a PER, useful.

Four doctors stated that a Prompt Card would be helpful to guide reflections after clinical scenarios where PERs were used. The remaining doctor felt that it would not be useful but did not specify why.

5.9. Conclusions

The Pilot Phase feedback confirmed that the majority of the elements included in the coaching and introduction of the PERFORM model to junior doctors was appropriate for the future Full Intervention. The main alterations that resulted from the Pilot Phase results which aimed to optimise Stage 1 of the Full Intervention can be categorised broadly into:

5.9.1. Organisational Aspects

More time would be allocated for Stage 1 of Full Intervention. This included both an increased time per participant session (at least 1.5 hours) but also between sessions to reset/restock simulation adjuncts. Although all of the simulations in the Pilot study had been successfully recorded to facilitate Think Aloud commentary, the researcher felt that it was necessary to become more familiar and confident with the recording equipment prior to the Full Intervention. In addition, the researcher would also consider the use of a computer tablet as a back-up recording.

5.9.2. Simulation Aspects

All four simulation scenarios were used rotationally throughout the Pilot, but for the Full Intervention a standardised order of chest sepsis, anaphylaxis and GI bleed scenarios would be used to allow between-case comparison at any given Stage. The PE scenario was abandoned as it was deemed too difficult to simulate the signs (i.e. swollen calf) using a manikin. It was imperative for the Full Intervention that an additional facilitator (not just the researcher) should be available for the simulation scenarios. If the assistant were to manage the simulation controls, the researcher would need to emphasise to them the need for strict time-keeping. The same scenario manikin programs would be used but would be overridden in response to doctor's management.

In the Full Intervention the list of PERs would be placed in a prominent position during the simulation immediately following the coaching of the PERFORM model. This list would act to remind the doctors of the PERs during their simulation scenario to support their implementation.

Optimum simulation adjuncts, including a wired telephone system and a range of cannulas/syringes would be made available for future simulations. Finally, before the doctors embark on their simulated scenario, the researcher would ensure that they understood the manikin's capabilities and that nurse in the scenario would not give hints/clues.

5.9.3. Coaching Aspects

As well as allowing more time to introduce PERs the overall time available for coaching the PERFORM model would be increased from 10 to 20 minutes. During the Full Intervention the doctors would be encouraged to identify a choice of target in the form of a specific task e.g. venepuncture, communication, interpreting ECGs, for the application of the PERFORM model, rather than asking them to target their entire clinical performance. Although most of the doctors performed their Think Aloud commentaries without much prompting, clearer instructions for future participants, emphasising that they should focus more on their emotions and behaviours as opposed to their clinical management, would be used to encourage the free-flow of metacognitive commentary.

5.10. Chapter Summary

The Pilot Phase evaluated the coaching strategy designed to introduce the PERFORM model to junior doctors prior to its implementation in the Full Intention Phase. The feedback from participants and the researcher confirmed that overall the approaches employed, including the PERFORM model handout materials, simulation scenarios, equipment and setting, were appropriate to be used in the Full Intervention. However, some changes to the organisation, selection of specific simulation scenarios and coaching strategy would be made prior to Full Intervention.

Building on the Exploratory Phase observations, the doctors' recognition of 'metacognitive feelings' facilitated their coaching in, and implementation of, the PERFORM model in simulation. Hopefully the doctors recruited to the Full Intervention will share this familiarity with metacognitive feelings, such that it will facilitate their understanding of the PERFORM model and its subsequent implementation of both in simulation and the real clinical environment.

Chapter 6. Phase 3: Full Intervention

This chapter begins with a description of the objectives of this phase of the study.

The methods pertaining to recruitment, data generation, collection or analysis are described. Results from previous phases which impacted the final design of the Full Intervention Phase are reiterated within the relevant section.

The results of the Full Intervention Phase are stated at the end of this chapter. Their discussion and conclusions are considered separately within the final two chapters of this thesis.

6.1. Introduction

The aim of the Full Intervention Phase was to evaluate the PERFORM model in the clinical context. As such it was conducted over a longer time period than the previous two phases, and organised into three stages, which are described in detail within the methods. The results are presented both through a cohort and single-case perspective to demonstrate the breadth and depth of the doctors' interaction and use of the PERFORM model throughout the three stages. The discussion and conclusion arising from the results of this phase are discussed in the subsequent chapters.

6.2. Objectives of the Full Intervention Phase

The Full Intervention Phase aimed to address the original research question:

“Can an intervention based on the PERFORM conceptual model improve the clinical performance of junior doctors when managing the simulated acutely unwell patient?”

Therefore, the specific objectives of this phase are those described previously in subchapter 3.4:

1. Do junior doctors experience negative emotions and behaviours during acute patient care?
 - a. Do they possess coping strategies?
 - b. If so, what are these?
2. Does the use of the PERFORM model improve performance when managing acutely unwell patients?
 - a. Does self-efficacy of controlling target behaviours improve?
3. How does the application of the PERFORM model by participants align with the (original) conceptual PERFORM model?
4. What are the perceptions of the participants using the PERFORM model?
 - a. Which are the most useful elements of the complex intervention?
 - b. When would be its optimal timing for implementation within training?
 - c. How could the study/coaching programme be improved?

6.3. Recruitment and Study Sites

6.3.1. Recruitment

An invitatory email (Appendix 7) outlining the details of Phase 3 of the PERFORM study was sent to the Foundation trainees' administrators at both study sites and forwarded to the Foundation doctors. The email included the Participant Information Sheet (Appendix 8) and Consent Form

(Appendix 9), the former explaining that involvement in the previous Pilot Phase was an exclusion criteria for enrolment in Phase 3 due to prior knowledge of the PERFORM model. As per the previous phase recruitment strategies, the researcher also attended one of the foundation doctors' weekly mandatory training sessions at each hospital to recruit those who may not have received/read their administrator's email.

6.3.2. Study Sites

The Full Intervention Phase was conducted at the same two hospitals used in the previous two phases of the study. The study content and time-lines were identical over both sites but ran in series rather than in parallel due to the constraints of being a single researcher study and the time allowance for formal ethics and HRA approval to be granted (Figure 3-1).

6.4. Data Generation Methods

During this final phase of the study the PERFORM model was evaluated. Its three stages were conducted within a four-month clinical placement which generated larger amounts of data compared to the previous two phases. Data collection was targeted to answer the specific objectives of this phase, and therefore not all generated data was subsequently analysed.

6.4.1.1. Stage 1: Building the PER

The approach used in the Pilot Phase, adapted from Cotterill's (2011) PPR construction in sport, was replicated during Stage 1 of the Full Intervention with three alterations:

(i) The Addition of the Exploratory Phase SSI

Although the first simulation in the Pilot Phase allowed the participant to demonstrate an example of their emotions and behaviours in simulation it did not allow exploration of these experiences from real clinical practice. To offer a more holistic approach to understanding the participant's experiences, current coping strategies and metacognitive awareness, it seemed appropriate for each participant to demonstrate their emotions and behaviours through both discussing clinical experiences through the Exploratory Phase SSI (Appendix 14) and simulating acute patient management. Therefore, Stage 1 of the Full Intervention amalgamated the Exploratory and Pilot approaches, beginning with an SSI and followed by a simulation scenario.

(ii) Standardised Simulation Scenarios

Four simulation scenarios were used in rotation throughout the Exploratory and Pilot Phases to test their feasibility. In the Full Intervention each of the doctors undertook the same simulation scenarios at the same stage of the study, allowing a more standardised between-case comparison.

(iii) Removal of Feedback Questionnaire

The anonymous questionnaire completed by the Pilot Phase participants was purely intended to inform the final design of the Full Intervention prior to its commencement and therefore was not completed by participants of the Full Intervention itself.

Figure 6-1 demonstrates the resulting organisation of Stage 1 of the Full Intervention following these alterations. The boxes and arrows beneath each *Demonstrate*, *Review* and *Construct* element indicate the metacognitive facets to which they align.

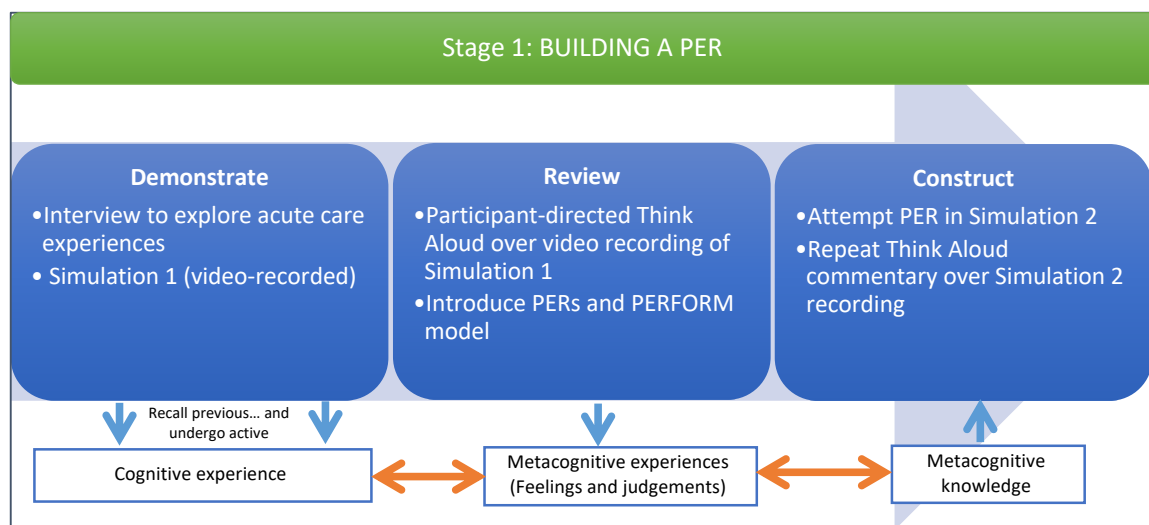


Figure 6-1: The building of a PER (Stage 1)

6.4.1.1.1. Demonstrate

Demonstrate in the Full Intervention Phase comprised both of an initial SSI (Appendix 14), identical to the Exploratory Phase SSI (Appendix 12), and a simulated scenario a young female with sepsis secondary to a lower respiratory tract infection (Appendix 17). Both were designed to highlight, either through recall of clinical experiences or by simulating acute patient management, negative emotions or behaviours.

6.4.1.1.2. Review

The *Review* element in the Full Intervention proceeded identically to that of the Pilot Phase in which the doctors conducted a Think Aloud commentary whilst watching their recorded simulation scenario. The doctors identified a specific negative emotion or behaviour that they experienced during the simulation, and assigned a self-efficacy score out of 100 to quantify their level of control over its effect on their clinical performance. This negative emotion or behaviour then became the focus of the discussion of the PERFORM model during the *Construct* stage.

6.4.1.1.3. Construct

The *Construct* element in the Full Intervention also mirrored that of the Pilot Phase, where the PERFORM model was introduced to the doctors before they then applied the model to a second acutely unwell patient simulation.

For all the doctors in the Full Intervention, their second simulated scenario was a case of anaphylaxis with no previously established allergies (Appendix 18), followed by a corresponding Think Aloud commentary and self-efficacy score. The *Construct* element of the Full Intervention was particularly important as it laid the foundations for the remainder of the Full Intervention Phase, particularly Stage 2, where doctors would apply the model and reflect on its use more independently within clinical practice.

At the conclusion of this first stage of the Full Intervention, the doctor was invited to ask any questions to clarify the information covered in this session. They were also and was given the Prompt Card (Appendix 21) to aid and structure reflections submitted in Stage 2.

Immediately after the conclusion of Stage 1, each doctor was emailed a link to their personal online folder to which only they and the researcher had access. The folder contained a list of the discussed PERs and a copy of the participant's second simulation scenario video. As access to video recordings of PER application is used in sport psychology for development of Pre-performance Routines (Cotterill, 2011), the participant's video was available throughout the remainder of the study to serve as an aide-memoire of how they implemented PERs in a clinical scenario. The doctors could also use their online folder to upload and share reflections with the researcher in Stage 2.

6.4.1.2. Stage 2: Refining the PER

At the conclusion of Stage 1, the doctors had applied a PER in a simulated environment. In Stage 2 the doctors were encouraged to use PERFORM model when attending acutely unwell patients and to adapt the model to optimise its use in the real clinical environment (Figure 6-2).

To support the development of PERs for golfers, Shaw (2002) suggested the use of diaries to log the stages of the intervention with the hope that they would "underpin deeper learning" (Cotterill, 2011). Although this idea was unpopular with the cricket players in Cotterill's study, reflective practice is commonplace within medical education and therefore the doctors in the study were not fazed by this request. The doctors reflected on their clinical applications of PERFORM with the aid of the Prompt Card (Appendix 21).

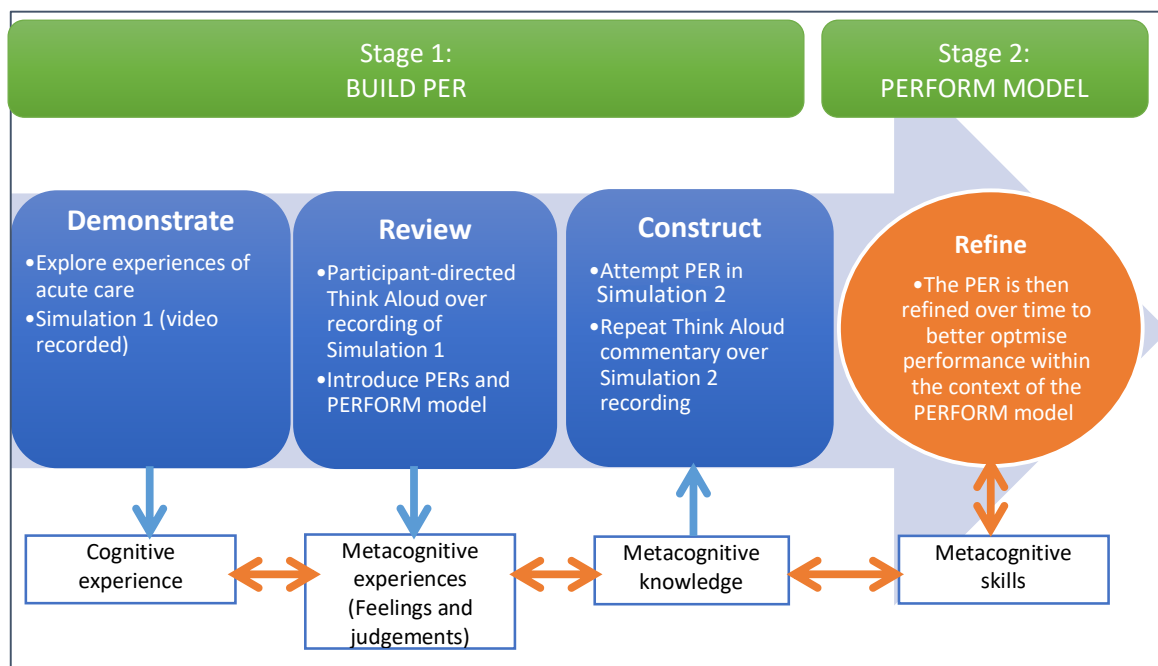


Figure 6-2: The building of a PER (Stage 1) leading to refinement of PERFORM model (Stage 2)

Deliberate practice is known to support development of expert performance in both medicine and sport (Ericsson, 2015), and was integral to the personalisation of the PERFORM model for each participant, including which PERs were used and when, why and how they applied them. It was anticipated each doctor would develop a unique version of the PERFORM model and would apply it in different contexts (*within-case* variation).

During Stage 2, the doctors undertook their usual clinical duties. On applying the PERFORM model to a real clinical scenario, they completed a reflective log and submitted this to the researcher as either a voice recording or written account. The Prompt Card was used to guide these reflections. The reflective logs served as feedback on the model at two different levels. For the researcher, they offered insight into the use and development of the model in clinical practice and for the participant, they encouraged feedback regarding the usefulness or limitations of certain PERs into the participant’s metacognitive knowledge bank.

Following the submission of one or more reflective logs, the doctors were contacted to take part in an SSI (Appendix 15) to discuss the scenario and outcomes further. The interview reinforced the participant’s feedback into their model regarding the success of the PERs used. In addition, the researcher confirmed their understanding of the context in which the model had been applied and allowed the doctor to be prompted, if necessary, to consider potential changes for future model

application. The doctors were also asked to comment on the perceived impact on themselves and patient care.

SSIs in Stage 2 were undertaken either face-to-face or via telephone, the latter being used as the best alternative when the doctor’s availability was limited (Creswell, 2013, p. 164).

6.4.1.3. Stage 3: Impact Evaluation

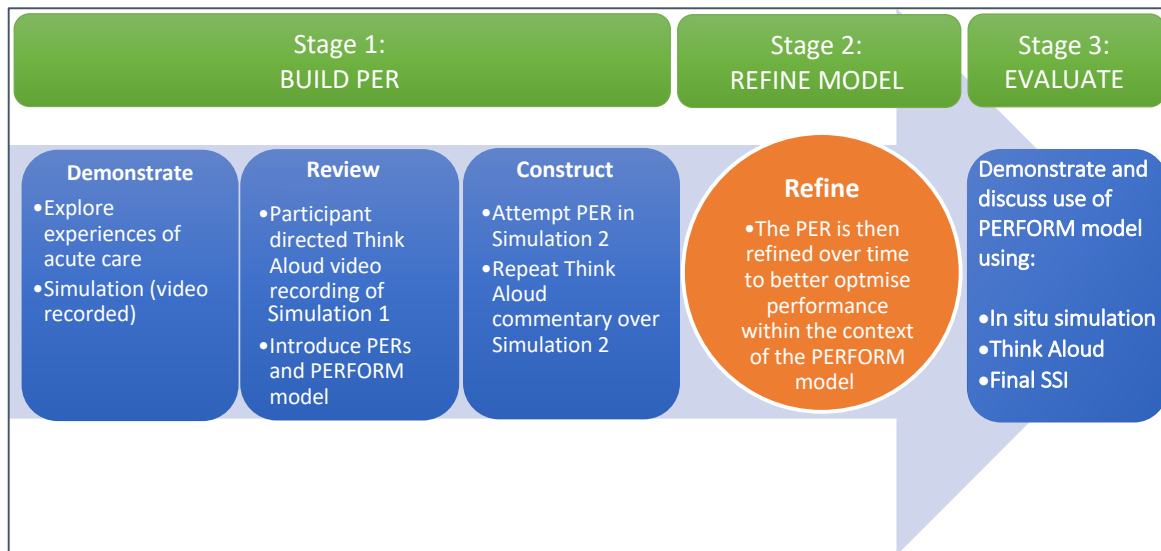


Figure 6-3: Overview of all three stages of the Full Intervention

During Stage 3 (Figure 6-3) the PERFORM model was evaluated. The doctors offered their perspective regarding the impact of the PERFORM model on clinical practice and gave feedback on potential further research and/or expansion into medical education training. The evaluation stage included an in situ simulation, corresponding Think Aloud commentary and a final interview.

6.4.1.3.1. In Situ Simulation

During Stage 3, the doctors underwent an in situ simulation in a clinical area during one of their usual clinical shifts. The doctors were either telephoned or beeped and asked to attend a ‘patient’ on the ward. Prior to arriving at the scene, they were not told by the researcher that this was a simulation but became aware of this on seeing the manikin lying in a patient’s bed. The simulation scenario was that of a patient having an upper gastro-intestinal haemorrhage (Appendix 19). The doctors managed the patient within the clinical environment and wherever possible a nurse or healthcare assistant working in that department assisted the doctor to increase realism. Each member of staff signed a consent form pertaining to them being video recorded (Appendix 11Appendix 11). If no clinical staff were available, a clinical skills technician, with clinical background, assisted. The simulation scenario was video-recorded using a computer tablet.

6.4.1.3.1.1. Realism

Rehmann *et al.*, (1995; in Ker and Bradley, 2014, p. 177) consider fidelity at three levels: psychological, environmental and equipment. Given that the target of the PERFORM study was for the model to be applied in the real clinical context, efforts were made to increase realism within these three domains over the course of the Full Intervention (Table 6-1).

Table 6-1: Authenticity/realism of elements utilised for each phase/stage of study

Phase of Study	Location / Equipment /Personnel/Patient involvement for each phase					
	Low authenticity			High authenticity		
	Clinical Skills Centre	Clinical Skills technician	Simulation equipment	Real patient encounter	Real ward setting	Real clinical staff
1. Exploration	✓	✓	✓			
2. Pilot	✓	✓	✓			
3. Full Intervention	✓	✓	✓			
				✓	✓	✓
			✓		✓	✓

(i) Domain 1: Psychological Fidelity

In the context of educational activities around the ‘acutely unwell patient’, simulation addresses the patient safety agenda and allows replication scenarios that would otherwise be difficult to achieve with real patients. This is discussed further in Ethical Considerations 3.7. . Therefore, simulation was used in Stage 1 and 3 of the Full Intervention.

Simulators range in fidelity from part-task trainers to fully-immersive simulated patients and environments (Dieckmann, Gaba and Rall, 2007). The level of fidelity should be chosen based on the desired outcome(s) (McGaghie *et al.*, 2010). Therefore, the simulations in the PERFORM study utilised a high-fidelity manikin with computer-controlled physiological manipulation, with the addition of a part-task trainer (arm) on which doctors performed invasive clinical skills such as venepuncture and arterial blood gases.

During Stage 2 of the Full Intervention, the doctors utilised genuine patient encounters to apply their PERFORM models.

(ii) Domain 2: Environmental Fidelity

The main objective during the first stage of the Full Intervention was for the doctors to build a PER and apply this in an acutely unwell patient scenario. This preliminary coaching stage required a sense of realism in terms of the scenario, physiological parameters and the presence of relevant medical equipment/devices. However, to achieve the main objective it was not necessary to deliver this session in a clinical environment and therefore the clinical skills centre was utilised.

The Stage 3 simulation was a reproducible and realistic scenario to demonstrate and evaluate the different PERs and PERFORM models used by each of the doctors. Achieving a reproducible scenario through simulation enabled between-case comparisons of the PERFORM model, which would not have been possible with real patient encounters because these would have varied widely.

Realism was more important to achieve during the final simulation than the first stage of Full Intervention. The reason for this was because during the 'refinement' (second) stage of the study the doctors had applied the PERFORM model with real patients in the clinical environment. To conduct the final simulation in a clinical skills environment may have undermined the doctors' perception of realism and the transferability of their individualised PERFORM model. Therefore an in situ simulation was conducted in a real clinical ward environment, devoid of patients, and where possible nurses and healthcare assistants were involved in the simulation and acted in their natural roles undertaking observations, handing over information, administering medications etc. This type of workplace-based simulation is increasingly being recognised as important in delivering more realistic learning experiences (Ker *et al.*, 2006), and a photograph of the in situ simulation is shown in Appendix 22.

(iii) Domain 3: Equipment Fidelity

All necessary equipment which would normally be found on a ward was provided for the doctors for each of the simulations held in Stages 1 and 3. This included clinical skills equipment such as intravenous cannulae, blood sampling methods and equipment for 'vital signs' observations, investigations with a fast processing time, e.g. arterial blood gas results and electrocardiogram (ECG), and communication equipment, either a telephone or walkie-talkie.

Appropriate clinical paperwork including drug cards and observation charts were available and tailored to each patient scenario accordingly (Appendix 23).

6.4.1.3.2. Think Aloud Commentary of In Situ Simulation

The doctor completed a Think Aloud commentary whilst reviewing the video recording of the in situ simulation. This review was conducted as soon as possible after the in situ simulation in order to maximise the detail retained by the participant. In a similar manner to previous Think Aloud exercises, the doctors articulated their thoughts, feelings and behaviours during the simulation, and highlighted the use of any PERs.

For the final in situ simulation, each doctor was asked to report their self-efficacy score *with* and *without* the use of the PER.

6.4.1.3.3. Final SSI

To conclude the study, each doctor took part in a final SSI (Appendix 16) which addressed the following objectives:

1. Usability of the PERFORM model in clinical practice
2. Usefulness of the PERFORM model in clinical practice
3. Identification of the most useful element of the study
4. Validation of the participant's current PERFORM model (following adaptation of the order in which the metacognitive facets are applied and selection/rejection/creation of PERs)
5. Suggestions for improvements to future PERFORM model programmes

Final SSIs were undertaken either face-to-face or via telephone, the latter being used as the best alternative when the doctor's availability was limited (Creswell, 2013, p. 164).

6.5. Data Collection Methods

Although many of the same *data-generating* methods were used across multiple phases of the study, the same data outcomes were not always *collected* (Table 6-2). The same denotation is used as per Tables 4-1 and 5-1 in the Exploratory and Pilot Phases, respectively: methods that did generate data which was used to address the phase objectives are indicated by an un-bracketed ‘tick’ ✓, whereas those methods which yielded data that was not collected and analysed are denoted by a bracketed ‘tick’ (✓).

Table 6-2: Methods used to generate and collect data at each stage of study ^u

Data Generating Method	Phase 1: Exploration	Phase 2: Pilot	Phase 3: Full Intervention
Semi-structured interview	✓		✓
Questionnaire		✓	
Simulation (video recorded)	(✓)	(✓)	(✓)
Think Aloud	✓	(✓)	✓
Reflective logs from participant			✓
Reflective accounts from researcher		✓	✓

6.5.1. SSIs and Think Aloud Commentaries

The researcher undertook the same data collection process pertaining to the SSIs and Think Aloud commentaries in the Full Intervention was followed as for the Exploratory Phase, including verbatim transcription and proofreading.

6.5.2. Reflective Logs from Doctors

During Stage 2 of the Full Intervention, the doctors submitted a reflective log of their application of the PERFORM model within real clinical practice. Reflective logs were either written or audio-recorded by the doctors and shared with the researcher via either email or the doctor’s online drive.

Although a Prompt Card (Appendix 21) was provided to the doctors to guide their reflections, the reflective logs were written/audio-recorded and transcribed by the researcher verbatim. A follow-up interview was conducted after each reflective log to gain further understanding of the ‘messy reality’ in which the doctors used their PERFORM models.

^u ✓ = data generated collected

(✓) = data generated but not collected for analysis

If the researcher had not received contact from a doctor for a few weeks, a polite email or text message was sent to check how they were progressing with the study in clinical practice and to address any questions that they might have.

6.5.3. Reflective Accounts from Researcher

Throughout the Full Intervention, the researcher was actively engaged in its progression and reflected on issues that arose. Some reflections resulted in changes to the Full Intervention which required ethical and HRA amendment approval (Appendix 29) including the need for an additional consent form when members of staff were unintentionally recorded during in situ simulation during Stage 3.

6.6. Data Analysis Methods

As shown in Figure 6-4, the data collected in the Full Intervention was both qualitative and quantitative. Therefore, mixed method approaches of statistical and open-ended question analysis were used to address the phase objectives.

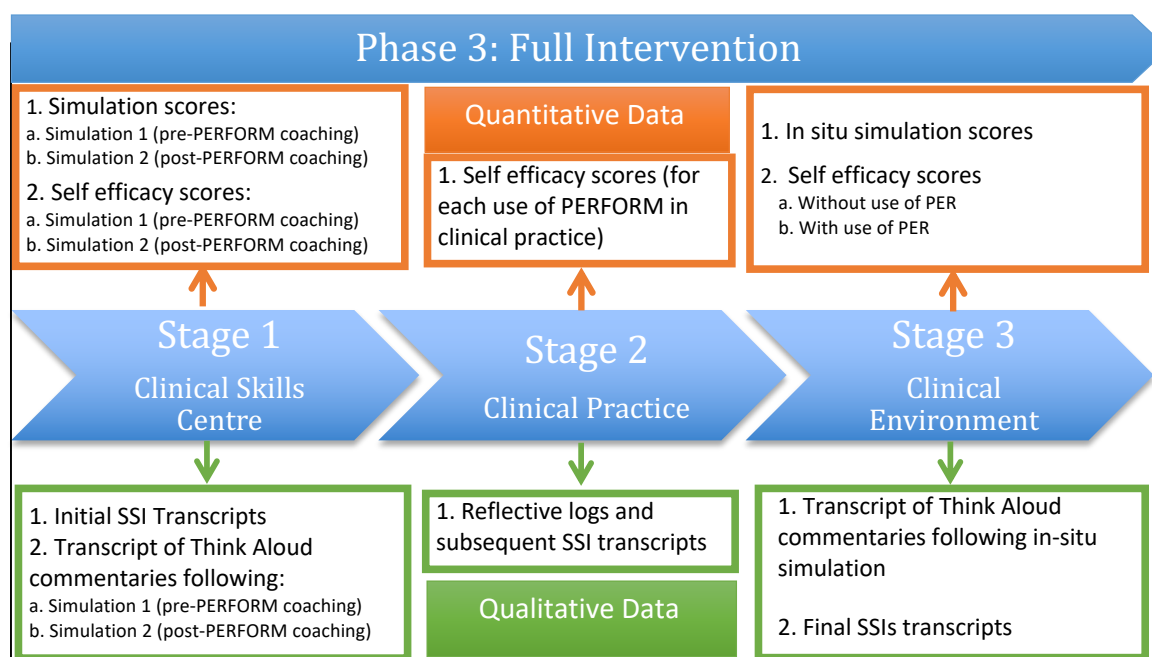


Figure 6-4: Type of data collected in Full Intervention Phase

Table 6-3 summarises how each of these types of data were analysed and how they related to answering the research questions. The table and the two figures use the same colour-coding scheme, where data surrounded by an orange border is quantitative data and a green border surrounds qualitative data.

Table 6-3: Summary of data collected, analysis and relevant research question

Data Collected	Method of Analysis Used	Research Question This Addresses
Initial SSI Transcripts	Thematic analysis	1. Do Junior Doctors experience negative emotions and behaviours during acute patient care? a. Do they possess coping strategies? b. If so, what are these?
Self-efficacy scores following in situ simulation (0-100 scale) <ul style="list-style-type: none"> • Before PER applied • After PER applied 	Statistical tests: <ul style="list-style-type: none"> • Overall change in self-efficacy with/without PER • Effect of variables on change in self-efficacy: <ul style="list-style-type: none"> ○ stage of training ○ place of work 	2a. Does self-efficacy of controlling target emotions/behaviours improve?
Think Aloud Transcripts from: <ul style="list-style-type: none"> • Stage 1 • Stage 3 	Metacognitive Framework analysis	3. How does the application of the PERFORM model by participants align with the original conceptual PERFORM model?
Reflective logs and Stage 2 SSI transcripts		
Final SSI Transcripts	Simple count: frequency of agree/disagree with whether conceptual model translates to real practice	
	Thematic analysis of popular elements of study and potential improvements	4. What are the perceptions of the participants using the PERFORM model? a. Which are the most useful elements of the complex intervention? b. When would be its optimal timing for implementation within training? c. How could the study/coaching programme be improved?
	Count and apply ordinal scale to elements of study reported to be most useful Count frequency of most commonly suggested time during medical training to introduce PERFORM	

Each of the data analysis strategies will now be discussed in turn.

6.6.1.1. Thematic Analysis

In the Exploratory Phase thematic analysis was used to analyse both the SSI and Think Aloud commentaries but in the Full Intervention Phase, the latter was analysed using framework analysis.

The analysis of the initial SSI (Stage 1) was largely approached via the same inductive thematic analysis strategy used in the Exploratory Phase, outlined by Braun and Clarke (2006), with the additional integration of a two hybrid framework analyses. The reason for this was because during the cyclical reviewing and refining of themes Figure 4-3 of the initial SSI familiar ideas began to emerge from the data.

The final SSI (Stage 3) data was analysed using a thematic approach (without integrated framework). However, the data collected within this SSI relating to the most important elements of the study and the optimal timing of a PERFORM-style intervention within medical training were not only thematically analysed, but additionally accumulated and presented in a statistical way i.e. counting and ranking the frequency of a common answer.

6.6.1.1.1. Hybrid Thematic/Framework Analysis

The use of a hybrid approach of deductive framework analysis and inductive thematic analysis is considered to increase the rigor of qualitative methods in medical education research (Fereday and Muir-Cochrane, 2006). Two hybrid frameworks were integrated into the thematic analysis of the initial SSI; one relating to *Coping Strategies* and the other to *Cognitive Effects*. During analysis of the initial SSI the data relating to each of these topics resonated with published medical education literature. Prior knowledge of this literature was likely to influence the coding of the data, even at a subconscious level. Therefore, a structured published framework was adopted and integrated into the inductive thematic analysis. Drawing and building upon previous literature on similar and/or overlapping topics aimed to avoid unnecessary confusion by not 'reinventing the wheel'. The *Coping Strategies* and *Cognitive Effects* frameworks were treated as individual analyses, independent of the remaining thematic analysis, and were developed and applied according to Rapley's (2011, pp. 274-275) summary of Ritchie and Spencer's (1994) 6-step framework analysis process.

6.6.1.2. Framework Analysis

Spencer and Ritchie (1994) first used framework analysis in large-scale social policy research but the method is now widely used in many other areas of research, including medical education (Gale *et al.*, 2013). Framework analysis can be *inductive*, where themes are generated from initial familiarisation with the data itself or *deductive*, where codes are pre-determined and based on literature, theory or

research questions. The three frameworks used in the analysis of the PERFORM study data adopted a deductive approach.

In the Exploratory Phase Think Aloud commentaries were employed to capture doctors' current emotions, behaviours and coping strategies at single time point. Contrastingly, Think Aloud commentaries in the Full Intervention (Stages 1 and 3), together with reflective logs (Stage 2), aimed to sequentially monitor each doctor's progression and individualisation of their PERFORM model over the 4 month study period. Therefore, the analysis of the Think Aloud commentaries and Stage 2 reflective logs in this final phase of the study adopted a more deductive approach, framework analysis, to specifically identify and subsequently analyse data relevant to the implementation of the PERFORM model and its facets.

The *Metacognition* framework was used to analyse the transcripts of the Think Aloud commentaries and Stage 2 reflective logs/follow-up SSIs. The framework was grounded in the theory of the conceptual PERFORM model, using each of its facets as an overarching theme.

6.6.1.2.1. Framework Approach Steps 1 and 2

Step 1 involved initial familiarisation with the data. This was followed by generating the thematic frameworks, the foundations and rationale of which will now be explained:

6.6.1.2.1.1. *Metacognitive Framework*

This framework was based on Efklides' (2008) metacognitive definitions to mirror those embedded in the conceptual PERFORM model. It was applied to the data to identify metacognitive descriptions used by the doctors pertaining to their emotions or use of strategies in the clinical environment. This enabled appreciation of both the progression of each doctor's own model throughout the study and also how closely their model related to the original conceptual model.

6.6.1.2.1.2. *Cognitive Effects (Integrated Hybrid Framework)*

During initial familiarisation of the data the themes explaining *how* cognition was affected by emotions and behaviours in the workplace resonated with the researcher's prior knowledge of Bloom's taxonomy of educational goals (1956). On reviewing the literature on this, Anderson *et al.*'s (2001; in Adams, 2015) revision of Bloom's taxonomy aligned best with the data and therefore was considered the most appropriate basis for the framework (Figure 6-5).

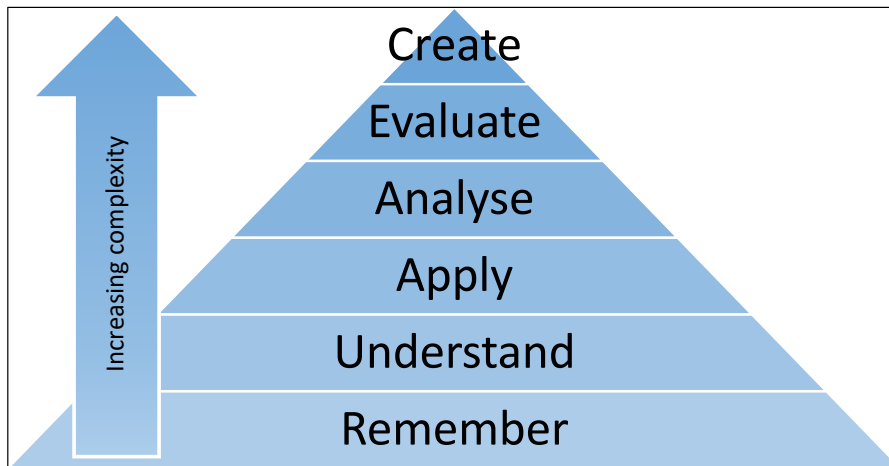


Figure 6-5: Summary of Anderson *et al.*'s (2001) revision of Bloom's taxonomy of educational goals (1956)

Bloom's revised taxonomy (Figure 6-5) was used to guide the naming and organisation of themes. Data was not forced into each level of the taxonomy and thus, not all of the levels within the hierarchy were reported in the final coding list.

6.6.1.2.1.3. Coping Strategies Used in Clinical Environment (*Integrated Hybrid Framework*)

In one of the first studies to explore newly-qualified junior doctors' coping strategies, Lundin *et al.* (2018) applied Gross' (1998) event-focussed emotional regulation model to categorise the identified strategies. This yielded a diverse and well-organised foundation through which their findings were clearly defined. Due to the similar research population and topic, it seemed appropriate to apply a similar framework to the PERFORM data with the addition of the category *Metacognitive skills* which was necessary to ensure comprehensive data categorisation.

6.6.1.2.2. Framework Approach Step 3

Following the selection of the three frameworks, each was applied deductively to the data (termed 'indexing') supported by the use of NVivo (version 12, QSR).

6.6.1.2.3. Framework Approach Step 4-6

The results of indexing were summarised in thematic charts. Alongside these, direct quotes were tabulated to demonstrate each top-level category.

6.6.2. Statistical Tests

The use of both simple, descriptive statistics and more complex analytical methods were used to answer the relevant research questions using the following data:

- Self-efficacy scores from the in situ simulation
- Multiple-choice elements of final SSI

6.6.2.1. Simple Descriptive Statistics

6.6.2.1.1. Frequencies

During the final interview each doctor was asked to identify the most useful element(s) of the study from the following set list:

1. Use of the Performance Enhancing Routine itself
2. Increased awareness of own feelings
3. The identification of the specific element(s) of acute care that induces the negative emotions/behaviours
4. The use of reflection post-scenario as a cognitive forcing strategy
5. Other suggestions from the participant

This data was collated, counted and displayed using a pie chart to demonstrate the most common responses and required no further statistical analysis. Similarly, data pertaining to the optimal timing for a PERFORM-style intervention within medical training was collated, counted and displayed on a timeline infographic.

6.6.2.1.2. Averages

Means or medians and their 95% confidence intervals were calculated for self-efficacy scores to compliment the results of the analytical statistics.

6.6.2.2. Analytical Statistics

Self-efficacy scores were collected at the end of the Full Intervention. Following the in situ simulation, the doctors gave a pre-/post-PER self-efficacy score regarding control over their target emotion or behaviour. To determine whether there was a statistically significant difference between these scores, the following flow diagram was used to select the most appropriate hypothesis test (Figure 6-6).

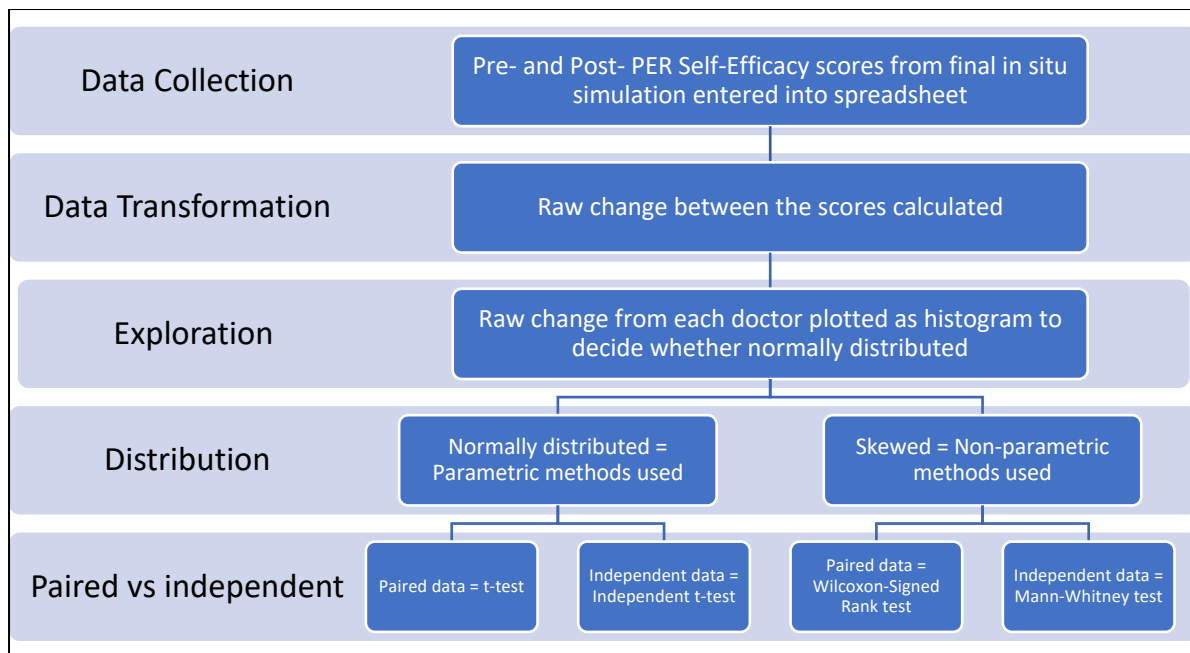


Figure 6-6: Hypothesis test selection flow diagram (Field, 2004) ^v

The appropriate hypothesis test was applied to the data within the statistical software SPSS (version 25, IBM). Where the hypothesis test yielded a statistically significant result appropriate post-hoc tests were carried out.

A multiple regression in the form of ANCOVA (**A**nalysis of **C**ovariance) was used to establish whether the in situ simulation change in pre-/post-PER self-efficacy score was affected by the doctors' training grade (F1 or F2), current work specialty/placement, place of work (DGH vs CTH) or gender.

^v Paired data refers to two measurements taken from the *same* subject. Unpaired data is taken from two *different* subjects

6.7. Results

This chapter presents the results from the Full Intervention Phase of the PERFORM study. Firstly, the doctors who participated in this phase as case studies will be described. Then the results of each stage of the study will be described sequentially. For each stage generalised descriptions from thematic and framework analysis and a concurrent vignette case study aim to deliver both a cohort and individual perspective.

6.7.1. Participants

The 12 doctors recruited to the Full Intervention Phase worked either in the DGH (Chesterfield) or CTH (Sheffield) and were Foundation Year 1 or 2 trainees (Table 6-4). They were engaged in the same 4-month-long rotation throughout the study activities, excluding 4 of the final SSIs which were completed within 2 weeks after placement changeover. They had all completed their medical training in the UK.

Table 6-4: Doctors enrolled in Full Intervention Phase

Doctor Code	Place of Work	Male (M) or Female (F)	Foundation Year 1 or 2 Trainee	Current clinical placement
C01	DGH	F	2	Accident & Emergency
C02	DGH	M	2	Critical Care
C03	DGH	F	2	Accident & Emergency
C04	DGH	F	1	General Medicine
C05	DGH	M	1	Gastroenterology Medicine
C06	DGH	F	2	Urology Surgery
C07	DGH	F	1	Upper Gastrointestinal surgery
S01	CTH	M	2	Medical education (with clinical locum shifts)
S02	CTH	F	2	Accident & Emergency
S03	CTH	F	2	Pulmonary Hypertension Medicine
S04	CTH	M	1	Respiratory Medicine
S05	CTH	F	2	Geriatric Medicine

Doctors were coded according to their place of work (C) for Chesterfield Hospital, (S) for Sheffield Teaching Hospitals and in numerical order of recruitment to the study. All doctors were able to complete the study in full. For anonymity purposes they will be referred to by their code throughout the thesis.

6.7.2. Time Frame

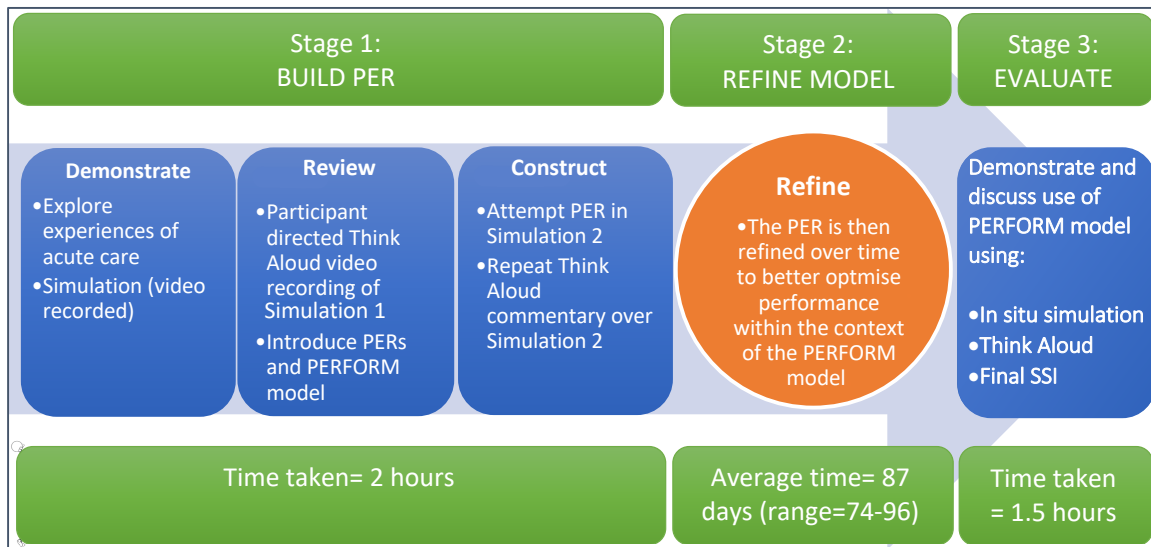


Figure 6-7: Outline of time frame of each stage of Full Intervention Phase

Figure 6-7 illustrates the time involved at each stage of the Full Intervention Phase. Stage 3 involved the in situ simulation, the Think Aloud commentary and final SSI. Cumulatively these lasted approximately 1.5 hours. However, there was often a delay between these three elements. The simulation took place during the doctor’s usual working hours and therefore it was deemed inappropriate to take more time out of their clinical duties immediately following this to complete the final discussions. Therefore, the Think Aloud commentary and SSI were held as soon as possible after the simulation, ranging from 0 days, i.e. completed later the same day, to 22 days later, having an average of 6 days.

No data was collected for Doctor C02 during Stage 2 as they did not apply the PERFORM model in a real clinical situation and therefore did not generate a corresponding reflective log. Otherwise, data was collected on all doctors throughout each of the three stages.

6.7.3. Stage 1a: Initial SSI

The key topics of the initial SSI were:

- A: Are foundation doctors aware of their behaviours or emotions during real-life acutely unwell patient clinical scenarios?
- B: Do emotional or behavioural responses affect patient care?
- C: Do doctors recognise their metacognitive feelings?
- D: Do doctors use coping strategies in the clinical environment?

6.7.3.1. Qualitative Results

Analysis of the qualitative data from the SSIs was guided by the six stages set out by Braun and Clarke (2006).

6.7.3.1.1. Stages 1 to 5 (Recap)

As explained in subchapter 6.6 the use of thematic and framework approaches resulted in a final unified thematic map. Table 6-5 displays the first five tiers of this whereas Appendix 37 displays the full thematic map.

Table 6-5: Final coding list for the Stage 1 SSI

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	<i>Subtheme 4</i>		
1. Emotions and behaviours	1a. Advice from others					
	1b. Awareness	Yes	Affect	Positive emotions or behaviours Negative emotions or behaviours Mixture		
			Manifestation	Physical Physiological Psychological Mixture		
				Peak		
				Triggers or enablers	De-motional variables Promotional variables	
			No			
			1c. Impact	Clinical performance		How emotions affect cognition ^w
	How emotions affect management behaviours	Actions taken Inaction (freeze) Time management				
	Indirect clinical performance	Colleagues				Colleagues' expectations Colleagues' perceptions Influencing colleagues' emotions or behaviours Team dynamics
		Patient's perceptions				
	Self			Establishing a negative cycle Negative view of self Rumination		
		No effect		Changes process but NOT outcome Functional levels of stress Have to do SOMETHING		
	Not sure					
	2. Motivation to enter study	2a. Job		Current job		
				Future job		
		2b. Personal investment		Education and learning		
			Interest			
			Problems			

^w See section on Framework Analysis (6.6.1.2.1)

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	<i>Subtheme 4</i>
3. Personality	3a. Change	Through interview		
		Through work		
	3b. Traits	Anxious		
		Calm		
		Competitive		
		Controlling		
		Insatiable		
		Perfectionist		
		Pessimist		
		Under confident	Unconscious competency	
Worrier				
4. Simulation	4a. Non-authenticity	Assessment		
		People		
		Stress		
		Timing		
5. Strategies	5a. Barriers to strategies	Self	Lack of insight to trigger use	
			Never considered it	
			Too overwhelmed	
			Unsuccessful experience	
			Unsure how useful they might be	
		Situational	Lack of opportunity to try them	
	Lack of time to initiate or allow them to work			
	Loss of control, others taking over			
	5b. Current thinking about strategies	No	It'll get better with experience	
			Would like some strategies	
	5c. Knowledge of strategies	Yes	Strategies in use	Current strategies used in clinical environment Current strategies used in other circumstances
			Strategies not used	
			Successful	Dealt with negative feeling or behaviour
	5d. Outcomes of strategies	Successful	Improved clinical performance	Calm
				Feel better
				More comfortable
Reassures				
Unsuccessful		Doesn't work	Check not missing anything	
	Focus			
		Limited relief		

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	<i>Subtheme 4</i>
6. Work	6a. Learning through work	Feedback from colleagues		
		Observing others		
		Paradox of learning versus support		
	6b. Organisation	Part time		
		Preparedness		
		Rotations		

6.7.3.1.2. Stage 6: Reporting the Findings

The analysis of the SSI was representative of the data itself rather than being purposefully aligned to the specific SSI topics. Therefore, to address the SSI topics all relevant themes and subthemes were selected across the coding list (Table 6-6).

Table 6-6: Cross referencing of themes/subthemes to answer each initial SSI topic

Topic	Themes/subthemes used to address topic	Location within coding list (Table 6-5)
A: Awareness of emotions or behaviours during acute clinical scenarios	Entire subtheme 1b	<i>Emotions and Behaviours > Awareness</i>
B: Whether emotions or behaviours affect clinical performance	Entire subtheme 1c	<i>Emotions and Behaviours > Impact</i>
C: Recognition of metacognitive feelings during acute clinical scenarios	Subtheme 1b, subsection Metacognitive	<i>Emotions and Behaviours > Awareness> Yes> Manifestation> Psychological>Metacognitive</i>
D: Employment of any strategies to cope with emotions or behaviours	Entire theme 5	<i>Strategies</i>

The results in the following chapters are arranged by SSI topic. Each topic is introduced with a thematic diagram to aid orientation and quotes from the doctors demonstrate each theme/subtheme. Due to the volume of the interview transcripts, additional data pertaining to the Stage 1 SSI topics can be found in Appendix 38.

6.7.3.2. Topic A: Are foundation doctors aware of their behaviours or emotions during real-life acutely unwell patient clinical scenarios?

The results of each of the subthemes within the theme of **Awareness** (Figure 6-8) will be discussed in turn with the exception of the subtheme of *Metacognitive*, which will be discussed within Topic C.

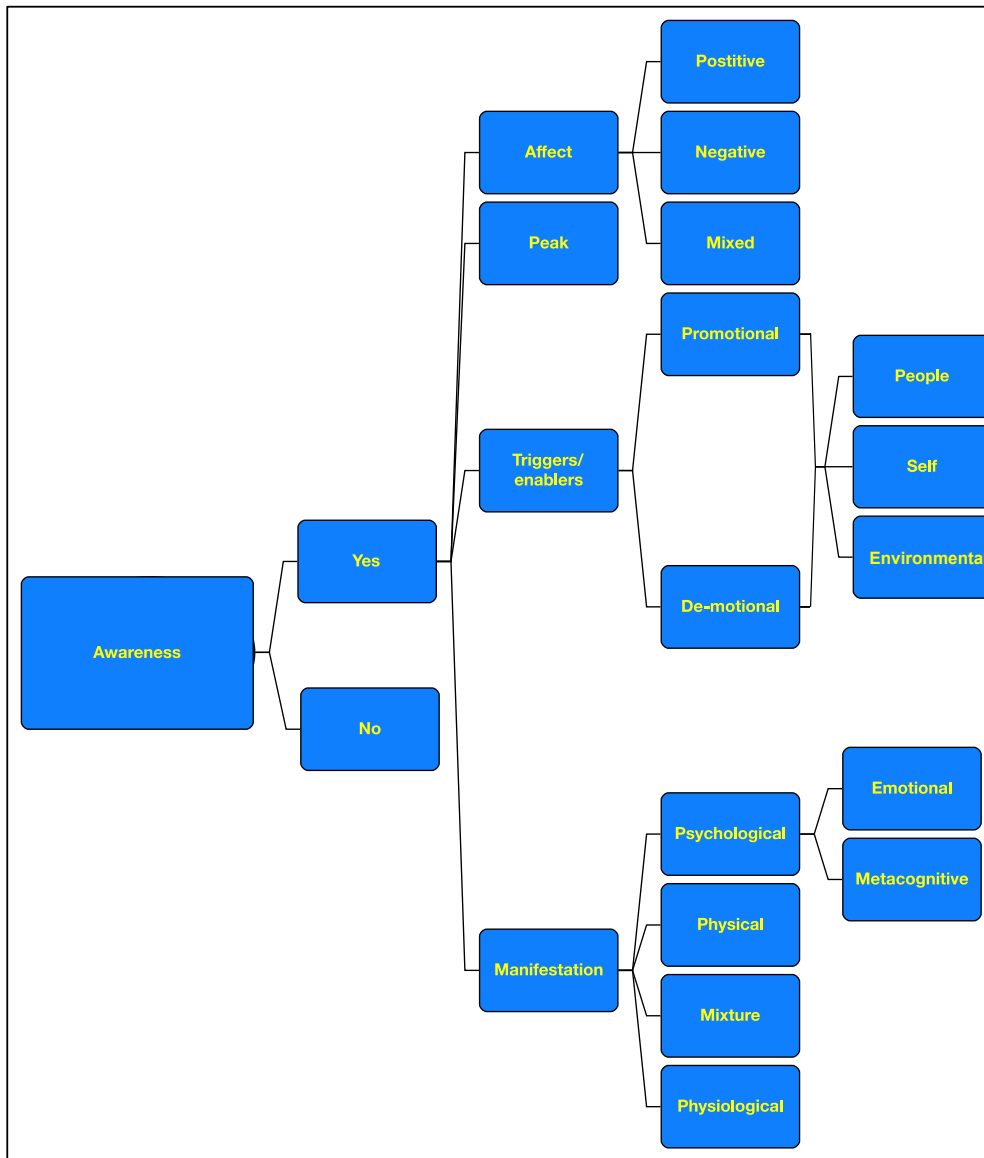


Figure 6-8: Thematic map: Overview of subtheme 1b. Awareness

6.7.3.2.1. Awareness of Emotion or Behaviour

All of the doctors recalled experiences where they had been aware of their emotions or behaviours during an acutely unwell patient encounter:

“Um I think the first time I saw someone who was um, sort of really unwell um, I think I was very aware of how out of my depth it was making me feel” (S04)

However, this was not true for every acute case that they had attended:

“N-yes, but no always...Whereas sometimes I know I have no idea- like I'm not even aware of it” (C02)

And sometimes these feelings were more evident following the conclusion of the event:

“mm, sometimes. Yes...Not always, until afterwards.” (C03)

6.7.3.2.2. Affect

The vast majority acutely unwell patient management experiences caused the doctors to experience negative affect:

“I suppose the only time I've noticed my emotions if I'm a bit, I guess scared yeah, so nervous or a bit worried about, y'know either feeling out of my depth or, just not quite knowing what I'm doing” (S01)

None of the doctors articulated acutely unwell patient management as an entirely positive experience. However, there was an appreciation of the fast pace of acute care which was perceived positively within the stressful situation:

“Erm, which is, one of the reasons people enjoy acute care IS...that, it feels good to be addressing what you know is an issue, but it's still fundamentally an uncomfortable feeling ... until you've resolved whatever it is” (C02)

6.7.3.2.3. Manifestation

A range of reactions to acutely unwell patient management scenarios were described which fell into psychological, physiological or physical categories.

The psychological or emotional reactions reported by the doctors ranged from very specific feelings of “worry” (C01), “stressed” (C02) and “scared” (S01) to more global feelings, like “freaking out” (S05) or “overwhelming” (S04).

Some were aware of physiological manifestations of stress, particularly sympathetic overdrive:

“I think err, I s-s'pose if you're asked to see an acutely unwell, patient you're first- well my first instinct is a little bit of like a surge of adrenaline” (C01)

Physiological symptoms included feeling “really hot” (C07) and palpitations:

"I guess you definitely feel your heart race a little bit" (S05)

One doctor acknowledged that they expressed their stress through altered physical behaviour:

"I know my eyes go quite wide, (laughs) which is quite weird" (C06)

6.7.3.2.4. Peak

Emotional or behavioural responses to stress were described to be most intense at the beginning of the acutely unwell patient clinical encounter:

"I think lots of the time it's when you first get there cos that's when you, sort of "oh this patient, doesn't look well at all" ..." (S01)

6.7.3.2.5. Triggers or enablers

Positive promotional enablers and negative de-motional triggers of emotional and behavioural responses during acutely unwell patient management were underpinned by the same broad categorical variables of *People, Situation* and *Self*.

6.7.3.2.5.1. People

The doctors articulated a preference to attend acutely unwell patients within a team rather than by themselves:

"...it very much depends on if I'm the first person in or not. I think if I'm-if I'm second or third in, I feel I'm a lot calmer and I feel much more-even if I end up sort of trying to lead the scenario...I feel much calmer, I feel like I can take a bit more time-stand back get a picture and then move in KNOWING something, erm...and allow the first person to do the panicking bit" (S05)

When the presence of a senior doctor was not possible, speaking on the telephone was a reasonable substitute to alleviate the doctor's concern:

"...when help eventually arrives or, y'know you speak to a senior you can feel a bit of relieve and a bit of reassurance" (S03)

Knowledge that a senior doctor was available was reassuring:

"...but actually you don't know what's next and you need a Reg(istrar) or a Consultant to come and help you out...and if you know that they're not far, and they're not inundated you feel more relaxed" (C02)

Knowing or expecting seniors to be unavailable induced negative feelings, even prior to senior help being required:

“...if there’s only one (Registrar) and they’re already-and I already know that they’re in A&E, HDU or something that I know they’re not gonna be able to help me, I think that already affects me before-if I’m go-being called somewhere” (C06)

Colleagues’ actions affected the doctors’ emotions and behaviours. Doctor S02 described their submission around seniors:

“...it’s kind of easier isn’t it, be like “oo, I can, just wait for them to tell me what to do”... (laughs) Panic over, someone else is here...(laughs) It’s their panic now.... yes I think it would be better if I did (use my initiative) cos sometimes it makes me feel a little bit like, useless like, standing like a spare part” (S02)

Communication difficulties also caused negative emotional and behavioural responses in the context of managing acutely unwell patients.

6.7.3.2.5.2. Self

Within the sub-theme of *Self*, both promotional and de-motional variables were further categorised into Experience, Knowledge and Expectations.

6.7.3.2.5.2.1. Experience

Doctors described managing acutely unwell patients as ‘uncomfortable’ learning environments:

“Erm it’s often quite daunting...because err at our stage we’ve not got a LOT of experience. So you can be worrying about whether you-what you’re doing is right or wrong?” (S03)

However, the need for such experiences was justified:

“I think that’d get easier anyway the more people you kind of, sort of treat as acutely unwell people” and “I think...just as I got more into the job I’ve just become a little more relaxed anyway” (S04)

6.7.3.2.5.2.2. Knowledge

Doctors articulated that they felt calmer if they were sure of the actions that they needed to take, whether that was due to diagnostic certainty:

“It depends what it is I think, so...if I feel it’s going somewhere that I recognise, so for instance if there’s blood everywhere I find that very easy...because I know what to do” (C05)

or how to manage the specific case:

"...if you've got a clear-clear something going on, like... severe chest pain, I actually find that very calming because you've got an idea of where you're going when you go in, erm and that focusses you" (S02)

The converse was also true. Doctor C05 described their "worry" over task prioritisation:

"...whereas when you're confronted with something vague...I find that harder, even though you know you SHOULD go for the airway cos you just still trying to have that first moment of "what is basically going on? Why is this person looking unwell?" rather than just getting on with the assessment." (C05)

Doctors were sometimes unsure whether their negative responses were always a consequence of how unwell the patient was:

"...it's difficult to differentiate if that's because, you just feel a bit out of your comfort zone or whether they are actually that unwell" (C03)

Doctors explained that their feelings might be a consequence of their clinical uncertainty due to "under confidence" (C05), insufficient knowledge "I kind of know this but NOT ENOUGH to, feel SAFE and secure in what I'm doing" (C02) or a lack of experience "...at our stage we've not got a LOT of experience...So you can be worrying about whether you-what you're doing is right or wrong?" (S03)

6.7.3.2.5.2.3. Expectations of Self

Doctors highlighted their own expectations of themselves regarding their ability to manage acutely unwell patients. The ideas of doing *something* and doing *everything* were identified within their responses:

"...when you're not DOING anything cos you're not sure exactly what to be doing, then I feel a bit panicked if I'm not doing something helpful" (S02)

Some doctors explained that they felt inadequate to undertake certain roles:

"I haven't come across a child in two years and all of a sudden I'm supposed to assess them and see they're okay to be kicked out the door...(laughs)...and like all of a sudden you kind of feel like "I am not qualified to do this"..."(S05)

6.7.3.2.5.3. Environmental

Doctors described how many environmental factors such as familiarity, time, logistics and complexity affected their emotional and behavioural response to acutely unwell patient management.

6.7.3.2.5.3.1. Familiarity vs Unfamiliarity

Familiarity of the patient, environment and clinical problem induced positive emotional or behavioural reactions during acutely unwell patient management:

“Erm, because if you already know the patient then obviously then you know a bit more about the (patient’s) background, like you might know that, there’s a plan from micro(biology) to escalate, antibiotics if they deteriorate or something...So...erm...so it’s always, it’s always NICER to be called to your own ward than to somebody else’s ward.”
(C04)

Contrastingly, unfamiliarity was associated with negative emotional or behavioural responses. A common example of an unfamiliar case was seizures, where Doctor C02 recalled that their first encounter caused them to *“kinda just freak out”* (C02).

Unfamiliar colleagues or teams also induced negative emotional responses during acutely unwell patient management:

“...(on nights) there’s not as many people around, and not-you know during the day it’s the team I work with so I know them whereas at night it might be a different Reg(istrar)” (C07)

The doctors described the cycle of unfamiliarity of each new clinical placement:

“...at the beginning of each new rotation...(...)...everything’s a bit more new and the problems are, are NEW problems, and the staff are new you don’t know them that well, and that kind of thing, so then it’s more heightened-by the end of the 4 months and when you’ve done it a few times and some of the same problems have come up and you therefore KNOW what you did last time, then you don’t get the same feeling, but then it’s-you just get to feeling a bit more comfortable and then you move to something new..(...)... it comes back again” (C03)

The doctors articulated a perceived knock-on effect of expectations from patients and staff around this change-over time:

“...when you start, really patients and other staff don’t know that it’s your first week, and so the people that’ve been in last week were at the end of their 4 months” (C03)

6.7.3.2.5.3.2. Time

Doctors described examples of what could be categorized as ‘bad days’, ‘long days’ and issues around unsociable hours. Both ‘bad’ and ‘long’ days, especially when leaving work later than expected, were perceived as detrimental to optimal acutely unwell patient management:

“Erm...if it's a-if it's a really bad day or some-if it's...erm...at a bad episode say when you're really tired or it's the end of the shift of whatever...erm then I think...it can HINDER your ability just to take a step back and think about what else might be going on in order to...move-move forward.” (C03)

Generally, the doctors described that working unsociable hours triggered negative emotions at three stages: prior to, during and after a shift. Prior to a night shift, Doctor C06 recognised that they “...already go into the shift with some dread in my head”. This subsequently compounded negative feelings triggered by an acutely unwell patient encounter:

“...so if something happens, it's (the negative feeling) already there. So it's EVEN harder to GET rid of it” (C06)

Additionally, unsociable shifts with low staffing levels caused anxieties for some of the doctors:

“on-call shifts is when you start to notice it cos the rest of the time there's loads of people around...and it's only with the-as the hospital empties out over night that I think you start to feel like that a little bit” (S01)

Some doctors found the completion of unsociable shifts disorientating:

“I find it difficult to sometimes switch it off...when you come away from work? Erm... So if you've, especially in A&E when you leave and it's, it's the middle of the night but it's still really bright (laughs) and it's like the-like the middle of the day, erm, to go home to a quiet house when everyone else is asleep (laughs)” (S03)

However, S02 articulated a different perspective to the rest of the doctors:

“I think when I've looked after patients on nights, erm weirdly I feel less panicky when I'm really tired and I can concentrate better?” (S02)

6.7.3.2.5.3.3. Logistical Problems

The doctors expressed frustration when equipment or treatment limitations hampered their ability to follow acutely unwell patient management guidelines:

"...when I can't do those things so if, y'know, bag of fluid straight away, if I can't DO that, that THROWS me a bit cos... I'm then struggling to...figure what to do next." (C05)

Likewise, the doctors explained that interruptions were detrimental to their flow of thoughts:

"...if I arrive to somewhere and I'm not entirely sure what I'm doing and then I'm interrupted, and things start becoming disjointed...my gut feeling is it's not going the right way and regardless of whether the patient's doing well or not I won't be performing at the level I don't think" (S05)

6.7.3.2.5.3.4. Complexity

Complexity was described by the doctors in different contexts. One example was the need to complete multiple tasks simultaneously:

"...as more and more things get added on, um, it-it became quite sort of "okay now I'm sort of just getting, overwhelmed- everything, I'm not sure I can make sense of, this situation" (S04)

In another example, complexity was described as facing clinical scenarios beyond one's competency:

"if it's a situation where I just felt like I didn't have the range of skills to deal with it I really felt, worried about it" (S05)

Complexity was also articulated when a single clinical encounter contained multiple negative triggers. The annotated transcript for Doctor C04 (Appendix 39) demonstrates sequential stressors of feelings of isolation, time pressure and expectations during the management of an acutely unwell patient.

6.7.3.3. Topic B: Do Emotional Or Behavioural Responses Affect Patient Care?

All of the doctors expressed the belief that their emotions or behaviours could affect acutely unwell patient management. The different subthemes arising from this will be discussed in turn (Figure 6-9).



Figure 6-9: Thematic map: How emotions and behaviours impact patient management

6.7.3.3.1. Direct Clinical Performance

Doctors stated that their clinical performance had been, or could be, affected by their stress responses during acutely unwell patient management either through interference with thought processes (cognition) or altered patient management behaviours.

6.7.3.3.1.1. Cognition

The doctors articulated how negative stressors in the workplace affected cognitive processing:

“I-I realise sometimes when I'm stressing out, and when I'm starting to feel kind of swamped and I know then that my mind's not working properly” (C07)

The doctors' explanations of *how* their cognition was affected aligned with Anderson's revision of Bloom's taxonomy (Bloom *et al.*, 1956; Anderson *et al.*, 2001), including the ability to remember, apply, analyse and evaluate information during acutely unwell patient management (see 6.6.1.2.1.2. Cognitive framework).

6.7.3.3.1.1.1. Remember

The most common cognitive effect reported by doctors during acutely unwell patient management was difficulty or failure to recall facts:

“My mind sometimes just goes a bit blank, so I don't really know, what I'm doing” (C07)

The ABCDE mnemonic is a cognitive aid designed to prompt the steps to take during acutely unwell patient management. However, the doctors recalled difficulties implementing the details *within* the ABCDE structure:

“...y'know even when you think it's Circulation, getting like cannulas and access in-I didn't even really think of that, at the time” (S04)

Some doctors explained that they had the necessary knowledge of the ABCDE cognitive aid, but could not always access it at the necessary time:

“Deep down I know that, it's in there somewhere...But in, y'know with adrenaline...erm that can cloud your judgement a bit sometimes can't it?” (S03)

6.7.3.3.1.1.2. Apply

When ABCDE knowledge *could* be recalled during acutely unwell patient management, its *application* was sometimes described as problematic.

(i) *Flow*

Many doctors recalled occasions where the right steps were taken, but often in “...less of a logical order” (C06). This was particularly true when initiating patient assessment or management:

“I just DID NOT KNOW where to even START, with that one.” (C06)

(ii) *Focus*

Similarly, sometimes cognitive overload caused uncertainty regarding how to prioritise:

“I think it’s the stress of the situation, you just...you have a million things rushing through your head and, don’t know which one to focus on” (S03)

Difficulties with focus caused subsequent problems with time management, which were detrimental to the time-critical situation:

“I’m quite scatty and inefficient in-in a sense I’d sort of think (gasp) “Oh no, I need to do that, but I need to do that as well” and then you kind of, don’t achieve anything, quick enough-like as quick as you would like” (S05)

(iii) *Focus and Flow*

Doctors explained that a lack of focus often caused difficulties with the flow of acutely unwell patient management. Distractions early in a patient encounter quickly led them down the wrong management pathway:

“...you’re taught ABC for a reason you should start with A - whereas if you’re confronted with something you’re not expecting, so you-you go in somewhere and there’s blood and you weren’t expecting it I tend to get DRAWN into that too quickly and then have to BACK off and start with my A, having gone the wrong way already” (C05)

6.7.3.3.1.1.3. *Analyse*

Emotional and behavioural responses during acutely unwell patient management affected doctors’ analysis of clinical information and could subsequently influence planning, problem solving and decision-making.

(i) *Plan*

Positive emotional reactions to a situation were perceived to aid construction of suitable plans prior to attending the patient:

“I think if you feel more calm and you feel that you can go into the situation...feeling like you have at least a slight PLAN or you know initially like the first steps you can take then erm it

makes it a lot EASIER to manage, and you can think a bit more CLEARLY about what you're gonna do?" (C01)

(ii) Problem-solve

The doctors reported that their problem-solving skills were hampered by their inability to think creatively beyond the guidelines being used:

"...if I'm noticing that I'm anxious about this patient or something then I DEFAULT to sort of that A to E and then I'll just do it in a very like standard way...(...)...if I'm worried about it I won't be actively thinking, "Oh could this be x-y-z? I need to do this-this this"...It's more almost like "B is breathing, I need to look the chest, have a listen, and check the obs" it's kind of just, it's kind of like a one-size fits all, sort of thing for every patient... So I'm not tailoring it to each, at the moment...just cos, just cos I think it's, um, when you're panicked you just sort of resort back to...(...)...making sure the basics are done" (S04)

In the above example, Doctor S04 described how they were limited to the 'remember' and 'apply' levels of cognition and were unable to take the next step to 'analyse'. They explained that the ABCDE approach was used to gather information, "relaying what I've got, or what I've found to...(...)...my senior" (S04) to allow their senior to make more sophisticated "fine print management" (S04) decisions.

(iii) Judge/Make Decision

The doctors explained that having 'distance' from the clinical problem improved clarity of thought. This was either a physical distance, for example when offering advice to someone else, or a time-delay from the initial problem:

"During my day-to-day job even I notice that...you know about, three four hours later and my mind's SO CLEAR...and I know EXACTLY what to do...or if there's y'know, if I was TEACHING or there was someone else asks me what my opinion would be...I'd be able to tell them fine....But then if I'M in that situation, no, it doesn't-it doesn't come across" (C07)

6.7.3.3.1.1.4. Evaluate

Doctors shared clinical examples in which their negative emotional or behavioural responses to stress may have impaired their evaluation of the situation. Doctor S03 identified the most serious consequence of failing to evaluate a situation appropriately:

"that poten-like in worst case scenario...(...)...I should be escalating treatment sooner...and potentially the patient might die" (S03)

6.7.3.3.1.2. Management Behaviours

Doctors expressed that their action, inaction and time management were affected by their emotional and behavioural responses during the delivery of acutely unwell patient management.

6.7.3.3.1.2.1. Action taken

Appropriate actions resulting from emotional or behavioural reactions during acutely unwell patient management included being prompted to call for senior help:

“I think that kind of, made me fall into my (laughs) panic a little bit, but also meant that I kind of got-I think I got help fairly quickly” (S04)

Inappropriate actions included calling for help prematurely. On reflection the doctor felt that they were capable of instigating some initial management by themselves:

“...probably call my seniors earlier than I should do to the point where I’m sort of like “oh, this is so silly, why didn’t I just do that”- I knew to do that” (S05)

Emotional and behavioural responses also led to initial misdiagnoses (incorrect action) or not completing a comprehensive assessment (incomplete action). For more details see Appendix 38.

6.7.3.3.1.2.2. Inaction

Doctors acknowledged that they ‘froze’ in a difficult situation, and subsequently this led them to “not really make any progress for a- for a few sort-of minute or so” (C03).

6.7.3.3.1.2.3. Time Management

Doctors most commonly attributed time mis-management to being inefficient. This was underpinned by cognitive difficulties with knowledge recall or focus:

“...if I’m really worried then I-yeah I think I do freeze up a little bit...(…)...and I don’t know if that just slows, slows the whole process down a little bit” (S01)

Contrastingly, the pressure to rush through patient management was deemed to have had further unwanted repercussions on management of their behaviours:

“I want to get things done as quickly as possible so maybe I’m not as thorough and I call a senior earlier in the process” (C07)

6.7.3.3.2. Indirect Effect on Clinical Performance

The doctors explained that emotional and behavioural responses during acutely unwell patient management not only impacted patient care, but also affected how they were perceived by colleagues, patients and themselves.

6.7.3.3.2.1. Colleagues' Perceptions

Doctor S02 articulated that often during acutely unwell patient management colleagues are *"WAITING for you to DO something"* and *"everyone's like "Why isn't she (the doctor) doing anything?"..."*. Failing to meet colleagues' expectations caused some doctors to feel *"a little bit incompetent"*.

Doctor C06 explained that colleagues had mirrored her behaviour in stressful situations, *"they were kind of copying what I did"* (C06). Similarly, Doctor S05 explained that if she expressed concern or uncertainty about how to manage a patient when working in a team, *"everybody gets a bit hanked up"* (S05).

The doctors articulated the need to retain control over emotional and behavioural responses in front of colleagues to aid team dynamics, *"I think you just, need a plan, you need to kind of not completely freak out"* (S05) because *"other people around you respond to that quite well if you're, if you appear a bit more calm"* (S01).

6.7.3.3.2.2. Patients' Perceptions

The doctors acknowledged that their emotions may have been noticed by patients:

"I don't know how sort of, calming I would come across to a patient (laughs) who's having- which is-which is another side of it as well, cos you need to be sort of, quite sort of reassuring and positive and not look like "Oh GOD this is bad!" (laughs)" (S04)

6.7.3.3.2.3. Perceptions of Self

The doctors expressed how their emotions experienced during acutely unwell patient management might affect them. For example, negative cycles of anxiety may become established in stressful situations:

"I think if I hear myself panicking, I probably become more panicky? Cos it feels like I've lost control of the situation" (S01)

Negative feelings continued if left unresolved and caused a hang-over effect later in the same shift:

"I would just have this feeling going on throughout the day I think that something wasn't right" (S04)

Negative feelings often spilled into the doctor's personal lives:

"...there have been a few times you know when you've woken up in the middle of the night and thought "oh no I should've done this, that and the other"...And, and you get really quite panicked then and, text whoever's on call" (C07)

Overall, many doctors had thoughts about themselves which aligned with 'imposter syndrome':

"I think yeah, for a very short time it was a bit, y'know, "Should I be here?" a bit like, y'know...I don't-I guess yeah, just cos I maybe thought I was struggling a little bit" (S01)

6.7.3.3.3. No effect/Not sure of effect

All of the doctors identified some elements of acutely unwell patient management that were affected by their emotional reactions to stress. However, a *"functional level of stress"* (C02) was also recognised:

"...although it's not PLEASANT to be feeling that stressed... In the moment I don't feel it THAT often hinders what I do...(...)... normally I still feel that I'm in a range that I am still able to do stuff (manage the patient)" (C02)

Similarly, despite the majority of the doctors' commenting that their ABCDE application when under pressure was sub-optimal, they conceded that they could at least *"get a blood gas or put a cannula in and get some fluids- I'd, I'd do SOMETHING"* (S02).

6.7.3.4. Topic C: Do Doctors Recognise Their Metacognitive Feelings?

The doctors were asked whether they were aware of a ‘gut feeling’ or a feeling that they couldn’t explain (non-analytical) during acutely unwell patient management. This resulted in descriptions not only of these *metacognitive feelings*, but also other metacognitive facets (Figure 6-10) through the application of the metacognitive framework (see 6.6.1.2.1.1. Metacognitive Framework).

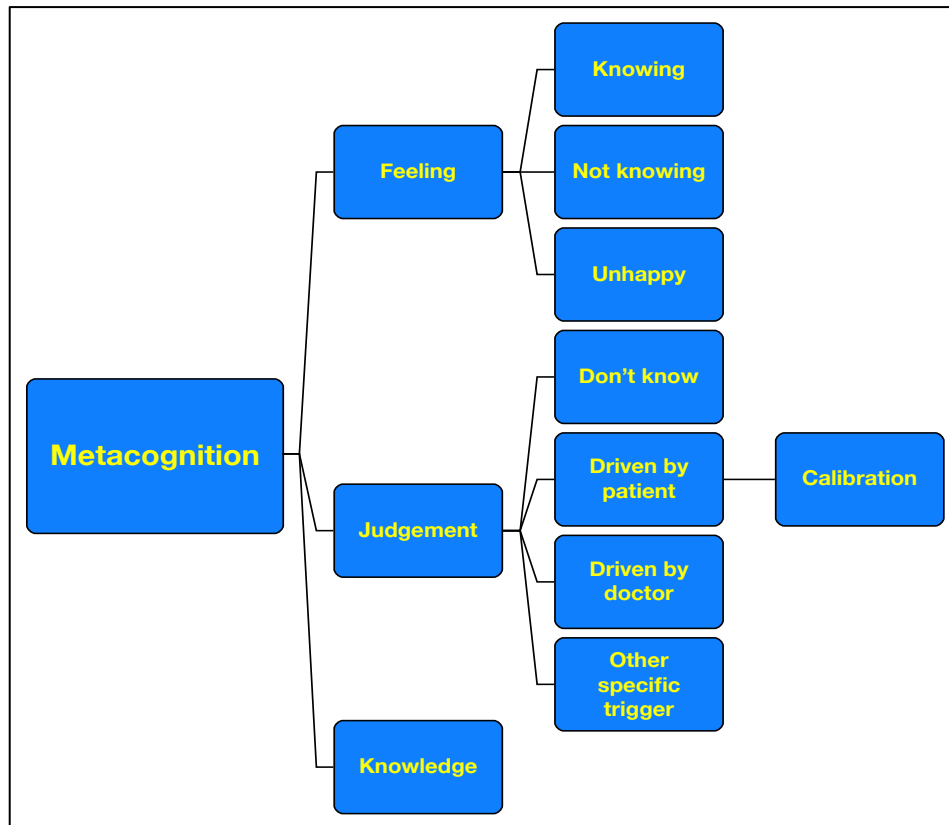


Figure 6-10: Thematic map: Metacognitive facets described during initial SSI

6.7.3.4.1. Metacognitive Feelings

The doctors expressed awareness of both positive and negative metacognitive feelings during acutely unwell patient management (Figure 6-11).

Positive	Negative	
Feeling of knowing/confidence	Feeling of not knowing	Feeling unhappy
<i>"sometimes you feel like "no no that's the right thing to do I'm happy with that"" (S05)</i>	<i>"I'm not entirely sure what I'm doing...things start becoming disjointed...my gut feeling is it's not going the right way" (C05)</i>	<i>"I'm out of my depth" (C01)</i>

Figure 6-11: Positive and negative metacognitive feelings

6.7.3.4.2. Metacognitive Judgements

The doctors articulated that they made metacognitive judgements about *why* they experienced metacognitive feelings during an acutely unwell patient encounter. Often these were due to their perceived level of knowledge, experience and/or confidence in managing the clinical problem:

“HC: Why do you get that ‘sinky’ feeling with the breathing (problem) patient?”

C06: I think because, as I said I've not had many jobs I'm not-I'd-I'd like to have had a respiratory job” (C06)

Metacognitive judgements were also used to evaluate their own clinical performance:

“I think I know very quickly in myself if I'm doing WELL and I know if I get that feeling I'll perform much better so on arriving on a scene if I feel like “oo, I'd said some clever things and I've managed to get the ABG first time” I'm IMMEDIATELY am then very focussed, whereas if I arrive to somewhere and I'm not entirely sure what I'm doing and then I'm interrupted, and things start becoming disjointed...my gut feeling is it's not going the right way” (S05)

At other times, metacognitive feelings were a reaction to how unwell the patient was. However, these feelings were not always assumed to be *accurate*. First-year foundation doctors appeared to be less trusting of their emotional responses due to their perceived clinical inexperience:

“I think I don't rely on it too much cos I feel like I'm still, quite, well still VERY junior” (S04)

Second-year foundation doctors articulated that their emotional responses during acute care were better calibrated to the patient's illness:

“I trust myself to walk into a patient and decide very quickly if they're unwell or not. Erm, I think I, I have a fairly good gut for if someone needs immediate management or if someone doesn't” (C05)

Sometimes the underlying reason for the metacognitive feeling was not identified:

“I don't know why I'm having this gut feeling” cos I do ask myself that question a lot like “what is my gut feeling?”...” (S05)

6.7.3.5. Topic D: Do Doctors Use Coping Strategies in the Clinical Environment?

Exploration of the strategies used by doctors to control their negative emotions and behaviours during acutely unwell patient management led to descriptions of their prior knowledge and application of strategies, their success or failure and potential barriers to strategy use (Figure 6-12).

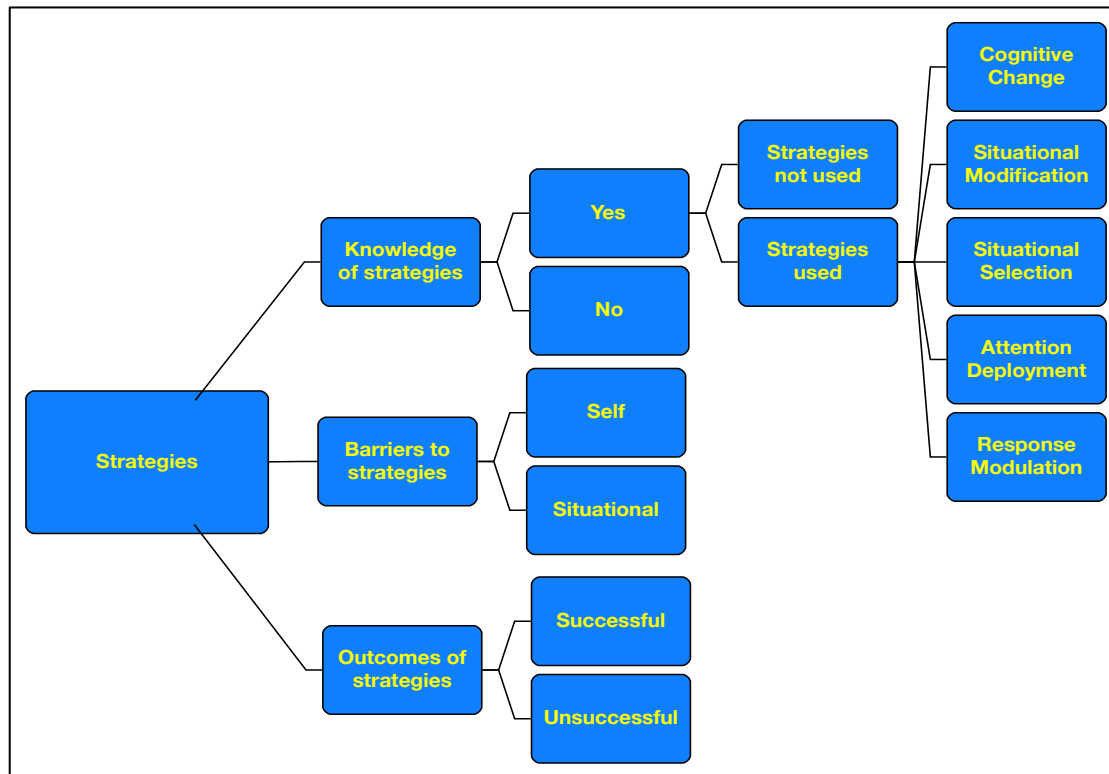


Figure 6-12: Thematic map: Strategies explained by doctors in initial SSI

6.7.3.5.1. Knowledge of Strategies

Many of the doctors had no knowledge of performance-optimising strategies prior to the PERFORM study. When questioned about the actions currently employed to manage any negative feelings or behaviours, Doctor S01 responded *“Erm...not a lot to be honest”*. Doctor S04 articulated prior knowledge of *“mindfulness and things like that”*, but lacked *“kinda ACTUAL strategy, in terms of ‘in the moment’ sort of thing”*. Furthermore, simply having knowledge of strategies did not necessarily equate to their application in the clinical environment:

“Erm, I don’t think I ever do these things...but these are things I’m aware of” (S01)

6.7.3.5.1.1. Strategies Used in the Clinical Environment

Table 6-7 uses the adapted version of Lundin *et al.*’s (2018) framework to display the strategies that the doctors used in the clinical environment prior to the study. Table 6-8 illustrates the relationship between the type of strategy used and the timing of its implementation within a clinical scenario.

Table 6-7: Framework using adaptation of Gross' (1998) emotional regulation (ER) model from Lundin *et al.* (2018) with example quotes from doctors

	Situational Selection	Situational Modification	Attention Deployment	Cognitive Change	Response Modulation	Metacognitive skills^x
<i>Definition</i>	<i>Choosing situation based on expected emotional response</i>	<i>Altering situation to modify emotional response</i>	<i>Focusing on specific aspect within task to shift emotional response</i>	<i>Alter thinking to change emotional response</i>	<i>Up/down regulating emotion by expressing, avoiding or suppressing</i>	<i>Use of metacognitive feeling or 'instinct' to drive change to in emotion</i>
Examples from Clinical Encounters						
Pre-scenario			FOCUS <i>"I start thinking like you know, I try to think "well, yes I have those other jobs, that's not important right now you know what's important is this patient...right here"" (C07)</i>	LIST <i>"I'd like think through the things that I have to ask when I get there so like, "Are they eating and drinking? How's the blood pressure? What's their urine output?"...So that when I arrive I've already got a list of things to do. (C04)</i>	BREATHE <i>"I try and calm myself, as I'm walking there... So that I can take more control of the situation... (...) I think I kind of tell myself "just breathe slowly" (C06)</i>	
Intra-scenario	DEFER <i>"Erm, maybe if I'm bleep-being bleeped excessively I'll just say you know "can you-is there anyone else you can bleep instead? I'm currently dealing with this...situation" (C07)</i>	GET HELP OR ADVICE <i>"if I have reached the limits of what I think I can do...then I'll got for some senior advice in some way" (S03)</i>	DISTRACT FROM EMOTION <i>"Erm...and then I think one-once I actually get there and I start DOING something, then I think about the thing that I'm doing rather than the fact that I feel anxious" (C04)</i>	COGNITIVE AIDS: ABCDE <i>"all the ABC stuff you do at uni? ...I'd write all of that down and then it kind of erm...well first of all it reassures me a little bit" (S02)</i>	DISTANCE <i>"I think sometimes I actually take myself away from the patient if it's stable enough to do that...in order to try and formulate my thoughts a bit more?" (C03)</i>	METACOGNITIVE JUDGEMENT <i>"But yeah I think use-yeah I just use that as y'know "am I out of my depth here?"...Erm, "do I feel like this is not going well, and need some help?"" (S01)</i>
Post-scenario			BUILDING KNOWLEDGE <i>"I think I-after that Friday I went, sort of over the weekend I went back and just read up on a lot of emergency type stuff." (S04)</i>		DEBREIF <i>"there's five of us in the flat...Um, and that's quite good for coming home and just, kind of, like either like getting everything off your chest, kind of a rant" (S04)</i>	

^x Additional category to original framework by Lundin *et al.* (2018)

Table 6-8: Frequency of quotes revealing different strategies at point of implementation

Number of strategies mentioned	Attention Deployment	Cognitive Change	Response Modulation	Situational Modification	Situational Selection	Metacognitive skills
Pre-scenario	2	3	2	0	0	0
Intra-scenario	3	8	3	6	2	2
Post-scenario	1	0	4	0	0	0
Total	6	11	9	6	2	2

The majority of the doctors applied current coping strategies *during* the management of acutely unwell patients (Table 6-8). The most commonly used intra-scenario strategies are explored in the colour-matched tree maps (Figure 6-13, Figure 6-14 and Figure 6-15), where the internal box size represents the strategy-frequency.

Cognitive Change		
<p>Re-focus</p> <p><i>“Erm, I try and step back and think from the top...If I feel like I’m, not comfortable...I give myself a bit of shake and...think from the beginning” (S03)</i></p>	<p>Headline</p> <p><i>“if I feel like I'm getting a bit flustered, I just have to be like “right, okay well what do you already know - right so they're 87 and they've come in with this, and they're on these antibiotics and, but they're still spiking” and, you have to sort of like stop and start again just to sort of sort things out, in your head” (C04)</i></p>	<p>Reframe through reassurance</p> <p><i>“like when I was on medical on calls, erm and then spoken to the Reg and like run it past them” (S02)</i></p>
<p>ABCDE</p> <p><i>“And you DO literally go through your ABCDE... And I guess if you’ve come to the end of that, erm...I don’t think you need to prioritise it as much because you, y’know you have a basic structure in your head I guess with the ABCDE.” (S05)</i></p>	<p>Motivational self-talk</p> <p><i>“I’ll say, in-in my head, “come on (says own name), think”” (S03)</i></p>	

Figure 6-13: Cognitive change strategies used intra-scenario

Response Modulation	
<p>Create distance from patient</p> <p><i>“Erm, that’s probably not a time efficient way of doing it but it, sometimes just moving away, being able to...think “okay right” and run through A to E of what I’ve done so far... helps me to formulate it a bit better... (...) ... So as long as they’re stable enough, then I usually just move away and it’ll-around the corner or, something just for a short time, I think” (C03)</i></p>	<p>Breathe</p> <p><i>“My mind sometimes just goes a bit blank, so I don't really know, what I'm doing, and I kind of TRY and take a breath back-a step back and breathe” (C07)</i></p>

Figure 6-14: Response modulation strategies used intra-scenario

Situational Modification	
<p style="text-align: center;">Seek Advice</p> <p><i>"I usually try and call for advice? That's probably how I cope. HC: Okay, and who-who would that be? CO1: Erm, it depends on the situation, so if I was on-call then it would probably be the registrar on-call, whoever's erm, but if I'm just on the ward then ask our senior-someone senior will probably just help me out. HC: Okay, and if you can't get hold of them, or if they're busy? Does that-has that ever happened? CO1: Yeah that has happened, erm just manage it as best I can, and then...a-and then try and get hold of someone else?"</i></p>	<p style="text-align: center;">Get help to attend</p> <p><i>"I need to be thinking about, getting someone else to come and help me" (S01)</i></p>

Figure 6-15: Situational Modification strategies used intra-scenario

6.7.3.5.2. Outcomes of Strategies

6.7.3.5.2.1. Successful

The doctors articulated that strategies were successful in two ways. They either modified negative emotions and behaviours, resulting in the doctors feeling *"calmer"* (S02), *"more comfortable"* (C06) or acted to *"reassure"* (S02, S04) them. Alternatively, they enhanced performance through improved focus and ensured that important clinical details were not overlooked.

6.7.3.5.2.2. Unsuccessful

Six of the doctors recalled employing strategies during a clinical encounter prior to the PERFORM study. Half of the doctors reported mixed success and half had never had a successful outcome:

"I kind of TRY and take a breath back-a step back and breathe, y'know but sometimes it just doesn't...really happen" (C07)

The doctors explained that some strategies had limitations in certain situations:

"...there are still situations where I know that the A to E WON'T be enough" (S04)

These limitations were further exacerbated when only a small range of different strategies were known, as explained by Doctor S05 when applying the ABCDE cognitive aid:

"S05: I think it definitely does (help) until you come to the point where you've been through it a couple of times and you realise that the patient's not getting any better (laughs)...And you're on your own and that's when you start to freak out a little bit more I guess..."

HC: Okay. So you get-so what do you do at that point?

S05: Erm...I-I think I probably just call a senior to be honest."

6.7.3.5.3. Barriers to using strategies in the clinical environment

The two main factors preventing the use of strategies in the clinical environment were categorised as *self* or *situational*.

6.7.3.5.3.1. Self

The doctors described being too overwhelmed by the experience or lacking the “*presence of mind to think “I’m panicking a bit here I need to do something to calm myself down then go in”...*” (S01).

They also lacked motivation to use strategies, particularly following previous unsuccessful implementation:

“HC: And you’ve tried, trying to take a step back and taking a deep breath...And how’s that gone? How’s that worked?”

C07: Not GREAT...I don’t think, but then as I say I don’t think I give myself enough TIME...And...I think sometimes I need more than just a STEP BACK...I need a longer period of time (laughs) you know”

6.7.3.5.3.2. Situational

Time pressure was identified as a common barrier to optimal strategy application:

“...if I’m rushed off my feet then I might not give it the amount of time it deserves” (S07)

Also, the doctors expressed discomfort about affording time to strategy implementation given the acute nature of the clinical situation:

“Cos, you know you get there and someone’s unwell you just think “I need to get on with this cos they’re unwell, don’t you?” (S01)

Limited exposure to the most acutely unwell patients reduced the opportunity to practice strategies:

“...they’ve (the patient) probably already been sorted out by the time I’ve ever got to see them” (C06)

6.7.3.5.4. Reasons for Failed Strategies

The results of Topic D outlined potential reasons for failed coping strategy employment. These are summarised in Figure 6-16.

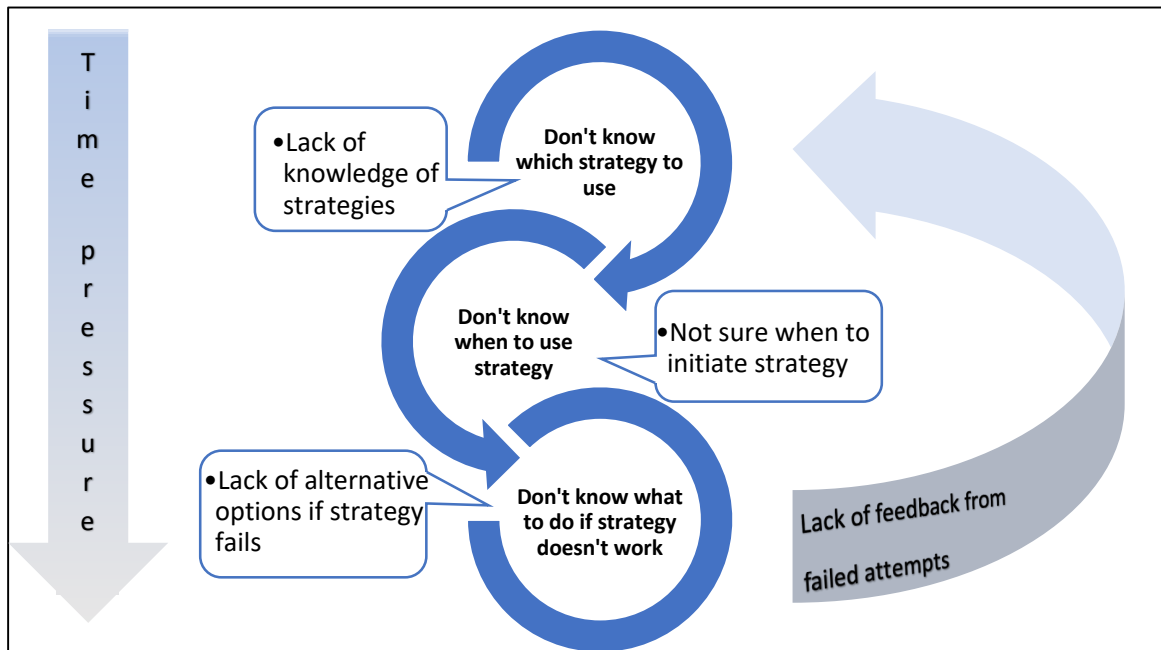


Figure 6-16: Reasons for failed coping strategy attempts

Figure 6-16 shows that prior to the study, the doctors experienced difficulty in applying coping strategies in clinical scenarios at one or more of the central cascading spirals. The first and third spirals both relied upon prior knowledge of strategies, which many of the doctors did not have. The second spiral represents the uncertainty of when to implement strategies, which was difficult for the doctors who, despite highlighting the peak of their negative emotions or behaviours *prior* to seeing the patient, employed more strategies *during* patient management.

Two compounding factors overarch the acutely unwell patient management situation. The first of these is the time pressure of the scenario, i.e. the vertical arrow in Figure 6-16, which may have caused the negative feelings in the first instance. The second factor is the failure to adjust or exchange an unsuccessful strategy leading to not generating feedback for future implementation, i.e. the curved arrow in Figure 6-16. Generally, when strategies failed the doctors deferred to senior support.

6.7.4. Stage 1b: Think Aloud Commentaries 1 and 2

The doctors completed Think Aloud commentaries 1 and 2 immediately prior to, and following the coaching of the PERFORM model, respectively. The metacognitive framework was used to analyse the data and identify the presence of, and relationships between, metacognitive facets. Steps 1 to 3 of the framework analysis process are recapped and stages 4 and 5 are described. Following this the results of both Think Aloud commentaries are presented.

6.7.4.1. Qualitative Results

The first three steps of framework analysis included data familiarisation, selection/generation of the framework and subsequent indexing of the data, as explained in subchapter 6.6.1.2.1.

6.7.4.1.1. Framework Approach Step 4: Coding List

In stage 4 of the framework approach (Ritchie and Spencer, 1994; in Rapley, 2011, pp. 274-275) the data generated from Think Aloud commentaries 1 and 2 was summarised in a coding list (Table 6-9 and Table 6-11, respectively). In these coding lists, each top-level theme represents a metacognitive facet from the PERFORM model.

6.7.4.1.2. Framework Approach Step 5: Cross-tabulation

Direct quotes from the doctors demonstrate examples at the level of *Subtheme 1* from Think Alouds 1 and 2 (Table 6-10 and Table 6-12, respectively).

Table 6-9: Coding list Think Aloud 1 (pre-PERFORM model coaching) ^v

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	
1. Metacognitive Feeling or Behaviour	1a. Behaviour	1a-1. Disorganised / lacking fluidity		
		1a-2. Inactivity		
		1a-3. Potential nervous 'tic'		
		1a-4. Suboptimal response to task		
	1b. Feeling	1b-1. Anger		
		1b-2. Confidence		
		1b-3. Discomfort		
		1b-4. Familiarity		
		1b-5. Knowing		
		1b-6. Not knowing		
1b-7. Nervousness				
1c. Physiological manifestation				
2. Metacognitive Judgement	2a. Patient	2a-1. Physiology		
	2b. Self	2b-1. Lack of Knowledge		
		2b-2. Under confidence	2b-2i. 'Bad run' with clinical task	
			2b-2-ii. Investigation interpretation	
			2b-2-iii. 'Second-guessing'	
	2b-2iv. Unsure			
	2b-3. Unfamiliar	2b-3i. Clinical problem		
		2b-3ii. Equipment		
	2c. Situation	2c-1. Inefficient		
		2c-2. Interruptions/distraction		
		2c-3. Lack of focus		
2c-4. Multi-tasking/overloaded				
2c-5. Pressure				
2c-6. Unsure whether senior input warranted				

^v ABCDE: Airway, Breathing, Circulation, Disability, Exposure

Sepsis 6: a cognitive aid to recall the investigations and treatments immediately necessary in suspected sepsis

SBAR: Situation, Background, Assessment, Recommendation- a clinical information handover tool

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	
3. Metacognitive Knowledge (PERs)	3a. Assistance			
	3b. Creating thinking time			
	3c. Priming			
	3d. Redirecting focus			
	3e. Reframing		3e-1. Established acronym	3e-1i. ABCDE
				3e-1ii. Sepsis 6
				3e-1iii. SBAR
	3e-2. Prioritisation			
	3e-3. Systematic approach			
3f. Verbalising thoughts		3f-1. Offload/share with assistant		
4. Metacognitive Skills (control and regulation)	4a. Success	4a-1. Avoided tunnel vision		
		4a-2. Increased/regained focus		
		4a-3. Reassured		
	4b. Failure			

Table 6-10: Cross-tabulation framework illustrating examples from Think Aloud 1

Top level theme	Subthemes					
1. Metacognitive Feeling/Behaviour	<p>1a-1. "...this is a bit scatter, scatter gun (laughs), "and then the chest and then the...and then this"... (S04)</p> <p>1a-2. "This is clearly a blank moment- that's where I stopped (laughs)" (S05)</p>		<p>1b-3. "So at this point, starting to become a little bit uncomfortable and, probably really-looking back would've asked for, or would-SHOULD'VE asked for a bit more help" (C05)</p> <p>1b-5. "Um...I felt like I knew what I needed to do" (S04)</p>		<p>1c. "...that's when I do notice it sometimes with, if I've got to put a cannula in, I'll notice I'm getting a bit sweaty... In-in a particularly difficult situation I think" (S01)</p>	
2. Metacognitive Judgement	<p>2a-1. "I was worried about oxygen sats not coming up" (C01)</p>		<p>2b-2i. "...even though I, like I've done them (ABGs) before and, um, I've been fine with them, I think at the moment if someone asked me to I'd be in my head I'd be thinking, "Okay I'm not going to get... with the pressure of the situation, I won't be able to get this one first time"... (S04)</p> <p>2b-3i. "I think I started getting more nervous at this point cos I thought "well is this cardiac then?" and I-I would feel less, confident managing, cardiac independently" (C05)</p>		<p>2c-2. "So I really HATE being interrupted- I don't like doing cannulas, I don't like doing anything-I WANT to do my ABCDE because, you miss things when you're interrupted" (C05)</p> <p>2c-5. "When they (the nurse) say "I've been trying to get hold of someone", you just think "argh!"....(...)...they're gonna need something quite, quickly or urgently and the fact that they've not got hold of someone means that, kind of I'm-I'm the last resort essentially. So I feel I do have to DO something" (C06)</p>	
3. Metacognitive Knowledge (PERs)	<p>3a. "...if that'd been a REAL life situation I'd be asking if y'know a healthcare assistant or someone could've come in just to squeeze that-squeeze that bag so the two of us are then free to do...everything else" (C07)</p>	<p>3b. "It's one of those sort of, slightly delaying tactics of, something to-to do to fill the time, whilst I'm also trying to think" (C03)</p>	<p>3c. "And when you said the short of breath was erm, was like the main complaint, I tried to -I tried to start thinking of causes of shortness of breath" (C04)</p>	<p>3d. "So I-I could like feel the same sort of nerves coming up then. I was just trying to focus on what it was that you were saying" (C04)</p>	<p>3e1-ii. "...that's ENGRAINED in me though so in a stressful situation I'd be able to pull, 'sepsis 6' out of...my, yeah my mind if I needed to" (S03)</p> <p>3e-2. "I'm gatherin' my thoughts and thinking "what's the MOST important thing that I need to do..." (S03)</p>	<p>3f1. "if you can offload those worries I think-I think it's probably unfair on the nurses it probably makes their job horrible but, I off load everything mentally that I'm trying to NOT think about" (C05)</p>
4. Metacognitive Skills	<p>4a-i. "So you can see yourself getting task focused when you watch it like this you suddenly... I'll keep remembering that that's what I've done and then, talking to the patient again" (C05)</p> <p>4a-2. "it was easy to get focused back on this (patient) and forget about that one that I'd just been on the phone about...I felt happy with the decision I'd made there, and that it was the right decision so, I didn't dwell on it too much" (S03)</p>			<p>4b. "So then at this point when I took my steth-my stethoscope off that was because I was like "Right, carry on with a-A to E, go back to that". But I still only really did B" (S04)</p>		

Table 6-11: Coding list Think Aloud 2 (post-PERFORM model coaching)

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	
1. Metacognitive Feeling or Behaviour	1a. Behaviour	1a-1. Disorganised / lacking fluidity		
		1a-2. Inactivity		
		1a-3. Potential nervous 'tic'		
	1b. Feeling	1b-1. Anger		
		1b-2. Calm		
		1b-3 Confidence		
		1b-4. Discomfort		
		1b-5. Familiarity		
		1b-6. Knowing		
		1b-7. Not knowing		
1b-8. Nervousness				
2. Metacognitive Judgement	2a. Patient	2a-1. Acute problem		
	2b. Self	2b-1. Lack of Knowledge/Recall	2b-1i. General 2b-1ii. Prescribing/Medication-related	
		2b-2. Under confidence	2b-2i. Specific clinical task 2b-2-ii. 'Second-guessing' 2b-2-iii. Unsure of diagnosis	
			2b-3. Unfamiliar	2b-3i. Clinical problem 2b-3ii. Equipment
				2c-1. Inefficient
		2c. Situation/Process	2c-2. Interruptions/distraction	
			2c-3. Lack of focus	
	2c-4. Multi-tasking/overloaded			
	2c-5. Pressure			
	2c-6. Unsure whether senior input warranted			
	3. Metacognitive Knowledge (PERs)		3a. Action	3a-1. Assistance
		3a-2. Breaths		
		3a-3. Use guideline		
3a-4. Physical movement		3a-4i. Clean glasses 3a4-ii. Clench fists		
		3a-5. Verbalising thoughts		
3a-6. Use task to create thinking time				

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	
3. Metacognitive Knowledge (PERs) <i>(continued)</i>	3b. Thought	3b-1. Count		
		3b-2. Motivational self-talk		
		3b-3. Negative thought blocking		
		3b-4. Priming		
		3b-5. Redirecting focus		
		3b-6. Reframing	3b-5i. Acronym	
			3b-5ii. Pragmatic approach	
			3b-5iii. Prioritising	
			3b-5iv. Systematic approach	
		3b-7. Trigger word		
3b-8. Visualisation				
4. Metacognitive Skills (control and regulation)	4a. Success	4a-1. 'Reset' themselves		
		4a-2. Achieved the task		
		4a-3. Avoided error		
		4a-4. Avoided tunnel-vision		
		4a-5. Cleared thoughts		
		4a-6. Created thinking time		
		4a-7. Gained control of situation		
		4a-8. In-action reflection or assessment		
		4a-9. Increased/regained focus		
		4a-10. Prompted next task		
		4a-11. Reassured/confirmed		
		4a-12. Not specific		
	4b. Failure			

Table 6-12: Cross-tabulated examples from Think Aloud 2 (post-PERFORM model coaching)

Top level theme	Subthemes		
1. Metacognitive Feeling /Behaviour	<p>1a-2. "So I think I was not quite having a freeze moment but having another moment here of trying to decide whether I wanted to carry on, with my examination or go off an do the ABG and the, cannula" (C05)</p> <p>1a-3. "I think I fidget a lot when I'm tryna think (laughs) –stethoscope on stethoscope off! Didn't realise I did that." (C06)</p> <p>1b-1. "So in my head now, I was thinking "Oh for god's sake, I should know this" and when I-as soon as I say that to myself" (C06)</p> <p>1b-2. "...MUCH better than the, CALMER than the last one, I think it-half of it was about allowing-like not being such a panic so...(....) you can take some time just to step back and think about what's going on...And like that-that can make you more effective" (C01)</p> <p>1b-3. "And I immediately forget about that phone call, cos I'm happy with the, advice I've given and I'm back in this scenario now." (S03)</p>		
2. Metacognitive Judgement	<p>2a-1. "I think I was-I was slightly more anxious but I think it's just because of the scenario, it's a lot more ACUTE. (C07)</p>	<p>2b-1ii. "I think I was doin' some of, the breathing again then...Cos I couldn't remember how much hydrocortisone to give" (C04)</p> <p>2b-2ii. "But I was second guessing myself at this point of, "should I be doing this?"..." (C05)</p>	<p>2c-1. "So at this point I think I was just wanted the cannula done as quick as possible cos I realised we'd taken some time out now" (C05)</p> <p>2c-3. "(using the breathing PER) I was actually tryna pay attention better...So I was tryna, focus on what I was being told, rather than erm sort of worrying about what I was about to do" (C05)</p>
3. Metacognitive Knowledge (PERs)	<p>3a-2. Yeah I took some breaths there because, he (the nurse in the scenario) kept asking me to prescribe things and I'm thinking "I-I don't have TIME" (laughs) but I thought "Okay, let's take some breaths" cos I don't wanna get angry with the, erm nurse as well (laughs)" (C07)</p> <p>3a-5.: "And I still think that sort of, explaining to the patient thing is as much for me as is it for them." (S01)</p> <p>3a-6. "It's (auscultating the patient's chest) kind of a bit of thinking time as well I think." (S02)</p> <p>3b-2. "So at this point I'm tryna-I TELLING myself that "I'm in control" (S03)</p> <p>3b-3. "I'm having to do the cannula, I had to kind of, switch-off the thoughts of being frustrated that I was doing it even though she unwell and just carry on, thought I'd share that point" (C06)</p> <p>3b-7. "Not IN the scenario, just beforehand I remember thinking "BREATHE" to myself, as id-cos...you told me about the trigger word thing... erm and that's not something that I've ever used but I thought actually that could be quite a good one to use" (C02)</p>		
4. Metacognitive Skills	<p>4a-3. "So I took a deep breath there (...)...Cos it-it...you're just like...not on the CUSP of doing something wrong...Not that I'm GOING to but I could do something wrong here so... like take a deep breath beforehand and just do it right." (C04)</p> <p>4a-8. "I think I still sort of dithered about a little bit I think, like you can see when I went over to the bloods and went back and, yeah, erm, yeah so I think like having just a, just a word in your head but I think also maybe...something I found useful was doing the breathing as well...Erm, so I did-I did it BEFORE I did the cannula just to kind of, take stock of what had been going on." (S04)</p> <p>4a-10. "So I think that's what prompted me to think "Right, so I've done this, so I need to call someone"...Which may've, probably would've still come, but might've been a little bit later" (S01).</p> <p>4b. "So I think if I'm gonna do it, it's worth like... HC: Being mindful. S01: Yeah. Cos I think just cleaning your glasses whilst you talking to them (the patient) ... Isn't gonna, isn't putting any of this into, effect is it?" (S01)</p>		

6.7.5. Stage 1: Case study

6.7.5.1. Introduction

Doctor S01 was a second-year Foundation Doctor working on an academic placement in Medical Education for the duration of their involvement with the study. They also undertook multiple locum shifts at the CTH and it was during these in which they applied their PERFORM model in clinical practice (Stage 2). To facilitate the in situ simulation in Stage 3, the researcher asked Doctor S01 to meet under the premise of an interview. However, on arrival they were asked to attend an ‘acutely unwell patient’.

This case study was chosen to:

- a. explore the level of engagement with the PERFORM study when doctors have limited clinical opportunities due to their current rotation and
- b. demonstrate how PERs created by the doctors fit with the conceptual PERFORM model.

Each of the objectives of the initial SSI will be discussed in relation to Doctor S01, followed by an example of the metacognitive facets described in their Think Aloud commentary pertaining to the first and second simulations, i.e. pre- and post-PERFORM model coaching.

6.7.5.2. Case Study Stage 1a: SSI

6.7.5.2.1. Topic A: Are Foundation Doctors Aware of Their Behaviours or Emotions During Real-Life Acutely Unwell Patient Clinical Scenarios?

S01 reported awareness of emotions or behaviours during the management of acutely unwell patients:

“I suppose the only time I’ve noticed my emotions if I’m a bit, I guess scared yeah, so nervous or a bit worried about, y’know either feeling out of my depth or, just not quite knowing what I’m doing”

Negative emotions manifested themselves in a behavioural way, making S01 “freeze up a little bit”. S01 explained that although there are lots of “things in my head”, they were aware that during clinical encounters they would be “just sort of stood there, staring”. When asked in the SSI, Doctor S01 denied having experienced physiological manifestations of these feelings. However, during the first Think Aloud commentary Doctor S01 recalled:

“...you know you were asking earlier about any sort of physiological signs...that’s when I do notice it sometimes with, if I’ve got to put a cannula in, I’ll notice I’m getting a bit sweaty...In- in a particularly difficult situation I think”

During clinical situations Doctor S01 was most aware of negative feelings caused by perceived isolation, uncertainty about how to proceed or when a clinical problem was more critical than initially thought:

“...if you get, called to something which, over the phone sounds not that serious and then you get there and then actually you realise that, this person was maybe a bit sicker than, than was let on, erm, and I think so that sort of like surprise element, catches you out a little bit”

Doctor S01 recalled feeling ‘isolated’ when working as a first-year Foundation Doctor, particularly when “you’re the first one there” in attending to acutely unwell patients. Despite this, Doctor S01 conceded that actually there is “always someone to call”:

“I think immediately when you get there, and someone’s quite unwell in front of you, it’s quite easy to just feel like you’re there on your own and, there’s no-one there to help you... I don’t think I was ever actually in a situation where I was isolated, it was just that immediate thought”

Having assistance, “even if it’s just another F1” was helpful to “bounce your ideas off each other” and “externalise what you’re thinking and try to work out what’s going on”.

Doctor S01 denied having awareness of negative emotions or behaviours during his undergraduate experiences nor his first placement after graduating as a doctor:

“I think not really at medical school, because, y-your never being called to see a really sick patient on your own at medical-so you might go and review the patient, but never someone that’s particularly unwell, and then I s’pose my first job was the community job so I didn’t really have it then, so it-I think it was really when I first got into the hospital on my second job”

For Doctor S01 on-call shifts triggered negative emotional and behavioural responses to acutely unwell patient management:

“...the rest of the time there’s loads of people around...And it’s only with the-as the hospital empties out over night that I think you start to feel like that a little bit”

6.7.5.2.2. Topic B: Do Emotional or Behavioural Responses Affect Patient Care?

Doctor S01 explained that although *“freezing up” “just slows, slows the whole process down a little bit”*, this did not necessarily affect the patient management outcome, *“I was still, y’know doing my full A to E assessment”*.

6.7.5.2.3. Topic C: Do Doctors Recognise Their Metacognitive Feelings?

Doctor S01 reported *“I can’t really explain what that feels like...you just sort of KNOW”*. They described experiencing this *“in the pit of your stomach”* during patient encounters when *“you just know if you’re doing something well or not”*.

During patient management, Doctor S01 would get a sense of *“I’m worried”* or *“I’m not worried”*, or *“I know what I’m doin’”, “I don’t know what I’m doin’”*. Doctor S01 reported more negative feelings than positive, *“I can’t explain the opposite side of it, I don’t know what it feels like when you know things are going right”*.

Doctor S01 confirmed that negative ‘gut feelings’ *“run alongside”* the feelings of being nervous, scared or *“freezing up”*.

6.7.5.2.4. Topic D: Do Doctors Use Coping Strategies in the Clinical Environment?

Doctor S01 created *“thinking time”* during his assessment of the patient assessment to evaluate whether he required senior input:

“... “am I out of my depth here?” and “do I feel like this is not going well, and need some help?”...”

Doctor S01 was aware of strategies that might manage negative feelings, but had never used them in practice:

“Well, they always talk to you about y’know, “take a deep breathing before you walk into the room” that sort of thing...Rather than going flying in...Erm, I don’t think I ever do these things...but these are things I’m aware of...And even just taking a minute just to sort of, just stop for a second.”

and explained the reason for this:

“I don’t think I’ve ever sort of had the presence of mind to think “I’m panicking a bit here I need to do something to calm myself down then go in...Cos, you know you get there and someone’s unwell you just think “I need to get on with this cos they’re unwell, don’t you?”

Doctor S01 suggested that there is probably sufficient time to implement coping strategies despite the urgency required to manage acutely unwell patients:

“...that’s one of the things you really learn in F1 that, you-you have a bit more time, not-not all the time obviously, but lots of the time you have a bit more time than you think so you can take things a little slower”

Doctor S01 also described coping strategies used outside the context of managing acutely unwell patients with regards to the importance of support in the workplace. Doctor S01 acknowledged that they had been fortunate with their placements during their first Foundation Year:

“I mean you get this from discussion with the other F1s, I think I’ve had quite a, lucky year in the sense that, I’ve been quite well supported all the way through... Y’know you hear horror stories about, y’know F1’s in certain departments that just feel really isolated, and then don’t feel they’ve got any senior support and, I think that would’ve been a very different year.”

Doctor S01 explained that for work-related problems support is best provided by people with a clinical background:

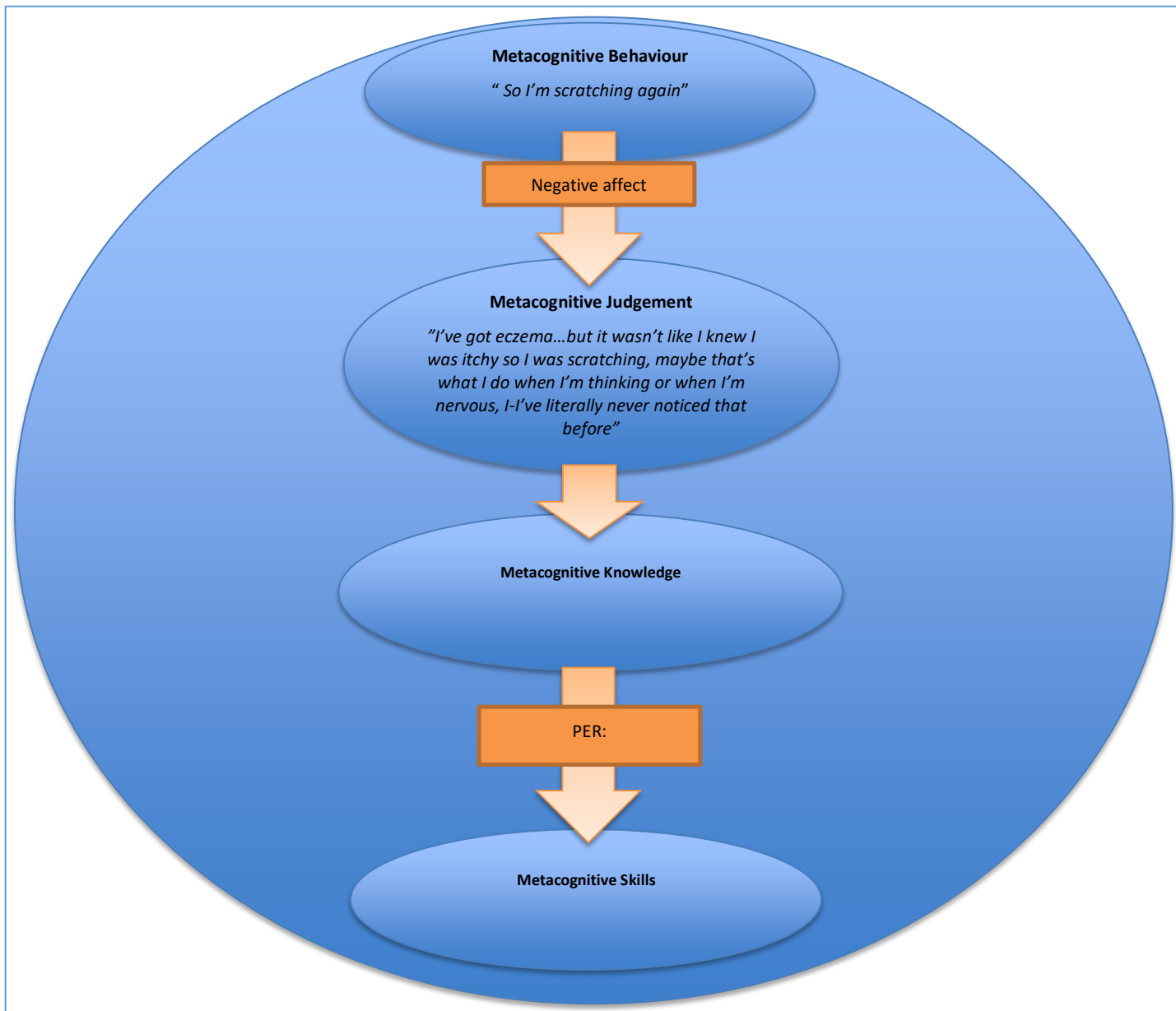
“...no-one in my family are medics so, they’re sort of good to moan to, but also, it’s quite hard sometimes because you have to explain lots of things and then it almost feels not worth moaning about...So, I do I’d-they-yeah they are useful and supportive, but I think probably in terms of, y’know specific medical things I find more support from colleagues, rather than, friends and family”

However, Doctor S01 considered that less support during Foundation training might improve clinical performance through greater independence:

“I don’t know if, people that feel like they didn’t have that support, sort of, by necessity are almost forced to, get better at managing y’know acute problems...because there isn’t someone they couldn’t immediately call-and I don’t know-don’t know if that’s, y’know that’s not the ideal way to train is it?”

6.7.5.3. Case Study Stage 1b: Think Aloud Commentaries

Doctor S01’s Think Aloud commentaries 1 and 2 are mapped to the PERFORM model using direct quotations (Figures 6-17 and 6-18, respectively). An editorialised summary of each metacognitive facet runs alongside.

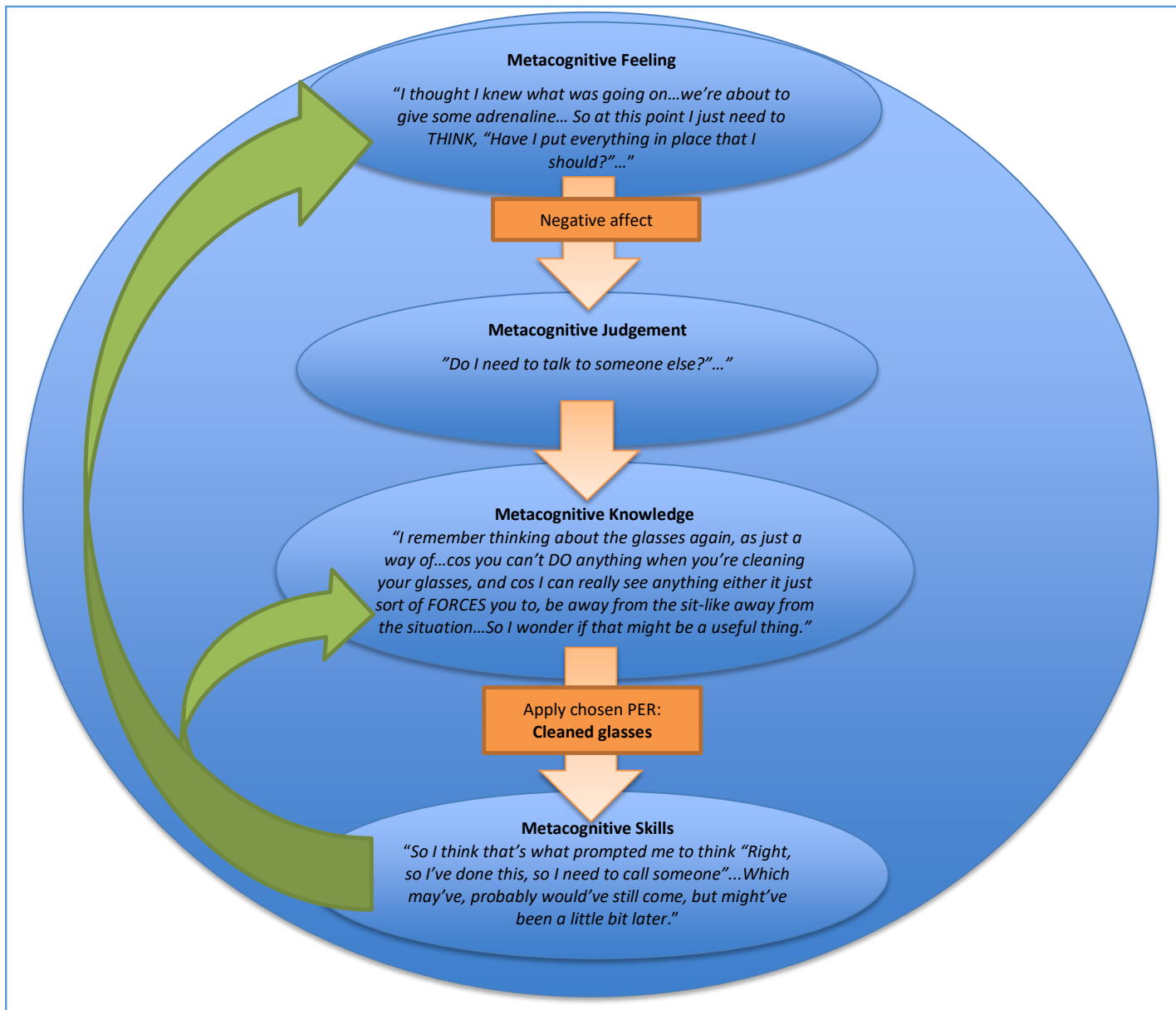


During the Think Aloud commentary following the first simulation, Doctor S01 noticed that they scratched their face or abdomen at multiple points throughout the scenario, which they were not aware of before watching the recording. This caused a negative affect.

Doctor S01 offered a judgement about why they were scratching and concluded that this was not due to their underlying skin condition but perhaps was a manifestation of their emotional state, i.e. being nervous.

In this example, no PER was selected from the metacognitive knowledge bank and therefore no metacognitive skills were required.

Figure 6-17: S01 Pre-PERFORM coaching example (TA1): Chest sepsis



Here Doctor S01 illustrated a feeling of 'not knowing' regarding whether they had done everything required prior to administering adrenaline to the patient, which caused a negative affect.

This feeling may have been driven by the consideration that since this is a severe reaction requiring adrenaline perhaps someone more senior should be contacted.

Doctor S01 used a PER that they created, removing glasses from their face, cleaning them and replacing them, to create some time to focus on deciding whether senior input was required.

After using the PER, Doctor S01 reported that the PER had prompted them to call for help earlier than they would have without the PER. This relieved the underlying concern (negative affect) and sent positive feedback into their metacognitive knowledge bank for future reference.

Figure 6-18: S01 Post-PERFORM coaching example (TA2): Anaphylaxis

6.7.6. Stage 1 Summary

The doctors interviewed were aware of their emotions or behaviours when managing acutely unwell patients. Generally, these were negative rather than positive and were perceived to influence clinical performance cognitively or through altered management behaviours. All doctors acknowledged the presence of metacognitive feelings during clinical encounters but strategies to manage these emotions lacked variety, were rarely successful and were unregulated.

The case study demonstrates how prior to the PERFORM model coaching, strategies and a regulatory framework were absent from the simulated clinical scenario. In the second simulation, immediately following PERFORM model coaching, the case study demonstrated the model through the different metacognitive facets and created and implemented their own successful PER.

6.7.7. Stage 2: Reflections of the PERFORM Model in Clinical Practice

The length of Stage 2 and number of patient encounters in which the PERFORM model was applied is shown for each doctor in Table 6-13:

Table 6-13: Duration of Stage 2 of Full Intervention for each participant

Doctor Code	Length of duration of Stage 2 (days)	Number of patient encounters
C01	96	5
C02	96	0
C03	88	2
C04	94	2
C05	85	2
C06	82	2
C07	86	4
S01	92	2
S02	86	2
S03	85	2
S04	79	2
S05	74	1 ^z
Mean (SD)	86.92 (SD 6.78)	2.17 (1.27)

6.7.7.1. Qualitative Results

The results from the reflections submitted to the researcher in Stage 2 are presented using the metacognitive framework, with an additional top-level theme pertaining to the doctors' reflections on the use of the PERFORM model itself. Also, Figure 6-19 and Figure 6-20 demonstrate the range of encounters in which the doctors applied PERFORM regarding the clinical problem and body system, respectively.

^z Not a specific scenario but reflected on how PERs used in general

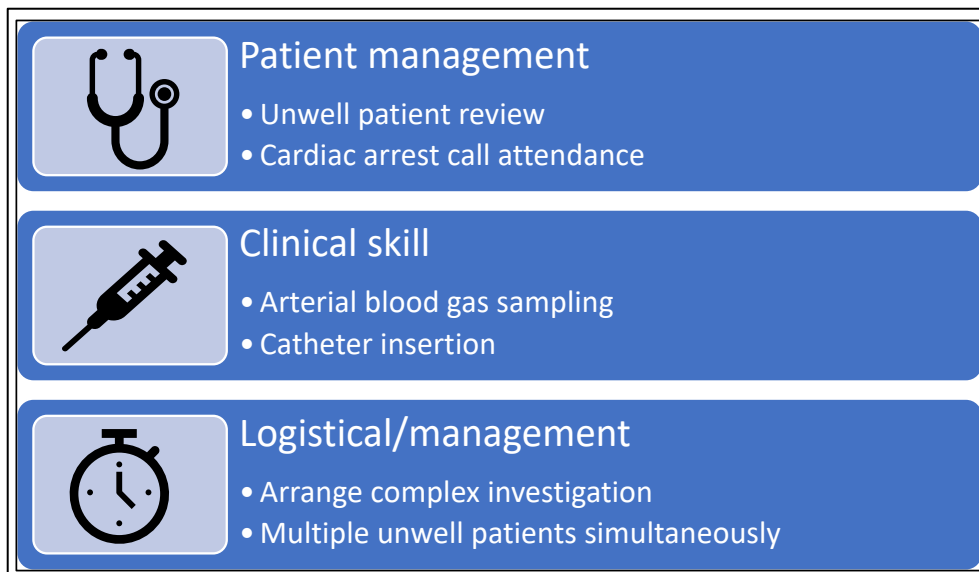


Figure 6-19: Types of clinical problem where PERFORM was applied during Stage 2

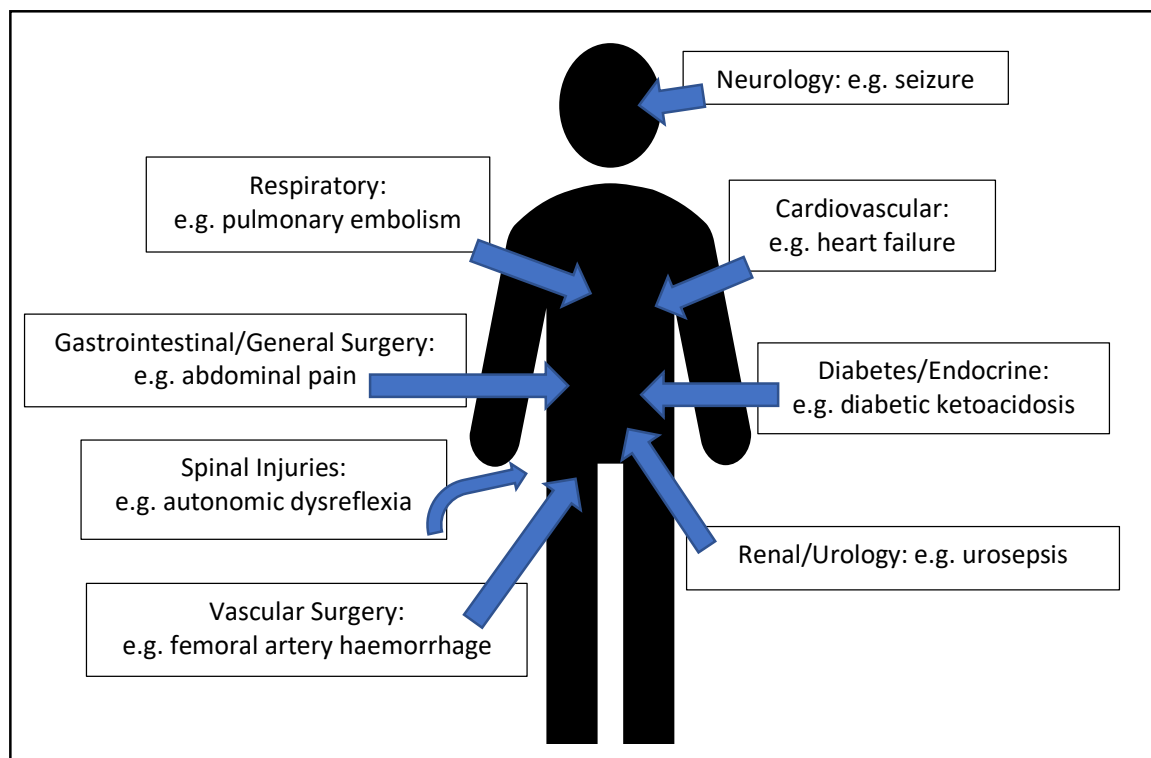


Figure 6-20: Range of body systems detailed in Stage 2 reflections

6.7.7.2. Metacognitive Framework Analysis of Reflections

Table 6-14 and Table 6-15 display the coding list and examples of the top-level themes from the Stage 2 reflections, respectively.

Table 6-14: Coding list Stage 2 Reflections

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	
1. Metacognitive Feeling or Behaviour	1a. Behaviour	1a-1. 'Huffing and Puffing'		
	1b. Feeling	1b-1. Anger		
		1b-2. Calm		
		1b-3 Confidence		
		1b-4. Discomfort		
		1b-5. Excitement		
		1b-6. Nervousness		
		1b-7. Not knowing		
		1b-8. Panic		
		1b-9. Relief		
		1b-10. Worry		
2. Metacognitive Judgement	2a. Patient	2a-1. Acute problem		
		2a-2. Familiar problem		
		2a-3. Prior knowledge of patient		
		2a-4. Very unwell		
	2b. Self	2b-1. Lack of Knowledge/Recall		
		2b-2. Personality trait		2b-2i. 'People pleaser'
				2b2-ii. Worrier
		2b-3. State		2b-3i. Not eaten/drunk all day
		2b-4. Suboptimal response to situation		2b-3ii. Tired
	2b-5. Under confidence		2b-5i. Specific clinical task	
	2c. Situation/Process			2b-5-ii. 'Second-guessing'
				2b-5-iii. Unsure of diagnosis
		2b-6. Unfamiliar clinical problem		
		2c-1. Assistance available		
		2c-2. Colleagues panicking		
2c-3. Colleagues unavailable				
2c-4. Inefficient				
2c-5. Lack of focus				
2c-6. Multi-tasking/overloaded				
2c-7. Pressure				
2c-8. Unsure whether senior input warranted				

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>
3. Metacognitive Knowledge (PERs)	3a. On-line knowledge: which PER to apply	3a-1. Automatic/not conscious choice	
		3a-2. Belief that it will work	3a-2i. Positive previous experience
		3a-3. Suitable for problem	
		3a-4. Had enough time	
		3a-5. Inconspicuous	
		3a-6. Most appealing	
		3a-7. Seen to be only option	
		3a-8. Try it out	
		3a-9. Active rejection of PER	3a-9i. Not suitable for problem
	3b. Action	3b-1. Assistance	
		3b-2. Breaths	
		3b-3. Clean glasses	
		3b-4. Create distance	
		3b-5. Modifies behaviour	
		3b-6. Note making	
		3b-7. Smile	
	3c. Thought	3c-1. Count	
		3c-2. Motivational self-talk	
		3c-3. Priming	
		3c-4. Redirecting focus	
		3c-5. Reframing	3c-5i. ABCDE 3c-5ii. As if advising someone 3c-5iii. 'Take step back' (globalising)
3c-6. Trigger word			
3c-8. Visualisation		3c-8i. Environment 3c-8ii. List of actions to take 3c-8iii. DOING the tasks	
4. Metacognitive Skills (control and regulation)	4a. Success	4a-1. Self	4a-1i. Cleared thoughts
			4a-1ii. Created thinking time
			4a-1iii. Gained control of situation
			4a-1iv. Increased autonomy
			4a-1v. Increased confidence
			4a-1vi. Increased/regained focus
			4a-1vii. Motivated
			4a-1viii. Prevented rumination
			4a-1ix. Reassured/confirmed
			4a-1x. Recalled knowledge

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>
4. Metacognitive Skills (continued)	4a. Success (continued)	4a-2. Task Process	4a-2i. Formulated plan
			4a-2ii. Increased efficiency
			4a-2iii. Prevented situation escalating
			4a-2iv. Prompted next task
		4a-3. Task Outcome	4a-3i. Achieved the task
			4a3-ii. Avoided error
	4a-4. Not specific		
	4b. Failure	4b-1. Unsuccessful use of PER	4b-1i. Didn't help specific problem
			4b-2ii. Didn't help at all
		4b-2. Subsequent action	4b-2i. Abandoned PERFORM model
4b-2ii. Chose alternative PER			
5. Reflections on the model	5a. General effects of PERFORM model	5a-1. Self/personal	5a-1i. 'Feel better'
			5a-1ii. Calmer
			5a-1iii. Increased self-awareness
			5a-1iv. Less worried
			5a-1v. More 'in-control'
			5a-1vi. More confident
			5a-1vii. No change/don't know
		5a-2. Patient interaction	5a-2i. Appear more professional
			5a-2ii. Better communication with patients' family
			5a-2iii. Improved rapport and trust
		5a-3. Clinical Performance	5a-2iv. More reassuring to patients
			5a-3i. Decreased error/cognitive bias
			5a-3ii. Improved reflective practice.
			5a-3iii. More efficient
	5a-4. Colleagues	5a-3iv. More independent	
		5a-3v. No change/don't know	
		5a-4i. Better communication	
		5a-4ii. Better cooperation/team-working	
		5a-4iii. More supportive/reassuring	
	5b. Supporters/barriers to use of model	5b-1. Effort to apply PER/model	5a-4iv. No change/don't know
			5b-1i. Conscious, purposeful
		5b-2. Supportive factors	5b1ii. Natural/automatic
			5b-2i. Colleagues present
		5b-3. Barriers	5b-2ii. Seniors available
			5b-3i. Lack of opportunity
			5b-3ii. Missed opportunity
			5b-3iii. Not affording it enough time

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>
5. Reflections on the model <i>(continued)</i>	5c. Individualisation of the model	5c-1. Specific applications/limitations	5c-1i. Experience/knowledge-based
			5c-1ii. Level of stress/anxiety
			5c-1iii. Location-based
			5c-1iv. How unwell patient is
			5c-1v. Time available
			5c-1vi. Task-specific
			5c-1vii. No limitations
		5c-2. Plans for future application	5c-2i. 'Take it as it comes'
			5c-2ii. Different PER
			5c-2iii. Same PER again
			5c-2iv. Modify PER
			5c-2v. Reject PER

Table 6-15: Cross-tabulated examples from Stage 2 reflections

Top level theme	Subthemes		
1. Metacognitive Feeling /Behaviour	<p>1a-1. "I kind of don't like myself when I get stressed so probably, so maybe huffing and puffing I don't think I MEAN to do it...I think I probably do it subconsciously but you know just sighing really loud" (S03)</p>	<p>1b-5. "I think I was a bit excited as well just cos I, I'm on patient week...So I might get a bit erm, a bit like a good, maybe a good feeling, not-not only a negative feeling" (S02)</p> <p>1b-7. I think, I think probably when I'm feeling overwhelmed like, "What the hell?!" (laughs) "What's going on?" ... like I don't, I don't "Where do I start...Or erm, "I don't know what's going on"-yeah "Where do I start?" I guess." (C01)</p> <p>1b-8. "I always feel panicked? Everyone feels panicked when someone's seizing?" (S02)</p>	
2. Metacognitive Judgement	<p>2a-3. "...the haematemesis was a patient that I KNEW, it was one of mine-I saw them during the...(.)...overnight on-call it was a patient that I knew very well erm, and I-so I was probably expecting, erm it from him, so I felt relatively, calm going to see him" (C05)</p> <p>2a-4. "...that was right when I went to go and see the patient, um, you just got-it was just that gut feeling of like "This person's really unwell"..." (S04)</p>	<p>2b-1. "I hadn't like handled a renal transplant patient before?...Erm and, erm only vague memories from medical school of what, in-like what to look for, what's involved" (C01)</p> <p>2b-3i. "I got a drink of water, I think I had a biscuit cos I hadn't eaten all day" (C07)</p>	<p>2c-2. "Yeah that was the first thing I thought because everyone else as panicking around me and I think I easily get swept up in a panic, so I though "Okay, calm"..." (C07)</p> <p>2c-3. "Erm, and it was a bit-it was a bit of an awkward time cos it was sort of, right before handover was due to happen, HC: Yeah. S04: Um so I was quite aware that people were, there wouldn't be anyone really, AROUND" (S04)</p>
3. Metacognitive Knowledge (PERs)	<p>3a-2i. "cos it worked so well the last time" (C07)</p> <p>3a-3. "it's more, performing a skill, so I think, I -it was that feeling of "well I know it's (the artery) NEAR here" (laughs)...it's near, so let's try and visualise it"..." (C03)</p> <p>3a-5. "when you're sort of in a conversation with someone ...(.)...it's quite natural to just sort of take a deep breath...and be like (takes deep breath), "okay well why don't we look at it from this angle?"..." (C04)</p> <p>3a-9i. "I was probably less able to use my visualisation cos, I think I hadn't had that much experience in it" (C01)</p>	<p>3b-7. "I get quite nervous on the ward anyway...(.)...so I did, before I got to the ward, took the breaths and then I walked down... smiled, smiling's a big think thing, I know I haven't written that down, but actually smiling is a big thing" (C06)</p> <p>"I took myself off into the kitchen, I think that probably worked quite well actually cos I could kind of gather my thoughts, get away from the situation... and put things into perspective" (S03)</p>	<p>3c-5ii. "It was more of a list...(.)...if one of my colleagues asked my advice about this...(.)...what I would suggest...it was more than what advice I would then give someone... because I feel like that helps me" (C07)</p> <p>3c-6. "What I've been using is to, the PER that's worked, that's been working for me, is just to tell myself to just "make it simple"..." (S03)</p> <p>3c-8i. "I was just tryna visualise the guidelines in my head... and think where things were on the ward, in case-and just try and work out how I could help best when I get there" (C06)</p> <p>3c-8iii. "...and just tryna visualise where the tip of the needle was, erm, yeah and it worked" (C03)</p>
4. Metacognitive Skills	<p>4a-1x. "...it brings, it makes things clearer it, it allows you, it allows me to draw on the knowledge that I know I've got there" (S03)</p> <p>4a2-ii. "...because I was able to think about what, the Reg(istrar) might NEED I think it just kinda expedited the whole thing so things happened a little quicker" (S01)</p> <p>4a-3i. "...a patient gave me 10 out of 10 the other day... a patient who's had plenty of ABG's.....(.)... So that was using the sort of technique that "I can do this, I can do this" y'know in my head?" (S05)</p>		<p>4b-1i. "I think it probably was helpful in that it calmed my mood, but I don't think it improved my performance in any respect to be honest" (C05)</p> <p>4b-2ii. "I tried then, counting to 5... And I don't think it helped that much... (.)...BUT what I did do then I have to admit is, I just said "Okay, I'm going to take a break at the moment" (C07)</p>

Top level theme	Subthemes		
<p>5. Reflections on the Model</p>	<p>5a-1iii. <i>"I'm much more AWARE now...of either how I'm feeling or you know how I perceive my control of the situation to be"</i> (S01)</p> <p>5a-2i. <i>"...maybe I came across a bit more professional...And that I knew, knew what I was doing more maybe because I was calmer?"</i> (C06)</p> <p>5a-3iv. <i>"...with the extreme patients, I just kind of panic and be like "Ah I need someone here now"...It probably gets me a little bit further"</i> (C01)</p> <p>5a-4ii. <i>"So if they see you smiling...(.)...the nursing staff...(.)... won't mind showing you where things are... so actually everyone IS more helpful"</i> (C06)</p>	<p>5b-1ii. <i>"No I think (laughs) I think at first (I used the PERs) cos you told me...But I think now, like I was on call yesterday, and I wasn't even thinking about this, but I did them"</i> (C06)</p> <p>5b-2ii <i>"...it mattered who is around and on the wards as well...(.)...so if I feel like there's a supportive consultant or, some registrars that are around IF I need them, I think that plays in the back of my mind as well, so it's probably a combination of factors"</i> (C01)</p> <p>5b3-ii. <i>"HC: was there a reason that you felt you weren't able to do that or was it just something that didn't kind of come into your head at that time? S04: I think yeah I think perhaps it was sort of that, being a bit tired"</i></p>	<p>5c-1v. <i>"if I've got TIME then I'll definitely use the visualisation...Erm, but I think if it's just an acute situation... It would be the key words...And I think I would, also if I-if everything's just getting a bit too...I'd take a break"</i> (C07)</p> <p>5c-2i. <i>"I think I will just probably take it as it ...Erm, because, it's-it's difficult to predict, like the nature of the situation"</i> (C04)</p> <p>5c-2iv <i>"so initially I would (count) get to about 3 and then, want to just go and do something else, that I try-try to do like the full 5...(.)...if I can only manage 3 I think that's better than nothing...But I think if I can get to 5, it's better"</i> (C03)</p>

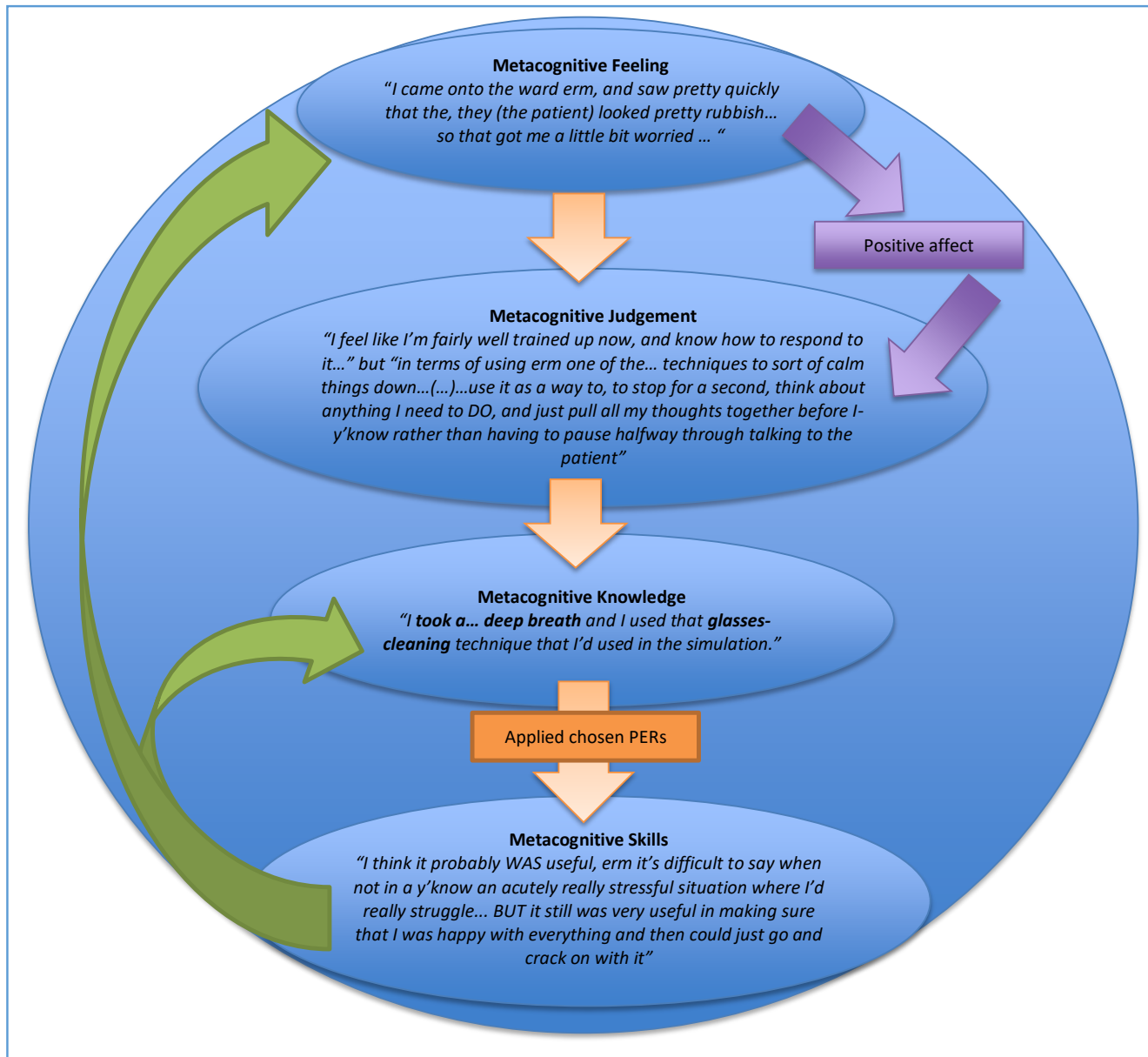
6.7.8. Stage 2: Case Study

Doctor S01 submitted two reflections on their application of the PERFORM model in real clinical situations (Table 6-16).

Table 6-16: Contexts of reflections submitted by Case Study S01

	Reflection 1	Reflection 2
Patient	43 year-old male inpatient following surgery 1 day prior	57 year-old male inpatient following a traumatic T4 injury after a motorcycle accident
Clinical Problem	New onset of pyrexia (high temperature) and tachycardia (fast heart rate)	New-onset hypertension (high blood pressure)
Location	Spinal Injuries Unit	Spinal Injuries Unit
Time of day/shift	Evening on-call shift	Day-shift during a weekend

Figure 6-21 and Figure 6-22 map each reflection to the conceptual PERFORM model using Doctor S01's quotations alongside an editorialised summary pertaining to each metacognitive facet.



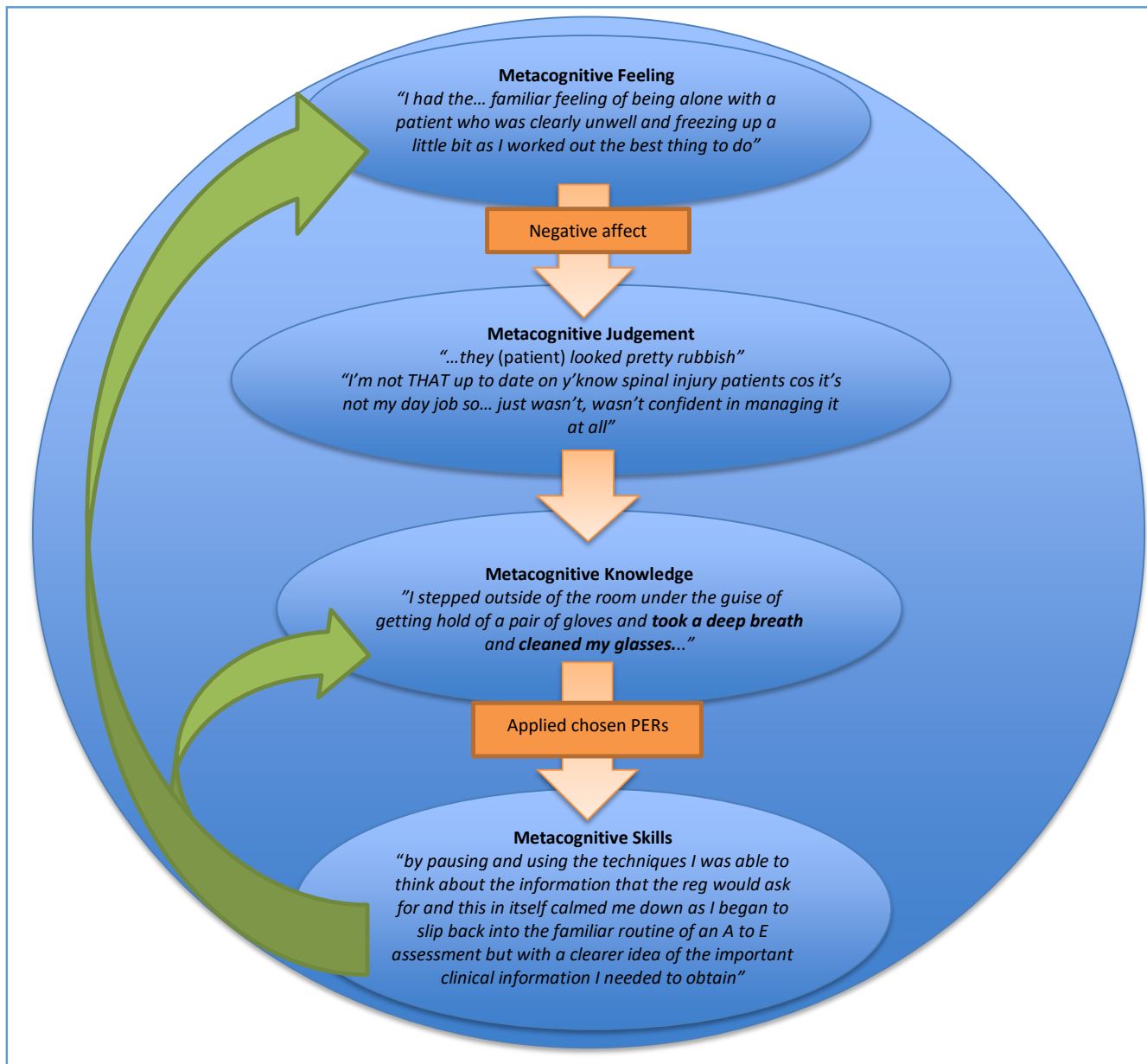
Doctor S01 reported feeling confident causing a positive affect, which, according to the original PERFORM model, would not warrant the need for a PER. However, Doctor S01 wanted to trial the use of PERs in this scenario.

The judgement or rationale for this confidence is *"having done a surgical job, y'know post op temperature spike is something that I'm fairly used to seeing"*.

Doctor S01 used a combination of two PERs that he created. This created time to focus on deciding whether senior input was required.

Doctor S01 reported that the PERs *"forced you to stop and think"* to ensure he was *"focussing...on, the task AT HAND"*. Doctor S01 concluded that this trial run *"was quite useful to be able to use it y'know not in a simulator"*, and in terms of future application *"actually, in a more difficult situation that might be quite useful"*. Thus, positive feedback was directed into Doctor's S01's Metacognitive knowledge bank for future reference.

Figure 6-21: S01 Stage 2 Reflection 1: Pyrexia and tachycardia



Doctor S01 recalled "I was out of my comfort zone, and dealing with a problem that had me properly frazzled". Awareness of this "freezing up" and "frantic" behaviour caused a negative affect.

Doctor S01 explained their under confidence due to both lack of knowledge, "I was aware of the concept of autonomic dysreflexia prior to seeing this patient but had not seen it in a real patient previously", and the severity of how unwell the patient looked.

Doctor S01 used a combination of two PERs that he created. This created time to focus on deciding whether senior input was required.

Doctor S01 "had already made the decision that I was going to call the registrar" but the PERs "just help you think "right, okay well now I feel I need to do a proper assessment on him, get all the information... for the Reg"". Doctor S01 reported "the anxiety was still there and I was still, y'know aware that I had this unwell patient...But, I guess it felt different...(...)... I felt I had, like I said the control". This experience fed back into Doctor S01's metacognitive knowledge bank "I think I would use the same techniques but I just, I might have a play around with whether it works y'know immediately beforehand... rather than as a reaction...to a problem".

Figure 6-22: S01 Stage 2 Reflection 2: Hypertension

6.7.9. Stage 2 Summary

During Stage 2 the PERFORM model was applied to real clinical situations by all but one of the doctors. These reflections demonstrate the varied situations in which PERFORM was used.

The Case Study S01 demonstrated the progression of the model through repeated use in two different clinical situations. In both, Doctor S01 successfully used their own personalised PER to clarify thoughts, increase focus and gain control over the situation.

6.7.10. Stage 3a: In Situ Simulation

The in-situ simulations generated both qualitative (Think Aloud commentaries) and quantitative results (self-efficacy scores).

6.7.10.1.1. Qualitative Results

6.7.10.1. In Situ Simulation Think Aloud Commentary

For each doctor, a final Think Aloud commentary was conducted following their in situ simulation. The commentaries were analysed using the metacognitive framework, the results of which are shown in Table 6-17. Quotations to demonstrate the data at level Subtheme 1 are shown in Table 6-18.

Table 6-17: Coding list Think Aloud In Situ Simulation

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	
1. Metacognitive Feeling or Behaviour	1a. Behaviour	1a-1. Disorganised/lacks fluidity		
		1a-2. Hands on hips		
		1a-3. Inactivity		
		1a-4. Ineffective communication with team		
		1a-5. Inefficient or slow		
		1a-6. Made error/omission		
		1a-7. Potential nervous 'tic'	1a-7i. Fiddling with pen	
			1a-7ii. Fidgeting with legs	
	1a-7iii. Scratching face			
	1a-7iv. Tapping fingers			
	1b. Feeling	1a-8. Rushing		
		1b-1. Anger/annoyance		
		1b-2. Anxious		
		1b-3. Calm		
		1b-4. Comfort		
		1b-5. Confidence		
1b-6. Confusion				
1b-7. Discomfort				
1b-8. Helpless				
1b-9. Knowing				
1b-10. Not knowing				
1b-11. Panic				
1b-12. Relief				
1b-13. Scared				
1b-14. Shock				
1b-15. Unsure				
1b-16. Worry				
2. Metacognitive Judgement	2a. Patient	2a-1. Patient's condition	2a-1i. Improvement	
			2a-1ii. Stable	
			2a-1iii. Very unwell	
	2b. Self	2a-2. Knowledge of clinical situation		
		2a-3. Lack of knowledge about the patient		
		2b-1. Clinical experience		
		2b-2. Knowledge/Recall		
		2b-3. Lack of Knowledge/Recall		
		2b-4. Under confidence	2b-4-i. 'Second-guessing'	
		2b-5. Unfamiliar	2b-5i. Clinical problem	
2b-5ii. Environment				
2b-5iii. Procedure/logistical task				
2b-5iv. Colleagues				

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>
2. Metacognitive Judgement (continued)	2c. Situation/Process	2c-1. Colleagues unavailable	
		2c-2. Distraction	
		2c-3. Inefficient	
		2c-4. Lack of focus	
		2c-5. Logistical/non-clinical problem	
		2c-6. Multi-tasking/overloaded	
		2c-7. Pressure	
		2c-8. Unexpected event	
		2c-9. Unsure whether senior input warranted	
3. Metacognitive Knowledge (PERs)	3a. On-line knowledge: which PER to apply	3a-1. Automatic/not conscious choice	
		3a-2. Belief that it will work	3a-2i. Positive previous experience
		3a-3. Suitable for problem	
		3a-4. Had enough time	
		3a-8. Try it out	
		3a-9. Active rejection of PER	3a-9i. Lacked time
			3a-9ii. Not suitable for problem
			3a-9ii. Not sure which to use
			3a-9iv. Self-conscious
	3b. Action	3b-1. Assistance	
		3b-2. Breaths	
		3b-3. Clean glasses	
		3b-4. Close eyes	
		3b-5. Fiddles with stethoscope	
		3b-6. Guideline	
		3b-7. Note making	
		3b-8. Smile	
		3b-9. Think Aloud	3b-9i. To self
			3b-9ii. To colleague
	3b-9iii. To patient		
3b-10. Tie hair back			
3c. Thought	3c-1. Redirecting focus		
	3c-2. Reframing	3c-2i. ABCDE	
		3c-2ii. Pragmatic approach	
		3c-2iii. SBAR	
		3c-2iv. 'Take step back' (globalising)	
	3c-3. Self-talk	3c-3i. Motivational self-talk	
		3c-3ii. Self-directional self-talk	
		3c-3iii. Confirmatory/reassuring self-talk	
	3c-4. Trigger word	3c-4i. 'ABCDE'	
		3c-4ii. 'Ah, Breathe, Calm'	
		3c-4iii. 'Airway'	
3c-4iv. 'Make it simple'			

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>
3. Metacognitive Knowledge (continued)	3c. Thought (continued)	3c-5. Visualisation	3c-5i. List of actions to take 3c-5ii. DOING the tasks
4. Metacognitive Skills (control and regulation)	4a. Success	4a-1. Self	4a-1i. Avoided distraction/increased focus
			4a-1ii. Created thinking time
			4a-1iii. Gained control of situation
		4a-1ix. Reassured/confirmed	
		4a-1x. Recalled knowledge	
		4a-1xi. Restored positive emotional state	
	4a-2. Task Process	4a-2i. Encouraged 'logical' management	
		4a-2ii. Formulated plan	
4a-2iii. Increased efficiency			
4a-3. Task Outcome	4a-2iv. Prevented situation escalating		
	4a-2v. Prompted next task		
4b. Failure	4a-2vi. Reviewed/summarised progress		
	4b-1. Unsuccessful use of PER	4a3-i. Avoided error	
5. Reflections on use of PERFORM	5a. PERFORM in this scenario	4b-2. Subsequent action	4b-1i. Used when unnecessary
		5a-1. Missed opportunities	4b-2i. Chose alternative PER
			5a-1i. Too overwhelmed
		5a-1ii. Too unfamiliar scenario	
	5a-2. Performing for researcher?	5a-2i. Yes	
		5a-2ii. Partially	
		5a-2iii. No	
		5a-2iv. Not sure	
	5b. Individualisation of the model	5b-1. Specific applications/limitations	5b-1i. Complexity
			5b-1ii. Patient severity
			5b-1iii. Task-specific
			5b-1iv. Timing
5c. PER optimisation	5b-1v. Whether working alone or with others		
	5b-2. Slipping into sub-conscious		
5c-1. Conscious use of PER	5c-1. Conscious use of PER		
	5c-2. Allowing more time		

Table 6-18: Cross-tabulated examples from in situ Simulation Think Aloud

Top level theme	Subthemes		
<p>1. Metacognitive Feeling / Behaviour</p>	<p>1a-6. “Here is where I think I cross out the WRONG prescription, I cross out the terlipressin instead of the omeprazole” (S03)</p> <p>1a-7iv. “I think I do that when I’m on the phone sometimes to people, I tap my fingers... like, cos I don’t like...(....)... telephoning someone you know is going to be horrible” (S02)</p> <p>1a-8. “when I feel more anxious I would have a tendency to, just like, just to get through it as quickly as I could” (C04)</p>	<p>1b-6. “Cos I genuinely had no idea why I was being bleeped there. Erm, so then that’s why I couldn’t really remember anything the nurse told me about the handover?” (C04)</p> <p>1b-8. “Erm...a little bit helpless but like yeah, just cos I’ve nothing to refer to I’ve no senior there to as...I just feel a bit, quite on my own and I also just worry about not calling the Med Reg(istrar) every 2 seconds goin’ “By the way, one more question, oh and one more thing”...” (S05)</p> <p>1b-14. “I’m kinda still a bit flummoxed, I’m like “Oh okay this is what’s happening”, trying to absorb the information but also trying to get over the shock” (C07)</p>	
<p>2. Metacognitive Judgement</p>	<p>2a-1i. “Erm, but I remember that sort of made me feel a bit more comfortable, probably was improving erm, and then even, the sats went up to, 100 %” (C02)</p> <p>2a-3. “I’ve done quite a few things now? and I’ve rushed into this from the corr-y’know from the corridor, I’ve gone straight into it now...not quite sure that I’m completely in control of what I’ve done and what I haven’t done-is there things that I’ve missed? Erm...like, actually I don’t know very much about her at all” (C03)</p>	<p>2b-1. I think I was the leader as in like I think I felt quite calm in the scenario, I think, I don’t know whether that’s due to, being on A&E?” (C01)</p> <p>2b-3. “I KNOW she needs terlipressin but I can’t remember, the dose” (C03)</p> <p>2b-5iii. “And-and with the major haemorrhage thing, I didn’t know who-who-who activates it, cos I’ve never seen it” (C06)</p>	<p>2c-8. “I think at first when I got there I thought it was a bit...scrambled cos as I said I wanted to physically DO something and I was like “oh everything’s been done”...” (C06)</p> <p>2c-1. “I think, if this was in A&E, I’d probably feel, fairly calm, but I think maybe coming called to the ward, made me a little bit more anxious, cos there’s no other senior on the ward with me. I think in A&E you’re always aware that someone’s present” (C01)</p>
<p>3. Metacognitive Knowledge (PERS)</p>	<p>3a-1. “I was repeatedly going back to “airway” but I wasn’t having to think “airway” to do that-that felt quite natural, just going back and, just going through again.” (C05)</p> <p>3a-2i. “I think it’s err, unfamiliarity with the situation so I’ll sort of go back to basics with ABCDE...And I think that’s the case when I’m in A&E I don’t really know what I’m doing, then I think I go back to ABCDE –yeah.” (C01)</p> <p>3a-9iv. “HC: D’you think there’s a reason WHY...you didn’t try to take some deep breaths? At this point in the scenario? S04: Erm, maybe-I yeah maybe I felt a bit self-conscious about it (taking deep breaths) perhaps.” (S04)</p>	<p>3b-2 and 3b-4. “I think I just tried to do, a deep breath there...I seemed to close my eyes longer than a normal blink” (C04)</p> <p>3b-9iii. “Now I’m running through everything in my head again. I find that explaining it to the patient as well helps me work through it to see if I’ve missed anything as well” (S03)</p> <p>3b-10. “It’s like “business mode” when you’ve got your hair tied up” (C04)</p>	<p>3c-3i. “Like, follow your instincts, if you have an any concern you can ring for help just do what you can do you’re good at this” y’know like that sort of thing ” (S05)</p> <p>3c-4ii. “Yeah so I wanted to, like I kind of thought “ok blood blood blood” and then I just went “Ah, Breath, Calm, A-A okay, speak to her” and that’s what I kind of went to do” (S05)</p> <p>3c-5ii. “I just see myself erm, doing the airway oxygen and then I see myself like listening to the chest...and then like feeling the, tummy... so literally it is a visual... of what I’m doing” (C01)</p>

<p style="text-align: center;">4. Metacognitive Skills</p>	<p>4a-1xi. <i>"It (trigger word) definitely calms me down... because then I realise that there ARE options... Whereas if I didn't do that then I think, the stress level'd just spiral...And I'd get more and more flustered and then you, you just end up with a fog in your brain and you can't see through it"</i> (S03)</p> <p>4a-2vi and 4a-1ix. <i>"You got all the information you need to, erm and then it's just a case of kind of putting it all together in your head... Um, but I think it's just-this is, that's where I find it most helpful just reassuring myself that I haven't, there's nothing else I can DO"</i> (S04)</p> <p>4a-3i. <i>"when you just reach that panic mode just think "Right ABC, Right A-she's speaking, right B-" y'know and then you eventually think like "Oh shit I didn't do D, right okay now have a quick feel of the tummy". Like you do always get there, I think it's just... I don't know as I said, a comfort to you so you go back to that"</i> (S05)</p>		<p>4b-1i. and 4b-2i. <i>"I did try and do some deep breaths... and I was like "Oh, I've gotta do one (a routine)", but actually I didn't find it was, helping that much... and I thought that was just not, not needed cos I didn't feel too worried...Cos I knew it wasn't a real patient, which is why I JUST SMILED instead"</i> (C06)</p>
<p style="text-align: center;">5. Reflections on the model</p>	<p>5a-1i and 5a-1ii. <i>"Erm, haven't really seen anything like that, like sort of patient before, erm... So, and then this, like again this is somewhere I don't use the, an approach (PER), maybe? ...Possibly because I'm a bit out of my depth and I'm thinking "just, let's just get someone senior involved...straight away"....but this is something where, I think, partly-y'know, taking deep breaths or, erm visualising could be quite helpful"</i> (S04)</p> <p>5a-2ii. <i>"I don't use it (the model/PERs) enough and it's a really good... theory to try and do...Erm, and something I WANT to try and use more, ...regardless of the study, erm, but yeah of course-I think y'know, I was AWARE that we were using-we were TRYING to use the techniques (in this scenario)... so therefore I was trying to-trying to use it to see if it helps.</i> (C03)</p>	<p>5b-2. <i>"But erm, yeah for whatever time this time round it seems, it sort of crept in as a, subconscious thing"</i> (S01)</p> <p>5b-1v. <i>"I think it works very well independently when I'm-when I'm on my own or in a small group or taking a leadership role, it works... within the setting, a bigger setting, I don't think it's anyway near as effective"</i> (C05)</p>	<p>5c-1. <i>"I definitely think it's the conscious ones at the moment give me the most benefit... Cos it's my guess I go through that thought process of "oh I'm cleaning my glasses so let's think about what's goin' on"... and stop. Whereas when I do it subconsciously, it was just sort of...didn't really think about what I was doing, and just carry on"</i> (S01)</p> <p>5c-2. <i>"I didn't get time to do the other two (breaths)... I would've preferred to do 3. Erm...Three would definitely be better"</i> (C04)</p>

6.7.10.2. Quantitative Results

The quantitative results from Stage 3a included the change in self-efficacy scores during the in-situ simulation with/without the use of a PER. This change in self-efficacy score was analysed in terms of both the overall change and then in relation to the participant variables of workplace and stage of training.

6.7.10.3. Change in self-efficacy score: Overall

The doctors who applied a PER during the in situ simulation assigned a self-efficacy score to their control over their target emotion or behaviour *prior to* and *immediately after* the application of the PER, or alternatively, without/with the use of their PER.

The scores are demonstrated for each doctor in Table 6-19. Doctor C02 did not apply a PER during the in situ simulation and therefore could not provide a pre-/post-self-efficacy score but did report a score to describe their overall control during the scenario.

Table 6-19: Pre-/post-self-efficacy scores and raw changes during in situ simulation

Doctor Code	Self-Efficacy Pre-PER	Self-Efficacy Post-PER	Raw Change
C01	58	78	20
C02	90		N/A
C03	50	62.5	12.5
C04	37.5	55	17.5
C05	25	90	65
C06	72.5	87.5	15
C07	70	85	15
S01	40	65	25
S02	50	85	35
S03	30	100	70
S04	50	80	30
S05	40	70	30
Median	50	80	

The raw changes were plotted as a histogram (Figure 6-23) and found to be positively skewed. The Wilcoxon-signed rank test demonstrated a significant increase in self-efficacy with the application of PERs (median change=25, 95% CI 17.21-43.70, Z = -2.94, p=0.003).

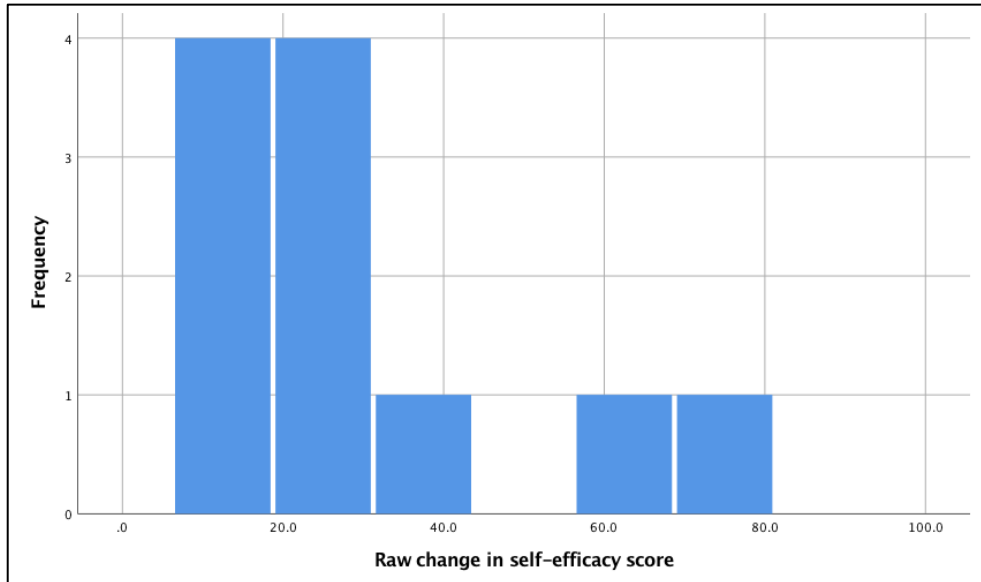


Figure 6-23: Histogram of raw self-efficacy score changes during in situ simulation

6.7.10.4. Change in self-efficacy score: Participant Variables

There was no statistically significant impact of any of the co-variables on change in self-efficacy score (Table 6-20).

Table 6-20: Multiple regression analysis results of self-efficacy scores after the use of a PER

Co-variate	Coefficient (B)	Confidence Interval (95%)	P value
Constant	84.693	-21.301- 190.687	0.084
Baseline SE score	-1.004	-3.167-1.159	0.236
Place of work	-14.547	-50.988 21.894	0.294
Trainee level	-9.543	-53.172 34.085	0.536
Job – A&E *	53.039	-23.644- 129.722	0.115
- General Medicine *	34.307	-29.457 98.072	0.185
- General Surgery *	92.397	-17.634 202.428	0.076
Gender	20.460	-25.580- 66.500	0.252

Doctors working in the CTH (median=30.00, IQR=25.00) had a greater change in self-efficacy score than those in the DGH (median 16.25, IQR=16.90) (Figure 6-24). Second-year Foundation doctors

* Compared to critical care rotation

(median=25.00, IQR=20.00) had a marginally greater increase in self-efficacy score than the first-year Foundation doctors (median=23.75, IQR=40.60) (Figure 6-25). Neither of these differences between variables of place of work or year of training yielded statistically significant results using either multiple regression analysis (Table 6-20) or Mann-Whitney-U tests for independent samples (($p=0.052$) and ($p=1.00$), respectively).

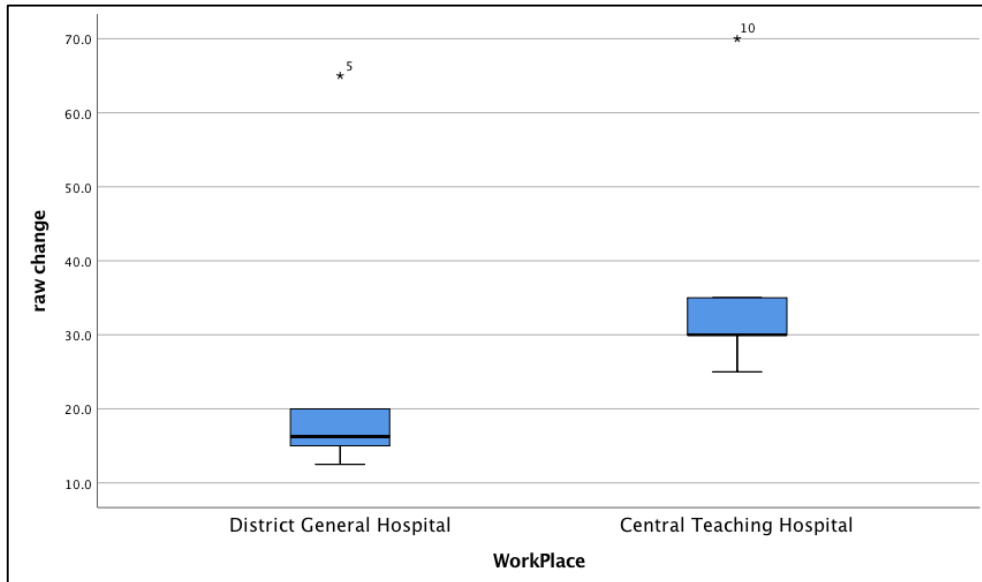


Figure 6-24: Box plots comparing raw in situ self-efficacy score change by place of work

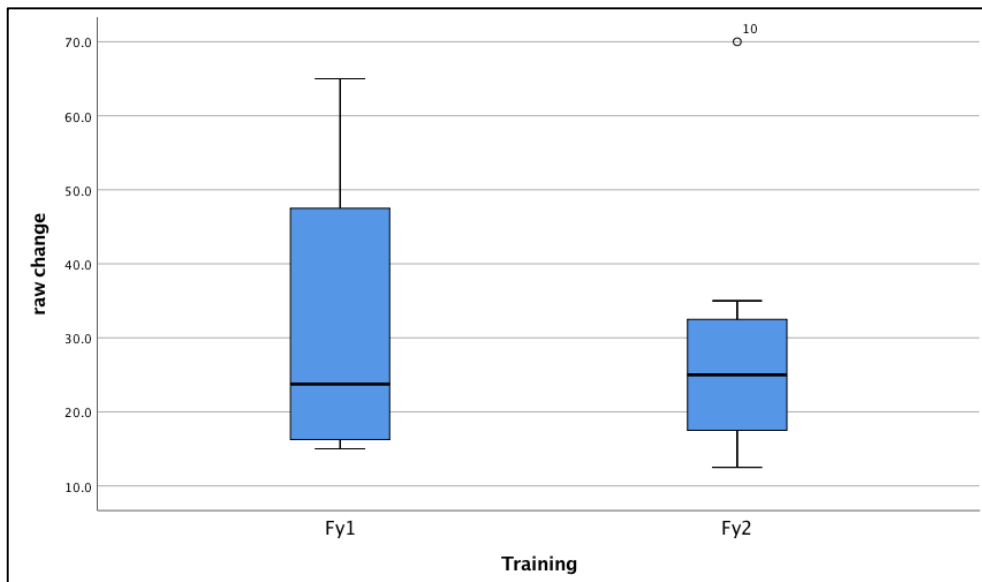


Figure 6-25 Box plots comparing raw in situ self-efficacy score change by trainee level

6.7.11. Stage 3b: Final SSI

The final SSI produced qualitative results in the form of the thematic analysis of the transcripts, and quantitative results regarding the doctors' opinions concerning the most useful study element(s) and optimal timing for PERFORM implementation.

6.7.11.1.1. Qualitative Results

The key topics of the final SSI were:

- A. Usability of PERFORM model in clinical practice
- B. Usefulness of PERFORM
- C. Validation of the PERFORM model
- D. Suggested improvements for PERFORM as an educational programme or topic of further research

Table 6-21 displays the first five tiers of the thematic analysis of the final SSI.

Table 6-21: Coding list for Stage 3 SSI

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	<i>Subtheme 4</i>	
1. Application	1a. Acute patient management	Self			
		Patient			
		Colleagues			
	1b. Other clinical	Administrative			
		Communication			
		Non-acute patient encounters			
	1c. Personal or social				
1d. Professional development					
2. Feedback on current approach	2a. Limitations	Current rotation	Too supervised		
			Too busy	Additional 'thing' to think about	
			Too few patient encounters		
		Missed opportunities	'Slipped my mind'		
		Self	Lack creativity		
			Self-conscious		
			Too overwhelmed		
	Trepidation				
	Team scenarios				
	Time	Pressures using PERs			
		Overall timescale			
	2b. Improvements	Cementing			
		Resources	Online	Video	
			Researcher contact	Same	
				More	
		Prompt card	Different opportunities		
			Keep design		
Self-regulatory		Change to include PERs			
Simulation		Realism	Level of stress		
		More frequent simulations	Simulation vs real patient		
Time					

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	<i>Subtheme 4</i>	
2. Feedback on current approach (<i>continued</i>)	2c. The Model	Facets	Feeling/behaviour	Triggered vs pre-emptive use	
			Judgement		
			Online knowledge	Task-specific	
				Time-specific	
			Not specific		
		Skills	Engaged		
		Not (consciously) engaged			
	Relationship between facets				
	As a resource	Used			
		Not used			
	2d. Process	Automaticity	Difficulty reflecting		
		Progression			
		Exceeding expectations			
Clinical experience		Interplay with	Experience and anxiety		
		Transition into	Experience and PERFORM		
2e. Useful elements	Self-efficacy scale				
	Think Aloud				
	Simulation				
3. Feedforward	3a. Personal plans	Change approach	Apply learning to new situations		
			Try different techniques		
		Continue same approach			
	3b. Sharing	Encouraging peers			
		Advising new F1s			
	3c. Future roll-out	Integration	On-the-job education		
			Simulation courses		
		Researcher contact	Meetings	Fixed	
				Flexible	
			Reminders		
		Resources	Background reading		
			Mobile phone 'app'		
Flexible reflections					
Peer debrief/support					
	Pool doctors' PERs				

<i>Theme</i>	<i>Subtheme 1</i>	<i>Subtheme 2</i>	<i>Subtheme 3</i>	<i>Subtheme 4</i>	
3. Feedforward (continued)	3c. Future roll-out (continued)	Target population	Medics	4/5 th years undergraduate	
				5 th year undergraduate /F1 doctors	
				F2	
				'Just enough experience'	
				Other healthcare professionals	
		Timeline			
		Challenges	Buy-in		
			Engagement		
4. Feelings and behaviours	4a. Own feelings	Validation	Strategies to manage		
			Building into clinical reflection		
			Altered perceptions of 'negative' feelings		
	Awareness	In-action			
		On-action			
4b. Own behaviours					
4c. Others' behaviour	Identifying strategies				
5. Motivation	5a. During study	Following simulations			
		Following researcher contact	Planned	Reflection follow-up	
			Unplanned	Reminders	
		Nearing study conclusion			
	Peer support				
	5b. Around study	Burnout			
		Optimising performance	Continuing professional development		
		Perception of job			
		Provenance	Research		
			Sports psychology		
Resilience					
6. Novelty	6a. New ideas	Flexible ideas	Creativity		
	6b. Upcycled ideas				
	6c. Individualised approach				

The analysis of the final SSI was representative of the data itself rather than being purposefully aligned to the specific SSI topics. Therefore, to address the final SSI topics all relevant themes and subthemes were selected across the coding list (Table 6-22). Each topic will be described in more detail below, with additional material in Appendix 40.

Table 6-22: Cross referencing of themes/subthemes to answer each initial SSI topic

Final SSI Objectives	Themes/Subthemes Used to Address Objective
A: Usability of PERFORM model in clinical practice	<ul style="list-style-type: none"> • Theme 1, Application • Subtheme 2d, Process • Subtheme 5a, Motivation During study • Subtheme 3a, Personal Plans
B: Usefulness of PERFORM	<ul style="list-style-type: none"> • Theme 4, Feelings and behaviours • Subtheme 5b, Motivation Around study • Subtheme 2a, Useful elements • Theme 6, Novelty • Subtheme 2a, Limitations • Subtheme 3b, Sharing • Also See 6.7.11.6. Quantitative Results <ul style="list-style-type: none"> ○ Multiple choice responses – most useful study element ○ Timing of Implementation of PERFORM as educational programme
C: Validation of the PERFORM model	<ul style="list-style-type: none"> • Subtheme 2c, The Model
D: Suggested improvements	<ul style="list-style-type: none"> • Subtheme 2b, Improvements • Subtheme 3c, Future roll-out

6.7.11.2. Topic A: The Usability of the PERFORM Model

The results of the themes/subthemes listed in Table 6-22 pertaining to Topic A are presented here:

6.7.11.2.1. Application

The PERFORM model was applied by the doctors in four domains: acute patient management, other clinical, personal and social or professional development.

6.7.11.2.1.1. Acute patient management

The doctors described how PERFORM impacted acutely unwell patient care through altering their own feelings or behaviours:

“...I don’t think I had a particular problem managing them before, so I think it’s more that it makes me more comfortable in the situation, I think my management, MAYBE slightly better...” (C05)

The doctors also explained how this affected interactions with patients and colleagues:

“... it makes a difference to the patient and...(...)...I think if, if you LOOK panicked, then they (nurses) feel panicked...Erm...so if you can manage not to look panicked, even if you are then...then that panic doesn’t spread” (C04)

6.7.11.2.1.2. Other clinical

PERFORM was also applied to less urgent clinical duties such as administrative or communication tasks:

“...like non-clinical things like when you have to go and speak to a patient’s family, and they’re gonna ask difficult questions and...I’ve like done the breathing BEFORE... so that when I go to them I’ve got a clear idea in my head of what the plan is and what’s happening and I feel calm. And I can handle the situation.” (C04)

6.7.11.2.1.3. Personal or social

Outside of work the doctors particularly used motivational self-talk and positive behaviours to improve their mood:

“...I think it’s the smiling, that’s the PMA (Positive Mental Attitude) ...And the deep breaths - I mean they’re the ones that I’ve really just used mainly anyway ... but I think those two just for any scenario, outside of work if I’m starting to feel a bit rubbish, I would do.” (C06)

6.7.11.2.1.4. Professional development

PERFORM supported other educational initiatives, such as clinical coaching to improve competence and confidence:

“...as I said they just complimented each other really well, this has kind of given me much more direct ideas of ways I could do it, where the other one’s a bit kind of like, “oh I couldn’t work this one out” y’know, like, “I kind of know what’s happening, kind of not”. (S05)

6.7.11.2.2. Process

In this theme, the doctors reflected on their involvement with the PERFORM study. These included how the model exceeded their expectations, their progression from application in simulation to clinical practice, the automaticity of their models and whether PERFORM supported their clinical experiences.

6.7.11.2.2.1. Exceeding expectations

Many doctors acknowledged that their initial expectations of the PERFORM study were exceeded. Initial reservations were overcome through PERFORM’s application in the real clinical context:

“...I didn’t think they (coping strategies) would be THAT helpful at the time, erm, but actually I think they’ve formed quite a useful part of the way that I cope with...(…)...I do seem to have just THOUGHT about what-what effects that has on me and-and made it part of my normal process and I think probably that HAS improved performance.” (C05)

6.7.11.2.2.2. Progression

The transition of applying the PERFORM model in simulation (Stage 1) to clinical practice (Stage 2) generally occurred without difficulty:

*“HC: And have you found it, sort of-erm easy to apply in clinical practice? With real patients?
S03: Yeah, yeah it’s so straightforward it just instantly, makes me focus it just makes it clear.”*

However, real-practice application was sometimes difficult due to a lack of thinking time:

“... (in real life it’s) harder because, all of a sudden something happens and you’re-y’know If it’s something on the ward and you need to go straight there then you don’t get that-I feel like I NEED THE TIME, BEFORE to sort of to think about it” (S05).

One doctor considered the challenge of time pressure comparable for simulation and real practice:

“I think the pressures are fairly similar... erm, in that erm...I think for me it’s the-it’s the time-time pressure thinking that you’ve got to do something-you have to be, or yeah or it’s moving on-moving forward to the next step... Um, it’s a bit of a, y’know that’s the barrier to use it, y’know perhaps using some of the more routines like counting down, from 5 to 1 or... taking deep breaths, but, erm, yeah so I think it’s-it’s about the same in both” (S04)

Many doctors reported that over the length of the study the application of PERFORM became “*sort of easier as it’s-as we’ve gone through*” (S01). Some considered this a result of “*a bit of practice...*” (S05). Others commented that, as the beginning of the study coincided with a change in clinical rotation, they were more focussed on the adjustment to their new role:

“...at the beginning when you don’t know the job that well to use these things but it-it has-it just has been more difficult to actually, get my brain to think “let’s try and do this”. I do TRY... but not as frequently as I might be able to” (C03)

6.7.11.2.2.3. Automaticity

Towards the end of the study most of the doctors articulated that their PERs became more automatic or “*second nature*” (S05):

“I think I, and I never really think about the engaging bit, but that’s probably like a subconscious thing” (S02)

For some, this process was in its infancy, whereas some recognised this earlier in the study. Automaticity was perceived to have certain advantages during clinical scenarios:

“once you can make it automatic, like I think this ABCDE thing has become... um it just-it just helps you kind of function a bit better in those sorts of situations” (S04)

However, automaticity caused challenges during Stage 2 of the study:

“I don’t think I was very good at keeping reflections on when I was doing it, I think that was MOSTLY because I rapidly, was using it subconsciously and therefore not NOTING when I was using it and not RECOGNISING is as being, y’know part of a study or recognising it as me being, doing a particular technique or anything I just, just thought it and, and cracked on...” (C05)

6.7.11.2.2.4. Clinical experience

Many doctors reported uncertainty regarding how much impact the PERFORM model had on clinical performance compared to the additional four months of clinical experience gained during the study:

“I mean, it’s hard to say what would’ve happened if I hadn’t done it (the study) and y’know whether or not, just I’d be more confident anyway? With erm, four months of, just purely have been four months on respiratory...but I -I personally feel that it has-it has been positive and I think it has helped...um, just mainly the anxiety side, yeah.” (S04)

But this distinction was clearer to Doctor C07, *“It’s just helped me develop further, than if I’d just done four months of work.”*

Others commented that PERFORM targeted specific elements of clinical performance that may not have been developed as much through experience alone. These included *“confidence and my ability to focus”* (S03) and *“clinical skills...(…)...and my confidence and...I think my competency? In dealing with sick patients?”* (C07).

Although the majority of the doctors agreed that having gained experience of *“seeing lots of unwell patients”* made them *“feel a lot more confident”* (S02), one doctor presented a different perspective:

“...obviously as I get more experienced, the-the more-the anxious, the anxious side will have more things to be anxious about, there’ll be more things that I’ll be aware of that could go wrong... I’m blissfully naïve at the moment” (C04)

6.7.11.2.3. Motivation During Study

The doctors recalled three factors or events that motivated them to apply the PERFORM model during the study: contact with the researcher, the study coming to an end and peer support.

6.7.11.2.3.1. Researcher Contact

Contact with the researcher, either through interviews or simulation, reminded the doctors to use and reflect upon their evolving PERFORM models:

“I think whenever we’ve had a meeting after that I’ve felt more enthused to go and try and use it again” (C03)

6.7.11.2.3.2. Nearing study conclusion

Realising that the study was drawing to a close had a similar motivational effect:

“...you’re aware it’s coming to an end and I’ve-well I’ve used it a few times and I’VE know that the breaths, and the counting sort of things that I... and even difficult cannulas and difficult ABGs I still- I TRY sometimes to do the visualisation more that I would’ve done at the beginning.” (C03)

6.7.11.2.3.3. Peer support

The two doctors who knew each other socially and were aware that they were both involved in the study engaged in informal peer support, sharing ideas:

“...because we’ve been able to say, erm, “Ah, I’m finding it difficult to...err actually put it in, what things do you use?” Or “how have you used it, okay maybe I’ll try...try and do that this time.” (C03)

and motivating each other to remain engaged with the study:

“I think we kind of reflected on the model itself... And the routines... And I think we also reminded each other to like put the reflections on” (C06)

6.7.11.2.4. Personal Plans

The doctors expressed many different ways in which they planned to use what they had learned during PERFORM in the future. Some intended to transfer their developed PERs to their next job, whilst others were still exploring different routines, *“y’know there’s probably other things that suit me even better that I don’t know yet” (C03).*

6.7.11.3. Topic B: The Usefulness of the PERFORM model

The results of the themes/subthemes listed in Table 6-22 pertaining to Topic B are presented here.

6.7.11.3.1. Feelings and Behaviours

The doctors explained the feelings and behaviours of both themselves and others which were affected by their involvement in the PERFORM study.

6.7.11.3.1.1. Own feelings

Many doctors reported that the PERFORM study provided an opportunity to discuss the feelings and behaviours that they had experienced when managing acutely unwell patients:

“I think it was good just talking about it cos firstly just as an issue I think it is fairly common among junior doctors? ...Erm, and it’s not something that’s necessarily openly acknowledged by, any like other seniors I suppose, or like in the teaching programmes or anything like that so erm it was a good think to have ACKNOWLEDGED and it helps YOU recognise your behaviours?” (C01)

For one doctor the PERFORM study encouraged a shift in their interpretation of negative reactions to complex clinical situations from self-blame to more rational conclusions:

“...you can end up feeling very dissatisfied with the way you’re performing, not necessarily that you’re doing anything wrong, but there’s just that “uh, it just didn’t go very well, that just didn’t go very well”. Erm, or “that seemed to take me a long time...(…)....And then using this, actually gives you an awareness that ...lots of people also have the same, thoughts and feelings and experiences and erm...I’m more aware that perhaps I’m feeling, like that it’s not going very well, because it’s complicated? And I-rath-and I-and I’m trying to hold lots of things in my head?” (C03)

One doctor described their realisation that *“it’s not something you just have to, tolerate (laughs) that level of anxiety” (C01)* and that PERFORM had enabled them to begin *“thinking of ways or STARTING to think of ways that you can manage it or know that it could possibly be manageable” (C01).*

By the end of the study the doctors reported increased awareness of their feelings and behaviours both during acutely unwell patient care and afterwards:

“...it’s made me think a little bit more about...how I react in, erm, in, like acute, acutely unwell patient situations...so I kind of have sort of THOUGHT about it a little bit more and been like, a bit more AWARE of how I’m feeling...(…)... So I think I’ve been a bit more aware

of it at the time, but then also, erm, afterwards sometimes I've thought of, sort of though "oh right...could've, like, could've been a bit calmer at that point"..." (S02)

Simply increasing recognition of these emotional and behavioural reactions was reported to be useful:

"...probably actually the most useful bit in the process was doing that and recognising that, just, anything, even just RECOGNISING that was fine, if I'd just RECOGNISED that every time and my word to recognise that with is "airway", but just recognising those situations, means that I deal with them much better" (S05)

6.7.11.3.1.2. Own behaviours

Although some doctors valued using their PERFORM model to simply recognise their emotional and behavioural reactions, others explained that it was more important to use their model to develop solutions:

"I think-I've-I kinda think I've always KINDA been aware that I've been nervous but I've never actively, made a path to try and solve that" (C06)

6.7.11.3.1.3. Others' behaviour

During the study the doctors identified occasions where senior colleagues appeared to use coping strategies during acutely unwell patient management:

"...when I've been to arrests and I've like looked to the Med Reg, when they're sort of leading it, it seems like they're doing the same thing as well... That they are, like working through that kind of check list...(.)...in the same way that I like talk to myself ...(.)...it almost seems like a coping strategy in those situations as well" (C04)

6.7.11.3.2. Motivation Around the Study

The doctors volunteered for the study for many reasons. The most common were to prevent 'burnout', to increase job satisfaction and improve clinical performance.

6.7.11.3.2.1. Burnout

The topic of “burnout” (S03) was raised with regards to “mental wellbeing” (C03) and some doctors highlighted the need for change in attitudes towards this, which they felt could be supported by wider roll-out of the PERFORM model:

“...we’re moving away from a period of “oh just get on with it”, to a trying to look after people’s mental wellbeing and erm...y’know you can go and do yoga and things in the hospital so, why can’t you come and have erm, some support with mental, resilience training and things, incorporating it into that and, showing people that it’s okay that you want to get some help-it doesn’t mean-you don’t know any less, than someone else just, you need more-you need some TIPS to try and apply, apply it better so I think it’s (PERFORM) definitely worth pursuing” (C03)

6.7.11.3.2.2. Perception of job

Doctors expressed that PERFORM was “a really WORTHWHILE study” (C01) because negative emotional and behavioural reactions in the workplace decrease job satisfaction, which can impair clinical performance:

“...anxiety in the workplace can make you’re experience of medicine completely different so it can make it a really unpleasant experience if it comes to the point where you feel overwhelmed, erm, and well that’s the first thing and then secondly it’s affecting how EFFECTIVE you are in the workplace because you’re so overwhelmed you can’t really think straight” (C01)

6.7.11.3.2.3. Optimising performance

Some doctors stated that the ideas promoted by the PERFORM study directly complemented clinical knowledge-based training:

“I think it’s a really, important erm, sort of mental resilience and, erm training, sort of more-more than, erm more than just knowledge training it’s about, actually ap-application of knowledge, so erm, I was really keen to be involved in it” (C03)

Being more aware of one’s feelings and behaviours was reported as a positive trait for doctors:

“...erm I know some people are quite err, dismissive of these sorts of ideas... But actually I think it’s...if only for the self-awareness I think that’s probably one of the most important things you can be as a clinician is being self-aware?...Erm, because you’re not ever gonna do everything perfect all the time?” (C02)

6.7.11.3.2.4. Provenance

The doctors acknowledged that some people may be dismissive of the application of psychological techniques to improve clinical performance. However, the provenance of their use in sports was considered helpful to alleviate these concerns:

“...obviously this is based in sport psychology which is sort of quite another, like acute stressful situation...Um, and they work really well there so, I think there, I don’t THINK there should be barriers to it I think it’s just how people feel...” (S04)

6.7.11.3.3. Useful Elements

The doctors were asked which was ‘the most useful element of the study’ both as an open question and then as a multiple-choice question. Although the initial open question responses overlapped with the options of the multiple-choice question, simulation and the self-efficacy scale were also identified as useful elements.

6.7.11.3.3.1. Simulation

The doctors identified three main ways in they found simulation to be useful during the PERFORM study. These are described through quotations in Figure 6-26.

Simulation	Individualised post-simulation discussions	Think Aloud commentary to prompt memory and identify difficulties
<ul style="list-style-type: none"> •“any simulation in my head is useful, so, y’know got two free simulations out of doing the study, that-that’s really useful” (C05) 	<ul style="list-style-type: none"> •S02: “It’s just the two of us (reviewing the simulation video) rather than like, 6 people being like “you’re an idiot, [laughs] why haven’t you do that?” •HC: “So, one to one review of sim is, has been better for you?” •S02: “Yeah much better” 	<ul style="list-style-type: none"> •“...it’s a good way of seeing, um y’know you how you were thinking and, um, sort of the bits where you perhaps get a bit stuck and actually kind of give you a guide as to where you might use those tools (PERS) ...(...)...yeah, making yourself more self-aware I suppose of what, um, how I felt in those situations.” (S04)

Figure 6-26: Three major uses of simulation in the PERFORM study according to the doctors

6.7.11.3.3.2. Self-Efficacy Scale

One doctor commented that the self-efficacy scale offered a new way of thinking about achieving tasks outside of medicine:

“the scale to me feels quite, applicable to non-clinical areas of life” (C02)

6.7.11.3.4. Novelty

Compared with previous training on acutely unwell patient management, the doctors commented that the PERFORM study was novel in its incorporation of new/upcycled ideas and individualisation.

6.7.11.3.4.1. *New and Upcycled Ideas*

The doctors recognised that the content of the PERFORM study included upcycled information that they already possessed but either had never tried or could be used in a different way. For example, the PERFORM model supported the coping strategies previously used by the doctors:

“I was probably doing them anyway, but not, didn’t have an awareness of that-well I actually WAS doing them and how they can be used, in a BETTER, more logical way...Following-following this model.” (C06)

This included different perspectives on the use of commonly-taught cognitive aids, particularly the ABCDE approach:

“... I know that’s why they really drum it (ABCDE) into you at med school, because you just have to be able to like reel it off in a stressful situation...(…)... but it wouldn’t’ve occurred to me to consider that as a coping strategy.” (C04)

The doctors highlighted the flexibility of PERs, particularly those who created their own PERs. One doctor discovered the trigger phrase ‘make it simple’ with the help of their clinical supervisor:

“...initially I did try a couple of things and they-and they wouldn’t work for me...(…)... but I was determined to carry on with it so, err, kept trying and then came across this with my consultant after a, erm Case Based Discussion, which started to work” (C03)

The broader ideas of the PERFORM study were considered potentially applicable to future situations:

“I might, like hopefully not, but I might do a different job at some point in the future... And, that will inevitably come with some kind of stress ...(…)... the A to E might not (be relevant)...(…)...but the awareness of the routines might mean that I come up with a new routine in a different situation? (C04)

6.7.11.3.4.2. *Individualised approach*

The doctors explained that undertaking the Think Aloud commentary with only the researcher present eliminated peer judgement, encouraged them to ask questions and allowed them more comfortably accept constructive criticism. The Think Aloud element promoted self-directed learning and simulation evaluation (see Appendix 40 for quotations).

6.7.11.3.5. Limitations

Doctors highlighted limitations with regards to their engagement with the study including time, missed opportunities and working in a team.

6.7.11.3.5.1. Time

The time taken to apply PERs within an acutely unwell patient scenario, including simulation, seemed counter-intuitive to some doctors:

“...it’s the time-time pressure thinking that you’ve got to do something-you have to be, or yeah or it’s moving on-moving forward to the next step...Um, it’s a bit of a, y’know that’s the barrier to use it” (S04)

Finding time to reflect on the PERFORM applications was sometimes challenging:

“...there’ve been times when I’ve used it and I haven’t really, written in down properly” (C03)

These time pressures were exacerbated by busy clinical rotations:

“I found it difficult I think in A&E just because, not necessarily, I suppose USING it, but I guess it was just getting in touch...(…)... I felt like, after the rota there’s just no excess time or energy left, cos when I’m out of work I just don’t wanna think about work” (C01)

Since many doctors found the model easier to apply in clinical practice towards the end of the study, they then lacked time within the study time frame to optimise its use:

“...you just start to feel comfortable in your job and think “actually maybe I can start to, make things better with using some of these techniques” and then it’s near the end” (C03)

6.7.11.3.5.2. Missed opportunities

Many of the doctors explained that involvement with the PERFORM study as an extra-curricular project meant that it was not embedded in their clinical practice. During busy shifts the need to apply the PERFORM model often “*slips your mind*” (S01), which led to missed opportunities to use the model in practice.

6.7.11.3.5.3. Current rotation

Conversely, some doctors reported that whilst they wanted to apply the PERFORM model in clinical practice, sometimes they lacked opportunities to do so:

“I guess the only thing was that, it was done while I was on surgical on-calls... so you don’t get as many acutely unwell patients...So I couldn’t use it as often.” (C07)

For others, the independent application of their PERFORM model was further hampered by working in a speciality in which they were “*heavily supervised*” (C02) by seniors, e.g. critical care.

6.7.11.3.5.4. *Self*

One doctor recalled trepidation during the initial stage of the study that may have impeded their initial engagement:

“...it’s been little bit daunting through the, role play, I think everybody gets a little bit nervous about that so, the first session was a little bit of not really knowing what to expect” (S03)

Another doctor felt self-conscious when using the PERs in clinical practice:

“I suppose sometimes feel-would feel a bit self-conscious about, so things like sort of doing deep breathing and things I think are obvious to myself...(…)...y’know even though that might not be true” (S04)

Some doctors’ lack of creativity hampered their progress:

“...I was probably not very imaginative, and I think that was through being quite tired so I was like “oh, visualisation, ABCDE”, but there’s probably other things which I could’ve used a bit more, or different techniques I could’ve tried” (C01)

Other doctors felt too overwhelmed to think about the study:

“...the mind can go into overdrive at times I don’t always kind of think about it...” (S04)

6.7.11.3.5.5. *Team scenarios*

One doctor recognised that the PERFORM model only accounted for control over his *own* emotions and behaviours in the workplace and not those of other team members (See Appendix 40).

6.7.11.3.6. *Sharing*

The doctors shared their experiences of the study with others in the hope that it might support their colleagues, particularly newly qualified doctors:

“I’ll definitely use it, I’ll probably tell this new F1 about it tomorrow...“you’ll feel better if you do these things”...”

6.7.11.4. Topic C: Validation of the PERFORM model

The doctors were asked how the original *conceptual* PERFORM model (Figure 3-3) compared to their *contextual* model. In particular the metacognitive facets of feelings and behaviours, judgement, knowledge and skills, and the relationship between the facets were discussed.

6.7.11.4.1. Facets

6.7.11.4.1.1. Metacognitive Feelings and Behaviours

Two doctors recognised that their PERFORM models were not initiated by experiencing metacognitive feelings or behaviours and individualised their models accordingly (Figure 6-27).

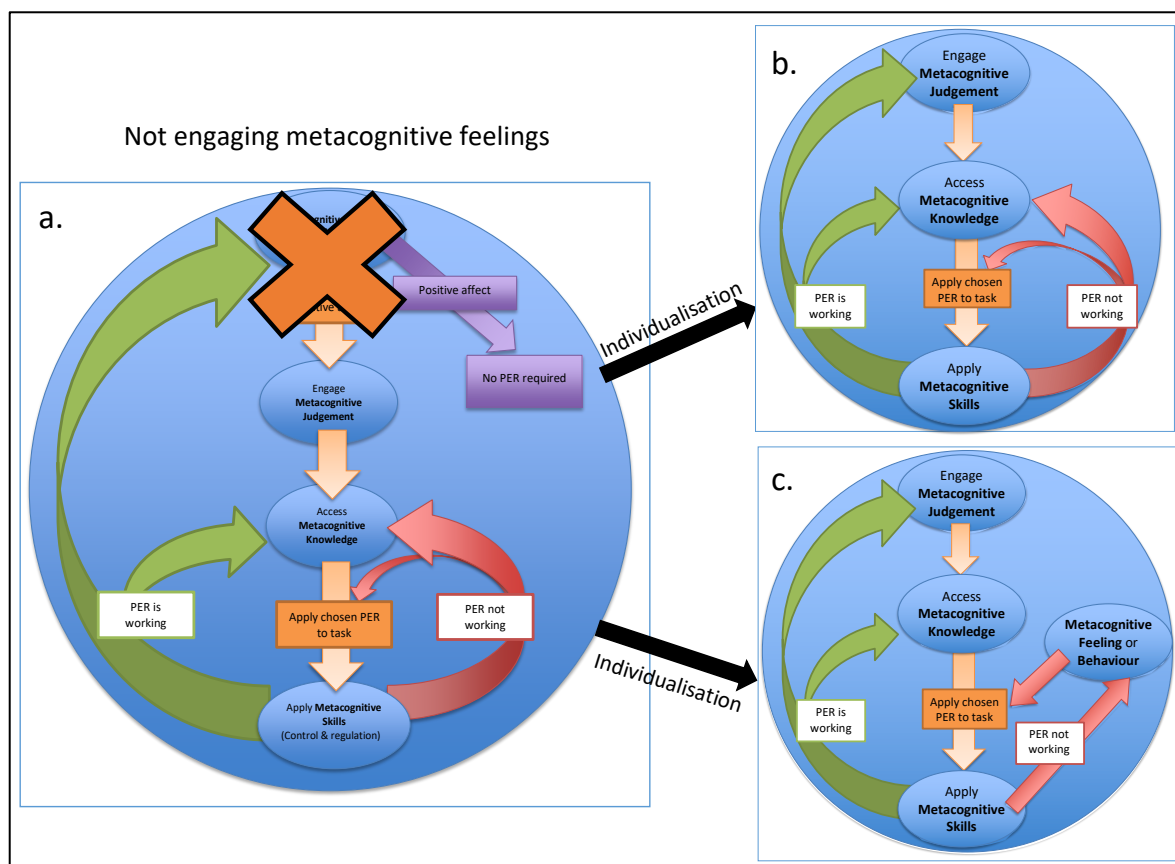


Figure 6-27: PERFORM Model Individualisation Example 1: Not engaging metacognitive feelings (a) and subsequent individualised models (b and c)

One doctor explained that when using their PERFORM model they were “...pre-empting that I was going to feel anxious, but it was kind of like recognising that’s a situation where I probably would feel, panicked normally” because “...if I let myself get really worried about it, it would kind of be a bit too late to bring it round” (S02) (represented as Figure 6-27b).

Another doctor initiated their PERs in situations pre-emptively *“just to make sure that I’m being, calm”*, but went on to explain that during a scenario their metacognitive feelings might increase the number of times they used their PERs *“...I think perhaps if I am stressed, particularly stressed then I use it MORE... yeah, you know within like a single, scenario”* (S04) (illustrated as Figure 6-27c).

6.7.11.4.1.2. Metacognitive Judgement

The doctors described how the PERFORM model had encouraged them to understand *why* they had a negative feeling or behaviour to a certain situation *“much more than I had done before”* (S01) and to identify specific reasons for their reactions:

“whereas before it was very much “Oh yeah I’m stressed, what’s goin on?”, I think now I’m much more aware I AM stressed because of these things.” (S01)

6.7.11.4.1.3. On-line Knowledge

Many of the doctors recalled that they engaged their on-line knowledge to select the most appropriate PER for the situation. Most commonly, PERs were selected based on task:

“So the erm, GOING to a patient, is like, is the deep, is the deep breaths and maybe the smile...but I think like a physical skill that I’ve got to do, for example, blood tests per say, erm, the smile definitely, but visualisation of-of the actual task ahead as well” (C06)

However, some doctors, when choosing their PER, also factored in the time available to perform the PER *“Because... you can’t really change the amount of time that you’ve got”* (C04).

One PER was often used in many different scenarios due to a common underlying problem, for example *“getting control in your mind”* (S01).

6.7.11.4.1.4. Metacognitive Skills

The doctors confirmed the use of their metacognitive skills to select alternative PERs when the initial routine was not deemed successful:

“I tried the breaths and I didn’t like that, but I-and I used the visualisation (instead)” (S03)

For some doctors the effects of positive feedback on subsequent PER selection only became apparent during post-scenario reflections (Figure 6-28):

“... on reflection, I think “oh that’s why I’ve used that again”...“This is why I like this (PER) because it’s worked last time”...” (C07)

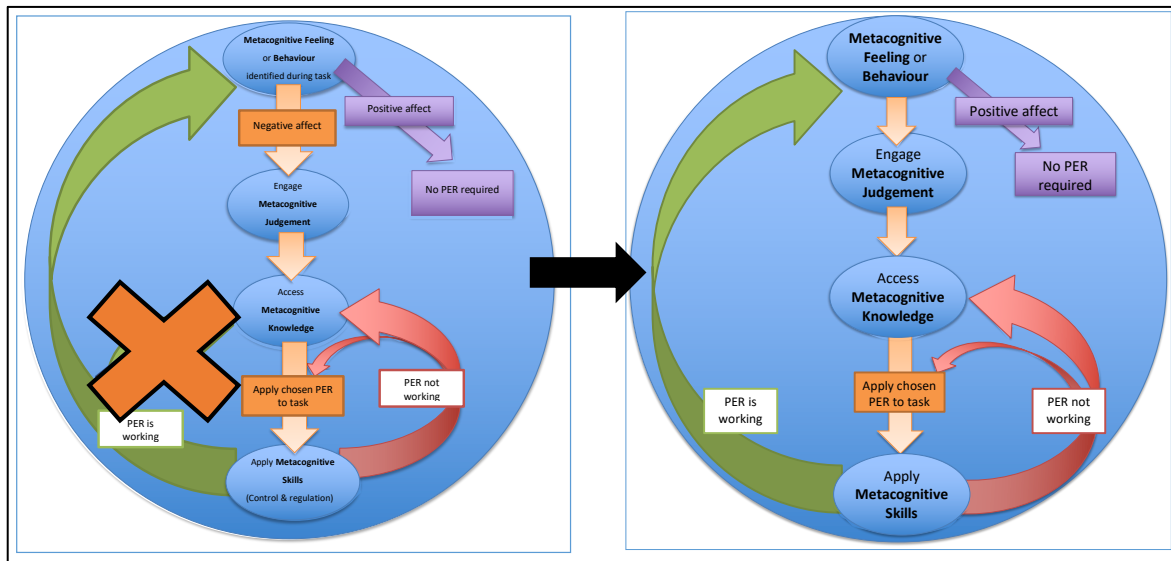


Figure 6-28: PERFORM Model Individualisation Example 2: No real time positive feedback

Some doctors explained “*I remember still feeling stressed*” (S04) in the event of an unsuccessful PER application. Following this either the same PER was repeated “*I just still keep going with the, “Come on, try again”...*” (S05) (Figure 6-29) or an alternative was chosen from the metacognitive knowledge bank, as described in the original PERFORM model.

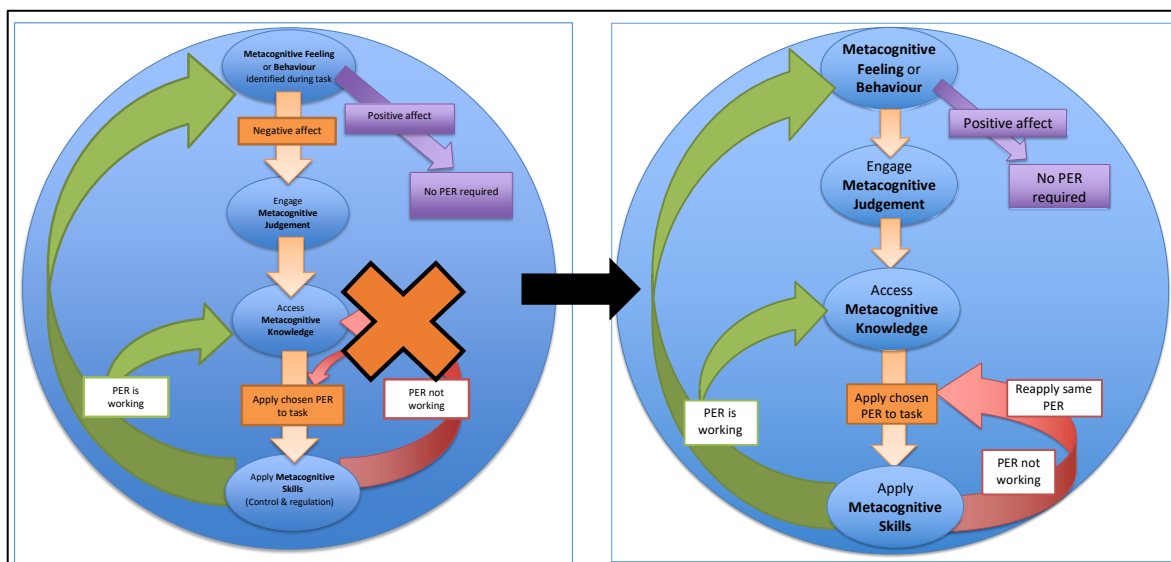


Figure 6-29: PERFORM Model Individualisation Example 3: Repeated application of same PER

In the longer term unsuccessful PERs were either dismissed for certain tasks or rejected from their metacognitive knowledge bank completely.

If PERs became automatic or subconscious doctors struggled to evaluate them with metacognitive skills. Doctor C05 explained that their PER “*is not something that I’m, I’m RECOGNISING anymore, it’s*

just something that I'm doing regardless" and therefore "if it didn't work, I would just think "oh I was really stressed there" but I don't think I would pick up on, "because 'airway' didn't work".

Doctor S04 was unsure as to whether he engaged his metacognitive skills but explained "that's probably um what I SHOULD do". Both of these issues could cause the PERFORM model to be modified as shown in Figure 6-30.

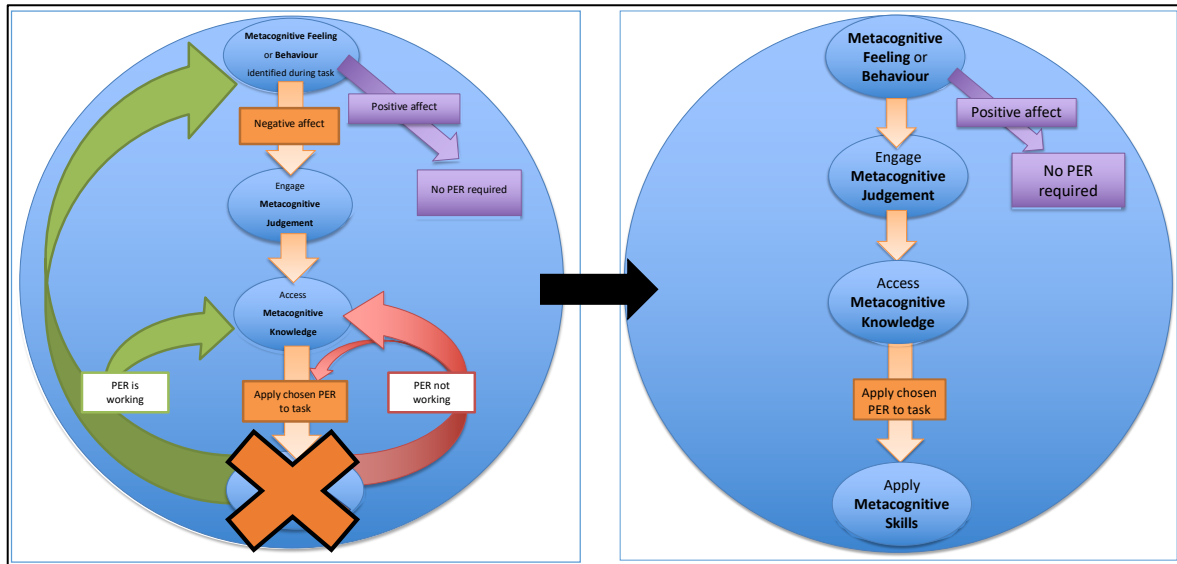


Figure 6-30: PERFORM Model Individualisation Example 4: No use of metacognitive skills

6.7.11.4.2. Relationship between facets

The doctors confirmed that the order of the facets in their contextual models aligned with the original conceptual model:

"I do agree that this is, this is kind of what happens in practice." (C06)

6.7.11.4.3. The Model As a Resource

The doctors generally only referred to the PERFORM model diagram at the start of the study if at all:

"Yeah, right at the beginning...When I was tryna use the different ones (PERs) on the card as well, but not since I've developed my own" (S03)

6.7.11.5. Topic D: Suggested Improvements

The doctors offered feedback regarding how the PERFORM study had been conducted and how a future larger roll-out might best be achieved.

6.7.11.5.1. Improvements on the PERFORM study

6.7.11.5.1.1. Time

Some of the doctors would have preferred a longer study period, *“maybe spread out throughout, throughout-over the year”* (C04) particularly if they felt that their current clinical placement lacked opportunities to use the model with real patients *“because I was doing surgery so couldn’t use them as often...(…)… if you are on Medicine four months is more than enough.”* (C07).

Flexible, rather than regular scheduled, meeting times and varied methods of communication, e.g. email, text, WhatsApp™, were reported as *“a good way of keeping-keeping in touch”* (S02) during Stage 2. The balance of autonomy and receiving email or text message reminders was *“probably like spot on to be fair”* (C06).

6.7.11.5.1.2. Cementing

Some doctors would have preferred more regular contact with the researcher, particularly *“at the beginning”* (S02) or more reminders during Stage 2.

Doctors on particularly busy rotations suggested *“catching us at the end of shifts”* (C01) to optimise reflection and debrief with the researcher.

6.7.11.5.1.3. Resources

Two of the doctors were unsure about how to use the resources in their online folder but stated it was *“really embarrassing”* (C02) to admit this during the study.

The majority of doctors did not view their uploaded simulation video in their online folder from Stage 1 *“because I don’t like looking at myself”* (C04).

The Prompt Card was more useful to the doctors. However some suggested altering it to include the list of PERs rather than the PERFORM model.

6.7.11.5.1.4. Self-Regulatory

One doctor explained that Stage 1 had enabled them to identify and address a specific problem but had not developed a broader self-regulatory strategy to identify subsequent workplace issues. They felt this would be important to address in a future study:

“... if you had a mechanism by which you could, continually recognise weaknesses and therefore, you’d-if you were doing that every time, automatically, then you would start thinking “oh right, well, I’m-I’m routinely doing this wrong and therefore, I’ll go and find a coping strategy for that” and I think that’s where this study would be going if you carried, if you carried on, that’s-that’s actually the end goal...(…)...and it hasn’t taught me to recognise problems I don’t think” (C05)

6.7.11.5.1.5. Simulation

Some doctors called for more in situ simulations throughout the study *“...because you see how people progress... through a rotation” (C02).*

For Doctor C06 the in situ simulations lacked elements of realism, *“tiny things that to make me think that it wasn’t (real)” “for example the bleeps, like, we don’t get bleeps like that”.*

Doctor S03 suggested that scenarios *“could be maybe a bit more stressful”* and perhaps personalised, *“I would’ve liked to’ve been tested with airway management I think... I think that’s something I’m not confident with” (S03).*

6.7.11.5.2. Future Roll-Out of the PERFORM Programme

The doctors made suggestions regarding the potential for the current PERFORM study to be either developed into a wider research project or an educational programme.

6.7.11.5.2.1. Target population

The doctors agreed that PERFORM should be introduced during the early stages of a doctor’s career because as a senior clinician *“you’ve probably developed some things (coping strategies) of your own and it’s harder to kind of... erm, break out of those maybe” (S04).*

The doctors also suggested that other healthcare professionals such as *“nurses”, “ACPs” (Advanced Clinical Practitioners)* and *“paramedics” (C03)* might benefit from PERFORM training.

The doctors felt that those receiving PERFORM coaching should have some prior experience of acutely unwell patient management:

“I would say, for things like...when you’re dealing with patients on your own basically so A&E... or if you have any form of on calls.” (S05)

6.7.11.5.2.2. Challenges

The doctors highlighted potential challenges in the event of a wider roll-out of the PERFORM study. Engagement and ‘buy-in’ from certain groups were a particular concern and the doctors reiterated that until participants have some acutely unwell patient experience they wouldn’t “appreciate” (S05) the need for the PERFORM model:

“I think you need sort of like a couple of months in (working as a doctor) and everybody’ll be able to identify a scenario where they have felt like “oh crap” y’know what I mean? ...And that’s when I think you’d sort of think “yeah, y’know what I could use that” ...” (S05)

Doctor S05 warned of the self-selection recruitment bias towards “under confident people” (S05). “I can IMAGINE, there is a select group of people who are quite confident and whatever...who’d just sort of think “What a pile of rubbish”...” (S05) and they “don’t realise how much they need it” (S05).

Doctors’ workloads, both in terms of clinical practice and professional development, may also hamper engagement with PERFORM unless participants are actively motivated and encouraged:

“...if you made this part of a curriculum, this would be so easy to fake...(…)... people would just, make up the answers to what they’d done the day before...(…)...to make this truly work would have to be quite an INVOLVED process, or to have people really on board with doing it, and realistically, there’s so much for everyone to do already, that I think to prioritise this you would have to...(…)... have regular, contact to push this and say “Look this is really important that you learn this, self-reflective, sort of ability” (S05)

The doctors considered that participant motivation might be improved through highlighting current mental health issues within the health service:

“...people don’t like talking about...their feelings, and in medicine it’s very much a “carry on” but that’s NOT good... err, and y’know that’s the whole point so, erm, and the, the-the burn out rates are so high I think there needs to be something, done to try and help, everyone” (C03)

6.7.11.5.2.2.1. Integration

The doctors suggested integrating PERFORM into resuscitation training and/or acutely unwell patient simulation courses that doctors already complete as part of their training, “...*they would fit together really well*” to offer “*a personal, rather than a clinical, perspective*” (C04)

6.7.11.5.2.2.2. Resources

Many new resources were suggested by the doctors for future PERFORM roll-out, including a mobile phone application to log reflections and motivate/remind participants to use the model more frequently in clinical practice. Doctor C02 had an interest in the psychology of performance enhancement and suggested supplementary reading to be offered to future participants. Doctor S03 suggested pooling the newly-created PERs from the study so that others may use them:

“...maybe putting in whatever ideas we’ve thought of, y’know people you’ve seen now... you could try and share them with others?” (S03)

6.7.11.5.2.2.3. Researcher Contact and Timeline

Feedback on the current PERFORM study was echoed in the doctors’ suggestions for researcher contact and the timeline of future PERFORM programmes. There were mixed opinions regarding fixed or more flexible meetings between future participants and their researcher/coach. Overall, there was a preference for a longer time period for a future study/educational programme. (More details in Appendix 40).

6.7.11.6. Quantitative Results

During the SSI in Stage 3b doctors were asked to choose and comment upon the most useful elements of the PERFORM study and the optimal timing for its future implementation into medical training. Both of these results were collated and quantified and are presented below.

6.7.11.7. Multiple Choice Feedback on Most Important Element of Study

The doctors selected up to two of the following four study elements which they deemed most important:

- a) Use of a PER itself
- b) Increased awareness of their own feelings
- c) The identification of a specific element(s) of acutely unwell patient care that induced negative emotions or behaviours
- d) The use of reflection following scenarios

Figure 6-31 demonstrates the spread of answers from all 12 doctors. Five doctors chose only one element and the remaining 7 doctors selected two equally important elements.

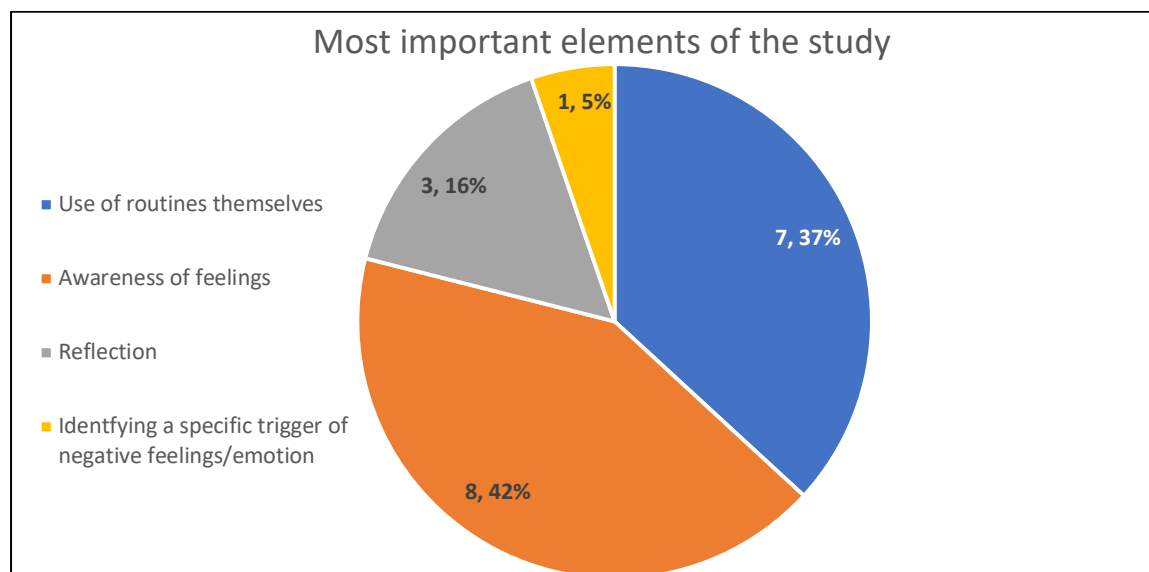


Figure 6-31: Pie chart displaying feedback on most important element of study

6.7.11.8. Target Population for Introduction of PERFORM During Medical Training

The doctors suggested the optimum time during medical training at which PERFORM should be introduced if it were rolled out as a larger teaching programme. One suggestion was to include an introduction and follow-up strategy:

“They do it-they do it in final year but they-the F1, we do it in F1 as well...(...)... maybe a chance to implement them (PERs) and then revisit them” (S01)

Some suggested a range of different timing options:

“...maybe like final year...(...)... And I feel like almost maybe, maybe even just F1 maybe that-in the first few weeks...” (C06)

Other suggestions were very specific:

“I think, erm, for, the-the transition phase F-fifth years into F1” (C03)

Each suggested time point for the introduction of PERFORM as an educational programme is represented by a vertical arrow in Figure 6-32. As some doctors suggested more than one potential introduction point there are more than 12 arrows.

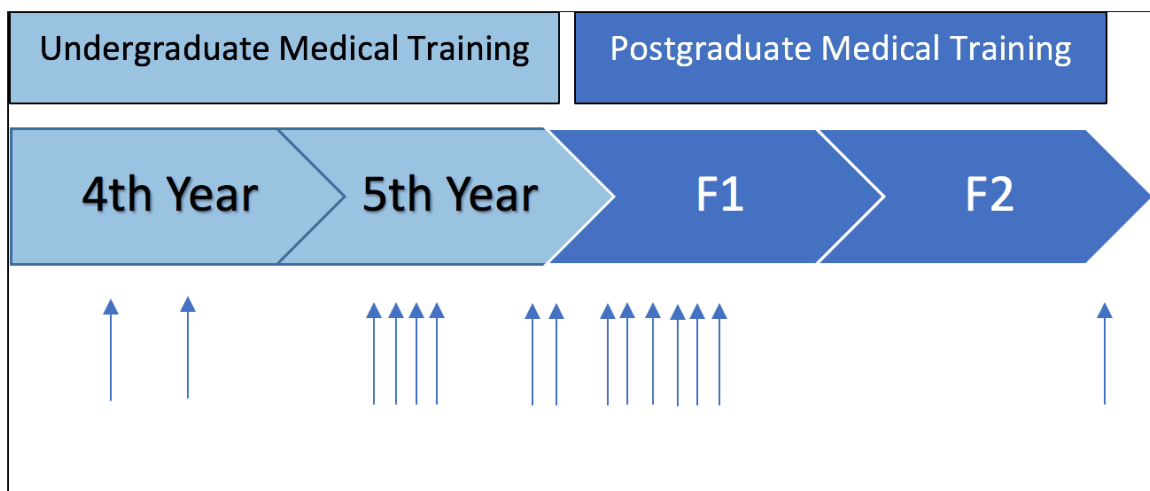


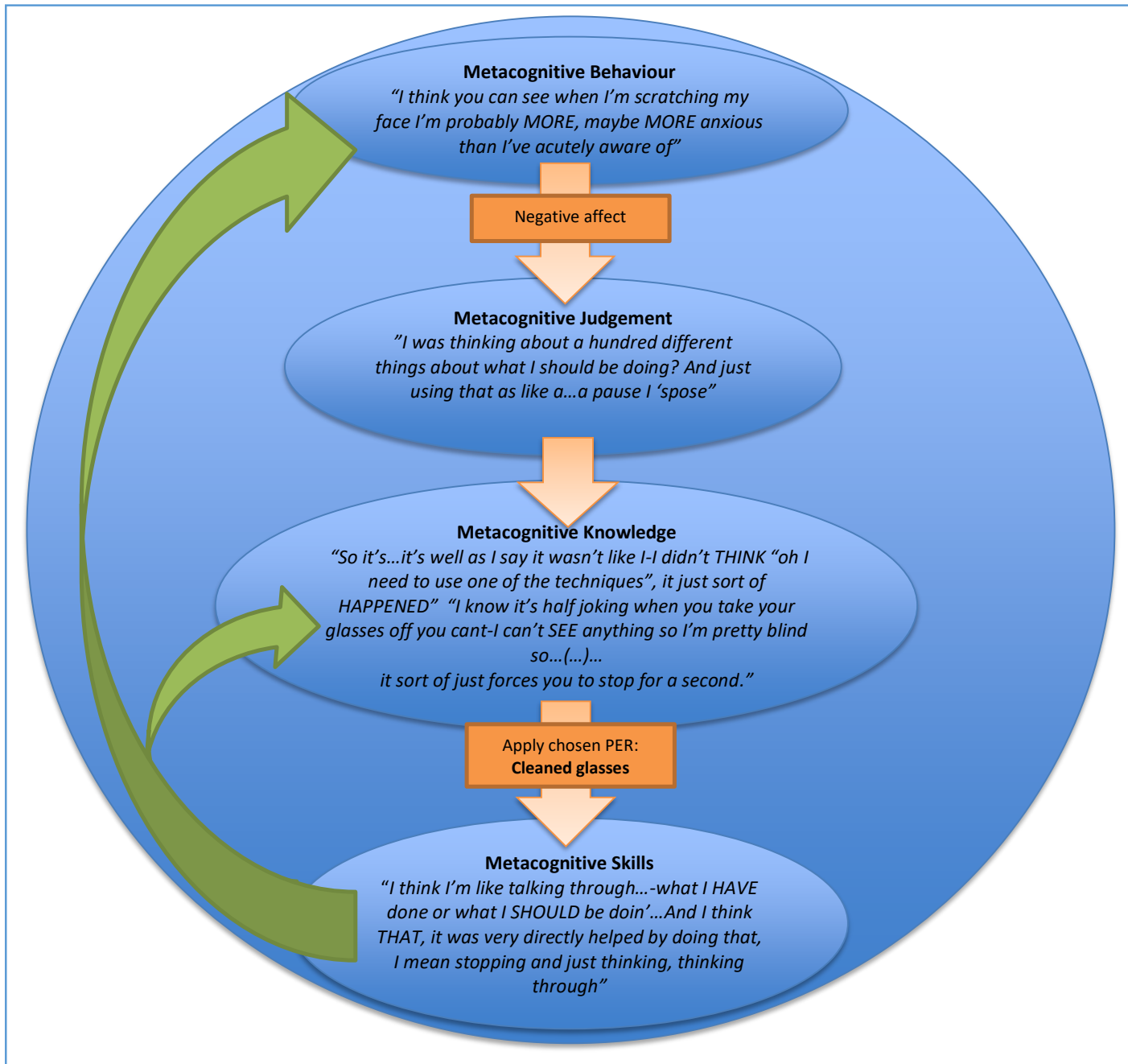
Figure 6-32: Potential targets for PERFORM introduction during medical training

6.7.12. Stage 3: Case Study

The Think Aloud commentary following case S01's in situ simulation scenario and Stage 3 SSI are presented here.

6.7.12.1. Stage 3a: Think Aloud Commentaries

Figure 6-33 maps Doctor S01's Think Aloud commentary of his in situ simulation to the conceptual PERFORM model using quotations alongside an editorialised summary pertaining to each metacognitive facet.



Doctor S01 highlighted the behaviour of scratching their face, which they interpreted as due to feeling "anxious" at a subconscious level. This caused a negative affect.

This underlying anxiety was described by Doctor S01 as a result of feeling overloaded with information and being uncertain about what to prioritise.

Doctor S01 used the PER that they created and practiced earlier in the study (cleaning their glasses) to create some time to think about the situation. Doctor S01 felt that this was not a conscious choice as "it only takes a few times to do it and think about DO THIS...before you just sort of start doing it naturally".

Doctor S01 reported that the PER provided "calmness as well as focus". However, "it's the conscious ones (PERs) at the moment give me the most benefit...Cos it's my guess I go through that thought process of "oh I'm cleaning my glasses so let's think about what's goin' on and stop. Whereas when I do it subconsciously, it was just sort of...didn't really think about what I was doing, and just carry on". This feedback was cycled into their metacognitive knowledge bank for future reference.

Figure 6-33: S01 In situ Simulation example PERFORM model: GI haemorrhage

6.7.12.2. Stage 3b: SSI

Doctor S01 reported that despite initial reservations, the study offered insights into behaviours of which they were not previously aware:

"...it is really interesting to sort of, discover how I behave at the bedside. Y'know all the scratching all that sort of thing which I was just tot-and I guess I probably do that in, not just in the simulation but in real life as well"

6.7.12.2.1. Topic A: Usability of PERFORM Model in Clinical Practice

Doctor S01 described the step-wise integration of their PERFORM model, explaining that initially they applied the model in clinical practice after being encouraged to do so by the researcher:

"... the first time I, used it it was a bit like "oo, I'm just doing this because, I think I should, y'know (the researcher) told me to try it out"..."

During Stage 2, PERFORM became more "useful" with each clinical application:

"...that first one I did it and I thought "hmm, I guess it sort of helps but I'm not really sure" and I think maybe that was partly because I felt that first one wasn't a super stressful scenario...but in the second one, it seemed to be-where I was ACTUALLY quite, I well I guess yeah a bit out of my depth and a bit panicky, I think yeah it-it was useful."

By the end of the study, their model application had become more automatic:

"I guess you saw there a little bit that it's, STARTED to become a bit more, subconscious, which I guess is potentially a good thing. Erm...so yeah it's been a bit of a like transition I suppose"

Doctor S01 specifically denied putting on a performance for the benefit of the researcher during the in situ simulation:

"...yeah there was never any, like aspect of performance...(...)...It wasn't like, "oh I'd better look like I'm using the thing"..."

Doctor S01 intended to continue using their PERFORM model in clinical practice following the study conclusion:

"it'll be interesting to see I think if it, if I keep using them and it just becomes part of what I do."

Doctor S01 also considered its possible application to other non-clinical situations, “Y’know like maybe before interviews and things”.

6.7.12.2.2. Topic B: Usefulness of PERFORM

The two most useful outcomes of the study for Doctor S01 were an increased self-awareness and reflection. Reviewing the initial simulation videos with the researcher was described as more valuable than self-directed reflection:

“I’m only becoming increasingly aware because we’ve sat and spoke about it afterwards I think if we’d just done the sim-the sims and even if I’d just watched the videos on my own, I don’t think I’d’ve taken that much away from it.”

Doctor S01 found reviewing the simulations with Think Aloud commentary “quite useful to watch yourself and think “well what was I thinking there?” and then you can think back and remember what it was...erm, which, which you don’t really get any other opportunity to do”. This had supported them to become “a bit more aware of my actions and what I was doing, and also my thought process”.

For Doctor S01 this laid the foundations for a general increase in reflective practice during Stage 2:

“...so just y’know after a day at work, something like that or...y’know, in the days after some of these scenarios and things like that...you just sort of think about the things that you went through and, and the techniques and that sort of thing ...(...)... I definitely think about, my own actions MORE own actions in terms of, when I’m at the bedside”

6.7.12.2.3. Topic C: Validation of the PERFORM Model

Despite Doctor S01 having only referred to the conceptual PERFORM model as a resource in the initial stages of the study, he confirmed that his *contextual* model agreed with the original *conceptual* model in terms of the arrangement of the different facets:

“I think that’s, that’s absolutely the order, erm like I wouldn’t start thinking about it consciously or subconsciously until there was some sort of...negative stressor or something yeah.”

Doctor S01 was unsure as to whether he used metacognitive skills to evaluate the use of a PER, admitting “I don’t know if I had a re-circle there where I was thinking “well I need to try something else”...”. This was because they “didn’t really come across a scenario where like, I’d try something, and it didn’t work” and therefore had not needed to select a different PER during a clinical scenario.

Doctor S01 recalled using the breathing technique as a PER in the first reflection, *“certainly in that first one, the breathing helped”*. Subsequently he had not it as frequently as the glasses-cleaning PER that he created *“...because, the glasses became the thing and it just... it never seemed to NOT work”*.

However, the breathing PER was not totally abandoned:

“So yeah it’s not, “oh the breathing didn’t work, so let’s dump it”...(the glasses are just) yeah preferred”

In practice, the two PERs were combined:

“I’d probably, without thinking, take a bit of a breath anyway when I’m doing that so I wonder if they’re just combined now”

Patient summarising was another PER applied in clinical practice. Doctor S01 explained that his choice of PER was task-dependent:

“I think the patient recap would be very much, is for, erm...is for recall and...I don’t know what the word is but like, yeah it’s essentially making sure you’ve not missed anything...(…)...Whereas the glasses I think, I don’t think ARE specific to any one thing...I think I found them useful for lots of different things...”

Doctor S01 concluded that his PERs address difficulties which have *“the same route-cause”* and are useful for *“... stopping, my brain going all over the place”*.

Doctor S01 acknowledged that individualisation of the PERFORM model resulted from positive feedback, as described in the conceptual model.

6.7.12.2.4. Topic D: Suggested Improvements

Doctor S01 intended to use PERFORM after the study conclusion hoping that he would eventually use the model *“subconsciously, pre-emptively”* in clinical practice.

It was during the first Stage 1 Think Aloud commentary that Doctor S01 became aware for the first time that he scratched, usually their face or abdomen, in clinical or simulation settings:

“I know that I scratch lots of the time without realising in every situation just cos of my eczema...but I think yeah when I’m, nervous or...err-yeah it just it happens more frequently...(…)... Erm, I don’t think it’s a particular, y’know, coping mechanism”

Doctor S01 explained his scratching as a 'nervous tic' which might precede, or replace, a negative emotional reaction. He inferred that initiation of a PER on becoming aware of his scratching might achieve pre-emptive application of PERFORM:

"I suppose if I realise as soon as I was scratching, I'm like "alright, well I'll obviously, subconsciously feeling a bit stressed about this situation"..."

Although this was appealing to Doctor S01, he conceded *"I don't know HOW I would become more aware of it?"*.

Outside the context of acutely unwell patient management, Doctor S01 identified broader potential future application of his PERFORM model, *"...maybe before interviews and things...as I go through training I imagine that'd be something that I consider."*

Doctor S01 considered that the four-month study period was *"enough time to see some change"*. However, a wider-scale future PERFORM roll-out *"over, like a year or like two years"* would allow the researcher to *"follow someone's journey through like from really junior and just see how they're progressing"*.

Doctor S01 elaborated on the potential contents of a longer programme:

"...a simulation once every, two or three months or whatever...and like a debrief like this but then also the continued reflection of using them (the PERs). And maybe y'know just for the next 10 years or so...(laughs)"

Doctor S01 highlighted the importance of motivating future participants due to busy schedules and work-loads, suggesting that this could be achieved through more regular meetings with the researcher/coach:

"...I would find it more useful to see you, yeah I dunno once a month, once every three weeks or something...Because then, you'd have a whole load of different experiences that you can just sort of bring to you..."

Doctor S01 initially recommended that the PERFORM model be introduced during the final year of undergraduate medical training. However, he then explained that participants might require some experience of managing acutely unwell patients to appreciate the *need* for PERFORM, which would only be possible after graduation:

“...because until you USE it in real life, you don’t know whether it’s useful for you or not, but then it-introducing the idea of it...as an undergraduate, so it’s there, you’ve got a tool ready to use...so yeah, early on I think.”

Therefore, Doctor S01 recommended the integration of PERFORM into undergraduate and postgraduate simulation sessions which are already established but currently focus on clinical knowledge and technical skills:

“...they do it (the SMART course) in final year but they-the F1, we do it in F1 as well. So yeah, even that’s a good opportunity...(…)...you’ve got this...set of tools to-that you’re aware of as of final year...maybe a chance to implement them and then revisit them...at the SMART course”

Doctor S01 justified why PERFORM should be introduced at an earlier stage of one’s career because for more senior, experienced clinicians *“it would be more difficult to change your learned behaviours from, years of doing whatever you do when you see a sick patient”*.

6.7.13. Stage 3 Summary

The cohort and case study results of Stage 3 of the Full Intervention demonstrated how the doctors used their PERFORM models during an in situ simulation and showed insight into the doctors’ perception of the model, the study and its future in medical education.

6.8. Chapter Summary

This chapter has demonstrated the design, methods, analysis and results of the Full Intervention Phase of the PERFORM study. The latter was presented from the point of view of the whole cohort of 12 doctors and as a case study vignette. In the next chapter, these results will be discussed in the context of the current literature.

Chapter 7. Discussion

This section contextualises the results of the Full Intervention with reference to the medical education and sport psychology literature.

The chapter begins by discussing the results from the Full Intervention Phase using the Medical Research Council (MRC) process evaluation guidance: Initially the results pertaining to the full cohort of 12 junior doctor participants are discussed. Then the participant variables of *training level* and *study site* are examined separately to determine their influence on the results.

Finally, the strengths and limitations of the study are evaluated regarding data collection, analysis and interpretation.

7.1. Introduction

The results of the PERFORM study both support and provide new evidence to the current literature surrounding the optimisation of junior doctors' management of acutely unwell patients. In order to interpret the study findings appropriately, the study's quality must be evaluated. As mentioned in Chapter 3, a process evaluation considers broader quality themes of a study and complement individual tools to ensure rigor such as triangulation and peer-debriefing. The process evaluation of PERFORM will use guidance from the MRC on complex health interventions.

7.2. Evaluation of the PERFORM Study using MRC Guidance

The MRC guidance stresses the need to understand not only *whether* something works but also *how* it works (Moore *et al.*, 2015, p. 222). In this way process evaluation is as important as the overall study outcome and is particularly relevant to the contextualisation of the PERFORM model undertaken by the doctors in the study.

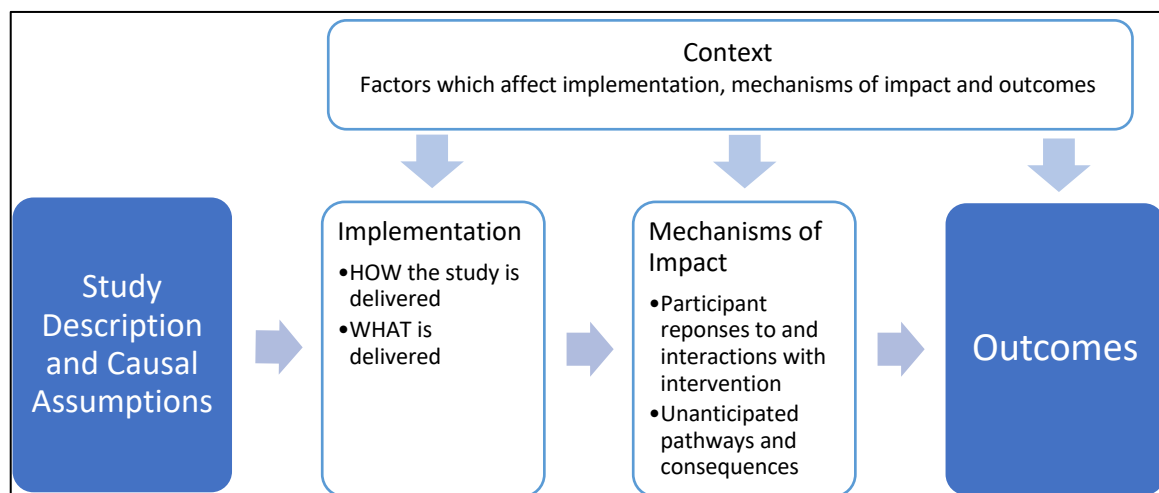


Figure 7-1: Process evaluation (adapted from MRC model, (Moore *et al.*, 2015, p. 223))

Figure 7-1 illustrates a simplified version of the MRC evaluation model, (Moore *et al.*, 2015, p. 223) with the evaluation elements shown in the white boxes. This model informs the topics discussed in this chapter but the order will be adjusted to better explain this PERFORM study.

The literature review, Exploratory and Pilot Phases comprise the *Study Description and Causal Assumptions* (Figure 7-1). They established the study's causal assumptions through exploration of the literature, SSIs and piloting the feasibility of the Full Intervention Phase. The outcomes of these precursory phases fed directly into the Full Intervention Phase.

The process evaluation of the Full Intervention Phase will be considered in relation to each of the three white boxes (Figure 7-1). *Mechanisms of Impact* (subchapter 7.4) will discuss both the doctors' interaction with and their responses to the PERFORM model. *Context* (subchapter 7.5) will consider the effect of the participant variables of place of work and level of training. *Implementation* will critique the design, data collection and analysis to outline potential limitations of the findings and is discussed in subchapter 7.6.

Outcomes are contained in the final chapter of this thesis and specifically address the research questions.

7.3. Study Description and Causal Assumptions

The literature review identified gaps in the current approaches to educate under- and post-graduate medical trainees about acutely unwell patient management. Many of these gaps were subsequently addressed in the PERFORM study:

7.3.1. Focus on Foundation

Whilst fifty percent of the literature review studies targeted final-year medical students and/or first-year postgraduate doctors, in this PERFORM study postgraduate doctors were considered a more motivated target group because they are responsible for managing acutely unwell patients. The PERFORM study also included second-year doctors due to potentially limited exposure of doctors to acutely unwell patients in their first 12 months of work (Amin and Cartledge, 2012). This also addressed the "minimal focus on the well-being of F2 doctors" (Mason *et al.*, 2013).

7.3.2. Individualised Simulation Sessions

Although only two studies in the literature review evidenced one-to-one simulation sessions (Schwind *et al.*, 2011; Thomas *et al.*, 2015), they were adopted in the PERFORM study as they are less prone to peer judgement than group simulation (Jansen *et al.*, 2010) and allowed more honest interactions between the doctors and the researcher.

7.3.3. Mixed Methods in Simulation Studies

Despite McGaghie's (2010) promotion for the use of mixed methods in simulation studies, this was only demonstrated in 30% of the studies in the literature review. Mixed methods research was considered the most comprehensive way of capturing the outcomes of the study.

7.3.4. Kirkpatrick Levels 3 (Behaviour) and 4 (Reaction)

The majority of studies in the literature review only measured outcomes pre- and immediately post-intervention. The PERFORM study was conducted over a four-month period, whereby longer-term impact on clinical practice could be evaluated.

In addition to addressing the above gaps in the literature, PERFORM continued to support the increasing trend of Clarification studies (Figure 2-7). Clarification studies, such as this PERFORM study, are embedded in theory so as to afford rigorous and transferable conclusions (Graham, Church and Murdoch - Eaton, 2017).

The Exploratory Phase of the PERFORM study confirmed the literature review's findings that doctors are aware of negative emotions and behaviours during acutely unwell patient management and that there is a general absence of coping strategies with which to manage these. Building on the literature review and Exploratory Phase of the study, the Pilot Phase subsequently verified that the PERFORM model could be coached to doctors in a similar way to Bond et al., (2004), who used simulation to instruct emergency medicine residents in the use of 'cognitive forcing strategies'. Coaching of the PERFORM model was applied under the definition of "unlocking a person's potential to maximise their own performance", (Whitmore, 1996; in Launer, 2013). A recent review by Lovell (2018) concluded that coaching was a promising yet underused tool to support both the acquisition of non-technical medical skills and medical student or doctor "wellbeing". It therefore seemed appropriate to use coaching in the PERFORM study.

7.4. Mechanisms of Impact

This facet of process evaluation contains both the doctors' interactions and responses to the study. Interactions will be discussed in relation to both the study and the PERFORM model.

7.4.1. Interaction with the PERFORM Study

7.4.1.1. Emotions and Behaviours

Stressful experiences are not always interpreted in a negative way. When viewed as a challenge, a 'promotion focus' is used (Leonardelli, Lakin and Arkin, 2007) and stress can increase "alertness, concentration, focus, or efficiency of actions" (Wetzel *et al.*, 2006). Conversely, a 'prevention focus' reframes the problem as a threat, inducing negative affect. The latter was the case for all of the doctors in the study, who reported some form of negative emotion or behaviour when managing acutely unwell patients. These findings aligned with previously published studies on medical trainees' emotional regulation which was analysed both objectively during medical emergency simulations (Duffy *et al.*, 2015) and self-reported clinical experience narratives (Lundin *et al.*, 2018).

The literature in this area mainly focuses on the psychological or emotional manifestations of negative clinical experiences, e.g. feeling "overwhelmed" when asked to attend an acutely unwell patient (Tallentire *et al.*, 2011a). However, physiological and physical manifestations of stress were also recognized by the doctors, including nervous tics or exaggerated facial expressions. Andreatta *et al.* (2010) observed similar behavioural manifestations of stress during simulated laparoscopic surgical training, where altered facial expression was most common.

The doctors in the study not only articulated that experiencing negative emotions and behaviours was unpleasant, but also considered them detrimental to their management of acutely unwell patients through altered cognition and/or clinical management behaviours. Cognitively, the doctors described either difficulty in retrieving or logically applying their knowledge. Similarly, they were unable to engage their higher cognitive functions and instead simply reverted to gathering information to allow their seniors to make more sophisticated decisions. Tallentire *et al.* (2011a), revealed similar cognitive difficulties for newly-qualified doctors during acute patient care.

The doctors altered clinical management behaviours included making errors. This was also highlighted by Wetzel (2006). The doctors in the PERFORM study recognised that they failed to act efficiently in time-critical situations, akin to the sense of 'paralysis' expressed by the newly-qualified doctors in Tallentire's (2011a) explorative study.

The most common point at which the doctors' emotional or behavioural stress peaked was reported to be at the beginning of a clinical encounter. This is also true of the evidence of stress in sport, hence the popularity of *Pre-Performance Routines* (Cotterill, 2010), which are undertaken just prior to an event.

The doctors in the study identified three main trigger categories of emotional or behavioural responses during acutely unwell patient care: people, situation and self (Figure 7-2). These in turn impacted patients, colleagues and the doctor themselves.

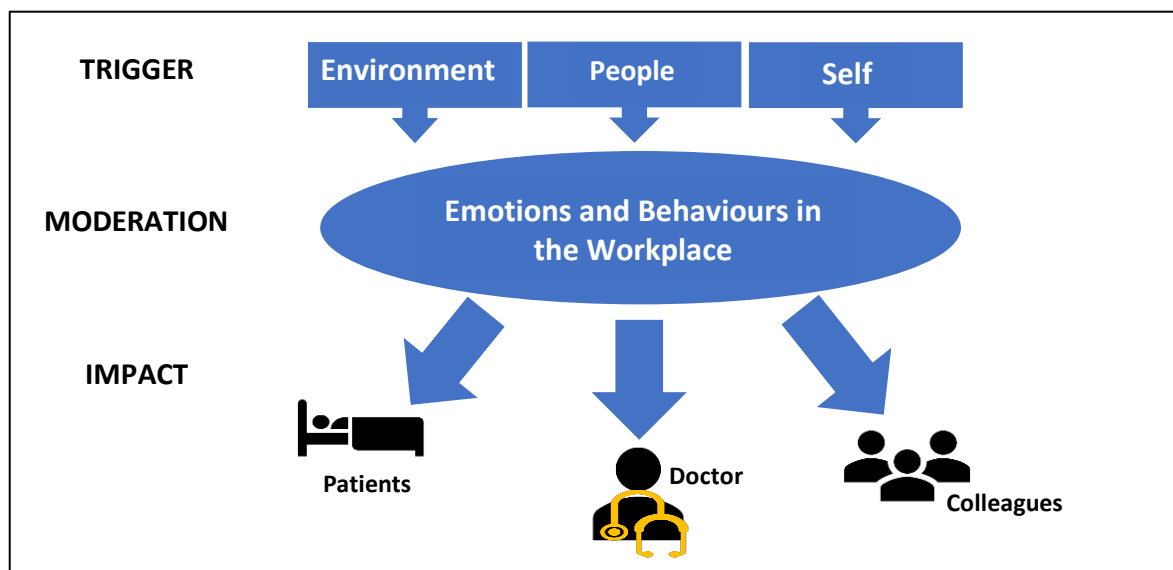


Figure 7-2: Emotions and behaviours in the workplace: triggers and effects

7.4.1.1.1. Trigger 1: Environment

Many environmental triggers related to a lack of familiarity with many aspects of the doctor's job, i.e. specialty, clinical equipment, local protocols etc. Such variables are exacerbated by transitions through clinical rotations and such environmental change may induce emotional and physiological stress (Pottier *et al.*, 2011). These effects culminate in the potential to adversely affect clinical performance (Kilminster *et al.*, 2011), which is well-evidenced in other industries, such as aviation. Other environmental triggers reported by the doctors in the study included complexity and multitasking. In an observational study community hospital doctors were engaged in multiple simultaneous activities for 21% of their shift (Weigl *et al.*, 2013), and the average time spent multitasking correlated significantly with self-reported 'strain', i.e. mental demands, effort and frustration. The doctors also experienced interruptions during their clinical work, which according to

Wiegl *et al.* (2011), occurs on average 5.3 times per hour, and doctors are not equipped to manage these distractions to avoid clinical error (Thomas *et al.*, 2015).

7.4.1.1.2. Trigger 2: People

Actual or perceived isolation were strongly associated with negative emotions or behaviours by the doctors in the study. This resonates with Plaice *et al.* (2002), who found that the most common stressful experiences reported by newly qualified doctors occurred when they either were the first to attend or they were unsure how to, or failed to, access assistance when managing an acutely unwell patient.

7.4.1.1.3. Trigger 3: Self

This theme included perceived lack of knowledge, skills or failed self-imposed expectations. In the latter category, self-criticism or doubts aligned with 'imposter syndrome'. Clance and Imes (1978) described "imposter phenomenon" as the "internal experience of intellectual phoniness" observed in high achieving women who persistently believed that they were not academically bright, but had convinced others into thinking otherwise. Legassie *et al.*, (2008) evidenced that imposter syndrome is common in medicine, with a prevalence of 44% amongst hospital residents; furthermore is not exclusive to junior doctors. LaDonna *et al.*, (2018) found this to be true for more experienced clinicians, who described their career achievements as "rising to the level of your incompetence", clearly demonstrating that self-doubt is not overcome purely through gaining clinical expertise.

Clinical environments are complex and fraught with many different challenges in which junior doctors are expected to strike the balance between patient safety and their own learning (Shojania, Fletcher and Saint, 2006). Furthermore, doctors often fail to recognize the personal impact of their working environment, (McGowan *et al.*, 2013) where unrealistic workloads and challenging shift patterns contribute to fatigue, which not only endanger patient safety but impacts on the doctor's own health.

7.4.1.1.4. Multiple Triggers

Some events described by the doctors in the study resonated with more than one trigger. One such example was working unsociable hours, which had a three-pronged effect on junior doctors' emotions and behaviours: prior to, during and after the shift. Pre-emptive fears or 'dread' were present prior to working unsociable hours, for example, night shifts. During a night shift, decreased staffing levels caused the doctors to be anxious. Following an unsociable hours shift doctors struggled to 'switch off' mentally from their work. Here, the three main trigger themes of

environment, people and self, collide. This was also evidenced by Paice *et al.*, (2002) in their discovery that night shifts in particular were commonplace for stressful incidents experienced by junior doctors, where a “dimension of loneliness” was added to pressure of “coping with responsibility at night”.

7.4.1.2. *Impact: The Uncomfortable Learning Environment*

The red box in Figure 7-3 represents an ‘uncomfortable’ learning environment (Wetzel *et al.*, 2006; Aggarwal, 2008; Wetzel *et al.*, 2011) for doctors when managing acutely unwell patients. The variables relating to the triggers of environment, people and self, are listed in black text within the red box. These either independently or in combination create the uncomfortable learning environment. By negotiating the uncomfortable learning environment by following the grey arrows, doctors gain knowledge and skills from their patient encounter, and emerge with additional confidence and competence (yellow box). This acquired confidence and competence then diminish potential negative emotions and behaviours prior to and/or during subsequent similar patient encounters.

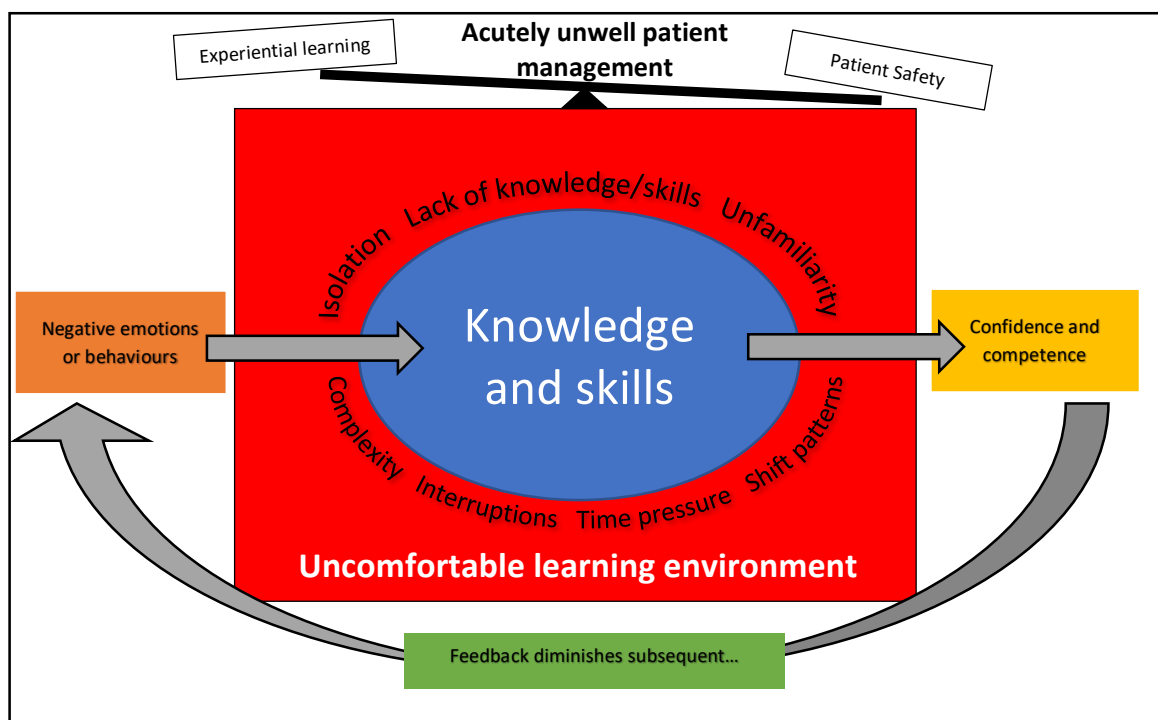


Figure 7-3: Conceptual diagram of an uncomfortable learning environment

Overarching this acute patient encounter is the delicate balance between gaining confidence and competence through autonomous experiential learning (Kolb, 2014) and delivering optimum care to the acutely unwell patients in a time-pressured situation (on top of red box, Figure 7-3). The doctors

in the study referred to this in their deliberations regarding the ‘appropriate’ time at which to call for senior support.

From a patient safety perspective, one might assume that having more senior input is always optimal. However, some doctors reported that their negative emotions and behaviours caused them to prematurely defer to seniors rather than thinking about how they might manage the situation themselves. This affects both patient care and doctors’ clinical development.

For patients, this causes a time delay in treatment which could otherwise be instigated by a junior doctor if they were able to access and apply their own knowledge. Furthermore, over-reliance on seniors increases their workload, which could cause subsequent time delays for other patients who *do* require senior input.

Doctors who choose a ‘prevention focus’ (Leonardelli *et al.*, 2007) and access senior support, short-circuit their own learning and leadership opportunities (Oliver, 2017). Selecting the optimum time to call for senior assistance is both driven by, and compounds, negative emotional and behavioural experiences in clinical practice.

7.4.1.3. Strategies

Despite multiple reports of the effects of stress on acutely unwell patient management, Lundin *et al.*, (2018) highlighted that there remains “surprisingly little evidence concerning the strategies that junior doctors within their first few months of practice use to handle emotions associated with clinical experiences”.

All of the doctors in the study acknowledged the presence and effects of negative emotional and behavioural responses to acutely unwell patient care. However, the majority had never previously employed strategies with which to manage these. The doctors generally reported that they were not taught specific coping strategies during their training. This was also reflective of the paper published by Wetzel *et al.* (2006). This not only established that stress poses “significant risks” to surgical performance, but also concluded that the surgeons interviewed received no training in coping strategies with which to decrease these risks.

The majority of the strategies that were used by the doctors in the study prior to the PERFORM coaching were categorised as either cognitive change, response modulation or situational modulation, according to Gross’ event-focussed emotional regulation model (1998). Prior to the

study the doctors were most likely to access senior support, a situational modulation strategy, in response to negative emotions and behaviours triggered during acutely unwell patient management. The second most commonly employed strategy was the ABCDE aid, a cognitive change strategy, which offered more autonomy to the doctor initial patient management. All of the doctors demonstrated awareness of the ABCDE aid, recalling it being repeatedly taught throughout medical school and post-graduate education. However, despite this, doctors articulated difficulty recalling all of the tasks or management decisions *within* each stage of the aid. Some doctors felt that the aid reached the limits of its usefulness after two 'A to E' cycles and others stated that it simply did not work to overcome negative emotional or behavioural reactions in certain situations.

The coping strategy literature within surgery (Aoun *et al.*, 2011; Eldred-Evans *et al.*, 2013; Cocks *et al.*, 2014) and nursing (Ignacio *et al.*, 2016) evidenced the use of visualisation techniques to improve clinical performance and reduce stress. However, none of the doctors recalled ever either using or being aware of the potential to use visualisation as a coping strategy prior to PERFORM coaching.

Prior to the study, the doctors generally used strategies to manage the clinical problem, i.e. the acutely unwell patient' symptoms or disturbed physiology. Occasionally, strategies were used to control their own feelings and/or behaviours and sometimes this was done to avoid inducing similar stressful responses in colleagues, particularly nursing staff. Winter *et al.*, (2017) discovered similar acts of "keeping up appearances" amongst medical students who felt the need to hide underlying mental health issues for fear of peer judgement. This attempt to "preserve present and future reputational value" in a workplace where social standing and connections are of vital importance to career progression appears to be learned early in medical training and applies within and across healthcare professions. By re-designing Figure 7-2, Figure 7-4 illustrates PERFORM's moderation of emotions and behaviours to subsequently diminish their impact on patients, colleagues and the doctor themselves.

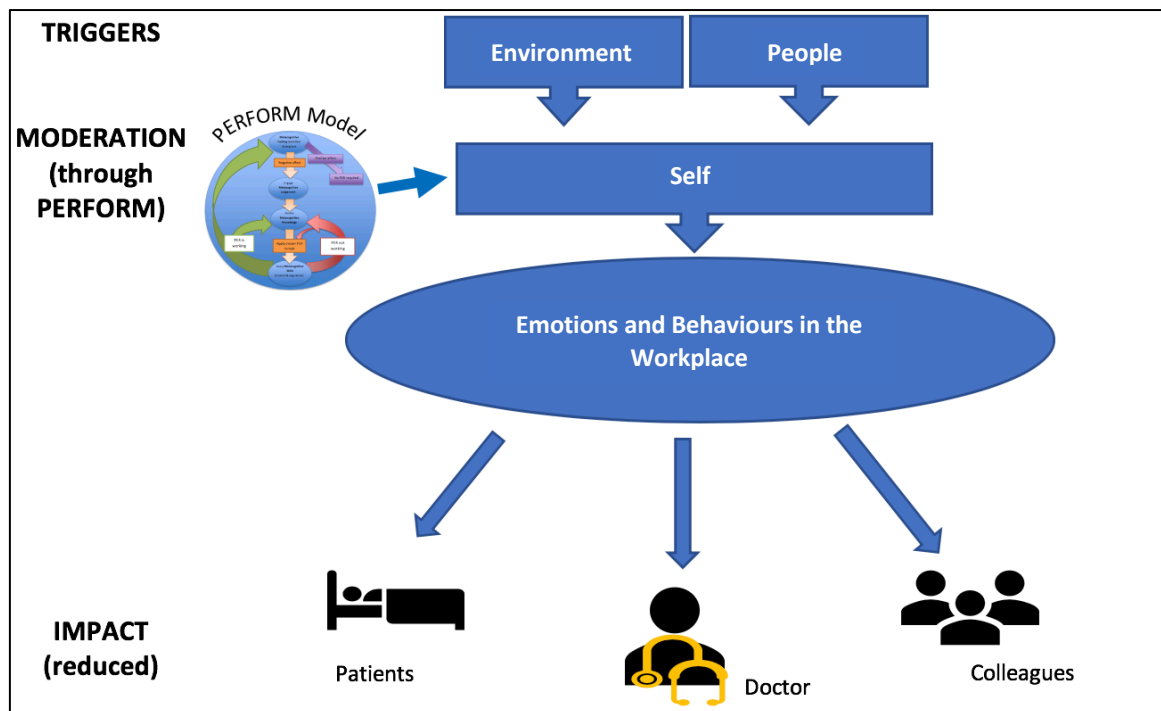


Figure 7-4: Revised emotions and behaviours in the workplace: impact of PERFORM model

7.4.2. Interaction with the PERFORM Model

In Chapter 3.3.2, the ‘theoretical lens’ level of Crotty’s (1998) framework pertaining to study methodology was not explicitly outlined. Instead, the theoretical foundations of the PERFORM study were identified through the doctors' interactions with the PERFORM model itself. These theoretical foundations are discussed below.

7.4.2.1. Adult and Transformative Learning

Initial motivations for entering the study resonated with the theories of adult and transformative learning. Adults require the need to understand the *reason* for learning (Knowles, 1980; and 1984; in Kaufman, 2003). Transformative learning is the change in perspective of the learner of themselves and their world-view resulting from personal experiences (Mezirow, 1991). The latter can be described as ‘disorientating dilemmas’, which according to Christie *et al.*, (2015) might be embedded in one’s professional practice. This resonated strongly with the doctors in the study, who were able to recall one or more experiences of negative emotional or behavioural reactions during acutely unwell patient management.

7.4.2.2. Deliberate Practice

Following Stage 1 of the Full Intervention Phase, the doctors engaged in deliberate practice to use and refine their PERFORM models in the clinical environment.

Deliberate practice is considered a fundamental element to both acquire and maintain expert performance (Ericsson, 2004). According to the traditional skill acquisition theory (Fitts and Posner, 1967; in Ericsson, 2004) when first learning new skills, individuals need to purposefully attend to their actions. With increasing experience, or practice, performance becomes smoother and more automated. This was the case for many of the doctors during Stage 2 of the PERFORM study, who noted that application of their models became automatic or worked on a subconscious level.

When a learner reaches this automatic stage of skills acquisition, they then follow one of two pathways (Ericsson, 2004). The first is “arrested development” whereby the learner continues to rely on the decreased effort afforded by automaticity of the skill to the detriment of further skill refinement. The second is that the aspiring expert performer “counteracts the tendencies toward automaticity by actively acquiring and refining cognitive mechanisms to support continued learning and improvement”. They seek out or design situations in which their current level of performance must be expanded to achieve the desired outcome.

At the end of the study, many of the doctors expressed the desire to continue to develop their PERFORM models either through repeated use of the same PERs, trialling the use of different PERs or applying their model to new situations. Although this signifies the intention to achieve expertise, confirmation of the reality of this is beyond the scope of this thesis. MacIntyre *et al.*, (2014) considers elite athletes to be not only experts at their own sporting domain but also of their own metacognition. The same might be expected if the doctors continue to apply, challenge and develop their models in parallel with their clinical development.

7.4.2.3. Experiential Learning and Reflective Practice

The doctors engaged with experiential learning (Kolb, 2014) to apply and adapt their PERFORM models in clinical practice. However, learning through experience relies on reflective practice and for the doctors who applied their PERFORM model to clinical scenarios, this occurred at two levels: in-action and on-action (Schön, 1983).

The PERFORM model inherently contains in-action reflection, where “prior experiences and knowledge are drawn upon and applied (almost experimentally) within the context of an unfolding situation, adding to the wealth of experiences already in place” (Ker and Bradley, 2014, p. 181). Doctors in the study used in-action reflection to engage their “metacognitive capability” (Kauffman and Mann, 2014), knowledge, judgement and skills, to select, apply and evaluate their PERs.

Furthermore, some doctors altered or adapted their PERs in real-time, such as condensing the routine to comply with time constraints.

7.4.2.4. Self-Regulated Learning

Whilst *in-action* reflection occurred through engagement with the metacognitive facets within the PERFORM model, *on-action* reflection occurred through self-regulated learning (SRL). In SRL “learners personally activate and sustain cognitions, affects, and behaviours that are systematically oriented toward the attainment of personal goals” (Zimmerman and Schunk, 2011, p. 1). In Stage 2 of the Full Intervention the doctors engaged with on-action reflection through the completion of reflective logs and subsequent follow-up interviews. Using on-action reflection the doctors considered which PERs were chosen, why they were chosen and evaluated their success in the clinical event. This reinforced conclusions already made in real-time through in-action reflection and drew new conclusions which triggered more substantial changes to the doctors’ models, e.g. dismissal of failed PERs from their metacognitive knowledge banks. These changes then fed forward and were acted upon in the next application of the model. Some of the doctors recognised that the positive feedback from the use of certain PERs within the context of specific tasks or timing constraints was only evident during this on-action reflection.

7.4.2.5. Metacognition and SRL

Metacognition forms part of the SRL cycle (Artino, Hemmer and Durning, 2011). All the doctors in the study acknowledged they had experienced metacognitive feelings prior to being coached in the PERFORM model. Metacognitive feelings are “crucial to self-regulation” (Efklides, 2006a). Zimmerman, (1995) explained that “self-regulation involves more than metacognitive knowledge and skill, it involves an underlying sense of self-efficacy and personal agency and the motivational and behavioural processes to put these self beliefs into effect”. Thus, whilst the conceptual PERFORM model can be used without individualisation, it is more useful when the user is motivated to engage, reflect and adapt it using SRL.

Within a clinical encounter, different cognitive levels are established. At the lowest level, the doctor is engaged in a clinical problem where they monitor their metacognitive feelings and behaviours until activation of the PERFORM model is required. Once they activate their PERFORM model, they ascend one level to engage in *in-action* reflection, shaping the details of the model until a satisfactory conclusion is reached, or the doctor aborts its use. After this, they return to the lowest level, the clinical problem. Following the event, *on-action* reflection of both the clinical problem, i.e. how the doctor managed the patient, and the PERFORM model itself occurs. This is the highest level

of reflection and outcomes of this filter down into the doctor's metacognitive knowledge bank for future use. Thus, the lowest level is the actual patient encounter, the second level is the *in-action* reflection affording real-time changes to the PERFORM model and the highest level is the *on-action* reflection where more substantial changes to the PERFORM model are cemented. It is the relationship between these three levels which explain the application of the model in clinical practice.

Through interaction with the model via the above theories, the doctors were able to apply the model, and PERs to clinical practice. The difficulties identified in the initial SSI (Figure 6-16) were overcome (Figure 7-5).

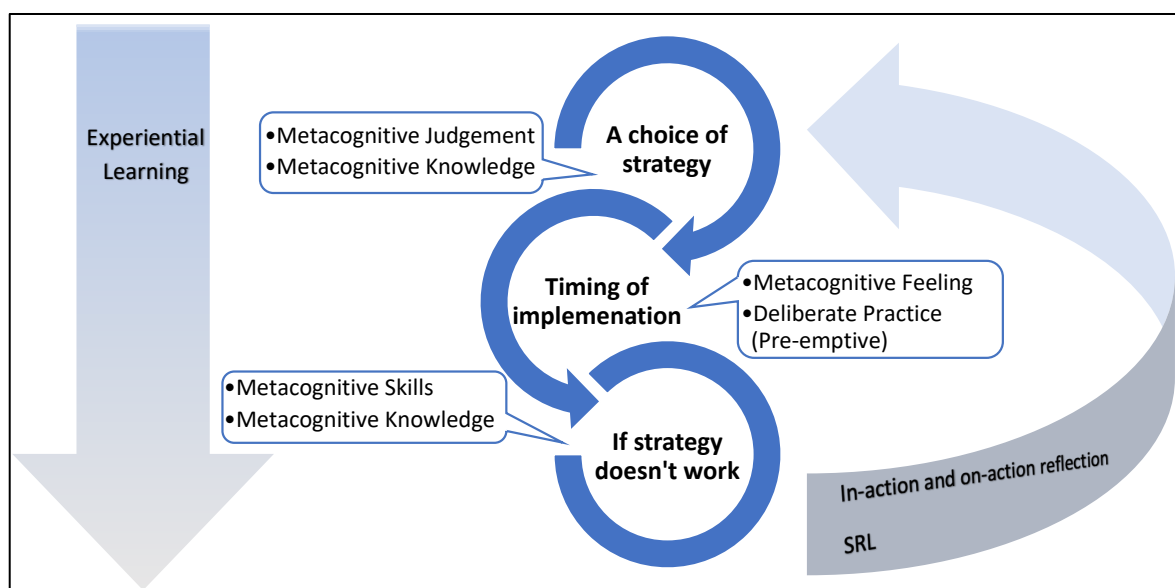


Figure 7-5: Theories underpinning successful coping strategy attempts

7.4.3. Responses to the PERFORM study

The doctors' responses to the study are considered. These include the accuracy of the conceptual PERFORM model in real clinical practice, outcomes driven by the doctors which were unanticipated by the researcher and the doctors' suggestions for improvement.

7.4.3.1. The PERFORM model

Although most of the doctors in the study did not refer to the PERFORM model diagram during Stage 2 of the Full Intervention, they generally agreed that the conceptual PERFORM model (Figure 3-3) aligned with their contextualised models in clinical practice. However, the main discrepancies between the two focussed on the first and last metacognitive facets.

Rather than acting upon emotions and behaviours, some of the doctors used the PERFORM model pre-emptively. Sometimes this was due to recognising a scenario which previously induced a negative reaction. These doctors tried to 'get ahead of the problem' to avoid an "emotional-generative moment" (Lundin *et al.*, 2018). This resonated with the original PPRs used in sport psychology. Other doctors in the study also used their PERs without a trigger and justified their use simply as an opportunity to use them. Atkinson (2011) encouraged GP trainees to use a similar opportunity during routine handwashing within a patient consultation to reflect upon how the consultation was progressing and consider any additional steps to optimise it. Finally, some doctors in the study enforced deliberate practice and took advantage of any opportunity to use PERFORM in clinical practice. The vignette case study, Doctor S01, did so in a less stressful situation (Stage 2: Case Study 6.7.8.) in order to experiment with different PER, cement a chosen PER and validate its use.

In sport, PPRs involve a number of prescribed steps which require little real-time adjustment. Over time, they often become automated (Cotterill, 2011), which allows attention to be directed to the actual task at hand rather than performing the routine itself. However, the PERFORM model relies on in-action reflection and therefore when the model became more automated/subconsciously controlled, the doctors in the study struggled to engage real-time metacognitive judgement and skills. Likewise, on-action reflection following the event was also difficult as the doctors were not always aware of when they had used their PERFORM model and therefore could not evaluate its success. This resonates with Ericsson's (2004) explanation of skill acquisition, where individuals' behaviours "become increasingly automated, they lose conscious control and are no longer able to make specific intentional adjustments." Automaticity was one of the reasons that some of the doctors in the study did not engage their metacognitive skills to evaluate their PER application. Others felt that, since their PER had always worked thus far, they then began to assume it would always work, and therefore ceased to evaluate it. Alternatively they would blame an external factor, rather than consider that their PER might not suit the specific task.

7.4.3.1.1. Unanticipated Pathways And Consequences

During Stage 2 of the Full Intervention of the PERFORM study, the doctors creatively applied their PERFORM models. This aligned with the self-concept assumption of adult learning in which adults seize control of their learning, adopt a problem-centred focus and seek opportunities to apply their learning to enable problem-solving (Knowles, 1980; in Kauffman and Mann, 2014). Thus, the doctors applied their PERFORM models to novel situations which were unanticipated by the researcher.

Some of the doctors used their PERFORM model in situations outside of the original target of acutely unwell patients. Instead, PERFORM was applied in both non-acute clinical and non-clinical events either as a trial run or because the situation warranted the use of a PER. Since in “non-emergency events, the stress level of trainees can fall within the ranges of responses that have been previously associated with impairments in performance” (Pottier *et al.*, 2011), it seems appropriate that some doctors acted upon their metacognitive feelings and applied their PERFORM model to non-acute situations. Other doctors in the study recalled using their PERs in their personal lives, i.e. non-clinical events, to encourage a positive mental attitude.

7.4.3.1.2. Combining of PERs

Although the doctors in the study were encouraged to create and adapt their own PERs, it was not anticipated that they might *combine* PERs and perform them simultaneously. This was the case for many of the doctors who most commonly combined deep, diaphragmatic breathing with other PERs such as visualisation or counting.

7.4.3.1.3. Developing PERFORM with the Support of Others

The PERFORM study created an opportunity for the doctors to admit difficulties and subsequently discuss the need for coping strategies at work, which is often not done by clinicians (Ladonna, Ginsburg and Watling, 2018). Furthermore, two doctors developed new PERs collaboratively with either a family member or their clinical supervisor. In both cases, this PER became their preferred routine in clinical practice. Seeking advice from parties outside of the study demonstrated these doctors’ engagement with adult learning and their commitment to develop clinical coping strategies. Simply discussing difficulties in the workplace, coupled with the effects of role-modelling (Paice, Heard and Moss, 2002) allowed the doctors to discover solutions to a problem which, in particular Doctor S03 confirmed, they would not have otherwise achieved.

7.4.3.1.4. Peer Support

Although two of the doctors gained support from parties outside of the study, two of the study doctors supported each other. The doctors knew each other socially and realised soon after enrolment that they were both involved in the PERFORM study but did not alert the researcher to this until the end of Stage 2 of the Full Intervention. The doctors compared their use of PERs and motivated each other to continue to apply the PERFORM model in clinical practice.

The scoping review highlighted a recent trend in near-peer studies to increase confidence in managing acutely unwell patients (Woods *et al.*, 2016; Cash *et al.*, 2017). Near-peer learning occurs

when one trainee engages in an educational activity with another trainee who is one or more years medically senior to them (Bulte *et al.*, 2007). Ten Cate and Durning (2007) distinguished between peer-learning and “collaborative or cooperative learning” where the latter has no “cognitive distance” between the learners, i.e. they are of the same training grade and the task is more informal. This better reflects the position of the two doctors in the PERFORM study as both were in the same training year and established their educational interactions within a social context. Like near-peer learning, collaborative learning also functions on the principles of shared clinical and educational experiences and objectives between the learners (Cash *et al.*, 2017). Collaborative learning is integral to situated learning (Steinert, 2014), and includes “collective problem solving” and “confronting ineffective strategies and misconceptions” (Brown, Collins and Duguid, 1989), both of which were evident from the peer-support during PERFORM.

7.4.3.1.5. Up-Cycled Learning

Many of the doctors had never used coping strategies in clinical practice prior to the study. Those with prior knowledge of coping strategies used the PERFORM model to apply them in a different way. One doctor highlighted this ‘up-cycling’ of her prior knowledge as the most useful element of the study. Examples of this up-cycling included using ABCDE to control negative feelings, rather than only as a cognitive aid, and incorporating a more self-evaluative perspective into clinical reflection.

Cotterill (2011) advised that trying to ‘un-do’ prior knowledge and replace it with new information during his coaching of PERs to elite cricketers was seen as both unrealistic and potentially detrimental to performance (Schmidt and Lee, 1999; in Cotterill, 2011). Instead, the PERFORM study offered doctors a working theory, i.e. the PERFORM model, into which their prior coping strategies, if any, could be incorporated. This supported the instruction and regulation of their prior strategies whilst not undermining their knowledge. In this way, the PERFORM model caters for individuals with varying prior knowledge and understanding of PERs and is therefore not *only* applicable to any one group.

7.4.3.2. Ideas for Improvement and Development

At the conclusion of the study, the doctors offered suggestions on the wider roll-out of PERFORM as an educational programme.

7.4.3.2.1. Target Population for Roll-Out

The doctors in the study highlighted that the optimum timing to introduce PERFORM would be between final-year and Foundation Year 1. In doing so, they acknowledged the difficulty surrounding

the transition between undergraduate medical student and newly qualified junior doctor (Rowland *et al.*, 2017). This is clearly not an exclusively UK-centric problem. Australian doctors interviewed in Sturman *et al.*'s (2017) study also found this transition period to be a "steep learning curve" which was described as "physically, mentally and emotionally exhausting". Cash *et al.*, (2017) explained that "the transition from medical student to junior doctor is abrupt, and any measures to smooth out this process should be welcomed". By suggesting that the PERFORM model be introduced into this transition period, the doctors in the study agreed with this statement.

7.4.3.2.2. Integration

Current simulation programmes in medical training which aim to support this transition period (Cleland *et al.*, 2016), might offer an ideal opportunity for the introduction of PERFORM. "Being prepared for practice included the concept of emotional preparedness and being able to deal with one's own negative emotions" (Lundin *et al.*, 2018). Therefore, integrating PERFORM into more clinically-orientated simulation courses could encourage both, the often-avoided, conversations about clinician's emotions (Tucker, 2018), and provide potential solutions to optimise clinical performance.

7.4.3.2.3. Study Period

The majority of educational studies in the literature review measured outcomes immediately post-intervention (2.6.6.1.). The mental rehearsal, i.e. visualisation, studies in surgery and nursing were typically conducted over less than one week (Aoun *et al.*, 2011; Eldred-Evans *et al.*, 2013; Ignacio *et al.*, 2016). By contrast, Cotterill (2011) allowed six weeks for the integration of PERs into practice or competition in sport. Stage 2 of the Full Intervention of the PERFORM study lasted an average of 87 days (12 weeks) but many of the doctors articulated their desire for a longer period because acutely unwell patient encounters can be limited, particularly during the first year post-graduation (Amin and Cartledge, 2012).

7.4.3.2.4. Engagement

The doctors highlighted three main challenges to engagement with a wider roll-out of the PERFORM programme.

Firstly, the ideas behind PERFORM may not appeal to those who deem it irrelevant or unimportant to their clinical practice. In adult learning, internal motivation to learn is strong when individuals know *why* they need to learn (Knowles, 1980; and 1984; in Kaufman, 2003). The doctors in the PERFORM study explained that until one has acquired the clinical responsibility which is only realised

post-graduation, one is unlikely to experience negative reactions. Therefore, medical students or other healthcare professionals, who had not yet managed acutely unwell patients, might regard PERFORM as an unnecessary exercise.

Secondly, PERFORM might be perceived as targeting 'struggling' or underconfident doctors. Clinicians who feel uncomfortable discussing their inadequacies (Tucker, 2018), or those who simply feel that they would not benefit from such training, may be reluctant to engage.

Finally, those with the motivation and intention to engage with PERFORM may be restricted by the other work-related factors such as challenging rotas. The literature supports this claim, highlighting additional career development demands on doctors' time where "long hours at work were typically supplemented with revision and completion of the e-portfolio" (Rich *et al.*, 2016). These contribute to the poor work-life balance of doctors who simply would not be able to add yet another task to their 'to-do' list. Ironically, the doctors who would potentially benefit the most from support in managing acutely unwell patients are those working in the Emergency Department (ED), where shift length and patterns are arguably the most challenging of all specialties. It has already been established that ED is a "challenging but worthwhile learning environment" but that "a significant amount of support" (Mason *et al.*, 2013) is needed for Foundation trainees. Introduction of PERFORM would be best approached through integration into these busy clinical schedules rather than as a voluntary extra-curricular activity.

7.4.3.2.5. Simulation, Realism and Scenario Difficulty

The use of simulation was perceived as positive by the doctors in the study with one doctor suggesting that more simulation scenarios along the course of the study would have been useful. However, two potential improvements were suggested:

The first suggestion for improvement concerned the fidelity of the simulation. "Fidelity is a complex issue" (Rosen *et al.*, 2012), but is considered by Hays and Singer (1989) as being of two main types: "physical (the degree to which a simulation looks and feels like the real thing) and functional (the degree to which learners are required to use the same performance strategies and competencies in the simulation and in the transfer environment—clinical practice)". The latter is considered most critical for learning (Rosen *et al.*, 2012).

The in situ simulation in Stage 3 of the Full Intervention was designed to be as authentic as possible. Physical fidelity was achieved through the clinical environment, hospital bed, clinical skills

equipment and real nursing and allied healthcare staff who participated in the scenario with the doctor. According to the doctors, the high-fidelity mannikin limited the authenticity of the in situ simulation. The extenuating pressures on the scenario were comparable with clinical practice, in part due to the functional fidelity of emergency-paging the doctors to the ward with little or no prior warning, which resonated with previous study findings (Ignacio *et al.*, 2015).

The PERFORM simulation scenarios were adapted from an established simulation programme that targeted higher-level trainees rather than foundation doctors (Appendices 17-20). Despite the scenarios being aimed at more clinically-advanced doctors, one doctor in the PERFORM study felt that the simulations could have been even more challenging and suggested that they could have been tailored to specific clinical problems that each doctor found difficult. For research purposes, having the same scenarios for each case, i.e. doctor, allowed between-case comparisons. However, for an educational programme, using personalised scenarios might increase engagement particularly if the Think Aloud commentary was paired with a more knowledge-based debrief.

The doctors in the study had not previously experienced a one-to-one simulation debrief or Think Aloud commentary, but both were highly valued. The desire for similar one-to-one feedback post-simulation was requested by the doctors in Bond *et al.*'s (2004) study into cognitive forcing strategies. This reflects the wish for a 'safer' space in which to specifically discuss emotional or behavioural reactions. Whether the same request would be made if the PERFORM study had been a more clinical-knowledge-based study is unclear. The doctors in Bond *et al.*'s (2004) study were eager to request the video recordings of their simulations. This was not replicated in the PERFORM study, whereby the video recordings were made available to, but not utilised by, the doctors.

7.5. Context: The Impact of Participant Variables

This chapter discusses the study participant variables of place of work and level of training. This includes both the quantitative and qualitative data results and aims to explain any findings within the context of the wider literature.

7.5.1. Workplace

Medical students perceive DGHs to provide clinical placements of a higher educational quality than CTHs (Bennett, Kelly and O'Flynn, 2010). Parry *et al.*, (2002), headlined this preference in their report "Hostile teaching hospitals and friendly district general hospitals: final year students' views on clinical attachment locations".

This preference of placements for undergraduates, i.e. medical students, seems clear but is less so for post-graduates. Kendall *et al.*, (2005) found that post-graduate junior doctors considered DGHs to provide better teaching programmes, supervision, both allowing more time and more access to their seniors, more detailed feedback and follow-through of patients with exposure to a broader range of clinical problems. Contrary to this, Brown *et al.*, (2007) revealed no difference in trainees' receipt of regular informal feedback between the DGH and CTH. However, recognition and acknowledgement of 'informal feedback' are known to vary widely in medical education (Urquhart, Rees and Ker, 2014).

There was no significant difference in the in situ simulation self-efficacy score changes without/with PER between the two hospitals ($p=0.052$) (6.7.10.4). However, there was a strong trend demonstrating that the doctors in the CTH tended to show greater benefit in raw score changes than the doctors in the DGH (Figure 6-24).

It is possible that there is a difference in PER benefit between different hospital work-places which was undetected by this study. If this is the case, this might be explained by Kendall *et al.*'s (2005) assertions that trainees in CTHs are less educationally supported than in those in DGHs and therefore have more to gain from self-directed interventions, such as PERFORM.

Running the two PERFORM study sites in series, rather than parallel, may have introduced an additional variable of 'timing within training rotations'. The doctors at the first site, the DGH, had been working there for the previous eight months and were simply rotating to a different specialty within the same hospital. However, the doctors at the CTH, the second study site, had only just

begun working at that hospital and included newly-qualified doctor. By rotating to a new, unfamiliar workplace, the CTH-doctors arguably had a steeper learning curve of transition (Sturman, Tan and Turner, 2017) including less control over their new working environment. Therefore, the PERFORM model may have been of more benefit to the CTH-doctors.

7.5.2. Training Level

There was no statistically significant difference in the change in the in situ simulation self-efficacy score between the Foundation Year 1 and 2 doctors ($p=1.00$) (6.7.10.4.). The increase in self-efficacy score across the two groups was almost identical, inferring that the use of PERFORM, and more specifically a PER, during a simulated clinical encounter affords equal benefit regardless of Foundation training level.

A more explicit difference between the Foundation Year 1 and 2 doctors during the initial SSI was their level of metacognitive judgement. Foundation Year 1 doctors were less trusting of their metacognitive feelings with regards to whether their positive or negative affect matched the severity of the patient scenario. This was attributed to a lack of experience of seeing acutely unwell patients, previously evidenced by Amin and Cartledge (2012).

Bond *et al.*, (2004) found that senior doctors both more highly valued and were more able to discuss the use of metacognitive strategies compared to junior doctors, who tended to focus more on pure knowledge-acquisition. This division was not the case during the PERFORM study, where all the doctors were able to discuss the different metacognitive facets and all but one, a Foundation Year 2 doctor, implemented their model in clinical practice. Perhaps the training gap between the PERFORM study doctors was too narrow to elicit any major differences in their use of the model and their resulting self-efficacy scores.

Using the entire cohort, discounting the variables of workplace and level of training for statistical calculation, the doctors' self-efficacy score changes during the in situ simulation were statistically significant ($p=0.003$). It is likely that the sample sizes for both workplace and level of training variables were too small to elicit statistically significant results.

7.6. Implementation: Strengths and Limitations of the PERFORM Study

The strengths and limitations of the PERFORM study are discussed under the headings of recruitment, data generation, collection and analysis. The overarching themes of generalisability and reflexivity will conclude this subchapter to support the rigor of the study conclusions.

7.6.1. Recruitment

Due to the voluntary recruitment strategy of the PERFORM study, the doctors were a self-selecting group. Their motivations for entering the study were largely explained by self-determination theory, where one engages with an activity either because “it is interesting and enjoyable” or it is expected to improve one’s skills (Albanese and Dast, 2014, p. 73). The latter motivation overlaps with the assumptions of adult learning (Knowles, 1980; Knowles, 1984) and transformative learning, as described by Mezirow (1991). Medical educators might question the applicability of the PERFORM model to doctors who do not share these motivations. However, the number of studies which acknowledge the lack of emotional preparedness to manage acutely unwell patients (Tallentire *et al.*, 2011a; Cameron *et al.*, 2014; Lundin *et al.*, 2018) may convince the wider population of its value. The unanticipated applications of PERFORM demonstrated by the doctors also support this hypothesis.

7.6.2. Data Generation

7.6.2.1. Interviews

Throughout the PERFORM study, there was a general trend towards longer interview times with each successive case. This reflects the iterative nature of SSIs whereby initial interview content closely reflects *only* the interview schedule topics but subsequent interviews accumulate additional discussion points. This is an inherent design of qualitative research and allows topics of interest to emerge from conversation which were not initially anticipated by the researcher. However, a potential criticism of iteration is that interview content varies between interviewees, so doctors who were interviewed at an earlier stage in the PERFORM study were not prompted to discuss some of the emerging topics to the same extent as were the doctors interviewed later in the process. This is likely to limit the depth and number of themes identified within these emergent topics. This was not the case for the PERFORM study interview data, as saturation was reached during analysis.

Saturation is most commonly referred to in grounded theory research (Cohen, Manion and Morrison, 2011, p. 601; Creswell, 2013, p. 89). It is reached when no new insights are produced, variations are supported, and the data is all accounted for in the main and sub-categories, or

themes. This was evident during the initial data immersion process in which each interview was proof-read, and notes were made. With each passing interview, fewer and fewer notes were made due to recurring ideas and perspectives. Saturation was not seen to this extent in the Think Aloud commentaries and reflections from Stage 2 of the Full Intervention. This was due to the individualisation of the PERFORM model by each doctor, where there was less overlap in clinical situations, PERs chosen and ways in which metacognitive facets were engaged.

All of the interviews were transcribed by only the researcher. On hindsight, asking another person to listen to a small sample of the interviews and proof-read its corresponding transcription would have served as an additional step in ensuring the accuracy of the transcriptions.

7.6.2.2. Simulation

Simulation was used to generate data for the PERFORM study. “Simulation is not, and can never be, a replacement for authentic experiential learning in the real work of clinical practice” (Ker and Bradley, 2014, p. 186). However, it can be used to prepare clinicians for the real world, both in technical and non-technical skills as an adjunct to, but not a replacement for, other learning approaches.

Simulation was used during the PERFORM study firstly to replicate the training environment in which PERs are built in sport (Cotterill, 2011), and secondly to allow demonstration of the doctors’ behaviours during a clinical encounter, with or without the application of their PERFORM model. For both of these purposes, realism was important but not to the detriment of providing a safe learning environment. The most important aspect of realism for this study was the creation of an authentic sense of the pressures or stress under which the doctors usually conducted their acute patient management, i.e. functional fidelity.

The medical education literature fails to reach a consensus regarding whether simulation replicates stress in the same way as a genuine clinical environment. It appears that the evidence against this argument focusses on skills that might be termed in sports as ‘closed’ (Church, Rumbold and Sandars, 2017). Closed skills are prepared for, and initiated, under the control of the individual performing them (Baker *et al.*, 2017). Andreatta *et al.*’s (2010) study into the ‘open skill’ of simulated laparoscopic surgery found that heart rate responses were statistically significantly increased during ‘high stress’, when more than one stressor was present, or at periods where doctors appeared to be highly focussed on the surgery. They also observed behavioural manifestations of stress, concluding that stress can be induced through simulation.

Tremblay *et al.* (2017) found that the simulated environment generated more stress and affected pharmacology students' ability to focus and problem-solve due to inherent distractions compared to their usual working environment. Assuming this was also the case for the doctors in the PERFORM study, learning to use the PERFORM model in the distraction-filled simulated environment may have assisted with the model's subsequent transfer into the clinical environment.

Suspension of disbelief is reliant on the realism of the simulated environment, which was tailored to each phase of the PERFORM study according to its objectives.

Table 7-1: Authenticity/realism of elements utilised for each phase/stage of study


STUDY		Location / Equipment /Personnel/Patient involvement for each phase					
		Low authenticity  High Authenticity					
Phase	Stage	Clinical Skills Centre	Clinical Skills technician	Simulation equipment	Real patient encounter	Real ward setting	Real clinical staff
1. Exploration		✓	✓	✓			
2. Pilot		✓	✓	✓			
3. Full Intervention	1	✓	✓	✓			
	2				✓	✓	✓
	3			✓		✓	✓

Table 7-1 demonstrates that Phase 3 included simulation immersed in a more authentic clinical setting that the prior two phases to support the doctors' prior use of the PERFORM models in real clinical scenarios (in Stage 2 of Full Intervention).

Many of Ker *et al.*'s (2006) approaches to achieving realism in simulation were incorporated into the PERFORM study. These included recreating the complexity of a clinical scenario through the need of the doctors to prioritise, undertake relevant tasks, work within a team and hand-over clinical information. Sometimes in simulation the arrival of equipment, investigations and other members of staff is expedited and occurs almost immediately after it is requested. This is not reflective of having to *wait* for such things in the real clinical environment. Waiting is not only an inconvenience but also a potential stressor for doctors and therefore was purposefully built into the PERFORM simulations.

Other limitations on realism were outside of the researcher's control. The following examples were all related to the in situ simulations in Stage 3 of the Full Intervention. Aligning the logistics to conduct multiple simulations in a clinical environment within a specific time frame with relevant assistance and equipment when the doctors were working 'regular' shifts required pragmatism.

Occasional compromises were made regarding how the simulations were conducted. The doctors commented that the way in which they were bleeped was unusual and this led them to believe that it was not a genuine patient case. Additionally, each doctor's clinical team, particularly the supervising consultant, was informed that the relevant doctor would be taken out of their clinical duties to attend their simulation. The researcher tried to negotiate the best timing for this without disturbing ward rounds and on-call duties. Casualties of this transparency with the doctor's team included one doctor being inadvertently informed by their supervisor that they would be called to their allotted simulation on a certain day, removing the element of surprise. Another doctor could only attend their simulation *prior to* an on-call shift due to rota considerations and therefore initially met with the researcher under the ruse of a 'meeting'.

7.6.3. Data Collection

Data measurements can be broadly separated into subjective, i.e. self-report, and objective, i.e. externally assessed. Two of the main outcomes of the PERFORM study were its effects on:

- 1) negative emotions and behaviours experienced by the doctors, and
- 2) clinical performance

Both of these were measured through self-report methods rather than objective methods.

7.6.3.1. Negative Emotions and Behaviours

Previous studies have identified changes in stress levels objectively through the collection of physiological, e.g. heart rate (Baker *et al.*, 2017), and behavioural (Andreatta, Hillard and Krain, 2010) outcomes.

Firstly, objective methods risk overlooking individuals who either do not display these signs or the researcher mis-interpreting the results. For example, an increased heart rate can be secondary to excitement or anxiety. Not all 'stress' manifests in a negative way but can sometimes optimise performance. The focus of the PERFORM study was to control the *negative* impact of emotions and behaviours on performance, and therefore this could only be identified by the doctors themselves. Using self-report methods captured psychological, physiological and behavioural effects because they all rely upon self-awareness. The same cannot be argued for heart rate monitoring or objectifying and interpreting the doctors' behaviours on video.

Secondly, self-assessment is a vital aspect of self-regulation (Eva and Regehr, 2005) and in itself is required to initiate, judge, monitor and evaluate the PERFORM model. When the doctors in the study used their PERFORM models in clinical practice, their self-assessment was implied. By asking

the doctors to score the effectiveness of their PERs using the self-efficacy scale their self-assessment was forced into their consciousness. This further cemented this feedback into their metacognitive knowledge banks for future reference and simultaneously informed the researcher of their model progression.

The main argument discrediting studies which report self-assessment data is that the “accuracy of self-assessment is poor” (Ward, Gruppen and Regehr, 2002) where poor performers overestimate, and high performers underestimate, their achievements. However, this discrepancy is only relevant if the outcome being measured can be done so appropriately, or better, objectively. With regard to the emotional or behavioural reactions to acutely unwell patient management, the researcher contends that there is no better alternative to measure this across the range of cases who all experienced their ‘discomfort’ in a different way. The same argument is not applicable for measuring objective clinical performance. However, the study design restricted the ability to measure this objectively and to confirm or refute causality between involvement in the PERFORM study and improved clinical performance.

7.6.3.2. Self-Efficacy Scores

“Self-efficacy is a context-specific assessment of competence to perform a specific task or range of tasks in a given domain” (Eva and Regehr, 2005). Prior to embarking on the study, the extent to which context was fundamental to self-efficacy scoring was not fully appreciated by the researcher. Initially, each doctor reported a single self-efficacy score following each simulation scenario or real clinical encounter to reflect the doctors’ overall control of their feelings or behaviours. However, as the study progressed it became evident that different clinical problems had inherently different self-efficacy *baseline* scores for each doctor. That is, one doctor was likely to feel a different level of anxiety about a specific clinical problem compared to another doctor. Therefore, the researcher changed the data collection strategy from a single self-efficacy score to a pre-/post-PER self-efficacy score for each scenario. This change was implemented during the first study arm (DGH) of Stage 2 of the Full Intervention. Thus, only the doctors in the second study arm (CTH) of the Full Intervention reported pre-/post-self-efficacy scores for their Stage 1 simulations (Appendix 41). The missing data from Stage 1 of the Full Intervention for the first study arm limited the analysis of how self-efficacy changed immediately after the introduction of PERFORM in Stage 1 and how self-efficacy changed within each case over the entire Full Intervention. As all doctors reported pre-/post-self-efficacy scores for their in situ simulations in Stage 3 of the Full Intervention, this data was used for statistical analysis.

7.6.3.3. Clinical Performance

Crossley *et al.*, (2002) advise that when assessing health professionals, the *purpose* of the assessment drives every aspect of its design. To assess clinical performance “we should not focus on competencies, but on the day to day activities and accomplishments of trainees, and infer the presence of competencies from adequately executed professional activities” (Ten Cate, 2006). Entrustable Professional Activities have become a more pragmatic approach to the assessment of healthcare professionals (Ten Cate, 2006). The assessment values the often intangible ‘gut feeling’ of whether a clinical supervisor could trust a doctor to act appropriately in a certain situation. This does not exclusively mean that a trainee would be successful in completing the task. The trainee would also have insight to recognise the need for, and access, help if required or refuse to engage with a task that they considered to be beyond their competency. The entrustability assessment does not always correlate with formally assessed knowledge or skills, despite arguably being more valid (Ten Cate, 2006) and reliable (Weller *et al.*, 2014). Due to the context-specific nature of performance, clinicians should be assessed using a sample of cases (Crossley *et al.*, 2011). There is no procedure that can replace or be substituted for this judgement (Ten Cate, 2006) and attempting to capture this entrustability in a ‘snap shot’ of a single clinical simulation lacks contextual validity.

This study aimed to quantify the effect of the PERFORM model on the doctors’ clinical performance when managing acutely unwell patients. Assessment standardisation through the use of simulated environments is “futile” (Crossley *et al.*, 2011). This was confirmed by the researcher who observed that despite her best intentions, no two simulations were exactly the same. This was particularly true for the in situ simulations immersed in the clinical environment. Furthermore, assessment of a doctor in simulation does not predict real workplace performance (Rethans *et al.*, 1991). In summary, to make an appropriate performance assessment, doctors should be assessed regularly within their clinical environment by other clinicians who are able to make judgements using workplace-based assessments.

Finally, notwithstanding the above difficulties in the *way in which* the PERFORM study doctors were assessed, let us assume that the doctors’ clinical performance was successfully assessed and was shown to improve over the length of the study period. To then conclude that the PERFORM model was responsible for this improvement would be extremely difficult to defend. The clinical placement in which each doctor worked during the study period contained educational experiences which almost certainly improved their competence and confidence. To separate out the impact of these

educational experiences from that of the PERFORM study would be impossible within the current multiple case study design of this research project.

In summary, the assessment of clinical performance in simulation lacks reliability and transferability to real clinical practice. Furthermore, to quantify the impact of the PERFORM model on clinical performance would be extremely difficult. Although this limitation fails to demonstrate that the study improved objective clinical performance, there is strength in not making unsubstantiated claims beyond the study's reach. Self-efficacy scores offer a different perspective of clinical performance. Self-efficacy scores are more inherent to the doctor's perception of their own performance as they measure the individual's sense of 'control' over their negative reactions to stressful patient encounters which cannot be objectively measured. If objective clinical performance measures were a desired target for a future PERFORM study, a different research design would be necessary and will be discussed in the final chapter of this thesis.

7.6.4. Data Analysis

In carrying out the data analysis, the researcher considered the order in which each interview and Think Aloud commentary was analysed to both promote thematic exploration *between* cases and allow appreciation of progression *within* cases.

The Stage 1 and Stage 3 SSIs from the Full Intervention were analysed *between* cases. Each interview was fully coded in turn. However, as the researcher moved through the interviews, constant comparison was used to explore similar or opposing findings around given topics and themes were refined accordingly. In this way, all of the interviews from the same stage were analysed simultaneously to gain a broad understanding of the topics discussed *between* cases.

By contrast, the Stage 1 Think Aloud commentaries and Stage 2 Reflective Logs from the Full Intervention were analysed *within-case*. For each doctor, or case, both of their Stage 1 Think Aloud commentaries were analysed as a single unit before moving on to the next case. This was done to compare the doctor's application of the PERFORM model immediately prior to, and after, coaching. The same process of *within-case* analysis was adopted for the reflections, where multiple reflective logs by the same doctor were analysed together.

Table 3-3 contains the details of the strategies to ensure rigor during analysis, including peer-debriefing, triangulation and member-checking. In addition, all interview and Think Aloud commentaries were transcribed by the researcher verbatim and accounted for tone of voice, which

is akin to discourse analysis. Reflexive field notes during interviews and memos in the form of spider diagrams (Appendix 32) were made during initial analyses. The use of reflexive field notes and memos aimed to preserve the richness of the data from collection until its analysis.

7.6.5. Generalisability

There is a growing emphasis for the qualitative researcher to understand how “the concept of generalisability” might be considered to best communicate their work to others (Schofield, 2002, pp. 180-193). The term ‘transferability’ is more appropriate to qualitative research and to demonstrate and communicate this, studying ‘what is’, ‘what may be’ and ‘what could be’ is now discussed.

7.6.5.1. Studying What Is

Natural science researchers “enhance study reliability by isolating a few variables in many settings and pursue generalisations through induction” (Cheek *et al.*, 2018). By contrast, case study research explores multiple variables in a smaller number of settings on the understanding that social environments encompass a “synergistic interplay of variables, including people and circumstance, that are often indivisible” (Thomas and Myers, 2015; in Cheek *et al.*, 2018). Therefore, case studies can deepen understanding and do not aim to deliver generalisability. Instead they offer transferable conclusions which may be applied to, but are not necessarily *replicated* in, other contexts (Tavakol and Sandars, 2014).

7.6.5.2. Studying What May Be

Increasing hospital workload outstrips medical workforce growth (Rimmer, 2017) and is likely to continue to do so. This has implications on patient safety in two ways. Firstly, trainees’ jobs will likely see an increasing shift towards more service provision to the detriment of their training and education. Secondly, there will be challenges to retain staff due to more pressured working conditions. Given these predictions, PERFORM is appropriately positioned to improve care of the acutely unwell patient. Through its self-regulated educational programme it supports emotional and behavioural aspects of clinical work and could reduce the burnout rates of healthcare professionals.

To be robust in its approach to the diverse population of doctors, PERFORM must prove itself to be flexible in its application. This is best articulated through its underlying theory (Graham, Church and Murdoch - Eaton, 2017). Thus, the most transferable element of this study is the PERFORM model as a mouldable ideology which can be adapted and applied to suit the needs and resources available to the educator. The evidence presented in this thesis regarding the model’s ‘transfer to practice’ and

its subsequent evolution from conceptual to contextual model offers more practically-minded educators some reassurance of its applicability to the real world.

7.6.5.3. Studying What Could Be

One can consider what could be possible by “locating situations that we know or expect to be ideal or exceptional on some a priori basis” and testing these within the study (Schofield, 2002, pp. 180-193). This was the case for the in situ simulations held at the DGH. The post-graduate educational department at this site had previously struggled to initiate a multi-disciplinary in situ simulation programme focussing on acutely unwell patient management. Therefore, the researcher formed a synergistic relationship to satisfy the outcomes of both the PERFORM study and the educational department. The in situ simulations were held with the primary intention of collecting the data for the PERFORM study. Involving nurses and other healthcare professionals in the simulations not only increased realism for the study participants, but also created a multidisciplinary educational platform. The researcher conducted additional simulation scenarios between those targeting the PERFORM study participants to involve more hospital staff. Feedback from all hospital staff involved in both study and non-study simulation scenarios was collected and fed-back to the head of the education department. These simulations established a momentum which has encouraged further ward team-based in situ simulations to be conducted beyond the conclusion of the PERFORM study. This is evidence of the possible further-reaching educational effects of studies, such as PERFORM, when supported by a motivated on-site education team.

7.6.6. Study Integrity

Throughout the PERFORM study the researcher was rigorous in maintaining the highest standards of transparency and integrity to support the study outcomes. Most of these measures were outlined in subchapter 3.8. However, despite extensive planning and consideration of different eventualities, the following additional observations and steps were taken during the study:

7.6.6.1. Ethical and HRA Amendments

At multiple stages through the study amendments regarding study expansions and updated paperwork were submitted for approval to the University of Sheffield Ethics Committee and HRA (Appendix 29). All proposed changes were discussed with the Research Integrity and Ethics Service at the University of Sheffield prior to submitting amendments and the outcomes were awaited before changes were implemented. Research study site leads were informed of submitted amendments at the earliest opportunity and the researcher was responsive to any queries raised.

7.6.6.2. Reflexivity

Just as transformative learning often begins with a disorienting dilemma in one's professional practice so can action research (Christie *et al.*, 2015). This research project was sparked by such a dilemma during the researcher's own Foundation training. Therefore, it was paramount that the researcher's personal experiences did not cloud the interpretation of the study doctors' experiences.

The doctors in the study were all aware of the researcher's clinical background and that she worked as an anaesthetist and intensive care doctor at one of the study sites. Potentially her role as both a researcher and a more senior clinician may have adversely affected the doctors' behaviours. This is referred to as the Hawthorne effect, or "participant reactivity" (Paradis and Sutkin, 2017). La Donna *et al.*, (2017) warn "how learners perform in the presence of an observer may not reflect what they do as independent practitioners", but instead, exchange their usual practice for a "textbook approach". In this study, participant reactivity is most relevant when considering the doctors' implementation of the PERFORM model and less so regarding their clinical performance, i.e. doing the 'correct' management steps. The researcher had sustained contact with the doctors over a period of three to four months, and such a longitudinal relationship is recognised as encouraging honest participant responses (Paradis and Sutkin, 2017).

The researcher limited her interpretation of the doctors' behaviours by only analysing the Think Aloud commentaries as opposed to objectively assessing their behaviour. This allowed the doctors to articulate and interpret *their own* behaviours whilst watching their simulation recordings and it is this self-reflective narrative which was actually analysed by the researcher.

Regular, usually fortnightly, meetings were held with the researcher's primary supervisor throughout the analysis of the data. The purpose of this was to ensure that the coding and interpretation of the data was supported by the data itself and was not biased towards the researcher's own experiences of clinical practice nor aspirations for the success of the PERFORM model.

7.7. Chapter Summary

This process evaluation of the PERFORM study revealed how the doctors' application of the PERFORM model resonated with numerous medical education theories. Furthermore, the concept of the 'uncomfortable learning environment' was explored. This considered the role of emotions and behaviours and their interaction with workplace triggers, which the PERFORM model aimed to moderate. Investigation of the workplace and training level variables revealed little impact on the results, possibly due to the small number of study participants. Finally, the study design and its conduct were evaluated, considering its strengths and weaknesses. The final chapter of this thesis concludes the process evaluation by addressing *Outcomes and* considers the future of PERFORM.

Chapter 8. Conclusions

This final chapter of the thesis begins by addressing the original aims and objectives of the research project in view of the previous results and discussion.

The contributions of the PERFORM study to the wider Medical Education literature are described. Potential future work following this study, including both an educational programme and/or further research, is considered.

Finally, the current publications arising from this work thus far are presented. The pre-prints of the journal articles are found in the appendices.

8.1. Introduction

This chapter considers the main outcomes of the PERFORM study in two ways:

1. The main research question will be addressed through the objectives originally set out in subchapter 3.4.
2. The contribution that PERFORM has made to the current medical education literature.

8.2. Addressing the Research Question

Junior doctors do experience negative emotions and behaviours during their management of acutely unwell patients and these manifest in psychological, physiological and/or behavioural ways. These do adversely affect acutely unwell patient management. Prior to the PERFORM study, the doctors had very few pre-existing coping strategies and lacked instructional context regarding how and when to use them and subsequent actions to take if a strategy was unsuccessful. The most common pre-existing strategy was the ABCDE cognitive aid. Despite being extensively taught within under- and post-graduate training, the doctors recognised limitations in its applicability to clinical practice.

Self-efficacy of control over negative emotions and behaviours in an in situ simulation was significantly improved by use of the PERFORM model. The doctors overwhelmingly agreed with the original conceptual PERFORM model structure and successfully implemented it in clinical practice with real patients. PERs used by the doctors included both those listed in the original coaching sessions in Stage 1 of the Full Intervention and novel self-created PERs.

The most useful element of the study was identified as an increased awareness of the doctors' own emotions and behaviours in clinical practice. The doctors recommended that PERFORM should be introduced to medical trainees between the final-year of undergraduate training and the end of Foundation Year 1. Many of the doctors specifically identified the transition from under- to post-graduate training as the optimum introduction period for PERFORM alongside established simulation courses which focus on the acutely unwell patient. Other suggestions included the introduction of a mobile phone application, more background information about metacognitive theory and increased realism within simulations.

8.3. Contributions to the Literature

Through the outcomes above, the thesis has contributed to the literature in three, interlinked ways: preparedness for transitions, emotions and behaviours in the workplace and an educational focus on managing the acutely unwell patient.

8.3.1. Preparedness for Transitions

The suggestion that medical students' acute care experience has a "direct relationship to their perceived preparedness" (Burford, Whittle and Vance, 2014) might be viewed as overly simplistic. Kilminster *et al.*, (2011) warn that there are two problems with the current view of 'preparedness' for practice. The first problem is that direct knowledge transfer from medical school to post-graduate clinical practice is naïve, i.e. "learning is situated" and the assumption that "preparedness depends on the trainee doctor alone" (Kilminster *et al.*, 2010) fails to appreciate the context or environment in which the doctor works. The second problem is the failure to acknowledge that such pre-existing knowledge, values and skills only represent part of what is required to perform effectively as a new professional in a new environment. The PERFORM study recognised the value of individualising preparedness strategies and utilised the under-used but promising tool of coaching (Lovell, 2018), to promote self-regulated professional development.

Transitions in training are recognised to adversely affect performance (Kilminster *et al.*, 2010). This is partly due to the inherent uncertainty in changing environment, role or the team in which the doctor works. The PERFORM study, through its individualisation and encouragement of autonomy through self-regulation, aligns with the current educational target of 'tolerating uncertainty' within clinical practice (Simpkin and Schwartzstein, 2016).

8.3.2. Emotions and Behaviours in the Workplace

The timing of the PERFORM study fits well with a recent shift in the literature towards both concern for, and interest in, the emotional well-being of junior doctors. "Medical educators, teachers and supervisors need to attend to students' emotional responses to the complex clinical situations they encounter, and should consider ways to prepare students for feeling out of control as an unavoidable part of their work" (Helmich *et al.*, 2018).

Lundin *et al.*'s (2018) exploratory study into current coping strategies employed by junior doctors highlighted two main outcomes from their initial analysis on which the PERFORM study has shed new light. Their first outcome was that "being prepared for practice included the concept of emotional preparedness and being able to deal with one's own negative emotions". This is

unsurprising given that the current culture of medicine neither promotes nor encourages clinicians to share their feelings of inadequacy (Tucker, 2018). The PERFORM study challenged this and the doctors in the study responded to the opportunity to acknowledge and discuss their feelings, ranking this as the most useful study outcome. La Donna (2018) proposed that “medical culture must create space for physicians to share their struggles”. If this were achieved, the PERFORM model would fit comfortably within this.

Lundin *et al.*'s (2018) second major outcome that doctors “frequently felt unprepared for their own negative emotional responses” was confirmed by the PERFORM study. Furthermore, the PERFORM study went further in coaching PERs to doctors within a metacognitive model and transferred this to clinical practice.

8.3.3. Educational Focus: Acutely Unwell Patient Management

The PERFORM study confirmed emotional and behavioural responses are invoked when doctors manage acutely unwell patients. A recent review found that “the capacity for junior doctors to effectively deal with patient deterioration was influenced by: educational models that incorporated non-technical skills; the integration of high quality clinical simulation into education; and the level and type of supervision in the clinical environment” (Callaghan *et al.*, 2017). The PERFORM study strongly addressed the two elements of non-technical skills and simulation. The element of supervision was indirectly addressed by promoting doctors’ autonomy when using the PERFORM model to optimise their clinical performance by reducing the impact of their emotional and behavioural responses to acutely unwell patients.

The doctors in this study reported that their involvement with the PERFORM study improved their management of acutely unwell patients in simulation and real clinical practice. Application of their contextual PERFORM models closely mirrored that of the original conceptual model whilst allowing individualisation through the creation of personalised PERs. All of the doctors had previously experienced negative emotions and behaviours in the clinical workplace and the opportunity to discuss these, particularly on a one-to-one basis, was one of the most useful elements of the study. The doctors suggested that the optimal timing for PERFORM coaching would be during transition from medical student to newly-qualified doctor. This would aid preparedness for practice. The ways in which PERFORM might be more widely rolled-out as either a larger research project or educational programme is discussed in the next chapter.

8.4. Future Work

Given the outcomes of this original PERFORM study, there are two main areas into which further work on the PERFORM model could progress. These are further research or the establishment of an educational programme.

8.4.1. Further Research

There are a number of potential avenues for further exploration of the PERFORM model following the conclusion of this study. The first would be to follow-up the doctors from this original study. This would be of interest due to both the comments by the doctors regarding their wish for a longer study period, and to observe whether their intentions to continue to use their PERFORM models were realised.

Also of interest would be whether the doctors continued to adapt and change their PERFORM models or whether they reached a final, stable model after a certain period of time. Finally, the argument of automaticity versus deliberate application of the PERFORM model in clinical practice could be addressed. Follow-up research could establish whether automaticity occurs naturally over time and whether it is more successful than deliberate practice in achieving 'expertise' in applying the PERFORM model.

It might be of value further explore specific elements of the PERFORM study. These include whether PERFORM would be improved by exchanging simulation as a data generating tool for observing the doctors in real clinical practice. This was not completed as part of this study due to ethical and funding considerations but might be possible with a non-clinical observer or within a study site which allowed the use of video recording in the clinical environment. Also, the relevance and potential impact of the researcher having a clinical background could be explored either through interviews or by using PERFORM coaches with a variety of different clinical and non-clinical backgrounds. This would then inform future roll-out of PERFORM.

The PERFORM study focussed on the lack of preparedness at the beginning of a doctor's career. However, the challenges of transition periods (Kilminster *et al.*, 2011) and imposter syndrome (Ladonna, Ginsburg and Watling, 2018) are not constrained only to recently-qualified doctors. Understanding how experts use coping strategies in their clinical practice may further inform and improve the current PERFORM programme. This would be possible through an exploratory study to

investigate coping strategies employed by senior trainees and consultants who manage acutely unwell patients.

Finally, to address whether PERFORM improves *objectively assessed* clinical performance would require a study which was embedded within the workplace and incorporated 'entrustability' criteria akin to workplace-based assessments. This could include a case-control design with efforts made to match participants and decrease the effect of extraneous variables such as clinical experience, training level and current workplace.

8.4.2. Educational Programme

The PERFORM model could be rolled-out as an educational programme for three healthcare professional groups.

8.4.2.1. Doctors

The GMC's most recent Outcomes for Graduates report states that "Newly qualified doctors must demonstrate awareness of the importance of their personal physical and mental wellbeing and incorporate compassionate self-care into their personal and professional life" (2018). This includes the need to "self-monitor, self-care and seek appropriate advice and support" and "manage the personal and emotional challenges of coping with work and workload, uncertainty and change" by developing a "range of coping strategies". The results from this current study would support these objectives, particularly the transition around graduation to better prepare doctors to manage acutely unwell patients.

The PERFORM programme could be initially introduced in the final year of medical school and revisited at multiple points during Foundation Year 1. It could be incorporated into current simulation-based courses on the management of the acutely unwell patient. Ideally it would be embedded within placements which are not only particularly stressful but also educationally rich regarding the management of acutely unwell patients, such as the emergency department (Mason *et al.*, 2013).

Each doctor could be assigned a coach, perhaps their clinical supervisor, with whom they would have regular contact over their first year of post-graduate training. The use of collaborative learning through near-peer support would alleviate the time commitment on coaches (Ten Cate and Durning, 2007). The development of more on-line resources, in particular a mobile phone application, could be explored to motivate, support reflection and consolidate learning.

8.4.2.2. Other Health-Care Professionals

Some of the doctors in the study acknowledged that other healthcare professionals might also benefit from PERFORM coaching. Not unlike their medical counterparts, nurses are “especially vulnerable during their transition” to qualification and reportedly have a higher intention to leave their profession at this early stage in their career (Zhang *et al.*, 2017). A survey of over 4,500 Australian nurses and midwives demonstrated that the odds of “intention to leave” decreased with increasing mental well-being (Perry *et al.*, 2017). After confirming the correlation between burnout and mental health complaints and acknowledging the potential effect on nursing retention, Mousavi *et al.*, (2017) recommended “emotion regulation-training classes” to decrease the effect of such experiences on the retention of nurses.

Advanced Clinical Practitioners (ACP’s) were highlighted by one of the doctors in the PERFORM study as another potential target group for PERFORM coaching. ACPs “are experienced professionals from a range of healthcare backgrounds including nursing, pharmacy, paramedical science, physiotherapy and occupational therapy” (Bench *et al.*, 2018). Potential ACPs undergo training to become independent practitioners in the assessment, diagnosis and management of patients within a variety of clinical specialties. ACPs have been developed primarily to address current and future gaps in the medical workforce. In their literature review, Moran and Nairn (2018) identified that the transitions in roles and responsibilities are important educational targets for ACPs. PERFORM might offer a flexible coaching programme to support ACPs in their new roles, particularly those who are expected to provide more independent acutely unwell patient management than their background had previously required.

8.4.2.3. Non-Clinical Domains

PERFORM is a flexible model which can be embedded in various environments. Sport psychology provided much of the evidence regarding the use of PERs to optimise performance. However, the precise reason for the success of PPRs in sport has eluded many sport psychologists (Cotterill, 2011). Perhaps a metacognitive model such as PERFORM could aid both understanding and instruction of PPRs, and perhaps extend them into PERs for ‘open skills’, in sporting practice and competition (MacIntyre *et al.*, 2014; Brick, MacIntyre and Campbell, 2015). Other industries, such as music, aviation and the armed forces, have also taken performance enhancement inspiration from sport psychology and may also be interested in the PERFORM model which builds upon their current use of PERs.

8.4.2.4. Potential Difficulties with Future Work

It is important to acknowledge the difficulties in conducting research within a 'real world' environment. To successfully conduct postgraduate medical education research a hierarchy of barriers must be overcome. The first is to gain the required permissions to access potential study sites and doctors, which can be a complex and lengthy process. At the study sites, clinical and educational supervisors have understandable reservations to conduct educational programmes which might disrupt service provision. Doctors have significant limitations on their availability due to busy rotas and this is compounded by the requirement for multiple points of contact with the researcher over a period of time. Additional logistical challenges include access to, and availability of, rooms, equipment and assistance, e.g. clinical skills technicians, for simulations and interviews. Again, these must also be accommodated within participants' rotas and service provision. For the PERFORM study, many of these aspects were negotiated through flexible organisation and good working relationships with the study sites' research and education departments whereby offering support with wider projects, e.g. in situ simulations, was exchanged for assistance with the study.

Any of the potential research or educational projects outlined above will require similar relationships to be established with the hosting organisations. The outcomes presented in this thesis demonstrate the value of PERFORM and given the current emphasis to support the mental health of healthcare professionals (Perry *et al.*, 2017; GMC, 2018), these might justify its adoption by hospital trusts and ease tensions on service provision to allow time to develop a more resilient workforce.

8.5. Publication List

The following publications and presentations have arisen from the PERFORM study during the writing of this thesis:

8.5.1. Publications

- **Church HR**, Murdoch-Eaton D, Patel R, Sandars J. What Can Medical Educators Learn from the Rio Olympic Games? *Medical Teacher*; 39 (6): 2017. (Pre-print in Appendix 41)
- **Church HR**, Rumbold J, Sandars J. AMEE Guide 121: Applying Sport Psychology to Improve Clinical Performance Submitted to *Medical Teacher* June 2017. (Pre-print in Appendix 42)

8.5.2. Poster Presentations

- Can Junior Doctors' Management of Acutely Unwell Patients in Simulation Be Improved Using Sport Psychology? **Church HR**, Murdoch-Eaton D, Sandars J. Yorkshire and Humber Clinical Academic Presentation Day 14th June 2017. York, UK. (Awarded 1st Prize in training category)
- Can Junior Doctors' Management of Acutely Unwell Patients in Simulation Be Improved Using Sport Psychology? **Church HR**, Murdoch-Eaton D, Sandars J. Sheffield Medical School Research Day 15-16th June 2017. Sheffield, UK.

8.5.3. Oral Presentations

8.5.3.1. Local

- Performance enhancing routines for optimisation using metacognition (PERFORM) study: improving junior doctors' management of acutely unwell patients using sport psychology. **Church HR**, Murdoch-Eaton D, Sandars J. Sheffield Medical School 3rd Year Oral Presentations. 9th July 2018. Sheffield, UK. (Awarded joint first prize for Day 1)

8.5.3.2. Regional

- PERFORM: Performance enhancing routines for optimisation using metacognition. **Church HR**. Keynote speaker at DEMEC Masterclass- In the steps of Olympic Athletes: Using performance psychology to improve clinical performance in challenging environments. 29th November 2017. Derby, UK.
- Performance enhancing routines for optimisation using metacognition (PERFORM) study: improving junior doctors' management of acutely unwell patients using sport psychology. **Church HR**, Murdoch-Eaton D, Sandars J. Keynote speaker at Inaugural Derby Hospital Teaching and Learning Conference. 29th June 2018. Manchester, UK.

8.5.4. National

- Performance enhancing routines for optimisation using metacognition (PERFORM) study: improving junior doctors' management of acutely unwell patients using sport psychology. **Church HR**, Murdoch-Eaton D, Sandars J. ASM 2018: Medical education with a global perspective. 11-13th July 2018. Gateshead, UK.

8.6. Thesis Summary

The story told through this thesis began with the recognition that many doctors feel insufficiently prepared for practice, particularly regarding the management of acutely unwell patients. Furthermore, the use of novel but promising metacognitive strategies had been thus far overlooked. To address this problem, the conceptual PERFORM model was developed through integration of sports psychology evidence and metacognitive theory. The model was designed to explain the implementation and regulation of PERs to optimise performance.

Exploratory and Pilot Phases were conducted to confirm the literature review findings and test the feasibility of the coaching of the model, respectively. Subsequently a dual-site Full Intervention Phase was held to explore the use of PERFORM in simulation and real clinical scenarios, with particular focus on the management of acutely unwell patients. The doctors' resulting contextual models were analysed and interpreted. The results confirmed the usefulness of the PERFORM model in increasing control over negative emotions and behaviours which adversely affect clinical performance.

During the course of this study, publications relating to the PERFORM model have attracted interest within medical education (Hunt and Sismey, 2018; Amos *et al.*, 2018).

Potential future research and educational programmes based on the PERFORM model have been outlined with the continued aim to support the personal and professional development of healthcare professionals.

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Appendices

Appendix 1: Spreadsheet- Literature Review Journal Articles and Abstracts

Journal or Abstract	Author	Title	Year published	Country	Target population	Number of participants	Descriptive, justification or clarification	Theme/theory?	Study aim	Statistically Significant?	Statistically significant objective or subjective	Outcome code	Outcome code 2	Outcome Code 3	Post intervention outcome measurement (time)	Simulation/ward/real life?	Simulation?	Outcome measurement (mixed/subjective/objective)	Mannikin/Patient simulator/Both/Neither	Debrief structure
Journal	Ellington, M and Campbell A.	Resuscitating two birds with one stone: Improving ambulance response times and enhancing medical student education of the acutely unwell patient.	2014	UK	medical students - final and penultimate yrs.	30	Descriptive		Increase confidence in managing acutely unwell patients in community	No		Confidence to manage acutely unwell	Course added to education		Not mentioned	Clinical environment	No	Subjective		
Journal	Carling, J	Are graduate doctors adequately prepared to manage acutely unwell patients?	2010	UK	All final yr. students took part in programme; 7 F1's followed up for validation of programme	Entire year group (no number stated)	Descriptive		Improve preparedness in acute illness management	No		Preparedness to manage acutely unwell patient			4 months	Simulation	Yes	Subjective	Not described	
Journal	Gregory, A <i>et al</i>	Innovative teaching in situational awareness	2015	UK	medical students - preclinical years	Not stated	Clarification	Constructivist	Improve non-technical skills, including situational awareness	No		Perceived educational outcomes of course in situational awareness	Enjoyment of course		immediate	Simulation	Yes	Subjective	Neither - patient-free environment	Yes - Gibb's cycle
Journal	Fisher, James <i>et al</i>	Hands on + hands free: simulated on-call interaction	2014	UK	medical students - 3rd years	54	Justification		Improve confidence in telephone interaction and handover	Yes	Subjective	Confidence in handover of acutely unwell			immediate	Simulation	Yes	Subjective	Nurse simulator	Yes - Pendleton's guidelines
Journal	Macdowall	The assessment and treatment of the acutely ill patient--the role of the patient simulator as a teaching tool in the undergraduate programme.	2006	UK	medical students - final year	23	Justification		1) Improve confidence in management of acutely unwell patient 2) Improve self-assessed ability in management of acutely unwell	Yes	Subjective	Confidence to manage acutely unwell	Perceived ability in acutely ill management		immediate	Simulation	Yes	Subjective	Mannikin	No
Journal	Graham P <i>et al</i>	Shadowing a foundation-year doctor: a third-year medical student's perspective.	2011	UK	medical students - 3rd years	18	Justification		Impact on learning for undergraduates through one-to-one shadowing of junior doctors	Yes	Subjective	Confidence to manage acutely unwell	Experience/exposure		immediate	Clinical environment	No	Subjective		
Journal	Lovell, B <i>et al</i>	Simulation training for acute medical specialist trainees: a pilot.	2013	UK	doctors - SPR	21	Descriptive		Mixed educational and curriculum supporting study: A training day for Acute Medical ST3+s which exposed them to ethically challenging scenarios. The learning objectives were mapped to areas trainees may traditionally describe as either difficult to achieve, or for those for which providing evidence challenging.	No		Course evaluation			immediate	Simulation	Yes	Subjective	Mannikin	No
Abstract	Woods A <i>et al</i>	Inspiring confidence in future doctors : a tailored, near-peer led programme combining theory and simulation teaching for undergraduates	2016	UK	medical students	Not mentioned	Clarification	Near-peer	Increase confidence in issues around acutely unwell patient management	Not Mentioned		Confidence to manage acutely unwell			Not mentioned	Simulation	Yes	Subjective	Not described	N/A
Abstract	Boakes, E	Improving the transition from medical student to junior doctor: a one month course in the final year of medical school	2016	UK	medical students	Not mentioned	Justification		Increase confidence	Not Mentioned		Confidence to manage acutely unwell			Not mentioned	Academic setting - lecture/tutorials	No	Subjective	Neither	
Abstract	Kelly, A	Managing the acutely ill patient upon graduation: A novel, interactive, case-based teaching programme aimed at improving confidence in acute care for final year medical students	2017	UK	medical students - final year	20	Justification		Increase confidence in acute patient management	Yes	Subjective	Confidence to manage acutely unwell			Not mentioned	Academic setting - case based discussion	No	Subjective	Neither	

Abstract	Hoi Ka Wu, C	Transition with Simulation	2017	UK	medical students - final year	21	Clarification	Contextual learning	To build emotional stamina and for students to remain focused in a stressful situation.	Not Mentioned		Confidence to manage acutely unwell			Not mentioned	Simulation	Yes	Subjective	Task trainer	
Abstract	Rowland K	Mind the gap: Facilitating the transition between medical student and foundation doctor	2017	UK	medical students - final year	around 264	Descriptive		Prepare medical students for the transition into F1	No		Confidence to manage acutely unwell	Preparedness for work		4 months	Academic setting - case based discussion	No	Subjective	Neither	
Abstract	Taylor, S	Transforming the Transition: Medical Student to Junior Doctor	2017	UK	medical students - final year	39	Descriptive		Prepare medical students for the transition into F1	No		Course added to education			Not mentioned	Not mentioned	No	Subjective	Not mentioned	
Abstract	Fadra, Adam <i>et al</i>	A study of high fidelity simulation in pre-clinical to clinical transition in third year medical students	2015	UK	medical students (third year)	35	Justification	clinical transition	Ease transition from pre-clinical to clinical	Yes (Confidence P<0.001), Transition P=0.02	Subjective	Confidence to manage acutely unwell			Not mentioned	Simulation	yes	subjective	manikin	n/a
Abstract	Broom, T	Does simulation training help to prepare final year medical students for their roles as junior doctors?	2015	UK	medical students (final year)	not mentioned	Descriptive	preparation for work	Preparation for practice	No Stats		Confidence to manage acutely unwell			Not mentioned	Simulation	yes	subjective	Not described	Addresses clinical themes and human factors
Abstract	Hayes, Conrad <i>et al</i>	Simulation-based teaching in using acute ABCDE assessment: improved final year medical student clinical confidence in preparation for foundation years	2015	UK	medical students (final year)	42	Descriptive	confidence	confidence	No Stats		Confidence to manage acutely unwell			Not mentioned	Simulation	yes	subjective	Not described	No
Abstract	Rajani, Chandni	The effectiveness of a short HDU placement for foundation Year 1 doctors in a district general hospital: A teaching evaluation project	2014	UK	F1's	17	Justification	learning in and on action	measure outcomes of HDU placement	Yes (self-reported improvement in 8 key competencies) p<0.05	Subjective	Confidence to manage acutely unwell	Communication around acutely unwell patient	Handover of the acutely unwell patient	Not mentioned	Clinical environment	no	subjective	N/A	N/A
Abstract	Tuckwell, E <i>et al</i>	Predicting the unpredictable: A pilot study demonstrating the use of simulation techniques in preparing medical students for the on-call shift	2014	UK	medical students (final year)	20	Descriptive	on call shift preparation	improve readiness for on-call shifts	Not Reported		Confidence to manage acutely unwell			Not mentioned	Simulation	yes	subjective	Not described	N/a
Abstract	Hardy, Edward	Novel uses of simulation for students learning the assessment and management of the acutely ill patient	2014	UK	medical students (final year)	Not mentioned	Descriptive	combined bedside and trauma/emergency assessment of acutely unwell patient	overcome lack of exposure to acutely unwell patients	No Stats		Course added to education			Not mentioned	Simulation	yes	subjective	Not described	N/a
Abstract	Eneje, Odiri	CMT SIM: A pilot study using simulation training to prepare core medical trainees (CMT) to take on the role of "the Medical Registrar"; trainee's perspectives	2014	UK	CMT junior doctors	6	Descriptive	transition to registrar	improve confidence to become registrar	Not Reported		Confidence to manage acutely unwell			Not mentioned	Simulation	yes	subjective	Not described	no
Journal	McGlynn M. C. <i>et al</i>	How we equip undergraduates with prioritisation skills using simulated teaching scenarios	2012	UK	medical students - final year	36	Descriptive		To equip undergrads with skills of 1) task prioritisation, 2) medical management, 3) prescribing and 4) their communication skills with patient and staff through on-call shift where student attends to a set of wards and a bleep.	No		Confidence in preparedness to manage acutely unwell	Course added to education		immediate	Simulation	Yes	Subjective	Mannikin	No
Journal	Patel P <i>et al</i>	Acute care simulation for foundation doctors: the perceived impact in the workplace	2013	UK	doctors first and second year after qualification	82	Justification		To explore junior doctors' perceptions of simulation 1) immediately 2) 2 months after intervention, 3) evaluation of impact of simulation training on subsequent practice	No		Confidence to manage acutely unwell	Nontechnical skills		2 months minimum (5 months max, 3 month mean)	Simulation	Yes	Subjective	Mannikin	Yes - but VERY brief
Journal	Hawkins, A <i>et al</i>	Extended assistantship for final year students	2015	UK	medical students - final year	248	Clarification	Experiential learning, Kolb's cycle	Self-assessed confidence in domains surrounding transition to F1 including assessing and manage unwell pts	No		Confidence to manage acutely unwell	Confidence in assessing acutely unwell patient		immediately, then 5-7 months later	Clinical environment	No	Subjective		
Journal	Green R <i>et al</i>	Simulation training improves clinical knowledge of major haemorrhage management in foundation year doctors	2014	UK	doctors first year after qualification	63	Justification		1) To develop a major haemorrhage simulation training programme. (2) To design an assessment tool to measure the effectiveness of this programme. 3) To use simulation training to create more effective protocols.	Yes	Objective	Confidence in managing haemorrhage	Objective ability to manage haemorrhage		3 months	Simulation	Yes	Both	Not described	No
Journal	Shah I, <i>et al</i>	Acute medicine teaching in an undergraduate medical curriculum: a blended learning approach	2008	UK	medical students - final year	210	Descriptive		To assess impact on confidence using the virtual learning environment (VLE).	No		Course evaluation			up to 1 year (doesn't clarify a lower-limit to timescale)	Computer-based VLE	No	Subjective		
Journal	Thomas I <i>et al</i>	Driven to distraction: a prospective controlled study of a simulated ward round experience to improve patient safety teaching for medical students	2015	UK	medical students - final year	28	Justification		To assess whether simulation-based training with targeted feedback can improve undergraduate management of distractions and interruptions to reduce error-making.	Yes	Objective	Decreased error frequency			1month	Simulation	Yes	Objective	Patient simulator	Yes - SET- GO criteria
Journal	MacEwen AW <i>et al</i>	A "Diabetes Acute Care Day" for medical students increases their knowledge and confidence of	2016	UK	medical students - 4th year	272 (144 completed the pre-	Justification		To investigate the impact of the introduction of a "Diabetes Acute Care Day" on undergraduate medical	Yes	Both	Confidence to manage acutely unwell	Course added to education	Objective ability to manage diabetes	Not mentioned	Academic setting - lecture/	No	Both	Neither	

		diabetes care: a pilot study.				course. 196 completed the post-course survey)			students' knowledge and confidence in acute/inpatient diabetes.					tutorials						
Journal	Xu, G <i>et al</i>	An educational approach to improve outcomes in acute kidney injury (AKI): report of a quality improvement project.	2014	UK	Doctors - mixed grade	357 (but not all provided sufficient data for analysis)	Justification		Improve awareness of AKI, diagnosis and investigation	Yes (Partially)	Subjective	Clinical performance to manage AKI	Confidence in perceived ability to diagnose and investigate AKI	Patient care improvements	Within 4 weeks post-intervention	Web-based learning, CBD and lectures	No	Both	Neither - patient-free environment	Yes
Journal	Mughal, Z <i>et al</i>	Development, Evaluation, and Delivery of an Innovative National Undergraduate Surgical Workshop: Recognition and Management of the Acutely Unwell Surgical Patient	2015	UK	Medical students	66	Justification		Facilitate the acquisition of knowledge and skill in the early recognition and management of acutely unwell surgical patients.	Yes	Both	Objective knowledge-based improvement	Enjoyment of course	Confidence to manage acutely unwell	Immediate and then 8 weeks	Simulation and classroom	Yes	Both	Mannikin	
Journal	Cash T <i>et al</i>	Near-peer medical student simulation training	2016	UK	medical students - 3rd years	25	Clarification	Near-Peer learning	To explore if near-peer simulation training is an effective teaching format.	Yes	Subjective	Confidence to manage acutely unwell	Course satisfaction		Immediate	Simulation	Yes	Subjective	Mannikin	Verbal feedback, self-reflection
Journal	Maddy, Joseph K <i>et al</i>	A Comparison of Simulation-Based Education versus Lecture-Based Instruction for Toxicology Training in Emergency Medicine Residents	2013	USA	doctors: emergency medicine residents	32	Justification		Our objective was to compare medical simulation (SIM) to traditional lecture-based instruction (LEC) for EM residents in the acute management of critically ill poisoned patients.	Yes	Objective	Objective knowledge-based improvement	Confidence to manage toxicology cases		Immediately and then 3 months	Simulation vs lecture	Yes	Both	Not described	
Journal	Binstadt, E S. <i>et al</i>	A comprehensive medical simulation education curriculum for emergency medicine residents	2006	USA	doctors: emergency medicine residents	All year 1-4 post graduate EM residents at the hospital	Descriptive	Simulation theory adult learning	Create and implement an innovative set of simulation-based modules for integration into current emergency medicine residency curriculum.	No		Curriculum development	Course satisfaction		Not mentioned	Simulation and classroom	Yes	Subjective	Both	Yes - fosters discussion of performance in the case. Use of slides and other materials to emphasize teaching points. Instant replay also available.
Journal	Schwartz LR, <i>et al</i>	A Randomized Comparison Trial of Case-based Learning versus Human Patient Simulation in Medical Student Education	2007	USA	medical students - 4th year	102	Justification	Case-based learning	Simulation vs case-based learning	No		Objective knowledge-based improvement			Not mentioned	Simulation vs classroom	Yes	Objective	Mannikin	Yes - but VERY brief
Journal	Miyasaka, KW, <i>et al</i>	A Simulation Curriculum for Management of Trauma and Surgical Critical Care Patients.	2015	USA	doctors: emergency medicine residents	15	Justification		To reinforce the preparedness and confidence of junior residents in their ability to manage common emergent patient care scenarios in trauma and critical care surgery.	Yes	Subjective	Confidence in managing trauma/surgical patients			Not mentioned	Simulation	Yes	Subjective	Both	
Journal	Brunt, LM <i>et al</i>	Accelerated skills preparation and assessment for senior medical students entering surgical internship.	2008	USA	Students - final year (4th year)	31	Justification		Increased preparation to enter surgical residency	Yes	Objective	Objective knowledge-based improvement	Confidence to diagnose and investigate AKI		Not mentioned	Simulation	Yes, and live pigs	Both	task simulators and live pigs	
Journal	Carter M <i>et al</i>	Didactic lecture versus instructional standardized patient interaction in the surgical clerkship	2005	USA	Medical students	140	Justification		To investigate whether SPI would increase the self-confidence and be perceived as a more valuable learning tool by surgery students in their history and physical examination (H&P) skills as compared with the classic lecture format	Yes	Subjective	Objective knowledge-based improvement	Confidence to manage surgical patients	Course satisfaction	immediate	Simulation vs lecture	Yes, Sim patient (group b)	Both	Patient simulator	
Journal	Kwan B <i>et al</i>	Exploring simulation in the internal medicine clerkship	2017	USA	medical students - 3rd years	43	Justification		Investigators sought to determine the effectiveness of simulation in improving student confidence in acute coronary syndrome (ACS) and the Advanced Cardiac Life Support (ACLS) curriculum.	No		Confidence to manage acutely unwell			immediate	Simulation	Yes	Subjective	Mannikin	No
Journal	Alsaad, A <i>et al</i>	Assessing the performance and satisfaction of medical residents utilizing standardized patient versus mannequin-simulated training	2017	USA	Residents: internal medicine	19	Clarification	Realism	Assess performance and realism of manikin vs simulated patient in acute scenario management	Yes	Both	Objective knowledge-based improvement	Course satisfaction		immediate	Simulation	Yes	Both	Both	
Journal	Mollo E A	The Simulated Ward: ideal for Training Clinical Clerks in an Era of Patient Safety	2012	USA	medical students - final year	89	Descriptive		Gather opinions from surgical clerks reading novel simulated floor management course to teach patient care concepts required on the surgical wards.	No		Perceived skills/knowledge gained	Course satisfaction		immediate	Simulation	Yes	Subjective	Both	No
Journal	Schwind CJ <i>et al</i>	Use of simulated pages to prepare medical students for internship and improve patient safety.	2011	USA	medical students - 4th year	16	Clarification	Activity theory	To pilot the use of simulated pages to improve medical student preparedness, decrease stress related to pages, and familiarize medical students with common patient problems.	Yes	Objective	Confidence to manage pages on acute shifts			Less than 4 weeks	Simulation	Yes	Both	Simulated nurse	Yes - based on performance
Journal	Rettinger,	What effect does an educational	2006	USA	interns	26	Justification		To investigate whether formal case-	Yes	Subjective	Confidence to	Self-reported clinical		4 months	Academic	No	Subjective	Neither	

	TM	intervention have on interns' confidence and knowledge regarding acute dyspnea management? A randomized controlled trial								based discussions run by junior doctor (in addition to usual teaching) would improve interns' knowledge and confidence in managing patients with acute dyspnoea.			manage dyspnoea	knowledge			setting - case based discussion				
Journal	DeWaay, DJ	Simulation Curriculum Can Improve Medical Student Assessment and Management of Acute Coronary Syndrome During a Clinical Practice Exam	2014	USA	medical students - 4th year	291	Clarification	Deliberate practice	This study investigated whether a simulation-based curriculum improved a senior medical student's ability to manage acute coronary syndrome as measured during a Clinical Practice Exam, compared to control (no intervention) or didactic teaching. NOTE: simulation group ALSO had didactic teaching.	Yes		Objective	Objective knowledge-based improvement			At least 2 months between intervention and assessment	None, Lecture or Sim & Lecture	Yes	Objective	Patient simulator	
Journal	Dworetzky, B <i>et al</i>	Interprofessional simulation to improve safety in the epilepsy monitoring unit.	2015	USA	doctors - 2nd year PG (neuro residents) and neuro nurses	21	Clarification	Deliberate practice	To train neurology resident-nurse interprofessional teams to maximize effective responses to high-acuity events.	Yes		Subjective	Perceived skills gained	Confidence in assessing acutely unwell patient		Immediately for self-report questionnaires ; up to 8 months post course for real life clinical seizure videos	Simulation	Yes	Subjective	Mannikin	'interactive'. Key objectives/learning points outlined.
Journal	McKenzie, S	Practically prepared? Pre-intern student views following an education package	2017	Australia	medical students - final year	53	Clarification	Experiential learning	To examine the impact of a pre-intern (Print) education package, consisting of a short intensive course, followed by a one-month clinical attachment.	Yes		Subjective	Confidence of practical procedures	Perceived skills gained	Increased experiences/exposure	Immediately following clinical attachment (part of the 4-week course)	Academic setting then clinical attachment	No	Subjective		
Journal	Christensen, MD <i>et al</i>	Remotely Versus Locally Facilitated Simulation-based Training in Management of the Deteriorating Patient by Newly Graduated Health Professionals	2015	Australia	nurses and doctors within 12 months of graduation	305	Justification		This study evaluated delivery of immersive simulation-based training (SBT) by distance education for newly qualified healthcare professionals.	Yes		Both	Course evaluation	Objective knowledge-based improvement		immediate	Simulation	Yes	Both	Mannikin	Yes - framework described by Raemer <i>et al</i> .
Journal	Wright A <i>et al</i>	Supporting international medical graduates in rural Australia: a mixed methods evaluation	2012	Australia	Doctors (grades not stated)	17	Clarification	Adult learning theory, contextualised theory and reflective practice	To support international medical graduates in rural Australia	Yes - Certain Aspects Of MSF		Subjective	Course evaluation	Colleague MSF	Sustained learning (self-reported)	Immediate and 3 months	Simulation	Yes	Both	Both	No
Journal	Fuhrmann <i>et al</i>	A multi-professional full-scale simulation course in the recognition and management of deteriorating hospital patients	2009	Denmark	doctors and nurses (grades not stated)	220	Clarification		1) Improve recognition of acutely unwell patient, 2) management of deterioration 3) teamwork/communication	No			Course evaluation			6 months	Simulation	Yes	Subjective	Mannikin	Yes - described but no validated framework used
Journal	Ruessler, M <i>et al</i>	Simulation training improves ability to manage medical emergencies	2010	Germany	medical students - final year	44	Justification		Improve medical students' ability to manage emergency situations	Yes		Objective	Objective knowledge-based improvement			up to 4 months	Simulation	Yes	Both	Both	Yes - but VERY brief
Journal	Beckers S <i>et al</i>	Evaluation of a new approach to implement structured, evidence-based emergency medical care in undergraduate medical education in Germany	2005	Germany	medical students - 1st year	236	Justification	Use a spiral curriculum diagram!	Implement structured, evidence-based emergency medical care in undergraduate medical education	No			Course evaluation			immediate and after one semester	Simulation and classroom	Yes	Subjective	Mannikin for BLS	
Journal	Herbstreit, F <i>et al</i>	Impact of standardized patients on the training of medical students to manage emergencies	2017	Germany	medical students - 4th year	274	Justification		To compare learning outcomes between traditional seminars vs simulated patients in three emergency clinical scenarios	Yes, forr OSCE only (not MCQ)		Both	Objective knowledge-based improvement	Confidence to manage acutely unwell		Within 2 weeks	Simulation vs classroom	Yes	Both	Simulated patient	
Journal	Wallin, CJ <i>et al</i>	Target-focused medical emergency team training using a human patient simulator	2007	Sweden	medical students - final year	15	Justification		1) Provide the participants with set responses, medical skills and team coordination skills in order to enable the student to function as a member of a trauma team during the initial assessment of the patient	Yes		Both	Teamworking			immediate	Simulation	Yes	Both	Mannikin	Yes - but VERY brief
Journal	Meurling <i>et al</i>	Leaders' and followers' individual experiences during the early phase of simulation-based team training	2013	Sweden	medical students - 4th and 6th year	54	Clarification	Self-efficacy	1) Improve team working ability (both clinical outcome and behaviours) 2) Improve self-efficacy	Yes		Both	Teamworking	Self-efficacy of acutely unwell management		immediate	Simulation	Yes	Both	Mannikin	Yes - described but no validated framework used
Journal	Cachia, M	Simulation training for foundation doctors on the management of the acutely ill patient	2015	Malta	foundation doctors	120	Descriptive		A study evaluating subjective trainee responses to simulation training organized by the Malta Foundation Program in particular whether this changed their clinical practice.	No			Course evaluation		Not mentioned	Simulation	Yes	Subjective	Mannikin	No	
Journal	Gruber <i>et al</i>	Teaching acute care: A course for undergraduates	2007	Hong Kong	medical students - final year	155	Descriptive		Describe a course designed to help medical undergraduates develop the necessary competencies to recognise and manage acutely ill patients.	No			Objective knowledge-based improvement			immediate	Simulation and classroom	Yes	Both	Mannikin	

Journal	Omrani S <i>et al</i>	Exploring an Appropriate Instructional Design Model for Continuing Medical Education	2012	Iran	General physicians and assistants	60	Clarification	Adult learning theory	To compare eLearning with traditional learning for continuing education around acute respiratory failure - outcomes knowledge and motivation	Yes	Both	Objective knowledge-based improvement	Educational motivation		immediate	Academic setting - lecture/tutorials	No	Both		
Abstract	Gan E <i>et al</i>	Preparing medical students for real life practice: a junior resident led OSCE workshop	2017	Singapore	medical students - final year	94	Descriptive		Exposure to common acute scenarios and gaining confidence in managing these	No		Confidence to manage acutely unwell	Increased experiences/exposure		Not mentioned	Simulation	Yes	Subjective	Not described	No
Abstract	Lo, FA <i>et al</i>	Before Taking the Plunge: Preparing our Junior Doctors for the Chaotic Clinical Environment with the Integrated Resuscitation Drill (IRD)	2017	Singapore	newly qualified doctors	40	Descriptive		The Integrated Resuscitation Drill allowed our doctors for hands-on activity in reviving a "collapsed" high-fidelity manikin as part of induction.	No		Preparedness for work			Not mentioned	Simulation	Yes	Subjective	Mannikin	
Journal	Beane A <i>et al</i>	Closing the theory to practice gap for newly qualified doctors: evaluation of a peer-delivered practical skills training course for newly qualified doctors in preparation for clinical practice.	2017	Sri Lanka	Pre-interns (newly qualified doctors)	320	Clarification	Peer-learning	Improve preparation for clinical practice	Yes	Both	Objective knowledge-based improvement	Confidence to manage acutely unwell		immediate	Academic setting - lecture/tutorials	No	Both	Neither	
Journal	Stanley, L. <i>et al</i>	A tool to improve competence in the management of emergency patients by rural clinic health workers: a pilot assessment on the Thai-Myanmar border.	2015	Thailand	Nurses and doctors	71	Justification		The development of a tool to improve the competence of local health workers in basic emergency assessment and management	Yes	Both	Objective knowledge-based improvement	Confidence in practical skills		immediate and then 8 weeks	Academic setting - lecture/tutorials	No	Both		
Journal	Arora <i>et al</i>	Crisis Management on Surgical Wards: A Simulation-based Approach to Enhancing Technical, Teamwork, and Patient Interaction Skills	2015	UK/USA	doctors first year after qualification	185	Justification		Using simulation to improve clinical, teamworking and patient-interaction skills for post-op surgical emergencies	Yes	Objective	Observed improved practical skills	Teamwork	Communication	immediate	Simulation	Yes	Objective	Patient simulator	Yes - described but no validated framework used
Journal	Jingyan Lu <i>et al</i>	Scaffolding problem-based learning with CSCL tools	2010	Hong Kong/Canada	medical students - third year	18 (calculated from the methodology - not stated)	Clarification	PBL, computer-supported collaborative learning, scaffolding	To determine if the scaffolding and communication different when interactive white boards are used, vs traditional white boards?	No		Discourse frequency and content during scenario			immediate	Simulation	Yes	Objective	Patient simulator	
Journal	Bryne-Davis L. <i>et al</i>	Efficacy and acceptability of an acute illness management course delivered to staff and students in Uganda by staff from the UK.	2015	Uganda/UK	medical students, student clinical officers, doctors and nurses.	159	Justification		Increase confidence and knowledge of managing acutely unwell patients	Yes	Objective	Objective knowledge-based improvement	Confidence to manage acutely unwell	Immediate and then 8 weeks	Simulation and classroom	Yes	Both	Mannikin	No	Yes

Appendix 2: Email to Clinical Directors: Phases 1 & 2

4th May 2016

Drs XXX
Clinical Directors



Dear Sirs,

My name is Helen Church and I am currently a part-time Clinical Fellow in Anaesthetics and Critical Care at Chesterfield Royal Hospital. I am also currently studying for my PhD in Medical Education at The University of Sheffield under the supervision of Professors John Sandars and Deborah Murdoch-Eaton.

My PhD project is centered around the educational theories of metacognition, and through my collaborative work with a sports psychologist from Sheffield Hallam University, I have developed a conceptual model which I would like to evaluate. My target population for this project is foundation trainees, and the aim of the project is to improve management of the acutely unwell adult using strategies from sports psychology. Due to the nature of the educational intervention being taught here, the strategies learned are not limited only to management of medical scenarios, but also are applicable to all specialties and many different scenarios. Although metacognitive strategies have never been taught in this way through simulation before, they have been shown to improve performance in such skills as venepuncture and more complex clinical tasks e.g. prescribing.

My plan is to recruit voluntarily from the foundation year 1 and 2 doctors commencing work at Chesterfield Royal Hospital in August 2016. I have identified dates to coincide with their induction where I have been invited to speak to the junior doctors about my project. I will provide the appropriate information sheets and consent forms for participants in line with HRA guidance. Once enrolled, participants will either be enrolled in a data collection phase and pilot, or the intervention itself.

The data collection phase is a preliminary study to identify the coping strategies that junior doctors already use when managing the acutely unwell patient. This data collection process will consist of an initial semi-structured interview, followed by a simulation and a debrief where these strategies can be demonstrated and discussed. This information will inform the pilot and intervention stages of this study which follow. The pilot study will allow me to practice and refine the coaching techniques that I will use in the first stage of the intervention, so that I can standardise my practice and ensure that all necessary equipment needed for the scenarios and debrief are available.

The intervention itself involves the participants initially undertaking a simulation session with a clinical skills assistant and myself where they will manage the acutely unwell adult. They will then be coached on the use of Performance Enhancing Routines (an approach used in sports psychology to decrease negative behaviours e.g. feelings of anxiety, loss of concentration) and have the opportunity to try this routine in another simulation scenario. The participants will then be encouraged to use these routines in clinical practice over the following three months and complete reflections on their use. The final stage of the intervention involves an in situ simulation where participants will be bleeped to a clinical area to manage an acutely unwell patient in simulation.

The data collection and pilot phases will be held between August 2016 and December 2016 and will involve between 5 and 10 participants. The intervention will be held between December 2016 and April 2016. Numerous time slots and dates will be available from which the participants may choose, and I will stipulate that the junior doctors must let their rota coordinators know when they will be attending their chosen session as soon as possible. This point is also made clear on the participant information sheet and features as an item to be initialled on the consent form.

I have spoken to the Head of Foundation Training Year 2 [REDACTED] and Senior Matron/R&D Lead [REDACTED] and both have been very helpful and enthusiastic about my project. I will also meet with [REDACTED], Head of Foundation Training Year 1 before the start of the project. I am currently working through the IRAS approval system and do not require NHS ethics according to the NHS toolkit.

I would like to ask for your cooperation with this project so that I may reassure the participants that the Clinical Directors of their departments are aware and, provided that patient care is not compromised by their absence, support the project. I would be delighted to speak to you in more detail about this project if you wish, or alternatively if you would like to see any of the documentation being used e.g. consent form, participant information sheet, please let me know and I will send this out to you at the earliest convenience.

Sincerely,

Helen Church
PhD Student at The University of Sheffield
Academic Unit of Medical Education
Beech Hill Road
Sheffield
Email: mda05hrc@sheffield.ac.uk

Appendix 3: Invitatory Email to Foundation Doctors phases 1 & 2

RE: Opportunity to improve management of the acutely unwell patient

Dear Doctor,

My name is Helen Church and I am an Anaesthetist at Chesterfield Royal Hospital and PhD student at the University of Sheffield. I am conducting an intervention to improve junior doctors' 'readiness' to manage the acutely unwell patient using educational techniques adapted from sports psychology.

When I was a Foundation Doctor I felt overwhelmed with the clinical environment. I had proved that I could take a history and examine someone, after all I'd passed my final year examinations. What I wasn't prepared for was the complexity of managing multiple patients, the busy environment, the feeling of sheer dread when the emergency bleep went off and being the first-responder to unwell patients.

The literature on the subject of 'preparedness for practice' shows that many junior doctors feel the same way, and I propose that these feelings of anxiety, lack of confidence and feeling overwhelmed are contributing to junior doctors struggling to cope at work, and in turn, poorer care for patients. The literature particularly highlights a feeling of lack of preparedness of junior doctors in the area of managing the acutely unwell patient, and therefore this is the target of my intervention.

Many of your favourite sports players and athletes use behavioural routines to increase their concentration for match-changing moments. This study proposes to teach junior doctors adapted versions of these routines to be used before and during your care for acutely unwell patients; times when you need to focus on the task at hand, despite how stressful the situation is.

This study will be taking place at Chesterfield Hospital over the next 6 months and will be split into two groups:

1. Group 1 will take part in a data collection interview and a pilot.
2. Group 2 will be enrolled in the full study.

All participants will be taught strategies to improve your concentration and get the chance to practice these in simulation before you apply them to the real clinical environment.

I am looking for enthusiastic Foundation Doctors who want to improve their acute management skills. If you are interested in volunteering for this project, please contact me at mda05hrc@sheffield.ac.uk.

Kind regards

Helen Church



Participant Information Sheet

Data collection and Pilot

A Simulation Project For Junior Doctors Using Sports Psychology Theory To Improve Management Of The Acutely Unwell Patient:

We would like to invite you to take part in a research study

- Joining this study is entirely up to you.
- Before signing up, please read the following information and ask if you have any questions.
- The first part of this form will explain what the study is about and how you will be involved.
- Then there will be more detail about how the study will be conducted.
- If you choose not to sign up, there will be no effect on your future post-graduate education.

Summary

- Many junior doctors feel unprepared to start clinical work and others struggle with their new responsibilities in their role throughout foundation training.
- One source of stress felt by trainees is managing the acutely unwell patient, especially during 'on-call' shifts.
- This research project aims to improve junior doctors' management of the acutely unwell adult using techniques from sports psychology known as Performance Enhancing Routines.
- This project will affect junior doctors and also have a direct impact on patient safety.
- The learning theory being used here is Metacognition. This has been deemed a promising educational theory in other research areas, but has never been used in an intervention like this before.
- Sports psychologists use similar theories to develop Performance Enhancing Routines, which improve concentration and focus and decrease anxiety and distractions during sporting competition.
- This simulation project will enable participants to learn these techniques in order to be better prepared at managing acutely unwell patients, particularly in stressful situations.
- All Foundation Year 1 and 2 trainees working in Medicine, Surgery, Obstetrics and Gynaecology, Accident and Emergency and Critical Care at Chesterfield Royal Hospital can enroll.
- If you chose to enroll in this project, you will attend the simulation center here at Chesterfield Royal for two one-hour sessions within a three month period.
- The first simulation day will be end of August/start of September.
- You can also upload a reflection to your portfolio if you wish.

Ethical approval has been gained from both the University of Sheffield and NHS via the IRAS application system.

Professor John Sandars and Professor Deborah Murdoch-Eaton, both of the Academic Unit of Medical Education, University of Sheffield, are the supervisors for this project.

What this participant information sheet will tell you:

- Why this project is important
- What the project is about
- Who is eligible to enrol
- How long the project lasts
- What participants can expect from this project
- What is expected of participants

Benefits and Risks

Benefits:

- Improve your management of the acutely unwell patient in the safe, controlled environment of simulation.
- Enhance patient safety on the wards.
- Learn new skills used by some of the world's most successful athletes and sportspeople to improve your management skills under pressure.
- The techniques learned here will also be useful for future post-graduate courses including Advanced Life Support (ALS).
- Be part of the first project ever to use such education theory in simulation.
- Get a reflection completed for your e-Portfolio.

Risks:

- There are no anticipated physical or psychological consequences to this study, however, if these do occur the researcher will seek appropriate support from post-graduate training department e.g. Head of F1 or F2, and remove the participant from the study if necessary/requested.

If you have any queries, comments or complaints regarding this project, please contact:

Helen Church
PhD Student at University of Sheffield
mda05hrc@sheffield.ac.uk
Mobile: 07877513326

Project Details

This is primarily an education project and does not involve any real patients.

- You will take part in the first two stages of this study (see Figure 1). Both of these stages take place on a one-to-one basis with the researcher. No other junior doctors will be present.
- Phase 1 is a data collection process. You will be asked to take part in a short interview discussing how you manage the acutely unwell patient. You will then take part in a simulation scenario involving an acutely unwell adult (manikin) which will be recorded to allow you and the researcher to talk about how you coped with the scenario.
- Phase 2 is a pilot for the future intervention. This is a really important aspect of the study, and you will receive the same training as the participants in the intervention. You will undertake an initial simulation, be coached on the use of Performance Enhancing Routine and then trial-run this routine in another simulation scenario.
- All scenarios will be conducted using a simulated patient and with the help of a simulation assistant who will act as nurse/health care professional to help you. You will not be observed by peers. Your marks from these scenarios have **no bearing** on your foundation training, and are not communicated to anyone within the Post-graduate of Foundation training programme. They are only used to demonstrate the impact of Performance Enhancing Routines.
- **PLEASE NOTE:** The scenarios used will all be common acute medical scenarios that you will experience frequently during your training. The emphasis of this project is not to teach you the medical knowledge behind each scenario, but to manage the complexities of assessing the acutely unwell patient and to learn to control the stresses, distractions and anxieties associated with it.
- By volunteering for phases 1 and 2, you will not be asked to take part in the final intervention (Phase 3) of the study, but will have gained the same skills as participants in Phase 3.

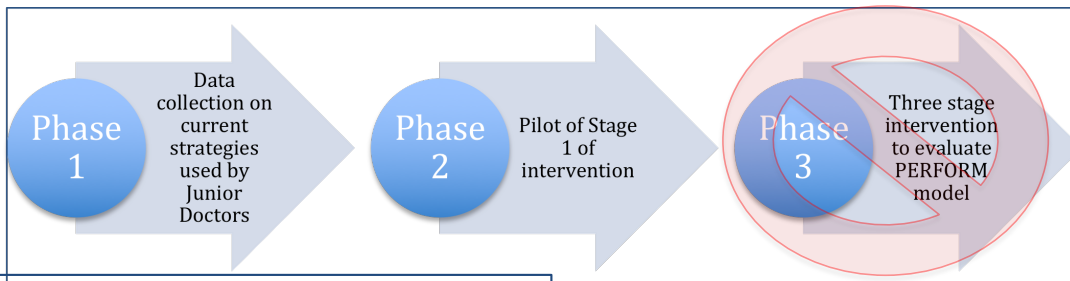


Figure 1: Schematic to show process/timeline of intervention

Responsibilities of the participant

By volunteering for this project, you will be asked to do the following:

1. Sign the consent form once you are happy that you understand what the project entails.
2. Book into both data collection and pilot sessions (one hour each) ensuring that there are other members of the team available to cover your ward and let your rota coordinator know.
3. If you are unable to attend a booked session, please let me know. (I will give my mobile number out for easy communication)

Responsibilities of the researcher

The study will abide by the following:

1. The taking part or not taking part in the study will NOT affect your post-graduate training opportunities or usual post-graduate teaching and training.
2. You will not be observed by other Junior Doctors during the interviews or simulation scenarios.
3. If support is needed, e.g. feeling upset at watching videos of performance, then appropriate steps to address this and gain future support will be taken by the researcher e.g. contacting Supervisor/ Head of Foundation Training.

Confidentiality/ Data Protection

- This is taken **very** seriously.
- All candidates will be anonymised, and only the researcher will have access to a password-protected document naming the participants for coding purposes.
- All scenarios will be video-recorded and will **only** be viewed by the individual participant and the researcher for data collection purposes.
- Conversations about the Performance Enhancing Routine and Case-based discussion will also be recorded via tape recorder, but will only be used by the researcher.
- With regard to both video and tape recordings, any identifying information will be removed at the earliest opportunity and the recording will be stored on the University of Sheffield password-protected drive.
- Direct quotes from the recordings may be used in future work e.g. thesis or publication but will be anonymized.
- If the researcher wishes to use any data which could reveal the identity of the participant, e.g. audio or video recording, they must obtain written consent from the participant for its use within the specific context. The participant retains the right to refuse to consent to their identity being revealed in any, or specific contexts.

Appendix 5: Consent Form Phase 1 & 2

Consent Form

URMS Number: 149353
 Chesterfield Hospital Study Number: 2016/41



Participant Identification Number for this trial:

CONSENT FORM

Title of Project: PERFORM Data collection and Pilot Study

Name of Researcher: Helen Church

Please initial box

1. I confirm that I have read the information sheet labelled **Participant Information Sheet Phase1&2 V1.0**, dated 17th August 2016 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my professional or legal rights being affected.

3. I understand that video and tape recordings of my simulation and conversations with the researcher, respectively, will be made and these are only for use by myself and the researcher / research team. If such recordings were to be used in other contexts e.g. for a presentation, my (the participant's) written consent must be obtained, and I (the participant) retain the right to refuse consent.

4. I understand that **anonymised** information collected about me will be kept by the researcher to a maximum of 5 years and may be used to support other research in the future. In addition, it may be shared anonymously with other researchers. The participant-identifying information, including my name, contact details and transcripts from video and tape recordings will only be kept until necessary, to a maximum of 3 years.

5. I understand that I must ensure that the rota coordinator is aware of my absence from the clinical environment during the two sessions that I will attend, and that there are other members of the clinical team available for patient care.

6. I agree to take part in the above study.

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Person taking consent	Date	Signature

When completed: 1 for participant; 1 for researcher to be kept in site file.
 Consent form Phase1&2 V1.0 19th August 2016

Appendix 6: Email to Clinical Directors: Phase 3

21 November 2016

Drs XXXX

Clinical Directors

Dear Sirs,

RE: Please Action: Educational Study for Foundation Doctors – Request for permission.

My name is Helen Church and I am currently a part-time Clinical Fellow in Anaesthetics and Critical Care at Chesterfield Royal Hospital. I am also currently studying for my PhD in Medical Education at The University of Sheffield under the supervision of Professors John Sandars and Deborah Murdoch-Eaton. I have written this email to ask for your permission to enroll foundation doctors in your division to take part in my study.

My PhD project is centered around the educational theories of metacognition, and through my collaborative work with a sports psychologist from Sheffield Hallam University, I have developed a conceptual model which I would like to evaluate. My target population for this project is foundation trainees, and the aim of the project is to improve management of the acutely unwell adult using strategies from sports psychology. Although metacognitive strategies have never been taught in this way through simulation before, they have been shown to improve performance in such skills as venepuncture and more complex clinical tasks e.g. prescribing.

Having already completed the Data Exploration and Pilot Phases in October 2016, I aim to now recruit foundation year 1 and 2 doctors into the full study on a voluntary basis. They will be contacted via email through the administrative staff, and provided with the Participant Information Sheet and Consent Form in line with ethical and HRA guidance. If possible, I will also speak to the foundation doctors at one of their mandatory training sessions.

The intervention itself involves the participants initially undertaking a simulation session in the clinical skills center with an assistant and myself, where they will manage the acutely unwell adult. They will then be coached on the use of Performance Enhancing Routines (an approach used in sports psychology to decrease negative behaviours e.g. feelings of anxiety, loss of concentration) and have the opportunity to try this routine in another simulation scenario. The participants will then be encouraged to use these routines in clinical practice over the following three months and complete reflections on their use. The final stage of the intervention involves an in situ simulation where participants will be bleeped to a clinical area to manage an acutely unwell patient in simulation.

The intervention will be held over a 3-4month period between December 2016 and August 2017 (depending on availability of clinical skills and length of time for ethical and HRA approval to be achieved). For stage 1, numerous time slots and dates will be available from which the participants may choose, and I have stipulated on the Participant Information Sheet and Consent Form that the junior doctors must let their rota coordinators know when they will be attending their chosen session as soon as possible.

The programme directors for Foundation Training Years 1 and 2, [REDACTED] and [REDACTED], respectively, have offered their support to the project. Senior Matron/R&D Lead [REDACTED] has been extremely helpful in guiding me through the preparation of the project and ensuring that all appropriate paperwork is in place. Dr [REDACTED] has given her support to the study also, but has encouraged me to seek your approval for your junior doctors to take part in this study.

Essentially, each junior doctor that enrolls would need to attend a session (up to two hours) for the first stage of the project. They would then continue their work as normal (hopefully whilst using Performance Enhancing Routines) for (up-to) the next 3 months. A final in situ simulation would take place on a day that they were working, but would only be completed secondary to any patients requiring their care more urgently. This is take approximately 10-15mins. A maximum of 10 participants will be enrolled in this study, and only one junior doctor would be released from clinical duties at any one time.

I am aware of the current pressures on staffing in clinical environments, and this project is aimed to support our junior doctors in such stressful environments and enable them to optimize their care, particularly of acutely unwell patients. I would really appreciate your permission to allow the foundation doctors in your division to take part in this study, with caveat that they can **only** attend during clinical time if patient care is not compromised by their absence. As ever, I would be delighted to speak to you in more detail about this project if you wish, or alternatively if you would like to see any of the documentation being used e.g. consent form, participant information sheet, please let me know and I will send this out to you at the earliest convenience. **If you are happy to grant permission for your junior doctors to enroll in this project, please email me on the address below.**

Sincerely,

Helen Church

PhD Student at The University of Sheffield

Academic Unit of Medical Education

Beech Hill Road

Sheffield

Email: mda05hrc@sheffield.ac.uk

Appendix 7: Invitatory Email to Foundation Doctors Phase 3

RE: Acutely unwell patient management: Opportunity to improve management of the acutely unwell patient

Dear Foundation Trainee,

My name is Helen Church and I am an Anaesthetist at Chesterfield Royal Hospital and PhD student at the University of Sheffield. In October 2016 you may have received an email from me regarding recruitment for the preliminary stages of my study. Those sessions were subsequently held at Chesterfield Royal Hospital and the Northern General Hospital, and the findings and the feedback were extremely encouraging. This email is a recruitment drive for the **full study**, which has been influenced by the data collected during these preliminary stages, and is explained in more detail below.

The Data Exploration phase of my study held in October 2016 corroborated with the literature on 'preparedness for practice': Junior doctors often feel anxious, under-confident and overwhelmed within the clinical environment and even report feeling 'paralysed' by stress, particularly in acute settings. Unsurprisingly, there is concern that these negative emotions and behaviours result in poorer care for patients. Managing the acutely unwell is often the most stressful patient encounter for junior doctors, and often requires the most time-critical treatment for optimum patient care. **Therefore, this study aims to equip junior doctors with coping strategies to manage their negative feelings and behaviours in order to optimise their care of the acutely unwell adult.**

During the study you will be coached in range of coping strategies used in sport, which are embedded within a type of learning called Metacognition. Previous studies have shown that people who engage with metacognition are more likely to succeed academically.

This study will be taking place at Chesterfield Royal Hospital and will be in four stages:

- Stage 1 involves data collection through simulation and discussion. Together, we will explore any coping strategies that you use when managing acutely unwell patients. A simulation will allow you to demonstrate your coping strategy(s) and identify points in acute management which cause you most stress/anxiety/under-confidence etc. A discussion about the possible coping strategies that might help you will follow, and you will undertake another simulation to put these into practice. A final discussion will allow us to understand whether/how these worked and how you can take this forward into your clinical practice.
- Stage 2 is where you apply what you have learned in simulation to real clinical scenarios. During this 2-3 month period, you will be encouraged to use the coping strategies when managing acutely unwell patients, and will inevitably adapt, alter and swap strategies to find ones which benefit you the most. After each episode where you have used a strategy, you'll make a short audio/written recording of the event and then the researcher will speak to you about it at a later date.
- Stage 3. This final simulation will still include a manikin, but will be held in a clinical area which you'll be bleeped to. Here, we will see a more realistic version of how you use any coping strategies in a real clinical environment. It will allow the researcher to see how your use of the strategies has evolved and how this impacts on your clinical performance.
- Stage 4. You'll have one final discussion with me, either on the phone or face-to-face, so that I can ask you your opinion on the study and get some pointers for improvement if we are able to roll this programme out further-afield.

IMPORTANT INFORMATION.

- Your participation is **purely voluntary**.
- If you do not wish to be involved, there are **no consequences to your future training/education**.
- All interviews and simulation are **confidential**.
- Interviews and simulation are **NOT performed in front of your peers**.
- All your data will be **anonymised**. (see Participant Information Sheet for more information)

I am looking for enthusiastic Foundation Doctors who want to improve their acute patient management skills through the use of coping strategies. If you are interested in volunteering for this project, please contact me at mda05hrc@sheffield.ac.uk and, if possible, indicate your preferred dates for the first stage of the study from the table below. Alternatively, if you have questions regarding the study, please feel free to email me. A certificate of attendance will be gladly provided for your portfolio, and this experience can be used as a reflection to be uploaded to your portfolio also as evidence of learning and involvement in a research project.

Kind regards
Helen Church

Date	Times available	Location
Xx/xx/xx	Xx:xx	Clinical Skills Centre
Xx/xx/xx	Xx:xx	Clinical Skills Centre

Participant Information Sheet

URMS Number: 150748
IRAS number 206630
Chesterfield Hospital Study Number: 2017/03



PERFORM Full Study (Phase 3)

A Simulation Project For Junior Doctors Using Sports Psychology Theory To Improve Management Of The Acutely Unwell Patient:

We would like to invite you to take part in a research study

- Joining this study is **entirely up to you**.
- Before signing up, please read the following information and ask if you have any questions.
- The first part of this form will explain what the study is about and how you will be involved, followed by more detail about how the study will be conducted.
- If you choose not to sign up, there will be **no effect** on your future post-graduate education.

Summary

- Many junior doctors feel unprepared to start clinical work and others struggle with their new responsibilities in their role throughout foundation training.
- One source of stress felt by trainees is managing the acutely unwell patient, especially during 'on-call' shifts.
- This research project aims to improve junior doctors' management of the acutely unwell adult using techniques from sports psychology known as Performance Enhancing Routines.
- This project will affect junior doctors and also have a direct impact on patient safety.
- The learning theory being used here is Metacognition. This has been deemed a promising educational theory in other research areas, but has never been used in an intervention like this before.
- Sports psychologists use similar theories to develop Performance Enhancing Routines, which improve concentration and focus and decrease anxiety and distractions during sporting competition.
- This simulation project will enable participants to learn these techniques in order to be better prepared at managing acutely unwell patients, particularly in stressful situations.
- All Foundation Year 1 and 2 trainees working in Medicine, Surgery, Obstetrics and Gynaecology, Accident and Emergency and Critical Care at Chesterfield Royal Hospital can enroll.
- If you chose to enroll, you will be involved in four stages (See next page for details).
- This is primarily an education project and does not involve any real patients.

Ethical approval has been gained from the University of Sheffield. Health Research Authority permissions have been granted via the IRAS application system.

Professor John Sandars and Professor Deborah Murdoch-Eaton, both of the Academic Unit of Medical Education, University of Sheffield, are the supervisors for this project.

What this participant information sheet will tell you:

- Why this project is important?
- What the project is about?
- Who is eligible to enroll?
- How long will the project last?
- What can participants expect from this project?
- What is expected of participants?

Benefits and Risks

Potential Benefits:

- Gain some new coping strategies for managing acutely unwell patients.
- Feel more in-control when in stressful situations.
- Enhance patient safety on the wards.
- Acquire skills used by some of the world's most successful athletes and sportspeople to optimize your clinical performance under pressure.
- The techniques learned here will also be useful for future post-graduate courses including Advanced Life Support (ALS), and can be applied to other clinical and non-clinical scenarios which require clear-thinking and increased focus.
- Be part of the first project ever to use such education theory in simulation.
- Get reflection(s) and a certificate for your e-Portfolio.

Risks:

- There are no anticipated physical or psychological consequences to this study. However, if these do occur the researcher will seek appropriate support from post-graduate training department e.g. Head of F1 or F2, and remove the participant from the study if necessary/requested.

If you have any queries, comments or complaints regarding this project, please contact:

Helen Church
PhD Student at University of Sheffield
mda05hrc@sheffield.ac.uk Mobile: 07877513326

Project Details

If you enroll for this study, you will be involved in four stages:

- Stage 1 – Simulation and discussion at Chesterfield Royal Hospital Clinical Skills Centre. This stage take place on a one-to-one basis with the researcher. No other junior doctors will be present. This lasts up to 2 hours and will involve the following:
 1. You will undertake a short interview discussing how you manage the acutely unwell patient. There are no right or wrong answers here – just your opinion. The researcher is trying to understand what you already do to help with stressful situations and this information will be used to tailor the coping strategies to best help you.
 2. You will then take part in a 'baseline' simulation scenario involving an acutely unwell adult (manikin). This will be recorded to allow you and the researcher to talk about how you coped with the scenario.
 3. Next, the researcher will explain the concept of the PERFORM model and offer some strategies to help you cope with the stresses that you feel when caring for acutely unwell patients.
 4. A final simulation scenario will enable you to put one or more of these into practice, to see how you can use them during your day-to-day clinical practice.
- Stage 2 – During your normal clinical practice you will be encouraged to use the strategies you were taught in Stage 1 when managing acutely unwell patients. You will keep a short audio/written log and then the researcher will contact you afterwards (not in clinical time) to discuss this further. At this stage the researcher is trying to understand whether/how the strategy(s) helped you in the clinical encounter.
- Stage 3 – You will be called to an 'in-situ' simulation during one of your normal shifts. This will still involve a manikin but will be held in a clinical area to be more 'authentic'.
- Stage 4 – Feedback interview to share your thoughts on the project. This will be done either face-to-face or via phone/Skype for the candidate's convenience.

For all the clinical simulations, a manikin will be used and there will be a simulation assistant who will act as nurse to help you. You will **not** be observed by peers. Your marks from these scenarios have **no bearing** on your foundation training and are not communicated to anyone within the post-graduate Foundation Training Programme. The scenario scores are only used to demonstrate the impact of Performance Enhancing Routines. All of the scenarios used will all be common acute medical scenarios that you will experience frequently during your training and have been piloted previously.

IMPORTANT INFORMATION:

The emphasis of this project is **not to teach you the medical knowledge behind each scenario**, but to manage the complexities of assessing the acutely unwell patient and to learn to control the stresses, distractions and anxieties associated with it. If you took part in the previous pilot for this study (October 2016) you will not be eligible to enroll in this study as you will have already been taught the PERFORM model.

Responsibilities of the participant

If you would like to volunteer for this project, you will need to do the following:

1. Email the researcher (mda05hrc@sheffield.ac.uk) to express your interest. Include which clinical rotation you are currently on and will be starting in April 2017. Please indicate which of the Stage 1 date/time slots on the email accompanying this Participant Information Sheet are convenient for you to attend.
2. Once your Stage 1 date/time slot has been confirmed, please ensure that there will be other members of the team available to cover your ward. Also, please let your rota coordinator know that you will be absent from the ward at this time.
3. Sign the consent form once you are happy that you understand what the project entails.
4. If you are unable to attend a booked session, please inform the researcher.

Responsibilities of the researcher

The study will abide by the following:

1. Taking part or not taking part in the study will have **NO effect** on your usual post-graduate teaching or training opportunities.
2. You will **not be observed by other Junior Doctors** during the interviews or simulation scenarios.
3. If support is needed, e.g. watching videos of performance causes feelings of self-doubt/low confidence which you are negatively affected by, then appropriate steps to address this and gain future support will be taken by the researcher, e.g. contacting Supervisor/ Head of Foundation Training. However, the aim of this study is to help manage such issues and as such we hope that participation would help in this regard.

Confidentiality/ Data Protection

- This is taken **very** seriously.
- All candidates will be anonymised and only the researcher will have access to a password-protected document naming the participants for coding purposes.
- For fair marking of the simulation scenarios, the recordings will be reviewed by another clinician working for the University of Sheffield. They will not be provided with the candidate's name, only their Candidate Number, and will not work at Chesterfield Royal Hospital.
- Any recorded conversations will only be reviewed by the researcher. These will be transcribed and anonymised as soon as possible.
- Any identifying information will be removed from the audio recordings at the earliest opportunity.
- When storing the tape and video recordings on the University of Sheffield password-protected drive. The title of the file will not include the participant's name, only their anonymised candidate number.
- Direct quotes from the recordings may be used in future work, e.g. thesis or publication, but will be anonymised.
- If the researcher wishes to use any data which could reveal the identity of the participant, e.g. audio or video recording, they may only do so if they obtain specific written consent from the participant. The participant retains the right to refuse to consent to their identity being revealed.

Appendix 10: Consent form for future use/dissemination for audio/video

Consent Form

URMS Number: 150748
IRAS number 206630
Chesterfield Hospital Study number: 2017/03



Participant Identification Number for this study:

CONSENT FORM

Title of Project: PERFORM

Details: Consent for use of audio/video data which contains personal identifying information

Name of Researcher: Helen Church

Please initial box

- 1. I understand that video and/or tape* recordings of my simulation and conversations with the researcher, respectively, will be made available for their use in **(Insert specific conference/presentation) on (Insert date(s))**.

- 2. I agree the previous consent given regarding the use of my anonymised data collected during the PERFORM study will still be retained and used as per the previous stipulations set out in the previous consent form.

- 3. I agree to the use of my personal identifying data for the purposes set out on paragraph 1, and allow the researcher the right to retain and use anonymised data as stipulated in paragraph 2.

Name of Participant Date Signature

Name of Person Date Signature
taking consent

*delete as appropriate

When completed: 1 for participant; 1 for researcher to be kept in secure file.
FUTURE DATA USE Consent form Phase 3 Chesterfield V1.0

16/05/2017

Appendix 11: Video Consent form for staff in in situ simulation

Video Consent Form

You are about to be involved in an in-situ simulation, which will be filmed for the purposes of an ongoing study, PERFORM. The reason for filming is to allow the junior doctor attending the scenario (who is a participant in the study) to watch the recording and reflect on their clinical performance and patient management.

The recording will inadvertently capture some of your involvement in this simulation, but is **not** being used to assess you in any way.

This video recording will **ONLY** be used/seen by the following people:

1. Researcher: Helen Church
2. Participant – the junior doctor who took part in the scenario with you
3. An independent researcher who will review **only** the performance of the participant (And does not work at your place of work).

The video will:

- not be shared with anyone else
- be destroyed once all data has been collected from it
- stored in a password protected drive only accessible by the researcher
- not be published online or otherwise

If you are happy with the above, please sign below. If you have any further questions, please ask the researcher, Helen Church.

Name

Signature

Date

Appendix 12: Phase 1 Semi-structured interview protocol

PERFORM Phase 1:

Semi-structured interview schedule

Introduction

Researcher introduces themselves and checks candidate's name.

Researcher checks that candidate has read the Participant Information Sheet and signed the consent forms, and ask if there are any questions before we begin the interview.

Finally, the researcher will explain and reassure the candidate that their interview will be anonymised as soon as it is transcribed, and they will be assigned a Participant number for analysis purposes.

Also, there are no 'wrong' answers to the following questions, and the following simulation will not be marked for clinical performance.

Interview

Topics to be covered by interviewer:

- Awareness (or absence of awareness) of behaviours e.g. anxiety during acute clinical scenarios.
- Whether such behaviours affect clinical performance for the individual.
- Recognition of metacognitive feelings e.g. feeling of not knowing during acute clinical scenarios.
- Employment of any strategies or PERs to cope with these behaviours, and if so, what are these strategies?

Some example questions:

TOPIC A : Awareness of behaviours/emotions

- During a clinical scenario with an acutely unwell patient, do you notice your feelings or emotions at all?
- If so, can you tell me more about the feelings/emotions you have during the management of an acutely unwell patient?
- How do you think that these feelings affect your behaviour?

TOPIC B: Behaviours affecting clinical practice

- How do you think that these feelings affect your ability to manage the patient?
- Have you experienced this? Talk me through this.

TOPIC C: Recognising metacognitive feelings

- Do you ever get the sense or 'gut feeling' about whether a task is going well or not, not specifically related to medicine? E.g. feelings of understanding, familiarity, feelings of 'not knowing'...?
- Do you ever get these feelings during your management of the acutely unwell patient? Tell me more about this.

TOPIC D: Employing metacognitive feelings

- IF AWARENESS OF FEELINGS: Tell me about how you cope with these feelings that you get when things are not going well.
- IF NO AWARENESS OF FEELINGS: Tell me about how you think you would cope if you felt a bad feeling about how you were approaching the management of the acutely unwell patient.
- Do you know of any other strategies that you could try to control these negative feelings? If so, how do you know about them and have you tried them?

Conclude the interview by asking if participant wishes to add anything to the responses they gave, and then invite them to take part in a simulation to demonstrate any strategies that they discussed above.

Appendix 13: Phase 2 Feedback Questionnaire

PERFORM Phase 2: Questionnaire for Candidate Feedback

Please indicate your answers by ticking the most appropriate box, and/or writing in the blank boxes. Please use the free-text boxes to suggest how aspects of the intervention could be improved for future participants.

The responses given in this questionnaire are strictly confidential and any subsequent evaluation reports will be anonymous, to ensure individuals cannot be identified.

Section 1: Simulation

Please indicate your opinion on the following statements:	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
1. The simulation scenarios were at an appropriate level for my grade.					
2. The equipment that I would expect to find on the ward was available during the simulation scenario.					

Section 2: Teaching methods/understanding of PERFORM model

Please indicate your opinion on the following statements:	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
1. The verbal explanation of the PERFORM model was clear.					
2. I understood the diagram of the PERFORM model.					
3. If the verbal explanation or diagram of the PERFORM model was not clear, how could this be improved?					
4. The explanation of Performance Enhancing Routines was clear.					
5. I found it difficult to choose a Performance Enhancing Routine to use in the simulation scenario.					
6. I understood how to use the Performance Enhancing Routine in the simulation.					
7. I found it difficult to use the Performance Enhancing Routine in the simulation.					
8. If the choosing, or use of Performance Enhancing Routines was difficult, how could this be improved?					

PERFORM Phase 2: Questionnaire for Candidate Feedback

Section 3: Reviewing simulation video and Think-aloud

Please indicate your opinion on the following statements:	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
1. Reviewing the video of my simulation helped me to recall how I felt during the scenario.					
2. It would have been more difficult to recall how I felt during the scenario without the use of video recording.					
3. When reviewing the video, I found it difficult to talk through how I felt during the scenario.					
4. If talking over the video recording was difficult, how could this be made easier?					

Section 4: Preparing for PERFORM in clinical environment

Please indicate your opinion on the following statements:	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
5. The instructions about using the Performance Enhancing Routine in clinical practice were clear.					
6. Using the Prompt Card will make reflections easier.					
7. A hand out of the PERFORM model diagram would be useful for future reference.					
8. It would be useful to receive a copy of my second simulation video recording in which I demonstrate using the Performance Enhancing Routine.					

Section 5: General comments

If you have any comments or suggestions to make regarding the Pilot that you took part in today, please use the box below.

Once you have completed this questionnaire, please return it to the researcher.
On behalf of the researcher and the University of Sheffield, thank you for your valuable feedback.

Appendix 14: Phase 3: Stage 1. Semi-structured interview protocol

PERFORM Phase 3: Stage 1

Semi-structured interview schedule

Introduction

Researcher introduces themselves and checks candidate's name.

Researcher checks that candidate has read the Participant Information Sheet and signed the consent forms, and ask if there are any questions before we begin the interview.

Finally, the researcher will explain and reassure the candidate that their interview will be anonymised as soon as it is transcribed, and they will be assigned a Participant number for analysis purposes.

Also, there are no 'wrong' answers to the following questions, and the following simulation will not be marked for clinical performance.

Interview

Topics to be covered by interviewer:

- Awareness (or absence of awareness) of behaviours e.g. anxiety during acute clinical scenarios.
- Whether such behaviours affect clinical performance for the individual.
- Recognition of metacognitive feelings e.g. feeling of not knowing during acute clinical scenarios.
- Employment of any strategies or PERs to cope with these behaviours, and if so, what are these strategies?

Some example questions:

TOPIC A : Awareness of behaviours/emotions

- During a clinical scenario with an acutely unwell patient, do you notice your feelings or emotions at all?
- If so, can you tell me more about the feelings/emotions you have during the management of an acutely unwell patient?
- How do you think that these feelings affect your behaviour?

TOPIC B: Behaviours affecting clinical practice

- How do you think that these feelings affect your ability to manage the patient?
- Have you experienced this? Talk me through this.

TOPIC C: Recognising metacognitive feelings

- Do you ever get the sense or 'gut feeling' about whether a task is going well or not, not specifically related to medicine? E.g. feelings of understanding, familiarity, feelings of 'not knowing'...?
- Do you ever get these feelings during your management of the acutely unwell patient? Tell me more about this.

TOPIC D: Employing metacognitive feelings

- IF AWARENESS OF FEELINGS: Tell me about how you cope with these feelings that you get when things are not going well.
- IF NO AWARENESS OF FEELINGS: Tell me about how you think you would cope if you felt a bad feeling about how you were approaching the management of the acutely unwell patient.
- Do you know of any other strategies that you could try to control these negative feelings? If so, how do you know about them and have you tried them?

Conclude the interview by asking if participant wishes to add anything to the responses they gave, and then invite them to take part in a simulation to demonstrate any strategies that they discussed above.

Appendix 15: Phase 3: Stage 2. Semi-structured interview protocol

PERFORM Stage 2: Semi-structured interview schedule

Topics to be covered by interviewer:

- Filling in the missing gaps from the scenario and teasing out the participants' metacognitive model for using PERs.
- The usefulness of the model in the clinical environment.
- Introduction
- Researcher introduces themselves and checks candidate's name.
- Researcher checks that candidate has read the Participant Information Sheet and signed the consent forms, and ask if there are any questions before we begin the interview.
- Finally, the researcher will explain and reassure the candidate that their interview will be anonymised as soon as it is transcribed, and they will be assigned a Participant number for analysis purposes. Also, there are no 'wrong' answers to the following questions, and the following simulation will not be marked for clinical performance.

Main Body of Interview

TOPIC A : Fill in missing gaps from scenario

- Could you start by telling me about the scenario, in your own words?
- Were you able to use a PER?

If yes –

- Tell me about how you used the PER
- (if not already eluded to) How did you **decide which** PER to use?
- (if not already eluded to) How did you **decide when** to use it?
- (if not already eluded to) Did you **do anything differently** this time to how you've used the PER or the model before? (i.e. different PER used, changed the PER...and WHY these changes were made)

If no –

- Why did you not use the PER?
- How did **this patient encounter affect the way you view the use of PERs** in future scenarios?

TOPIC B: The usefulness of the model

If you used a PER...

- How do you think that the use of your PER **affected you**?
- How do you think the use of your PER **affected the patient**?
- What has been the **most useful part** of the PERFORM model for you?
- If prompting if necessary, ask them to think about...
- Use of the routine itself
- Increased awareness of own feelings
- The identification of the specific element(s) of acute care that induces the negative emotions/behaviours (from Stage 1)
- The use of reflection post-scenario as a cognitive forcing strategy
- How are you **planning to use the routine next time**?
- What **changes (if any) will you make**?
- Will they apply this to the **same problem**?

Conclude the interview by asking if participant wishes to add anything to the responses they gave, and thank them for their time.

Appendix 16: Phase 3: Stage 3. Semi-structured interview protocol

PERFORM Stage 3: Semi-structured interview schedule

Topics to be covered by interviewer:

- Usability of the PERFORM model in clinical practice as a whole
- Usefulness of the PERFORM model in clinical practice as a whole, and what in particular was the MOST useful element of the study.
- Validate how the PERs were used in the context of metacognitive processes by the participant. (The researcher will have gained an interpretation of this from the post-scenario reflective data, but this feedback session will allow participants to validate this model or alter it accordingly.)
- Suggestions for improvements.

Introduction

- Researcher introduces themselves and checks candidate's name.
- Researcher checks that candidate has read the Participant Information Sheet and signed the consent forms, and ask if there are any questions before we begin the interview.
- Finally, the researcher will explain and reassure the candidate that their interview will be anonymised as soon as it is transcribed, and they will be assigned a Participant number for analysis purposes. Also, there are no 'wrong' answers to the following questions, and the following simulation will not be marked for clinical performance.

Main Body of Interview

Some example questions:

TOPIC A: Usability of the PERFORM model in clinical practice as a whole

- Tell me about your experiences of this study
- How have you found using the PERFORM model and PERs in the clinical environment?

TOPIC B: Usefulness of the PERFORM model in clinical practice as a whole, and what in particular was the MOST useful element of the study.

- How useful has the study been in helping you when managing the acutely unwell adult?
- Have you used what you have learned in the study in any other way? (clinically or non-clinically)
- What was the most important element of the study for you?

TOPIC B: The usefulness of the model

If you used a PER...

- How do you think that the use of your PER **affected you**?
- How do you think the use of your PER **affected the patient**?
- What has been the **most useful part** of the PERFORM model for you?
- If prompting if necessary, ask them to think about...
- Use of the routine itself
- Increased awareness of own feelings
- The identification of the specific element(s) of acute care that induces the negative emotions/behaviours (from Stage 1)
- The use of reflection post-scenario as a cognitive forcing strategy
- How are you **planning to use the routine next time**?
- What **changes (if any) will you make**?
- Will they apply this to the **same problem**?

Conclude the interview by asking if participant wishes to add anything to the responses they gave, and thank them for their time.

Appendix 17: Simulation Scenario -Sepsis from Community Acquired Pneumonia

Story Board or background information:

Patient Name Lilly Smith		Hospital Number: H148356	
Age	40 years	Gender	Female
D.O.B	12/02/1976,	Address	2 Church Street, Bakewell
Current Admission	This patient has seen by Emergency department and admitted to MAU. Mrs Smith has been unwell for over a week with a cough fever and headaches. She spoke to the NHS out of hours advice service, who recommended she come to A&E. She presents with shortness of breath, cough and feeling exhausted.		
Past medical history	Nil		
Social History	Lives with husband and son, who is 8 years old. Works as a receptionist for solicitor.		
Drug history / Allergies	Allergy to penicillin – rash		
Information for candidates	You are on AAU and the nurse asks you to urgently review this patient who has just come in. She seems drowsy and not very responsive. She is short of breath and struggling. She left work early today due to feeling unwell but couldn't get a GP appointment. Feeling worse this evening, she contacted 111, who advised her to attend the emergency department.		
Information for facilitator	<p>This is Sepsis from a pneumonia.</p> <p>The patient will have a positive x-ray. They will be an Emergency department admission to MAU who has had bloods done. The candidate will be expected to make a full assessment of the patient, recognise sepsis and start the sepsis protocol. They should commence IV antibiotics and fluids, obtain a blood gas and recognise the patient is deteriorating and call ITU.</p> <p>The patient will deteriorate regardless of what the candidate does, but the rate of deterioration will vary on the candidate's actions. If the candidate does the right interventions the patient will not arrest.</p>		

Simulation set up

<p>Airway</p> <p><input type="checkbox"/> Tongue Oedema</p> <p>Throat sound</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Stridor, inspiratory</p> <p><input type="checkbox"/> Stridor, expiratory</p> <p><input type="checkbox"/> Biphasic</p>	<p>Breathing</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Kussmaul's</p> <p><input type="checkbox"/> Cheyne-stokes</p> <p><input type="checkbox"/> Biot's</p> <p><input type="checkbox"/> Apneustic</p> <p><input type="checkbox"/> Apnoea</p> <p>Right lung Sounds</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> wheezing</p> <p><input type="checkbox"/> insp squeaks</p> <p><input checked="" type="checkbox"/> crackles</p> <p><input type="checkbox"/> stridor</p> <p><input type="checkbox"/> bronchitis</p> <p>Left lung Sounds</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> wheezing</p> <p><input type="checkbox"/> insp squeaks</p> <p><input checked="" type="checkbox"/> crackles</p> <p><input type="checkbox"/> stridor</p> <p><input type="checkbox"/> bronchitis</p>	<p>Circulation</p> <p>Cardiac rhythm</p> <p><input checked="" type="checkbox"/> Sinus rhythm</p> <p><input type="checkbox"/> VT</p> <p><input type="checkbox"/> VF</p> <p><input type="checkbox"/> Heart Block</p> <p><input type="checkbox"/> AF</p> <p><input type="checkbox"/> Other</p> <p>Heart sound</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Systolic murmur</p> <p><input type="checkbox"/> S3</p> <p><input type="checkbox"/> S4</p> <p><input type="checkbox"/> PDA</p> <p><input type="checkbox"/> loud P2</p> <p><input type="checkbox"/> VSD</p> <p><input type="checkbox"/> Other murmur</p> <p>Absent pulses radial</p> <p><input type="checkbox"/> L <input type="checkbox"/> R</p>	<p>D Disability</p> <p>Temperature 38.9 degrees</p> <p>Seizures</p> <p><input checked="" type="checkbox"/> None</p> <p><input type="checkbox"/> mild</p> <p><input type="checkbox"/> severe</p> <p>Eyes status</p> <p><input checked="" type="checkbox"/> Spontaneous Opening</p> <p><input type="checkbox"/> Half-closed</p> <p><input type="checkbox"/> Closed</p> <p><input type="checkbox"/> Blinking</p> <p>Pupils state</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> L</p> <p><input type="checkbox"/> R</p> <p><input type="checkbox"/> pinpoint</p> <p><input type="checkbox"/> dilated</p> <p>Bowel sounds</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Absent</p> <p><input type="checkbox"/> Tinkling</p> <p><input type="checkbox"/> Overactive</p>
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<p>Equipment</p> <p><input type="checkbox"/> Nasal Cannula</p> <p><input type="checkbox"/> Venturi</p> <p><input type="checkbox"/> CPAP Hood</p> <p><input checked="" type="checkbox"/> Simple Face Mask</p> <p><input checked="" type="checkbox"/> Non-rebreather</p> <p><input type="checkbox"/> Self-inflating bag</p> <p><input type="checkbox"/> Anaesthesia Bag</p> <p><input type="checkbox"/> MDI / Spacer</p> <p><input type="checkbox"/> Suction</p> <p><input type="checkbox"/> Nebuliser</p> <p><input type="checkbox"/> Intubated</p> <p><input type="checkbox"/> Ventilator Settings _____</p> <p>PIP: PEEP: IMV: TV: FIO2:</p>	<p>Access</p> <p><input checked="" type="checkbox"/> I V Cannula</p> <p><input type="checkbox"/> Arterial line</p> <p><input type="checkbox"/> Central venous line</p> <p><input type="checkbox"/> Intraosseous</p> <p><input type="checkbox"/> Fistula</p> <p>Fluids</p> <p><input type="checkbox"/> 10% dextrose</p> <p><input checked="" type="checkbox"/> 5% dextrose</p> <p><input checked="" type="checkbox"/> 0.9% saline</p> <p><input type="checkbox"/> Ringer Lactate</p> <p><input checked="" type="checkbox"/> Volplex / Gelofusin</p> <p><input type="checkbox"/> Blood</p> <p><input type="checkbox"/> Sodium Bicarbonate</p>	<p>Equipment</p> <p><input checked="" type="checkbox"/> ECG</p> <p><input checked="" type="checkbox"/> CXR</p> <p><input checked="" type="checkbox"/> Arterial Blood Gas</p> <p><input type="checkbox"/> Abdominal X-ray</p> <p><input type="checkbox"/> CT scan (s)</p> <p><input type="checkbox"/> MRI scan (s)</p> <p><input type="checkbox"/> Dialysis Machine</p> <p><input checked="" type="checkbox"/> Drug Chart</p> <p><input checked="" type="checkbox"/> IVI Chart</p> <p><input checked="" type="checkbox"/> ECG machine</p> <p><input checked="" type="checkbox"/> Observation Chart</p> <p><input type="checkbox"/> Patient Case Notes</p> <p><input checked="" type="checkbox"/> Blood Bottles</p> <p><input checked="" type="checkbox"/> Blood Culture Bottles</p>	<p>Mannikin Monitor</p> <p><input checked="" type="checkbox"/> HR</p> <p><input type="checkbox"/> Heart Rhythm</p> <p><input checked="" type="checkbox"/> Saturations</p> <p><input type="checkbox"/> invasive Blood Pressure</p> <p><input checked="" type="checkbox"/> Non-invasive Blood Pressure</p> <p><input type="checkbox"/> RR</p> <p><input type="checkbox"/> ETCO2</p> <p><input type="checkbox"/> PAP</p> <p><input type="checkbox"/> Temperature</p>
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Scenario

	RR	SpO2	HR	Rhythm	BP	Temp	AVPU
Baseline Observations	40	92% Air	120	Sinus	80/60	38.9	V
Observations @ 4 mins	42	85% Air	130	Sinus	70/50	38.9	P– getting more tired and breathless
Observations @ 8 mins	45	80% Air 92% O2	130	Sinus	65/40 weak pulse	38.9	P
Expected Scenario Progression	<p>6 minutes into scenario – phone call/bleep. Nurse asking for a prescription for paracetamol IV for a patient who is unable to swallow the tablets.</p> <p>The candidate is expected to carry out an ABCDE assessment and start Oxygen therapy. They should also give a fluid challenge, obtain IV access, ABG and ask for monitoring.</p> <p>They should recognise that this is Shock, likely secondary to Sepsis.</p> <p>They should consider all causes of sepsis and should be thinking about escalation early on.</p> <p>Once source of sepsis is identified, IV antibiotics should be started.</p> <p>The ABG will demonstrate a metabolic acidosis which they should identify.</p> <p>The candidate should reassess the patient, continue fluids, possibly another fluid challenge.</p> <p>They should then discuss the patient with the on call SpR and discuss escalation.</p> <p>They should recognise that this patient is going to need ITU and likely intubation and should also refer to ITU.</p>						
If candidate Gives Oxygen	The saturations improve to maximum of 92%						
If candidate Gives fluid challenge	The pulse and Blood pressure improve by 10% each						
If candidate Doesn't give Oxygen	The sats deteriorate and patient will arrest – end scenario here.						
If candidate doesn't give fluids/fluid challenge	The Blood pressure and pulse will worsen, and patient will deteriorate						

Appendix 18: Simulation Scenario - Anaphylaxis

Story Board or background information:

Patient Name Joanna Clark		Hospital Number H789412	
Age	35 years old	Gender: Female	
D.O.B	27/04/1981	Address	10 Herringbone Road, Staveley
Current Admission	Ms Clark was admitted this morning for an elective seton change for her anal fistula. During the operation the Consultant Surgeon found a small collection of pus near the fistula and asked that the patient be kept in overnight for observation and treatment.		
Past medical history	Crohn's disease, Asthma on Inhalers,		
Social History	Works as a computer operator. Does not smoke or drink.		
Drug history / Allergies	No known allergies		
Information for candidates	You have been called urgently to see a patient with shortness of breath and wheeze on the surgical ward. She is 35 years old, a few hours post-op for a seton change for anal fistula and has a past medical history of asthma and Crohn's disease.		
Information for facilitator	This is the anaphylaxis protocol. You have just set up an IV antibiotic (co-amoxiclav). The patient will become breathless but is still conscious and looks reasonably well and you have called for the doctor to review her.		

Simulation set up

<p>Airway</p> <p><input checked="" type="checkbox"/> Tongue Oedema</p> <p>Throat sound</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input checked="" type="checkbox"/> Stridor, inspiratory</p> <p><input type="checkbox"/> Stridor, expiratory</p> <p><input type="checkbox"/> Biphasic</p>	<p>Breathing</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Kussmaul's</p> <p><input type="checkbox"/> Cheyne-stokes</p> <p><input type="checkbox"/> Biot's</p> <p><input type="checkbox"/> Apneustic</p> <p><input type="checkbox"/> Apnoea</p> <p>Right lung Sounds</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input checked="" type="checkbox"/> wheezing</p> <p><input type="checkbox"/> insp squeaks</p> <p><input type="checkbox"/> crackles</p> <p><input type="checkbox"/> stridor</p> <p><input type="checkbox"/> bronchitis</p> <p>Left lung Sounds</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input checked="" type="checkbox"/> wheezing</p> <p><input type="checkbox"/> insp squeaks</p> <p><input type="checkbox"/> crackles</p> <p><input type="checkbox"/> stridor</p> <p><input type="checkbox"/> bronchitis</p>	<p>Circulation</p> <p>Cardiac rhythm</p> <p><input checked="" type="checkbox"/> Sinus rhythm</p> <p><input type="checkbox"/> VT</p> <p><input type="checkbox"/> VF</p> <p><input type="checkbox"/> Heart Block</p> <p><input type="checkbox"/> AF</p> <p><input type="checkbox"/> Other</p> <p>Heart sound</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Systolic murmur</p> <p><input type="checkbox"/> S3</p> <p><input type="checkbox"/> S4</p> <p><input type="checkbox"/> PDA</p> <p><input type="checkbox"/> loud P2</p> <p><input type="checkbox"/> VSD</p> <p><input type="checkbox"/> Other murmur</p> <p>Absent pulses radial</p> <p><input type="checkbox"/> L <input type="checkbox"/> R</p>	<p>Disability</p> <p>Temperature 37.9 degrees</p> <p>Seizures</p> <p><input checked="" type="checkbox"/> None</p> <p><input type="checkbox"/> mild</p> <p><input type="checkbox"/> severe</p> <p>Eyes status</p> <p><input checked="" type="checkbox"/> Spontaneous Opening</p> <p><input type="checkbox"/> Half-closed</p> <p><input type="checkbox"/> Closed</p> <p><input type="checkbox"/> Blinking</p> <p>Pupils state</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> L</p> <p><input type="checkbox"/> R</p> <p><input type="checkbox"/> pinpoint</p> <p><input type="checkbox"/> dilated</p> <p>Bowel sounds</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> Absent</p> <p><input type="checkbox"/> Tinkling</p> <p><input type="checkbox"/> Overactive</p>
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<p>Equipment</p> <p><input type="checkbox"/> Nasal Cannula</p> <p><input type="checkbox"/> Venturi</p> <p><input type="checkbox"/> CPAP Hood</p> <p><input type="checkbox"/> Simple Face Mask</p> <p><input checked="" type="checkbox"/> Non-rebreather</p> <p><input type="checkbox"/> Self-inflating bag</p> <p><input type="checkbox"/> Anaesthesia Bag</p> <p><input type="checkbox"/> MDI / Spacer</p> <p><input type="checkbox"/> Suction</p> <p><input checked="" type="checkbox"/> Nebuliser</p> <p><input type="checkbox"/> Intubated</p> <p><input type="checkbox"/> Ventilator Settings _____</p> <p>PIP: PEEP: IMV: TV: FiO2:</p>	<p>Access</p> <p><input checked="" type="checkbox"/> I V Cannula</p> <p><input type="checkbox"/> Arterial line</p> <p><input type="checkbox"/> Central venous line</p> <p><input type="checkbox"/> Intraosseous</p> <p><input type="checkbox"/> Fistula</p> <p>Fluids</p> <p><input type="checkbox"/> 10% dextrose</p> <p><input checked="" type="checkbox"/> 5% dextrose</p> <p><input checked="" type="checkbox"/> 0.9% saline</p> <p><input type="checkbox"/> Ringer Lactate</p> <p><input type="checkbox"/> Volplex / Gelofusin</p> <p><input type="checkbox"/> Blood</p> <p><input type="checkbox"/> Sodium Bicarbonate</p>	<p>Equipment</p> <p><input checked="" type="checkbox"/> ECG</p> <p><input checked="" type="checkbox"/> CXR</p> <p><input checked="" type="checkbox"/> Arterial Blood Gas</p> <p><input type="checkbox"/> Abdominal X-ray</p> <p><input type="checkbox"/> CT scan (s)</p> <p><input type="checkbox"/> MRI scan (s)</p> <p><input type="checkbox"/> Dialysis Machine</p> <p><input checked="" type="checkbox"/> Drug Chart</p> <p><input checked="" type="checkbox"/> IVI Chart</p> <p><input type="checkbox"/> ECG machine</p> <p><input checked="" type="checkbox"/> Observation Chart</p> <p><input checked="" type="checkbox"/> Patient Case Notes</p> <p><input type="checkbox"/> Blood Bottles</p> <p><input type="checkbox"/> Blood Culture Bottles</p>	<p>Other</p> <p><input checked="" type="checkbox"/> Epipen</p> <p><input checked="" type="checkbox"/> Hydrocortisone</p> <p><input checked="" type="checkbox"/> HR</p> <p><input type="checkbox"/> Heart Rhythm</p> <p><input checked="" type="checkbox"/> Saturations</p> <p><input type="checkbox"/> invasive Blood Pressure</p> <p><input checked="" type="checkbox"/> Non-invasive Blood Pressure</p> <p><input type="checkbox"/> RR</p> <p><input type="checkbox"/> ETCO2</p> <p><input type="checkbox"/> PAP</p> <p><input type="checkbox"/> Temperature</p>
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Scenario

	RR	SpO2	HR	Rhythm	BP	Temp	AVPU
Baseline Observations	35	90%	110	Sinus	90/70	37.9	Awake, but breathless
Observations at 4 mins	40	85% 90% with O2	120	Sinus tachy	80/40	37.9	P
Observations at 4 mins	45	80% no O2 88% O2	130	Sinus tachy	70/40	37.9	P
If no adrenaline by 9 mins – arrest							
Expected Scenario Progression	<p>The candidate will be called to review the patient who has suddenly become unwell.</p> <p>They should identify that the patient is shocked and unwell. They commence oxygen, nebs and fluids. They should identify that this patient is in anaphylactic shock. They should give 0.5 ml of 1 in 1000 adrenaline. After this they should commence steroids and Chlorpheniramine.</p> <p>They should identify the cause of the anaphylaxis, alter the drug chart and document this on the allergy section. They should discuss with medical SpR about disposal. The patient should be kept in overnight.</p>						
If candidate Give oxygen or nebs or both	The Sats will improve , slightly but temporarily						
If candidate Gives fluid challenge	The Blood pressure improves slightly, but then goes down						
If candidate gives adrenaline	The patient will improve in all observations and be almost back to normal						
If candidate doesn't give adrenaline	The patient will deteriorate and go into cardiac arrest						

Appendix 19: Simulation Scenario - Upper GI Bleed

Story Board or background information:

Patient Name Miss Tracy Walton		Hospital Number: H170301	
Age	33	Gender:	Female
D.O.B	02/04/1983	Address	79 Downgate Drive, Chesterfield
Current Admission	Miss Walton presents with haematemesis and melaena. She has had four episodes of melaena and six episodes of 200mls of fresh haematemesis.		
Past medical history	Alcohol excess and chronic liver disease		
Social History	She lives with her partner who is an ex IVDU and chronic alcoholic. She works as a glass collector in her local pub. She is a smoker of 20 a day for 20 years and drinks 40 units of alcohol a week.		
Drug history / Allergies	No known drug allergies		
Information for candidates	You are on EMU for acute medical take and a patient has arrived on the ward from the Emergency Department. The medical SpR on call is with another acutely unwell patient on the ward. This patient is a 35 year old female named Tracy Walton who presents with haematemesis and melaena. Her past medical history includes alcohol excess and chronic liver disease. She has had four episodes of melaena and six episodes of 200mls of fresh haematemesis. She has one grey cannula sited in the right anti cubital fossa and FBC, U&E, LFT, CLS and 4 unit cross match have been sent.		
Information for facilitator	You are looking after a 35 year old female the on the MAU who presents with melaena and haematemesis. She has been seen in the Emergency Department and has been sent around to the ward. Please assist the CMT with this patient. The patient has one wide bore cannula in situ and the doctor may need prompting to site another one. If any instructions you receive are not clear, then please request clarification. If you are asked to administer any drugs, please request that they be prescribed. There is an observation chart which has been already started for this patient.		

Simulation set up

<p>Airway</p> <input type="checkbox"/> Tongue Oedema	<p>Breathing</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Kussmaul's <input type="checkbox"/> Cheyne-stokes <input type="checkbox"/> Biot's <input type="checkbox"/> Apneustic <input type="checkbox"/> Apnoea	<p>Circulation</p> <p>Cardiac rhythm</p> <input checked="" type="checkbox"/> Sinus rhythm <input type="checkbox"/> VT <input type="checkbox"/> VF <input type="checkbox"/> Heart Block <input type="checkbox"/> AF <input type="checkbox"/> Other	<p>Disability</p> <p>Temperature 36.5 degrees</p> <p>Seizures</p> <input checked="" type="checkbox"/> None <input type="checkbox"/> mild <input type="checkbox"/> severe
<p>Throat sound</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> None <input type="checkbox"/> Stridor, inspiratory <input type="checkbox"/> Stridor, expiratory <input type="checkbox"/> Biphasic	<p>Right lung Sounds</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> None <input type="checkbox"/> wheezing <input type="checkbox"/> insp squeaks <input type="checkbox"/> crackles <input type="checkbox"/> stridor <input type="checkbox"/> bronchitis	<p>Left lung Sounds</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> None <input type="checkbox"/> wheezing <input type="checkbox"/> insp squeaks <input type="checkbox"/> crackles <input type="checkbox"/> stridor <input type="checkbox"/> bronchitis	<p>Heart sound</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Systolic murmur <input type="checkbox"/> S3 <input type="checkbox"/> S4 <input type="checkbox"/> PDA <input type="checkbox"/> loud P2 <input type="checkbox"/> VSD <input type="checkbox"/> Other murmur
		<p>Absent pulses radial</p> <input type="checkbox"/> L <input type="checkbox"/> R	<p>Eyes status</p> <input checked="" type="checkbox"/> Spontaneous Opening <input type="checkbox"/> Half-closed <input type="checkbox"/> Closed <input type="checkbox"/> Blinking
			<p>Pupils state</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> L <input type="checkbox"/> R <input type="checkbox"/> pinpoint <input type="checkbox"/> dilated
			<p>Bowel sounds</p> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Absent <input type="checkbox"/> Tinkling <input type="checkbox"/> Overactive

<p>Equipment</p> <input checked="" type="checkbox"/> Nasal Cannula <input type="checkbox"/> Venturi <input type="checkbox"/> CPAP Hood <input type="checkbox"/> Simple Face Mask <input type="checkbox"/> Non-rebreather <input type="checkbox"/> Self-inflating bag <input type="checkbox"/> Anaesthesia Bag <input type="checkbox"/> MDI / Spacer <input type="checkbox"/> Suction <input type="checkbox"/> Nebuliser <input type="checkbox"/> Intubated <input type="checkbox"/> Ventilator Settings _____ PIP: PEEP: IMV: TV: FIO2:	<p>Access</p> <input checked="" type="checkbox"/> I V Cannula <input type="checkbox"/> Arterial line <input type="checkbox"/> Central venous line <input type="checkbox"/> Intraosseous <input type="checkbox"/> Fistula	<p>Equipment</p> <input checked="" type="checkbox"/> ECG <input checked="" type="checkbox"/> CXR <input checked="" type="checkbox"/> Arterial Blood Gas <input checked="" type="checkbox"/> Abdominal X-ray <input type="checkbox"/> CT scan (s) <input type="checkbox"/> MRI scan (s) <input type="checkbox"/> Dialysis Machine <input checked="" type="checkbox"/> Drug Chart <input checked="" type="checkbox"/> IVI Chart <input checked="" type="checkbox"/> ECG machine <input type="checkbox"/> Observation Chart <input type="checkbox"/> Patient Case Notes <input type="checkbox"/> Blood Bottles <input type="checkbox"/> Blood Culture Bottles	<p>Other</p> <input checked="" type="checkbox"/> Terlipressin <input checked="" type="checkbox"/> Consent form <input checked="" type="checkbox"/> Syringe driver <input checked="" type="checkbox"/> Bowl of haematemesis
			<input checked="" type="checkbox"/> HR <input type="checkbox"/> Heart Rhythm <input checked="" type="checkbox"/> Saturations <input type="checkbox"/> invasive Blood Pressure <input checked="" type="checkbox"/> Non-invasive Blood Pressure <input type="checkbox"/> RR <input type="checkbox"/> ETCO2 <input type="checkbox"/> Temperature

Scenario

	RR	SpO2	HR	Rhythm	BP	Temp	AVPU
Baseline Observations	20	95%	120	Sinus	90/60	36.5	A
Observations at 4 mins	25	95%	130 if no fluids 110 if fluids	Sinus	85/55 if no fluids 95/65 if fluids given	36.5	A
Observations at 8 mins	30	95%	140 if no fluids 100 if fluids	Sinus	70/40 if no fluids 100/60 if fluids	36.5	A
Expected Scenario Progression	<p>At 4 mins – Nurse hands a note to Dr: Hb is 6.8 (phoned through from haematology)</p> <p>At 6 mins – Blood bank call (if Dr not already called them)– the patient has antibodies so cross-match will take a little longer than expected. Estimated time=30mins. They cannot use O-negative blood. Advised to speak to team Consultant.</p> <p>When calls Consultant – he/she says NOT to transfuse, and to continue with fluids. Theatre will call shortly to take patient to endoscopy.</p> <p>The candidate should take a full history and perform ABCDE assessment of the patient. They should identify that the patient is shocked and commence fluids. They should review the notes and identify that this is a GI bleed. They should request further IV access.</p> <p>They should repeat the bloods and when anaemia is identified they should chase blood bank and prescribe blood.</p> <p>The candidate should then discuss the case with the Medical SpR or Consultant gastroenterologist and request an endoscopy (once they have all the results). They should consent the patient for endoscopy.</p> <p>Appropriate further management and disposal should be discussed- Medical HDU and OGD, possibly in theatre if patient too unstable</p>						
If candidate Starts fluids	The blood pressure should improve						
If candidate prescribes and gives blood	Blood pressure and pulse improve						
If candidate defines appropriate further management plan	End scenario						
If candidate doesn't start blood or fluid	The patient will continue to deteriorate.						

Appendix 20: Simulation Scenario - Acute Pulmonary Embolism

Story Board or background information:

Patient Name Hannah Michaels		Hospital Number H002486	
Age	25	Gender	female
DOB:	6/8/1991	Address	17 Baker Street, Chesterfield
Current Admission	Pleuritic chest pain.		
Past medical history	Migraine		
Social History	She lives with her boyfriend. She is the manager of a high-street coffee shop. She smokes 10 a day and drinks about 14 units of alcohol per week.		
Drug history / Allergies	NKDA. On microgynon.		
Information for candidates	You are on acute admissions for medicine and are asked to see the Hannah Michaels. She is a 25 year old female who presents with pleuritic chest pain of 12 hours duration. The nurse is concerned about her oxygen saturations.		
Information for facilitator	The candidate is called by you (a nurse on EMU) to review Hannah Michaels, who is a 25 year old lady with pleuritic chest pain on the OCP. She has had an ECG performed but it hasn't yet been reviewed. She initially has low saturations and stabilises, but then decompensates and drops her BP. She needs to be assessed for thrombolysis.		

Simulation set up

<p>Airway</p> <p><input type="checkbox"/> Tongue Oedema</p> <p>Throat sound</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> Stridor, inspiratory</p> <p><input type="checkbox"/> Stridor, expiratory</p> <p><input type="checkbox"/> Biphasic</p>	<p>Breathing</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Kussmaul's</p> <p><input type="checkbox"/> Cheyne-stokes</p> <p><input type="checkbox"/> Biot's</p> <p><input type="checkbox"/> Apneustic</p> <p><input type="checkbox"/> Apnoea</p> <p>Right lung Sounds</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> wheezing</p> <p><input type="checkbox"/> insp squeaks</p> <p><input type="checkbox"/> crackles</p> <p><input type="checkbox"/> stridor</p> <p><input type="checkbox"/> bronchitis</p> <p>Left lung Sounds</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> wheezing</p> <p><input type="checkbox"/> insp squeaks</p> <p><input type="checkbox"/> crackles</p> <p><input type="checkbox"/> stridor</p> <p><input type="checkbox"/> bronchitis</p>	<p>Circulation</p> <p>Cardiac rhythm</p> <p><input checked="" type="checkbox"/> Sinus rhythm</p> <p><input type="checkbox"/> VT</p> <p><input type="checkbox"/> VF</p> <p><input type="checkbox"/> Heart Block</p> <p><input type="checkbox"/> AF</p> <p><input type="checkbox"/> Other</p> <p>Heart sound</p> <p><input type="checkbox"/> Normal</p> <p><input type="checkbox"/> Systolic murmur</p> <p><input type="checkbox"/> S3</p> <p><input type="checkbox"/> S4</p> <p><input type="checkbox"/> PDA</p> <p><input checked="" type="checkbox"/> loud P2</p> <p><input type="checkbox"/> VSD</p> <p><input type="checkbox"/> Other murmur</p> <p>Absent pulses radial</p> <p><input type="checkbox"/> L <input type="checkbox"/> R</p>	<p>Disability</p> <p>Temperature 37.9 degrees</p> <p>Seizures</p> <p><input checked="" type="checkbox"/> None</p> <p><input type="checkbox"/> mild</p> <p><input type="checkbox"/> severe</p> <p>Eyes status</p> <p><input checked="" type="checkbox"/> Spontaneous</p> <p>Opening</p> <p><input type="checkbox"/> Half-closed</p> <p><input type="checkbox"/> Closed</p> <p><input type="checkbox"/> Blinking</p> <p>Pupils state</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> L</p> <p><input type="checkbox"/> R</p> <p><input type="checkbox"/> pinpoint</p> <p><input type="checkbox"/> dilated</p> <p>Bowel sounds</p> <p><input checked="" type="checkbox"/> Normal</p> <p><input type="checkbox"/> Absent</p> <p><input type="checkbox"/> Tinkling</p> <p><input type="checkbox"/> Overactive</p>
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<p>Equipment</p> <p><input type="checkbox"/> Nasal Cannula</p> <p><input type="checkbox"/> Venturi</p> <p><input type="checkbox"/> CPAP Hood</p> <p><input type="checkbox"/> Simple Face Mask</p> <p><input checked="" type="checkbox"/> Non-rebreather</p> <p><input type="checkbox"/> Self-inflating bag</p> <p><input type="checkbox"/> Anaesthesia Bag</p> <p><input type="checkbox"/> MDI / Spacer</p> <p><input type="checkbox"/> Suction</p> <p><input type="checkbox"/> Nebuliser</p> <p><input type="checkbox"/> Intubated</p> <p><input type="checkbox"/> Ventilator Settings _____</p> <p>PIP: PEEP: IMV: TV: FiO2:</p>	<p>Access</p> <p><input checked="" type="checkbox"/> I V Cannula</p> <p><input type="checkbox"/> Arterial line</p> <p><input type="checkbox"/> Central venous line</p> <p><input type="checkbox"/> Intraosseous</p> <p><input type="checkbox"/> Fistula</p> <p>Fluids</p> <p><input type="checkbox"/> 10% dextrose</p> <p><input type="checkbox"/> 5% dextrose</p> <p><input checked="" type="checkbox"/> 0.9% saline</p> <p><input type="checkbox"/> Ringer Lactate</p> <p><input checked="" type="checkbox"/> Volplex / Gelofusin</p> <p><input type="checkbox"/> Blood</p> <p><input type="checkbox"/> Sodium Bicarbonate</p>	<p>Equipment</p> <p><input checked="" type="checkbox"/> ECG</p> <p><input checked="" type="checkbox"/> CXR</p> <p><input checked="" type="checkbox"/> Arterial Blood Gas</p> <p><input type="checkbox"/> Abdominal X-ray</p> <p><input type="checkbox"/> CT scan (s)</p> <p><input type="checkbox"/> MRI scan (s)</p> <p><input type="checkbox"/> Dialysis Machine</p> <p><input checked="" type="checkbox"/> Drug Chart</p> <p><input checked="" type="checkbox"/> IVI Chart</p> <p><input type="checkbox"/> ECG machine</p> <p><input checked="" type="checkbox"/> Observation Chart</p> <p><input type="checkbox"/> Patient Case Notes</p> <p><input checked="" type="checkbox"/> Blood Bottles</p> <p><input type="checkbox"/> Blood Culture Bottles</p>	<p>Other</p> <p><input type="checkbox"/> Thrombolysis Check List</p> <p><input checked="" type="checkbox"/> HR</p> <p><input type="checkbox"/> Heart Rhythm</p> <p><input checked="" type="checkbox"/> Saturations</p> <p><input type="checkbox"/> invasive Blood Pressure</p> <p><input checked="" type="checkbox"/> Non-invasive Blood Pressure</p> <p><input type="checkbox"/> RR</p> <p><input type="checkbox"/> ETCO2</p> <p><input type="checkbox"/> PAP</p> <p><input type="checkbox"/> Temperature</p>
--	---	---	---

Scenario

	RR	SpO2	HR	Rhythm	BP	Temp	AVPU
Baseline Observations	35	85% On Air	120	Sinus	90/60	37.9	Alert Anxious
Observations at 4 mins	45	80% on air 88% oxygen	135	Sinus	80/45	37.9	Voice
Observations at 8 mins	45	80% on air 88% oxygen	140	Sinus	70/45	37.9	Voice/confused
Observations at 9.5 mins	If no O2 given, ARRESTS						
Expected Scenario Progression	<p>At 7 minutes the bleep/phone rings. It is the Consultant asking the doctor to come to clinic as there are too many patients for him/her to see.</p> <p>The consultant is a little irritated that the F1/2 can't attend and keeps them on the phone for around 20 seconds.</p> <p>The candidate should undertake an ABCDE Assessment and brief history. They should ask for an ECG and administer oxygen promptly.</p> <p>After oxygen is given the saturations should improve,</p> <p>The Candidate should request an Urgent Chest X-Ray, ABG and review the ECG.</p> <p>IV fluids should be given for the low Blood pressure and the BP will rise accordingly once commenced.</p> <p>They should identify that the patient is likely to be having a massive PE, if so they should consider a Well's score assessment.</p> <p>Analgesia should be given for the pain.</p> <p>The candidate should identify the possibility of a Pulmonary Embolus and understand the need for escalation. They should recognise that it is acute and seek further advice from – Medical SpR, Cardiology SpR. They should also recognise the need to escalate the patient to a higher dependency environment- HDU or CCU.</p> <p>They should be then directed to discuss with the Respiratory Consultant. The candidate is NOT expected to Thrombolysse the patient.</p>						
If candidate gives Oxygen	The Saturations improve to 90%						
If candidate gives IV Fluid	The pulse and Blood pressure improve						
If candidate doesn't commence High Flow Oxygen	The patient will desaturate and deteriorate.						

Appendix 21: Prompt Card

PERFORM Prompt Card for Reflections in Clinical Practice

1. Brief description of clinical scenario
E.g. attending 56-year-old patient with chest pain
2. How long after the event is this reflection taking place?
3. Were you aware of your feelings during the scenario, and what were these feelings?
4. How did you decide to use the PER?
5. Which PER did you use?
6. How was the PER useful/not useful?
7. How well were you able to control your target behaviour on scale 0-100? (0= poorly, 100=very well)

FRONT



BACK

N.B. Actual size of prompt card = 5.4 x 8.6 cm.

Appendix 22: Photograph of in situ simulation



Appendix 23: Additional simulation materials used in upper GI bleed in situ simulation

Drug Prescription

Intravenous Fluid Chart

Chlordiazepoxide Prescription Chart

The image displays a collection of medical documents used in a simulation. At the top left is a 'Drug Prescription' form from Chesterfield Royal Hospital NHS Foundation Trust, detailing patient information and medication orders. To its right is an 'Observation chart for the National Early Warning Score (NEWS)', which is a grid for tracking vital signs and clinical observations. Further right is a 'Chest x-ray film' showing a frontal view of the thorax. Below the drug prescription is an 'Intravenous Fluid Chart' with columns for drug, concentration, dose, and rate. To the right of the fluid chart is an 'Arterial Blood Gas (ABG) result' slip showing values for pH, pO2, pCO2, Hb, Hct, HbA1c, and lactate. Below the ABG result is an 'Electrocardiogram (ECG)' strip showing a regular rhythm. At the bottom left is a 'Chlordiazepoxide Prescription Chart' with a table showing the dose of the drug over a 10-day period. To the right of this chart is an 'Abdominal x-ray film' showing a frontal view of the abdomen.

Chest x-ray film

Arterial Blood Gas (ABG) result

Electrocardiogram (ECG)

Abdominal x-ray film

Appendix 24: Ethics approval letter: Phase 1 and 2



Downloaded: 28/09/2018

Approved: 17/08/2016

Helen Church
Registration number: 150117612
Medical School
Programme: PhD

Dear Helen

PROJECT TITLE: PERFORM Phases 1 and 2

APPLICATION: Reference Number 008371

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 17/08/2016 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 008371 (dated 03/08/2016).
- Participant information sheet 1022518 version 2 (17/08/2016).
- Participant consent form 1022519 version 2 (17/08/2016).

The following optional amendments were suggested:

Comment 1 regarding recruitment: The key ethical issue here is that relatively junior colleagues must fully understand that declining to take part in this study will not compromise their clinical training, supervision and general training opportunities whatsoever. This needs to be spelt out in the participant information sheet (I note the comment about foundation training marks not being affected in the PIS but perhaps this needs slight elaboration). Also, this must be communicated whilst advertising the study in the power point talk proposed. Comments regarding Potential Harm to Participants: Reviewer 1: I would err on the side of caution here with regard to the psychological consequences statement. If you are asking participants to explore their ways of reacting to a scenario (albeit simulated) then anxiety, stress, self-esteem and confidence issues could all be thrown up in the course of doing this. It might be worth saying 'It is not anticipated that there will be any negative psychological consequences to this study, however, should participants require any support' etc. then point out the resources available for them as NHS employees and state that you will signpost. Reviewer 2: I agree with the first reviewer regarding psychological consequences. How many individuals will be observing the simulated exercise and will it include other participants in the study? Having perceived to have poorly performed in a scenario in front of peers maybe particularly distressing to very junior doctors. Lead Reviewer: Please take the above into account. My reading is that the participants/methods will be evaluated one on one, this could be made clearer perhaps? I agree in general that it may raise issues for some participants and it would be useful to signpost potential sources of help if needed. Comments regarding data storage Reviewer 1. I think the consent form needs to be updated to include that anonymised data will be retained by the researcher indefinitely and that participant-identifiable data will not be stored longer than needed for producing scientific outputs.

If during the course of the project you need to [deviate significantly from the above-approved documentation](#) please inform me since written approval will be required.

Yours sincerely

Paula Blackwell
Ethics Administrator
Medical School

Appendix 25: HRA approval phases 1 and 2



Health Research Authority

Dr Helen Church
2 Laxfield Close
Chesterfield
S40 3DZ

Email: hra.approval@nhs.net

10 October 2016

Dear Dr Church,

Letter of HRA Approval

Study title:	PERFORM Phase 1 and 2: Data collection and Pilot
IRAS project ID:	211919
Protocol number:	URMS number 149353
REC reference:	16/HRA/4660
Sponsor	University of Sheffield

I am pleased to confirm that HRA Approval has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications noted in this letter.

Participation of NHS Organisations in England

The sponsor should now provide a copy of this letter to all participating NHS organisations in England.

Appendix B provides important information for sponsors and participating NHS organisations in England for arranging and confirming capacity and capability. **Please read *Appendix B* carefully**, in particular the following sections:

- *Participating NHS organisations in England* – this clarifies the types of participating organisations in the study and whether or not all organisations will be undertaking the same activities
- *Confirmation of capacity and capability* - this confirms whether or not each type of participating NHS organisation in England is expected to give formal confirmation of capacity and capability. Where formal confirmation is not expected, the section also provides details on the time limit given to participating organisations to opt out of the study, or request additional time, before their participation is assumed.
- *Allocation of responsibilities and rights are agreed and documented (4.1 of HRA assessment criteria)* - this provides detail on the form of agreement to be used in the study to confirm capacity and capability, where applicable.

Further information on funding, HR processes, and compliance with HRA criteria and standards is also provided.

It is critical that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details

Appendix 26: Ethics approval letter: Phase 3



Downloaded: 29/11/2016
Approved: 29/11/2016

Helen Church
Registration number: 150117612
Medical School
Programme: PhD Medical Education

Dear Helen

PROJECT TITLE: PERFORM Study Phase 3

APPLICATION: Reference Number 012007

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 29/11/2016 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 012007 (dated 22/11/2016).
- Participant information sheet 1025185 version 2 (29/11/2016).
- Participant consent form 1025186 version 2 (29/11/2016).

The following optional amendments were suggested:

Suggested amendments: Section D5 "However, should participants require any support e.g. participant feels upset at watching videos of performance, then appropriate steps to address this and gain future support will be taken by the researcher e.g. contacting Supervisor/ Head of Foundation Training." - I'd just suggest that this could be reworded slightly: "However, should participants require any support e.g. the activities raise feelings of self-doubt or low confidence which they are negatively affected by, then appropriate steps to address this and gain future support will be taken by the researcher e.g. contacting Supervisor/ Head of Foundation Training. However, the aim of this study is to equip participants with strategies to overcome such issues and as such we hope participation would help in this regard." Just a suggestion to articulate the potential issues and benefits a bit more clearly as 'feels upset' is a bit subjective. Same for this entry on page 2 of the Patient Involvement Sheet. Section E2 Data storage 'Analysis of the simulation scenarios will likely require review by another clinician not directly involved in the research project.' Cant see this in the relevant section of the participant information sheet. In fact it says the videos will only be viewed by the researcher and participant In the consent sheet it says they will be viewed by 'myself and the researcher / research team' Make consistent and accurate across all documents Information and consent sheet Formatting issue some text cropped from 'IMPORTANT INFORMATION' section Additional documents Typo in figure 2: Contextual PERFORM model for 'PER not working' says back not bank

If during the course of the project you need to [deviate significantly from the above-approved documentation](#) please inform me since written approval will be required.

Yours sincerely

Paula Blackwell
Ethics Administrator



Health Research Authority

Dr Helen Church
PhD Student at Academic Unit of Medical Education
The University of Sheffield
Academic Unit of Medical Education
Beech Hill Road
Sheffield
S10 2RX

Email: hra.approval@nhs.net

20 February 2017
Amended and Reissued 02 March 2017

Dear Dr Church,

Letter of HRA Approval

Study title:	Performance enhancing routines for optimisation of readiness using metacognition Phase 3: Full Study
IRAS project ID:	206630
Protocol number:	URMS number 150748
Sponsor	University of Sheffield

I am pleased to confirm that **HRA Approval** has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications noted in this letter.

Participation of NHS Organisations in England

The sponsor should now provide a copy of this letter to all participating NHS organisations in England.

Appendix B provides important information for sponsors and participating NHS organisations in England for arranging and confirming capacity and capability. **Please read *Appendix B* carefully**, in particular the following sections:

- *Participating NHS organisations in England* – this clarifies the types of participating organisations in the study and whether or not all organisations will be undertaking the same activities
- *Confirmation of capacity and capability* - this confirms whether or not each type of participating NHS organisation in England is expected to give formal confirmation of capacity and capability. Where formal confirmation is not expected, the section also provides details on the time limit given to participating organisations to opt out of the study, or request additional time, before their participation is assumed.
- *Allocation of responsibilities and rights are agreed and documented (4.1 of HRA assessment criteria)* - this provides detail on the form of agreement to be used in the study to confirm capacity and capability, where applicable.

Further information on funding, HR processes, and compliance with HRA criteria and standards is also provided.

Appendix 28: University of Sheffield Sponsorship Agreement Phase 3



The
University
Of
Sheffield.

Research &
Innovation
Services.

Ms Helen Church
Medical Education
Medical School
Beech Hill Road
Sheffield
S10 2RX

New Spring House
231 Glossop Road
Sheffield
S10 2GW

30th November 2016

Telephone: +44 (0) 114 222 1400
Email: a.j.kenny@sheffield.ac.uk

Project title: PERFORM Phase 3
URMS number: 150748

Dear Ms Church,

**LETTER TO CONFIRM THAT THE UNIVERSITY OF SHEFFIELD IS THE PROJECT'S
RESEARCH GOVERNANCE SPONSOR**

The University has reviewed the following documents:

1. A University approved URMS costing record;
2. Confirmation of independent scientific approval;
3. Confirmation of independent ethics approval.

All the above documents are in place. Therefore, the University now **confirms** that it is the project's research governance sponsor and, as research governance sponsor, **authorises** the project to commence any non-NHS research activities. Please note that NHS R&D/HRA approval will be required before the commencement of any activities which do involve the NHS.

You are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Good Research & Innovation Practices Policy: www.shef.ac.uk/ris/other/gov-ethics/grippolicy, Ethics Policy: www.sheffield.ac.uk/ris/other/gov-ethics/ethicspolicy and Data Protection Policies: www.shef.ac.uk/cics/records

Your Supervisor, with your support and input, is responsible for providing up-to-date study documentation to all relevant sites, and for monitoring the project on an ongoing basis. Your Head of Department is responsible for independently monitoring the project as appropriate. The project may be audited during or after its lifetime by the University. The monitoring responsibilities are listed in **Annex 1**.

Yours sincerely

cc. Supervisor: Professor Deborah Murdoch-Eaton
Dean of Medical Education: Professor Deborah Murdoch-Eaton



Appendix 29: HRA amendments

Amendment number	Date approved by HRA	Details	Amendment category
Original submission	02/03/2017		
1	10/05/2017	Study extension to include STH as additional site	Study extension
2	03/08/2017	Incorrect version of PIS/Consent for STH study	Non-substantial
3	01/02/2018	Additional consent form (bystanders caught on video)	Non-substantial
4	21/02/2018	Multiple reviewer consent form	Substantial
5	18/07/2018	New consent form for video bystanders	Non-Substantial

Two greyed out rows not acted upon for the study

Appendix 30: Chesterfield Approval Letter: Phase 3



Chesterfield Royal Hospital **NHS**
NHS Foundation Trust

Calow
Chesterfield
S44 5BL
Tel: 01246 277271
Minicom: 01246 512611
www.chesterfieldroyal.nhs.uk

Research Department
Clinical Standards and Governance

Tel: 01246 513632
E-mail: sue.glenn@nhs.net

8 March 2017

Ref: 2017/03 (206630) SG/jw

Dr H Church
Clinical Fellow in Anaesthetics
CRH

Dear Dr Church

Re: PERFORM Full study (Phase 3). A simulation project for junior doctors using sports psychology theory to improve management of the acutely unwell patient

I would like to confirm Chesterfield Royal Hospital NHS Foundation Trust's agreement to participate in the above study.

Target date to recruit first patient by: 1 May 2017

Documents reviewed:

- Protocol – v1.0 (18 November 2016)
- Participant information sheet – v3.0 (16 February 2017)
- Participant consent form – v2.0 (29 November 2016)
- Participant consent form (audio/video use) – v2.0 (4 October 2016)
- Interview schedule – Stage 1 – v1.0 (18 November 2016)
- Interview schedule – Stage 2 – v1.0 (18 November 2016)
- Interview schedule – Stage 3 – v1.0 (18 November 2016)

Yours sincerely

A handwritten signature in black ink that reads 'S.P. Glenn'.

Sue Glenn
Senior Matron for Clinical Research

Copy to

- Lesley.stevenson@nhs.net
- Julie.toms@nhs.net
- d.mcclean@sheffield.ac.uk

Appendix 31: Sheffield Teaching Hospital Approval Letter: Phase 3

Sent on behalf of Prof Simon Heller, Director of R&D, Sheffield Teaching Hospitals NHS FT

Dear Sponsor Representative,

STH ref:	STH19947	
IRAS Number:	206630	
Study Title:	PERFORM: Phase 3 Full Study	
Principal Investigator:	S Nawaz, Sheffield Teaching Hospitals NHS FT	
NIHR Target FPFV recruitment Date:	26/07/2017	
<i>The Research Department has received the required documentation as listed below:</i>		
1.	Clinical Trial Agreement Material Transfer Agreement Statement of Activities Sponsor Monitoring Arrangements	Not applicable Not applicable See attached, 31 May 17 Not applicable
2.	Local ARSAC certificate/IRMER assessment	Not applicable
3.	Evidence of local Capacity and Capability - STH Principal Investigator - Operations Director - Clinical Director - Research Finance	S Nawaz, 16 May 17 C Monk, 31 May 17 P Chan, 20 May 17 L Fraser, 18 May 17
4.	Honorary Contract/Letter of Access	Helen Church, 16 May 17
5.	Protocol	Version 1, 18 Nov 16

This email confirms that Sheffield Teaching Hospitals NHS Foundation Trust has the capacity and capability to deliver the above referenced study. Please find attached our Statement of Activities as confirmation, along with our Conditions of Confirmation of Capacity and Capability.

We agree to start this study on a date to be agreed when you as Sponsor give the green light to begin. When this date is confirmed, please inform me so that I can update our records.

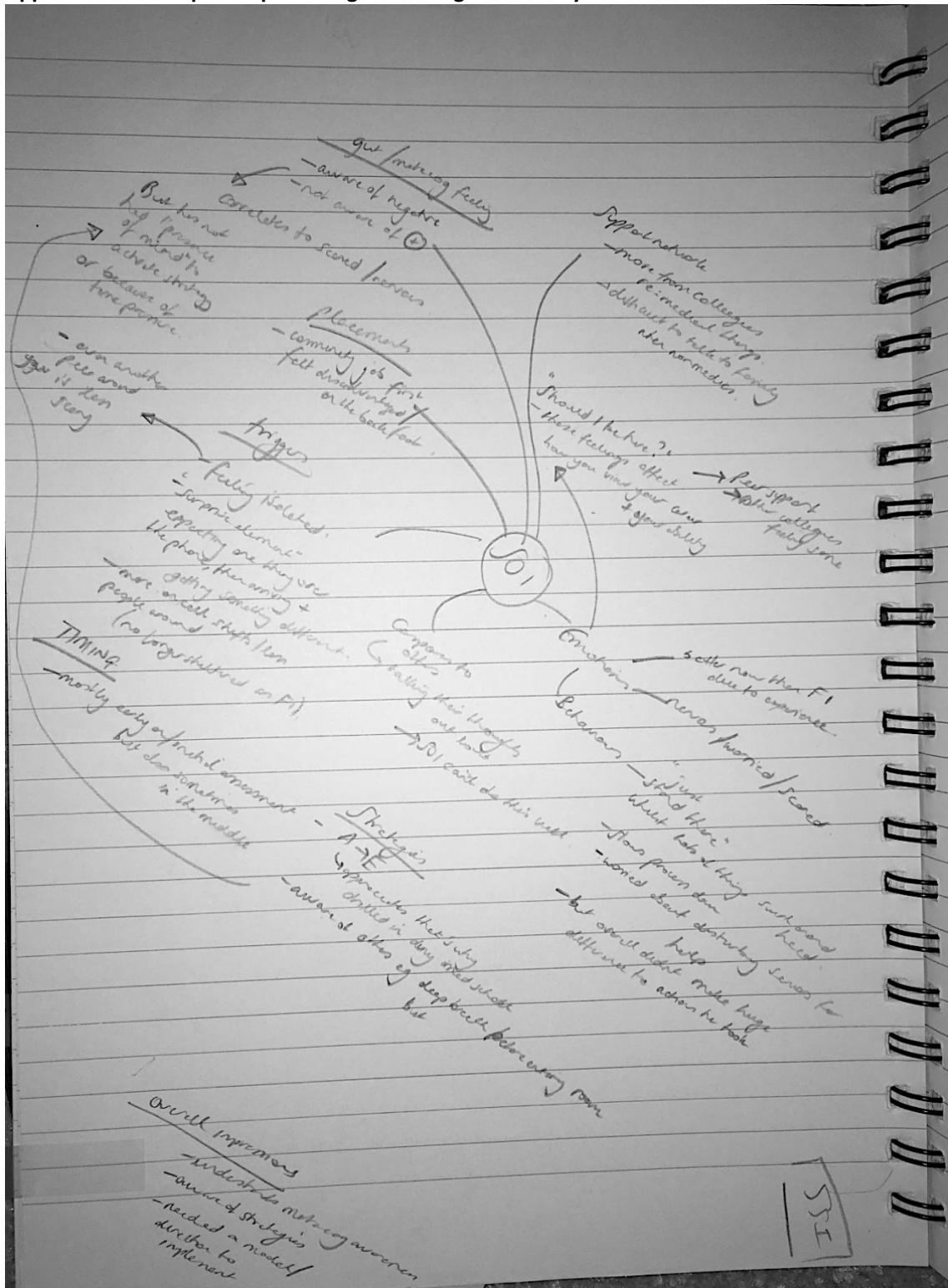
If you wish to discuss further, please do not hesitate to contact me.

Kind regards
Nana

Dr Nana Theodorou
Research & Innovation Coordinator
Research Ethics and Human Tissue Lead

Sheffield Teaching Hospitals NHS FT

Appendix 32: Example of spider diagram during initial analysis of S01



Appendix 33: GDPR update email sent to all PERFORM doctors

Dear Participant of PERFORM study

I hope you are well. You are receiving this email as you were involved in either the Pilot or Full PERFORM study. As you are probably aware, new Data Protection legislation is being rolled out tomorrow (25th May) and therefore I've been advised to disseminate the following guidance (from the Health Research Authority) on how GDPR affects the data I collected for the study. In essence, I will maintain the agreements on your personal data as already outlined in your consent forms which you signed previously. The reason that I will keep your contact information is in case I wish to contact you to clarify some information from the data analysis (called member checking) or for further permissions for publications, if applicable/necessary.

The below text is for your information only, and I have set up a receipt system just to let me know that you have received the information. No action is required but if you do have any questions, please do not hesitate to contact me.

Kind regards and once again, thank you for all your help and support with the study.

Helen Church

The University of Sheffield is the sponsor for this study based in the United Kingdom. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. The University of Sheffield will keep identifiable information about you for up to 5 years after the end of the study.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained. To safeguard your rights, we will use the minimum personally-identifiable information possible.

You can find out more about how we use your information at

The researcher (Helen Church) will keep your name and contact details confidential and will not pass this information to University of Sheffield. The researcher will use this information as needed, to contact you about the research study, and make sure that relevant information about the study is recorded, and to oversee the quality of the study. Certain individuals from the University of Sheffield and regulatory organisations may look at your records to check the accuracy of the research study. University of Sheffield will only receive information without any identifying information. The people who analyse the information will not be able to identify you and will not be able to find out your name or contact details.

The researcher will keep identifiable information about you from this study for up to 5 years after the study has finished.

Appendix 34: Summary of Phase 1 Doctors' responses to Exploratory Phase Objectives

	Are junior doctors already aware of their behaviours e.g. anxiety during acute clinical scenarios?	Do they feel that such behaviours affect their performance, and if so, how?	Do they recognise metacognitive feelings e.g. feeling of not knowing during acute clinical scenarios?	Do they employ strategies or PERs to cope with their behaviours, and if so, what are these strategies? Demonstrated strategies	Problems identified in Data Collection relevant to application of PERFORM model
EP01	<ul style="list-style-type: none"> • On take – “don’t enjoy” • Concerns about not having seen something before. • Frustrated if not a clear plan for why she is asked to see a patient. • Unhappy about waiting for seniors to review their patient, in case they have missed something. • Identifies herself as generally ‘under confident’ person, which has been highlighted by others. • However, does not want to become ‘overconfident’ as feels this risks complacency. • Struggles working with people that she doesn’t know – feels they are less supportive to her. • Anticipation of things that might go wrong on the ‘take’ shifts ‘more than any other shift’. She ‘expects them to be stressful’ and this causes her to feel ‘anxious’, but after the shift realises that it wasn’t stressful. • Example of metacognitive feeling of not knowing, felt ‘blind panic’ and ‘froze’ for a couple of seconds. Then ABC. • Feels angry with herself if almost/makes a mistake. • Often takes work issues home, e.g. frustration, feelings of guilt. 	<ul style="list-style-type: none"> • Doesn’t feel behaves differently with patients. • Spends time afterwards thinking through what she has done...feels this wastes time and feels she could be faster/more efficient if she could overcome this feeling that she’s missed something. • Aware that she seeks advice earlier than perhaps she needs to, and she feels this might be annoying to seniors. Feels that she is probably perceived as an ‘anxious Annie’ by them. • Likes to ensure that she has completed seeing one patient before moving onto next and will only break this rule if second patient is higher priority. In this situation, feels that she can shift her focus successfully onto the second patient until after the second patient encounter, at which point she would start to worry that the first patient may become unwell again. • Example of potential clinical mistake – did feel distracted by this. Couldn’t stop herself from checking the patient every few hours. Then worried when went home- couldn’t sleep. Was able to see other patients, but that patient was in the back of her mind the whole night. Felt she was ‘stuck’ on this and couldn’t deal with this. 	<ul style="list-style-type: none"> • Yes. • Example given – on an on-call. She saw the patient and immediately knew she ‘couldn’t manage her’. Patient was in respiratory distress. Didn’t complete an A to E assessment, but called the senior, who shouted at her and did arrive. The senior concluded that the patient was dying. • Feeling of knowing example used the Oxford Handbook to confirm that she had done everything necessary. ?More reassurance than metacognitive feeling of ‘knowing’. • Identifies that she is better at recognising the negative feelings, than positive ones. 	<ul style="list-style-type: none"> • No strategies to overcome under confidence or ‘coping’ with the unfamiliarity of her colleagues on take shifts • Checks plans with seniors/handbook to ensure doing right things. • To overcome feeling of panic and being ‘frozen’ ABCDE. “I find it easier to move out of panic if I have a system to follow” • ABCDE DOES “solve the panic”. • Anticipates that ABCDE won’t always work, as sometimes she needs the senior there, and the panic returns. • Hasn’t experienced a scenario where ABCDE hasn’t resolved the ‘panic’ but gave example of post-ictal patient where ABCDE didn’t allow her to adequately overcome ‘feeling uncomfortable’. <p>Demonstrated in scenario</p> <ul style="list-style-type: none"> • ABCDE • Stop and pause to check the unfamiliar drug chart 	<ol style="list-style-type: none"> 1. Distracted-Not concentrating on breath sounds, as thinking ahead to oxygen therapy. 2. Cannula insertion in acutely unwell patient – apprehensive, worried, thinking about calling for help. (NB didn’t feel this was a major problem with a manikin) 3. Distracted by the concerns of the nurse – but not sure if the nurse was leading her to something important 4. Unfamiliarity with equipment – made her feel frustrated as she felt this wasted time. 5. Time pressures- In real life, feels that she sometimes goes ‘too fast’ and is scared of missing something. Doesn’t mind the time pressures, unless she hasn’t seen something before, or the ABCDE doesn’t quite fit.

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EP02	<ul style="list-style-type: none"> • Preceding emotions are more relevant – heart rate increase, palpitations, sweating- sympathetic responses. Things running through your mind are ‘what am I going to do when I get there’. • The approach is “nerve-wracking” • Anticipation is worse than the reality. • The adrenaline rush – not unpleasant, but not comfortable. • Afterwards – feels better ?perhaps relieved? • When with the patient, all the emotions go ‘out of the window’ and you’re just focussed on the patient. • Example – member of staff collapsed. • Not experienced deteriorating patient on the ward yet – on psychiatry. • Apprehensive about moving onto seeing acutely unwell patients for the next job but tried to reassure himself that it’s normal for F1’s to feel this way. • Added pressure is perceived expectation that the staff will expect him to know what to do as he will be on his 2nd placement. ? feels behind the curve due to starting on psychiatry. • Specific apprehension – environmental issues (familiarisation with systems, logistical tasks). Demonstrates an understanding of knowing WHAT to do (ABCDE) but not knowing how to do it, from a logistical point of view. • The feelings of apprehension over the non-clinical tasks will likely be resolved much faster (i.e. within the first week) than the apprehensions of managing acutely unwell patient, which may take “months or even years”. 	<ul style="list-style-type: none"> • Two ways it can affect behaviour <ul style="list-style-type: none"> • Fight or flight – can be useful • Cognitively, “clouding of consciousness” when you are feeling not calm • Being apprehensive at work (when moves to different job) could be beneficial as it will make him more careful to check things e.g. when ordering scans. • More likely to ask for help – which is perceived as a good thing as he will be able to check what he is doing. • The adrenaline symptoms won’t affect the non-clinical tasks as much as perhaps a cannula, which needs manual dexterity. <p>Mentioned from scenario</p> <ul style="list-style-type: none"> • Feels likely to forget individual aspects of ABCDE when ‘caught up’ in the scenario 	<ul style="list-style-type: none"> • Yes • Lots of different situations inside and outside of medicine, but not sure how calibrated these feelings are. • Would act on the gut feelings – try to confirm/refute the feelings. (metacognitive judgements?) 	<ul style="list-style-type: none"> • Non-clinical scenarios – uses things like deep, diaphragmatic breathing is effective in situations where he becomes anxious • Not had the opportunity to implement this in clinical scenario – but perhaps he might. • ABCDE for clinical scenarios. Uses this as a structure, which helps overcome the ‘clouding of consciousness’. • Outside of clinical environment - Reassurance strategy as the first responder – take the pressure off as he unable. <p>Demonstrated in scenario</p> <ul style="list-style-type: none"> • ABCDE 	<ol style="list-style-type: none"> 1. Lack of focus? Not reading/taking in the observation chart and ECG. 2. Cannulation – not in simulation, but in real life – getting cannula into unwell patient with low BP very difficult. Not something that medical school prepares you for...Concerned about this if real life. 3. Cognitive overload and failing to multitask – “couldn’t concentrate on two things at once” (on the phone but picked ECG up at same time). 4. Uncertain about when to escalate to senior/anxieties about over-escalating and ‘everyone hating you’ for attending something that is not necessary. 5. Unfamiliarity with equipment and paperwork

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EP03	<ul style="list-style-type: none"> • Yes – feels aware of feelings/behaviours. • Before (last year) – if didn't know what was going on, would feel 'panic'. Now, still feels uncertainty, but not as much panicked. • Still feels panicked, but aware of how to refer upwards, and also feels happier to undertake initial management and is not afraid to utilise guidelines, whereas before felt that he should know everything. • Being more comfortable with the uncertainty. Accept that once he has seen a particular scenario a couple of times, he shouldn't be so scared. • There is apprehension about things he hasn't seen, but aware that there are guidelines and he knows roughly what to do. • Last year (in F1) had more intense feelings of being scared. • Big emphasis on the type of placement that you are on, and the level of support/'safety net' that you have. Interesting inverse balance between support and experience. • Now changed attitude from "panic, get through it and feel crap afterwards" to "treating it like a learning opportunity". • It still is draining, when you are "clueless", feels tired afterwards. • Doesn't call for help straight away for help, which he would have done last year. • Understanding of the need to seem more relaxed or in control to help the patient and the team. 	<ul style="list-style-type: none"> • Hopes the panic/uncertainty does not come across to patients • Unable to say objectively whether his behaviour towards a patient was affected by him feeling panicked. • Tries to maintain energy levels whilst at work, but then 'crashes' afterwards, so "friends and family get the brunt of it". 	<ul style="list-style-type: none"> • "Yeah...more or less with everyone (every patient), either I feel in control, or you're not". Metacognitive feeling. • When feeling not in control, doesn't have any associated negative feelings, but just feels that he wished he had "known more". Copes better with this now – change in attitude from last year. Would be harder on himself last year about not knowing, but now just uses more as learning experience and accepts it as such. 	<ul style="list-style-type: none"> • ABCDE – most useful for things that he isn't used to seeing • No strategy to control the panic. • After an on call shift where felt panicked, felt more tired after the shift. "It tired me out, but I could cope with it". • When feeling not in control – very cognitive strategies – ABC, guidelines, asks seniors/nursing staff. Emphasis on preparation, as he feels you rarely don't know what's coming e.g. you are called to see someone. So you can "ask someone on the way" to give you a place to start. • If no-one available to ask, feels he is approaching it "blind and unarmed...which is never nice...". You have to be prepared to accept this, and if you don't get used to it, it's very draining. • Hiding feelings of anxiety/panic. <p>Demonstrated in scenario</p> <ul style="list-style-type: none"> • ABCDE 	<ol style="list-style-type: none"> 1. Environmental unfamiliarity e.g. obs chart 2. Cannulation- generally feel okay, but if they would have difficult access, he would have felt 'more panicky'. 3. Communication – felt needed to make clear, structured communication but on reflection this could have been better. 4. Feeling lost/'thrown' - stuck to ABC as "you don't need to know where you're going, as long as you follow it"

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EP04	<ul style="list-style-type: none"> • Yes. The beginning – taking a second to think about what she should be doing, and what people expect of her. Once she gets over this initial feeling, she can focus more on the patient. • Feels expectation to give instruction – they are “waiting” for her to give instruction. But once she starts to undertake the management, she worries less about what people expect her to do. • Pressure to perform. “you don’t want to look like you’ve got doubts”. • Sometimes feels confident, but “quite often, no (I don’t feel confident)”. • Apprehension precedes scenarios where she is aware of a potential difficulty, e.g. difficult to gain IV access/bloods. It “puts me on the back foot at first”. This makes her second-guess decisions too. 	<ul style="list-style-type: none"> • Confident that she can act safely but also aware that under-confidence might affect perceptions by the patient and staff members. • If feels under-confident before a scenario, will affect her ability to make decisions about patient care. • Frustration/worry when things are not going well – “wouldn’t make her think in a logical way”. They get in the way of the plan that you had in mind. More likely to forget to do things e.g. document after a scenario. 	<ul style="list-style-type: none"> • Yes – both in and outside of Medicine. • Feelings that “something isn’t going too well” often preceded by a few little things not quite going to plan/unexpected events happen. • When things go well, they run smoother. • When things not going well – feels frustrated, and a little worried wondering if she should have done something different. (?metacognitive judgements?) 	<ul style="list-style-type: none"> • Doesn’t do anything to control apprehensive feelings – just “have a go”. “it’s things that I know I can do, and I know that it’s me that has to try and do them”. (?like positive thoughts?) • She will inform the patient about this and warn them that there is a likelihood of failure e.g. with a cannula. This is in an attempt to build rapport with patient, and this makes her feel better about the situation. • Agrees that a strategy would be good too, so that she has a safety net, and something to fall back on (particularly if difficult to build rapport with patient). • Escalation is a coping strategy. • No conscious effort to calm herself down, but has sometimes “taken a step back”, which might be related to this. This would be a subconscious strategy to help her regather what she is doing/what she needs to do next. • Strategies already in used e.g. taking a step back, helps her to “put things in an order” to regain her structure. Doesn’t work for every scenario. Not something she’s consciously done, and not used it many times but has worked ‘okay’ so far. <p>Demonstrated in scenario</p> <ul style="list-style-type: none"> • ABCDE 	<ol style="list-style-type: none"> 1. Distracted by jobs/list of things to do 2. Unfamiliarity 3. Not concentrating/losing focus

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E06	<ul style="list-style-type: none"> • “Yep...panic” • Sometimes doesn’t feel competent to manage situation. • Sometimes unsure what to do • When can’t get hold of senior – panic • Anxious, worried • Both situations where she has panicked have been when managing acutely unwell patients and struggling to get hold of a senior • Admits that her personality is one where she panics/gets stressed a lot in her personal life, and since beginning work feels that she generally copes better at work than she does at home. Point – perhaps there is a tendency for certain personality types to develop feelings of panic/stress at work. Perhaps not having coping strategies outside of work also influence clinical scenarios. 	<ul style="list-style-type: none"> • Felt that panic rushed her...unable to focus on certain elements e.g. ECG • Can’t logically think through likely diagnosis • From the example, it seems that during these panics, she defers any decision-making to her senior, rather than attempt work through the problem herself • “I think it means that I can’t do as good a job as I would be able to if I wasn’t panicking”, but not unsafe 	<ul style="list-style-type: none"> • Yes – clinical scenarios and outside of work • Not explored these gut feelings...doesn’t know what they mean • When panicking, feels ‘unhappy’ as not sure what’s going one (metacognitive feeling of not knowing) • From the example given, the participant knows she is panicking at the time (not just on reflection) 	<ul style="list-style-type: none"> • When panicking, calls senior or uses nursing staff to reassure her (both external strategies) • No strategies to help control the panic – but feels that a strategy would be beneficial. • Identified that she probably needs to ‘take a step back’ but doesn’t currently have any strategies to help her calm down enough to do this. • Mum has suggested she try yoga. – point here is that she recognises this as a problem so much that she speaks to/seeks advice from family about it. • In the moment of panic – “I cope because I had to cope”. She persisted and found someone to help eventually. <p>Demonstrated in scenario</p> <ul style="list-style-type: none"> • ABCDE • Checklist of things to do in her head. Once she exhausts this, that’s when she panics. (No panic demonstrated in the scenario, as had a clear plan) When can’t find things on the ward – “quick to ask for help” from others 	<ol style="list-style-type: none"> 1. Multitasking – trying to prioritise jobs and do ABC assessment at same time 2. Distracted by phone call – was about to take an ABG but forgot to do it after phone call

Appendix 35: White-box comments from Pilot Questionnaire on each element of the study

Element of Study	Anonymous Doctor A	Anonymous Doctor B	Anonymous Doctor C	Anonymous Doctor D	Anonymous Doctor E
Teaching methods/ understanding the PERFORM model	<i>"Good example of book - reading paragraph"</i>	<i>"Model diagram was clear just needs time to process"</i>	<i>"Really clear, like the reading a book explanation"</i>	<i>"It was clear and well explained"</i>	
Teaching methods/ understanding the PERs	<i>"?Able to prompt when struggling"</i>		<i>"There were a lot to choose from so I think I chose ones I have previously tried to use but put more effort into them"</i>	<i>"It was easy-ish for me because I was already aware of one (PER). I think other candidates may find it easier to choose one if they use one (a similar technique) already."</i>	
Reviewing simulation video/Think Aloud			<i>"It's cringey to do, but really like it!"</i>	<i>"Volume was quite quiet and it (the video recording) was difficult to pause and restart it"</i>	<i>"Perhaps adding regular pause to discuss each section"</i>
General Comments	<i>"Great study topic. Nice to know that it's normal and have a method to work on"</i>	<i>"Thank you"</i>	<i>"Really enjoyable scenario. Probably not intended for actual learning on how to deal with an acutely unwell patient but some feedback on clinical decision making would be appreciated"</i>	<i>"Good timing of the session (not too long/short). Well explained model. Videos were useful. Comfortable environment to talk about feelings/thoughts. Thanks!"</i>	<i>"Good to analyse the use of PER's in clinical practice. Will be interesting to see if it helps my practice"</i>

Appendix 36: Researcher's Reflections of the Pilot Phase

Participant	Scenario 1 and 2	Researcher's reflections	Issues raised/ demonstrated by the doctor	Solutions <i>during</i> scenario or <i>planned</i> for future scenario
EP01	GI bleed PE	<ul style="list-style-type: none"> Timing issues – too long on the explanation of PERFORM/PERs Failed to ask Self-efficacy at correct time Phone/communication issues: not enough assistance to act as people on phone/bleep etc. 	<ul style="list-style-type: none"> Struggled to articulate emotions occasionally during Think Aloud Felt simulation did not capture anxieties/true feelings as well as real clinical scenario, however, admitted feeling 'stuck' and 'frustrated' at times, especially on the final scenario 	<ul style="list-style-type: none"> Changed physiological parameters of some scenarios to add more 'drama' Changed sounds of manikin so more realistic and easier to hear Walkie-talkies for next participant
EP02	GI bleed Anaphylaxis	<ul style="list-style-type: none"> Timings better than previous pilot Asked about SE after first scenario at right time, but not second scenario Walkie-talkies worked well overall 	<ul style="list-style-type: none"> Communication was 'too efficient' with walkie-talkies and there was no time delay when phoning seniors. 	<ul style="list-style-type: none"> Added time delay on walkie-talkies by going through 'switch board' first
EP03	PE GI bleed	<ul style="list-style-type: none"> Timings okay but will need 1.5 hours minimum for Stage 1 of Full Intervention Forgot to ask Self-efficacy again at appropriate moment Need to remember to encourage doctors to alter/change the routines as they wish 		
EP04	Anaphylaxis Chest sepsis	<ul style="list-style-type: none"> NEED EXTRA ASSISTANCE – phone calls very difficult to multitask 	<ul style="list-style-type: none"> No British National Formulary (BNF) available 	
P05	Anaphylaxis Chest sepsis	<ul style="list-style-type: none"> Overran the simulation scenario by 5 mins 	<ul style="list-style-type: none"> Need phone/walkie-talkie instructions in pre-brief 	<ul style="list-style-type: none"> Need to have stricter time instructions for subsequent assistants Assistants need to be familiarised with equipment/ environment

Appendix 38: Additional thematic details – Phase 3, Stage 1

Chapter	Topic/Theme	Details
6.7.3.2.4	Topic A Peak	<p>However, negative feelings sometimes peaked <i>during</i> patient care, sometimes due to misinterpreted severity of the patient’s illness:</p> <p><i>“But then I think sometimes as you sort of work through your assessment you, you may have initially thought “oh they’re not too bad”...and then you realise that they’re not very good at all. Erm, so I think yeah most of the time it would be quite early on, but not-not always.”</i> (S01)</p>
6.7.3.2.5.1	Topic A People	<p>Examples of communication breakdown identified by doctors were categorised as either <i>inaccurate</i> and <i>unclear</i> communication, and both centered around the initial request to attend a patient.</p> <p>An example of inaccurate information was where a patient had been described as not being as unwell over the phone, but on arrival to review them <i>“you realise that, this person was maybe a bit sicker than, than was let on...”</i> (S01).</p> <p>Descriptions of unclear information included the use of medical jargon or coded information. For example, the National Early Warning Score (NEWS) (NHS, England) quantifies by how much the patient’s vital signs (heart rate, blood pressure, oxygen saturations etc.) differ from the ‘normal’ range, and therefore can be used to indicate how unwell a patient is. However, this cumulative score includes many different physiological values, which can lead to vagueness as to the specific problem;</p> <p><i>“...especially if it’s a...“oh can you come and see this patient they’re scoring an 8”...(....)over the phone that doesn’t really mean anything or like WHY are they scoring and 8, what are they scoring on?”</i> (C04)</p> <p>Having good support from colleagues <i>“just knowing you’ve got good nursing staff around you to help you”</i> (C02)</p> <p>Although collegial support was generally viewed positively, a ‘difficult colleague’ was viewed as a negative trigger:</p> <p><i>“(when) you’ve got a Reg(istrar) who’s not the friendliest to work with...that makes things a bit more stressful”</i> (C02).</p>
6.7.3.2.5.2	Topic A Self: Knowledge	<p>Doctors articulated that they felt calmer if they had been sure of the actions they needed to take, whether that was due to diagnostic certainty;</p> <p><i>“It depends what it is I think, so...if I feel it's going somewhere that I recognise, so for instance if there's blood everywhere I find that very easy...because I know what to do”</i> (C05)</p> <p>Or the required management of the specific case;</p> <p><i>“if you’ve got a clear-clear something going on, like... severe chest pain, I actually find that very calming because you've got an idea of where you're going when you go in, erm and that focusses you”</i> (S02)</p>

6.7.3.2.5.3	Topic A <i>Environmental: Time</i>	<p>Junior doctors reported that having preparatory time allowed for planning prior to attending an acutely unwell patient:</p> <p><i>"I'm very aware that if I'm coming-I'm coming from the other end of the hospital or I arrive having got my mind into the right mind-set and I've already thought "Right I need to start with airway", so I start with airway...so it helps to have just that bit of time to PLAN, whereas if someone asks "Oh can you just have a look at Mrs So-and-so" I don't, get that, mentality quick enough" (S05)</i></p> <p>One doctor used the term 'break in play' to describe a natural pause during patient management, for example <i>"if someone erm, had COPD and you were giving them a nebuliser and you're waiting for that to go through"</i> (S02). These events were reported as opportunities to think about the next steps of patient management;</p> <p><i>"...if someone's hypotensive and you give them some fluids and you can sort of think while that's happening"</i> (S02)</p>
6.7.3.3.1.1.4	TOPIC B <i>Direct Clinical Performance: Cognition: Evaluate</i>	<p>Doctor S04 experienced cognitive overload during a complex clinical case which compromised evaluation of the entire situation;</p> <p><i>"...the family had just arrived and they were wanting to talk to someone about it, and as the first person there there's all these things going on...um, and like I think you very-as more and more things get added on, um, it-it became quite sort of "okay now I'm sort of just getting, overwhelmed-everything, I'm not sure I can make sense of, this situation" (S04)</i></p>
6.7.3.3.1.2.1	TOPIC B <i>Direct Clinical Performance: Management: Action taken</i>	<p><i>Incorrect Actions</i></p> <p>Doctors acknowledged that their reactions to difficult clinical encounters may lead to incorrect diagnosis or management, and even if these mistakes are recognised, this would still cause the doctor to be "delayed in going the right direction" (C05).</p> <p><i>Incomplete Actions</i></p> <p>Negative emotions caused cognitive problems such as failure to recall or apply knowledge. Doctor C06 recalled an example of this during application of the ABCDE cognitive aid, whereby "you can miss out obvious steps that you, you know you know, but because you, are flappy and-and not fully prepared" (C06).</p>
6.7.3.3.2.3	TOPIC B <i>Indirect Effect on Clinical Performance: Perceptions of Self</i>	<p>Doctors recognised that negative emotional and behavioural responses that were initially triggered by specific stressful events had become more generalised;</p> <p><i>"Erm, I think probably at the like, at the start of my training I could've realised correlation but unfortunately I think I just developed a general, un-under confidence so it presents in a lot of situations...rather than just one, after a period of time" (S05)</i></p>

6.7.3.3.3	TOPIC B <i>No effect/Not sure of effect</i>	<p>Doctor C03 recalled events whereby difficulties with applying knowledge had caused problems with the <i>process</i> of patient management, but was not thought to have affected the <i>outcome</i>;</p> <p><i>"I'm not sure I've got an experience of it actually having a detrimental effect...In terms of an outcome. I think I can probably think of times where, probably could've acted on things a bit quicker or in retrospect looking back thinking...maybe I should've done THAT bit before THAT bit and so forth, but I don't think I... I can't think of anything where it's gone, seriously wrong"</i> (C03)</p>
6.7.3.5.3.1	TOPIC D <i>Barrier to Using Strategy: Self</i>	<p>Strategies which relied on patient-specific information were deemed unsuitable for more vague or unknown situations;</p> <p><i>"Obviously if-if it's just somebody that's generally unwell and you don't really know much about them then...there's not much specific that you can prepare on the way"</i> (C04)</p>
6.7.3.5.3.2	TOPIC D <i>Barrier to Using Strategy: Situational</i>	<p>Opportunities to practice strategies was interrupted when other colleagues arrive to assist in the management of the patient;</p> <p><i>"...help arrives too quickly for me to change what I'm doing, cos someone else does because someone else turns up and ...(...)... takes the lead...And if that happens, I don't think that I change what's going on I think that someone else comes and changes it."</i> (C05)</p>

Appendix 39: Annotated transcript of multiple triggers (Doctor C04)

<p><i>"I suppose it depends HOW unwell they are. Sometimes when you go to see somebody and they're peri-arrest then...that's...obviously that's the worst situation to be in... Because...if you, if you knew straight away what the right things to do were and you could get them done quickly then you'd KNOW that you can sort of, stop them deteriorating to the point where they might arrest. But you have to figure out what those things are, and you have to DO them and actually get them DONE quickly...And sometimes...you do KNOW what they are but like there might not be a nurse around or whatever and ...so...so if some-like if somebody IS peri-arrest then I always feel like there is a time pressure to-to get whatever it is that I decided needs to be done it needs to...I need to MAKE that decision and get it done quickly. Erm... when somebody's just sort-of more generally unwell and you get called to see them, then...it can just...it-it's just sort-of like kind-of like swimming through a cloud, because...you-you're trying to get as much information as you can from all of the difference sources like asking the nurse "how long have they been like this?", "are they normally, this confused?"...like "what is the plan from the day team?", "are they on antibiotics?", and then you-like go through the JACS and go through ICE and through the notes and...you're gathering lots of information but I still don't really feel like...well I-I feel like it takes me a long time to sort through all of that...Erm...and...to go... to sort of go from there to then, decisions about, okay well err-I'll give fluids or I'll give frusemide or, I'll change antibiotics or stop antibiotics or whatever it is that the situation, erm sort of dictates.....(...)... So...erm...so it's always, it's always NICER to be called to your own ward than to somebody else's ward." (C04)</i></p>	<ul style="list-style-type: none"> ⇐ Specific case ⇐ Lack of knowledge ⇐ Isolation ⇐ Time pressure ⇐ Unfamiliar patient ⇐ Expectations of self> needing to do everything ⇐ Unfamiliar environment
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Appendix 40: Additional thematic details – Phase 3, Stage 3

Chapter	Topic/Theme	Details
6.7.11.2.2.3	Topic A Process: Automaticity	<p>Some doctors recognized that automaticity of their model was in its infancy;</p> <p><i>“I guess you saw there a little bit that it’s, STARTED to become a bit more, subconscious, which I guess is potentially a good thing. Erm...so yeah it’s been a bit of a like transition I suppose.”</i> (S01)</p> <p>Whereas some recognised this earlier in the study:</p> <p><i>“HC: And did that integration happen quite early on, in the process, d’you think cos you’ve been doing this about 3 months now. C05: Yeah, it probably a month and half or a couple of months”</i> (C05)</p>
6.7.11.3.1.1	Topic B Feelings and Behaviours: Own feelings	<p>Some doctors described how they had incorporated aspects of PERFORM into their clinical reflections:</p> <p><i>“I think when I’ve written things down and, I put things in my portfolio and things I have tried to say HOW I feel and why that might be-WHY, um why I did what I did.”</i> (S04)</p>
6.7.11.3.2.4	Topic B Motivation Around the Study: Provenance	<p>Simply the fact that the PERFORM study was taking place promoted the use of techniques that had otherwise been dismissed as “silly” (S05):</p> <p><i>“(if someone) was struggling and I was tryna offer a bit of advice I’d just be like “it sounds ridiculous right and I always thought it was ridiculous and never used it in practice, but actually, you know I did a study for this purpose cos I was a bit nervous and like, y’know it y’know someone’s doing a study on it like must be some sort of proven technique”...(...)... it’s very very useful and I really recommend it”</i> (S05)</p>
6.7.11.3.4.2	Topic B Novelty: Individualised approach	<p>The doctors explained that the individualised simulation review was a useful element of the study because it eliminated peer judgement, encouraged doctors to ask questions and allowed more constructive criticism. The Think Aloud element promoted self-directed learning and simulation evaluation.</p> <p>The doctors compared the individualised simulation reviews in the study to their previous debrief experiences:</p> <p><i>“I think a lot of simulation teaching can be quite pressurised cos you’re doing it in front of your peers and worry about what they’re gonna think? Erm and also watching yourself back, I think previously when we’ve done that in Medschool I’ve not enjoyed that”</i> (S03)</p> <p>Having simulation (or its recording) watched by one’s peers was a common source of discomfort for the doctors:</p> <p><i>“I hate erm, I really don’t like, erm one aspect of sim I don’t like is ...(...)... When you’re at (a simulation centre), so when you do sim there, you have erm, behind the glass... everyone’s sat behind the glass...(...)...you know that you’re sort of-everyone just is TALKING as you go along...They’re saying “Oh haven’t they done this? Why haven’t they done this?”...And, I really hate it”</i> (S02)</p> <p>By removing the audience, doctors reported feeling more comfortable to ask questions:</p> <p><i>“especially when it’s not in group sessions like sim sessions are and you feel embarrassed and, you kinda want to ask more questions and you can’t-that sort of thing y’know?”</i> (S05)</p> <p>And perhaps more receptive to critical performance evaluation:</p>

		<p><i>“we do an awful lot of sim, and the critique is actually quite, positive, which is great and y’know everyone loves positive feedback, but totally useless because someone telling you what you can do well is fine, but someone, needs to tell you where you’re struggling...(...)...picking up on the bits that weren’t QUITE as good was very useful, and spotting, and making it PERSONAL it was PERSONAL “this is the thing that YOU struggle with” not, “oh lots of people have difficulty with this, so here’s a generic feedback mechanism” actually to have the time to say “well here’s something that YOU DO, that’s not ideal, here’s how we might address that”, that was really useful” (C05)</i></p> <p>Furthermore, the Think Aloud allowed doctors to drive their own reflection on their simulation:</p> <p><i>“to watch yourself and think “well what was I thinking there?” and then you can think back and remember what it was... which, which you don’t really get any other opportunity to do, cos whenever you do sim there are videos aren’t there but it’s other people watching you, rather than you, erm, so that part of it has, been very useful.” (S01)</i></p>
6.7.11.3.5.2	Topic B <i>Limitations: Missed opportunities</i>	<p>Doctors explained that involvement with extra-curricular projects such as the PERFORM study often “slips your mind” (S01), which led to missed opportunities to use the model in practice:</p> <p><i>“you can often be juggling a few people (patients) and, therefore you’re mind’s not always also thinking about what’s going on, outside of-of work... and “oh I’m involved in this-this study I should be using that”, cos you-there’s lots of things occupying, erm, so, and I often I’ve got MANY (laughs) memories of thinking AFTER situations “oh I should’ve really used it then, it would’ve been helpful”, erm but it’s too late then (laughs)” (C03)</i></p>
6.7.11.3.5.5	Topic B <i>Limitations: Team scenarios</i>	<p>One doctor recognised the limitation of the PERFORM study to only being able to control his own emotions and behaviours in the workplace:</p> <p><i>“I still have moments where I stop, and those moments are because, of other people or lack of leadership or for other ...(...)... I don’t think they are PERSONAL issues...(...)...because there are 12 people there ALL not taking the leadership role, and-and, so I don’t think, I don’t think the-the things we’ve done in this study would NECESSARILY, help with that issue.”</i></p>
6.7.11.4.1.3	Topic C <i>Facets: On-line knowledge</i>	<p>Many of the doctors recalled that they engaged their ‘on-line knowledge’ to select the most appropriate PER for the situation. Most commonly, PERs were selected based on task;</p> <p><i>“So the erm, GOING to a patient, is like, is the deep, is the deep breaths and maybe the smile...but I think like a physical skill that I’ve got to do, for example, blood tests per say, erm, the smile definitely, but visualisation of-of the actual task ahead as well” (C06)</i></p> <p><i>“...ABC when I’m walking and the “Ah Breathe Calm...Or with the cannulas it’s ...(...)... then sort of go with the positive reinforcement “Right come on, no you’re gonna give this a go like, you’ve done this a million times” (S05)</i></p> <p>Some doctors considered both task and the time available for the PER:</p> <p><i>“HC: ...d’you think one of those two things either scenario or ...how much time you’ve got, is one of those things tipping the balance more than the other? Or are they both equally important to you? C04: Because... you can’t really change the amount of time that you’ve got...so when I did the breathing earlier on I would’ve liked the time to do three...And I feel, it would’ve helped-three would’ve DEFINITELY helped more than one did, and that’s what I was trying to do, it was just that I</i></p>

		<p><i>got interrupted, so I had to stop at one."</i></p> <p>Some doctors explained that one PER fit many different scenarios due to a common underlying problem. In this example regarding the use of cleaning one's glasses as a PER, the common problem was identified as <i>"getting control in your mind"</i> (S01):</p> <p><i>"...the glasses I think, I don't think ARE specific to any one thing...I think I found them useful for lots of different things, um... And as I say I think it just comes back to fact that it's...it's, stopping, my brain going all over the place"</i> (S01)</p>
6.7.11.4.1.4	Topic C Facets: Metacognitive Skills	<p>Doctors confirmed the use of their metacognitive skills within their contextual models to select alternative PERs when the initial routine was not deemed successful:</p> <p><i>"I tried the breaths and I didn't like that, but I-and I used the visualisation (instead)"</i> (S03)</p> <p>In some instances, doctors were aware that they not only dismissed certain routines for particular tasks, but often rejected PERs from their models completely. In this example, counting was felt to be too slow to use in acute situations:</p> <p><i>"S04: I do remember using, the counting, the counting down one before...(....)I remember still feeling stressed because you still felt "ahh y'know do it, do it but while you're waiting this guy's y'know unwell"... (...)...I feel like I've attached something negative to that... HC: And have you tried that since...(....)... S04: No I don't-yeah I don't think I have I think it's been I've been trying more stuff that's kind of more, um in the moment"</i></p> <p>Rather than PER rejection, some doctors opted to repeat the same PER again:</p> <p><i>"S05: I don't think I've not picked another one so like for example if I don't get a cannula in I just still keep going with the, "Come on, try again" like. HC: You just try that positive reinforcement again. S05: Yeah, yeah-yeah-yeah I don't ever pick another one."</i></p> <p>For some doctors, the effects of positive feedback on subsequent PER selection only became apparent during post-scenario reflections:</p> <p><i>"I think it's more just an unconscious thing (when using the PER) and then on reflection, I think "oh that's why I've used that again"... "This is why I like this (PER) because it's worked last time..." (C07)</i></p> <p>However, other doctors were less confident (or perhaps less aware) that they engaged their metacognitive skills.</p> <p><i>"I don't know if at the end if I really, actually analyse HOW, WELL that is helping. ...Erm and that-and that, yeah, that's probably-that's probably um what I SHOULD do"</i> (S04)</p> <p>Following an unsuccessful PER application, some doctors failed to consider that there might be a potentially 'better' PER for that task. This was potentially due to the difficulty of being objective about PERs once they became automatic:</p>

		<p><i>"...if it didn't work, I would just think "oh I was really stressed there" but I don't think I would pick up on, "because 'airway' didn't work" ... I would just think "there was something in that situation that was very stressful". So I don't...I don't know that I would have a secondary, recognition and coping strategy, because, the airway thing is not-is not something that I'm, I'm RECOGNISING anymore, it's just something that I'm doing regardless." (C05)</i></p>
6.7.11.4.3	Topic C <i>(The Model)</i> As a resource	<p>Some doctors had referred to the original conceptual model during the study period:</p> <p><i>"I've still got (the PERFORM model diagram) in the back of my phone... But erm, erm, If I'm honest I SEE it but I don't really, look at it." (C04)</i></p> <p>Many only used the model at the start of the study in conjunction with the list of PERs:</p> <p><i>"Yeah, right at the beginning...When I was tryna use the different ones (PERs) on the card as well, but not since I've developed my own" (S03)</i></p> <p>Whereas some doctors had <i>"forgotten"</i> (S02) about it:</p> <p><i>"I'm not gonna lie I've not looked at the model." (C07)</i></p>
6.7.11.5.1.2	Topic D <i>Improvements:</i> <i>Cementing</i>	<p>Some doctors would have preferred more regular contact with the researcher, particularly <i>"at the beginning maybe a bit more"</i> (S02), or simply more reminders once doctors had developed their models:</p> <p><i>"I think you would probably hoping for a, weekly or two-weekly just, discussion with someone to-to just go over and, right "any issues this week" and y'know, talk about a bit of reflective practice "how have you performed? How did you do?", y'know, I think that would be very useful, I think...But obviously that's quite intensive" (C05)</i></p> <p>Doctors on particularly busy rotations suggested the optimum time for reflection and debrief with the researcher would be immediately post-shift:</p> <p><i>" I think, for-obviously limiting factor was participation...and I don't know how, that could've changed? Other than, catching us at the end of shifts on A&E?...That's the only other thing, only other way I could do it cos I think erm...I was, yeah I just found it difficult to, go home and reflect outside of work" (C01)</i></p>
6.7.11.5.2.1	Topic D <i>Future Roll-Out:</i> <i>Target population</i>	<p>The doctors suggested other healthcare professionals who might benefit from PERFORM training:</p> <p><i>"I don't think it's, JUST going to work for DOCTORS either, so y'know I think, IT probably will help nurses and the ACPs (Advanced Clinical Practitioners) that are now doing something completely new and out of their comfort zone and the paramedics that are going into new situations, y'know perhaps things would work-we're all very similar in lots of ways" (C03)</i></p> <p>The doctors agreed that PERFORM should be introduced during the earlier stages of one's career:</p> <p><i>"I think it's probably, less useful the more senior you are too? Cos you've probably developed some things of your own and it's harder to kind of.. erm, break out of those maybe" (S04)</i></p> <p>However, the doctors expressed that participants should also have some prior experience of acute patient management:</p>

		<i>"I would say, for things like...when you're dealing with patients on your own basically so A&E... or if you have any form of on calls." (S05)</i>
6.7.11.5.2.2.3	Topic D Future Roll- Out: Challenges: Researcher contact and Timeline	<p>There were mixed opinions regarding whether fixed or flexible meetings with the researcher during Stage 2 would be best;</p> <p><i>"I would find it more useful to see you, yeah I dunno once a month, once every three weeks or something" (S01)</i></p> <p><i>"Yeah, flexible's much easier...(...)...Because you don't always know, and then something else comes up and whatever and you just arrange it in your own time" (S05)</i></p> <p>One doctor considered a longer time period for future PERFORM programmes would be both beneficial <i>"just to see how, particularly if you could follow someone's journey through like from really junior and just see how they're progressing" (S01).</i></p>

Appendix 41: Self-Efficacy Score Table

Doctor code	Stage 1 simulation 1	Stage 1 simulation 2		Stage 2 Reflections					Stage 3: In situ simulation	
	SE score (overall)	SE Pre PER	SE Post PER	Pre/post PER Self-efficacy scores					SE Pre PER	SE Post PER
C01	35	-	50	58/68	60/70	50/65	80/90	30/50	Simulation	78
									Real life	65
C02	60	-	70	-					90 (no PER used)	
C03	60	-	50	50/60		70/85			50	62.5
C04	45	-	60	50/50		40/60			37.5	55
C05	70	-	85	-/80	-/10		25		25	90
C06	Real life 55	-	50	45/85		50/60		72.5	87.5	
	Simulation 80									
C07	65	-	75	70/85	40/60	40	65	70	85	
S01	50	45	60	50/65		30/60		40	65	
S02	80	60	60	70/85		80/90		50	85	
S03	95	65	90	50/65		40/95		30	100	
S04	40	45	75	45/80		25/50		50	80	
S05	70	25	60	30/65					40	70

What can medical educators learn from the Rio 2016 Olympic games?

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ABSTRACT

Medical Educators face an ongoing challenge in optimizing preparedness for practice for newly qualified doctors. Junior doctors have highlighted specific areas in which they do not feel adequately equipped to undertake their duties, including managing the acutely unwell patient. In these highly stressful, time-critical scenarios it might be assumed that a lack of knowledge underpins these feelings of apprehension from junior medics; however, having studied, trained and passed examinations to demonstrate such knowledge, perhaps other factors should be considered.

The recent Olympic Games in Rio demonstrated the impact of sport psychology techniques in allowing athletes to achieve their optimum performance in the face of adversity. The use of mental and behavioural strategies to control feelings of anxiety and low self-efficacy are pivotal for athletes to deliver their best performance under extreme pressure. We consider whether such techniques could improve the preparedness of the newest recruits to the healthcare system, and the impact this could have on patient care.

Finally, suggestions for potential research directions within this area are offered to stimulate interest amongst the research community.

The Rio 2016 Olympics allowed athletes across a range of different sports to deliver once in a lifetime individual and team Gold Medal winning performances, and demonstrated new levels of competitive expertise through setting new World Records. It seemed that such individuals and team members overcame the pressure of performing on the biggest stage and in the most stressful of environments in order to achieve their ultimate prizes. Two consistent themes across most, if not all of the interviews given by athletes in the moments after their successes centered around expert coaching and a huge amount of preparation.

Over the last decade, coaching by experts of elite athletes to improve performance has been increasingly informed by insights from the discipline of sports psychology. A major aspect of applied sports psychology involves helping athletes to mentally prepare for, and perform sporting feats under extreme pressure in the face of intense competition (Mesagno & Mullane-Grant 2010). Individuals must develop a frame of mind which is focused on persistence, resilience and perseverance whilst also managing any anxiety triggered by the situation as they prepare to compete with others around them. Just prior to a race or competition, the ability to control and regulate one's emotions in order to maintain focus and optimize performance is essential, especially with the added pressure of millions of people watching and scrutinizing one's every move.

Pre-performance routines (PPR), which have their origins in sports psychology, have long been used by expert coaches for supporting elite athletes in the control and regulation of emotions to maintain focus on the task at hand (Gallucci 2013). There are a range of PPR and these fall into two main inter-related categories which act to optimize performance through different strategies. The first category of PPRs are concerned with reducing the mental and physical components of anxiety: These include positive self-talk and mental and physical relaxation through mindful respiration and muscle relaxation, respectively. The second category of PPR aim to maintain a clear focus on the intended performance: These include mental rehearsal and visual imagery of the

performance, setting clear goals related to the essential processes in the performance and blocking distractions, especially from the surrounding environment. In relation to the Olympic games, observing the focused concentration on the faces of athletes preparing for the 100 meters sprint final readily identifies those individuals who employ PPRs prior to their efforts to deliver their best performance.

PPRs are commonplace across various skills with a defined beginning and end (“closed-skills”), such as sprinting and long-jump. However, the use of PPRs as an intervention for improving the performance of individuals engaged in open-skill team performance, where play is more dynamic and fluid, such as soccer, is increasing. Traditional methods of coaching for these skilled performances have been mainly prescriptive, with the development of deliberate practice and mastery learning for the athlete. More recently there has been a growing interest for using individually tailored approaches that enhance PPR. In particular, these approaches share a commonality which fundamentally relate to the development of metacognitive and self-regulation skills in the athlete. In many of these sports activities, both individual and team, there is now greater emphasis on developing individuals who can dynamically adapt their strategies to the evolving situation at a given point in time, (MacIntyre *et al.* 2014) thus changing a particular style of play in response to a change in momentum within the game. An example would be to develop rowers who are able to negotiate the threat from crewing in boats who sprint off soon after the start of the race, but also keep enough energy in reserve for increasing their stroke rate to fend off any late challenges by others towards the end of the race.

As medical educators interested in supporting junior doctors to enhance performance within the highly pressured environment of a busy clinical workplace, we have become increasingly interested in applying insights from sport psychology into the educational approaches used across the post-graduate curriculum. There have been concerns about the preparedness of junior doctors for real-life practice, especially in the management of the acutely ill patient (Carling 2010). Strategies are not usually addressed in junior doctors’ training to enable them to deliver their best clinical performance in the complex environment of the wards, where distractions, lack of confidence and anxieties can impact negatively on the individual’s ability to access their knowledge and skills. There are close parallels between the performance of junior doctors in acute care management and athletes engaged in competitive open skill performances. In both disciplines, individuals are required to perform at the highest level in a highly pressured environment, with a constantly evolving series of tasks but a clear ultimate goal. In both of these circumstances, whilst the individual may be a member of a team, at any given moment in time the focus and responsibility rests on the quality of the individual’s performance. Despite these similarities, we have been surprised by the little attention to given to PPR within medical education beyond simple descriptions such as the “diagnostic pause” by Atkinson *et al.* (2011), who encouraged General Practitioner trainees to take a moment to review the progress of the consultation during natural intermissions in proceedings, e.g. during hand-washing.

If PPR can enable elite athletes to achieve improved performance in highly pressured environments, can PPR also offer doctors the same benefits? This is a broad question that we are sharing with other medical educators with an intention to stimulate research in this new exciting and innovative approach to supporting medical trainees to increase their preparedness for practice, improve their clinical performance and ultimately to have an impact on their care of acutely ill patients. There are a number of potential research areas associated with how PPR have been used in sport that can be considered in the context of medical education. These include the identification of the current use of PPR in junior doctors, the use of PPR across different areas of clinical performance, the use of PPR in simulated performance compared with performance in real-life clinical situations, the contribution of metacognition and self-regulation skills in adapting PPR during an evolving clinical situation and the nature of an effective approach to the coaching of PPR.

The application of sports psychology is an exciting opportunity to afford junior doctors, and indeed other healthcare professionals, the coping strategies to empower individuals to function at their highest ability

despite external pressures. This in turn could have influential consequences on preparedness for practice and most importantly, patient care, particularly in the most acute situations.

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AMEE Guide 121: Applying Sport Psychology to Improve Clinical Performance

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ABSTRACT

Preparedness for practice has become an international theme within Medical Education: for healthcare systems to maintain their highest clinical standards, junior doctors must “hit the ground running” on beginning work. Despite demonstrating logical, structured assessment and management plans during their undergraduate examinations, many newly qualified doctors report difficulty in translating this theoretical knowledge into the real clinical environment. “Preparedness” must constitute more than the knowledge and skills acquired during medical school. Complexities of the clinical environment overwhelm some junior doctors, who acknowledge that they lack strategies to manage their anxieties, under-confidence and low self-efficacy. If uncontrolled, such negative emotions and behaviors may impede the delivery of time-critical treatment for acutely unwell patients and compound junior doctors’ self-doubt, thus impacting future patient encounters. Medical Education often seeks inspiration from other industries for potential solutions to challenges. To address “preparedness for practice,” this AMEE Guide highlights sport psychology: elite sportspeople train both physically and psychologically for their discipline. The latter promotes management of negative emotions, distractions and under-confidence, thus optimizing performance despite immense pressures of career-defining moments. Similar techniques might allow junior doctors to optimize patient care, especially within stressful situations. This AMEE Guide introduces the novel conceptual model, PERFORM, which targets the challenges faced by junior doctors on graduation. The model applies pre-performance routines from sport psychology with the self-regulatory processes of metacognition to the clinical context. This model could potentially equip junior doctors, and other healthcare professionals facing similar challenges, with strategies to optimize clinical care under the most difficult circumstances.

Practice points

- Junior doctors experience high levels of stress in the management of acutely unwell patients but current training does not address how to control the stress-related negative feelings and behaviors that can impair clinical performance.
- Performance during similar stressful situations in sport can be optimized by the use Performance Enhancing Routines, such as maintaining focus and control of anxiety.
- An innovative conceptual model (PERFORM - Performance Enhancing Routines For Optimizing Readiness using Metacognition) adapts the use of Performance Enhancing Routines from sport to improving clinical performance of junior doctors.
- The PERFORM model highlights the importance of metacognitive processes in the individual adaptation of Performance Enhancing Routines to optimize clinical performance.
- Using the PERFORM model, clinical teachers may support junior doctors to self-regulate their response to the pressures of the clinical environment and in turn optimize their clinical performance.

Introduction

The world of healthcare is complex and invokes cognitive, affective, motivational and physical pressures on individuals. Despite this, healthcare professionals must perform to the highest standard to deliver effective patient care. Our guide is motivated by experiences of supporting junior doctors in the complex real-life world

of healthcare. However, senior doctors and other healthcare professionals endure similar challenges (Suresh *et al.* 2013; Rudman *et al.* 2014), and therefore, our model is applicable to any group which may benefit from its implementation.

Sport and healthcare share many similarities: both can be busy, distraction-filled environments where optimal self-efficacy and anxiety management are integral to success (Hazell *et al.* 2014). Athletes achieve optimal performance despite these pressures using strategies such as pre-performance routines (PPRs) (Cotterill 2010). Utilizing the success of PPRs in sport, this guide outlines their transformation into performance enhancing routines (PERs) to optimize clinical performance.

This AMEE Guide presents the truly collaborative and novel conceptual model developed by medical educators and a sport psychologist. Firstly, challenges faced by junior doctors in the clinical environment and the literature regarding preparedness for practice are outlined. A short review summarizes optimization strategies used in sport before metacognition, and its current implementation in both disciplines, is described. The PERFORM model is presented, and its applicability demonstrated using clinical examples to conclude the guide.

Challenges within Healthcare

Patient safety concerns regarding suboptimal management of acutely unwell patients cite junior doctor's working patterns as a serious contributor (Massey *et al.* 2009; Quirke *et al.* 2011): both the European Working Time Directive (EWTD) and the frequency of rotations through different specialities limit doctors' clinical exposure to acutely unwell patients, thereby decreasing experiential learning opportunities (Cullinane *et al.* 2005). Shift patterns increase the frequency of handovers, allowing more opportunities for tasks to "slip through the net" and be inadvertently overlooked, especially when the urgency of the task is not adequately communicated (NPSA 2007). When out-of-hours shifts commence, decreased staff numbers create a bottleneck of outstanding tasks and despite optimum efficiency the time to attend to patients will increase. All of these factors are compounded by the complexity of patients with multiple comorbidities (Massey *et al.* 2009), and junior doctors' heavy workloads (Quirke *et al.* 2011) in an environment often lacking senior clinical support (Smith *et al.* 2013).

Healthcare as a Complex Environment

Medicine is complex, encompassing many different areas of health. The patient's history, examination findings and investigation results yield potentially hundreds of pieces of clinical data which must be analyzed to reach a working diagnosis. Medicine's dynamic nature compounds this complexity, with the ever-expanding knowledge base of diseases and their management. Comorbidities cause acute-illness presentation to be muddled by the waters of preexisting pathology, and their increasing prevalence is partly due to an ageing population (Bion and Heffner 2004), hence the time taken to manage a patient's presenting complaint in the emergency department is proportional to their age (George *et al.* 2006).

Environmental factors cannot be ignored: the increasing patient: doctor ratios in hospital (Cullinane *et al.* 2005) require medical staff to deliver patient care over more clinical environments, many of which are unfamiliar. Variations in ward layout, equipment storage and nursing staff levels (Cutler 2002) cause additional stress during patient management. Junior doctors require resilience to navigate these complex, error-prone healthcare environments (Kjeldstadli *et al.* 2006), thus acquiring strategies to control their anxieties and optimize focus may improve patient care.

Factors contributing to suboptimal care of the acutely unwell include patient complexity, clinical environments and education (Quirke *et al.* 2011). When considering targets for improvement, patient factors are difficult to control and the environment and workforce are large-scale, slow-moving variables. Education is the most

realistic target for intervention to empower healthcare staff and improve healthcare provision on the front-line.

An Unprepared Workforce

Given the complexities of healthcare, it is unsurprising that a significant proportion of medical students feel unprepared to become doctors. This global problem seems independent of organizational variables, with similar reports from the UK (Goldacre *et al.* 2014), Germany (Ochsmann *et al.* 2011) and America (Hall *et al.* 2011).

In hospitals, doctors are interrupted on average every 11 minutes, the highest interruption frequency occurring in clinical areas accommodating the most unwell patients, e.g. intensive care units (Weigl *et al.* 2011). Distractions cause adverse outcomes (Thomas *et al.* 2015) including prescribing errors (Li *et al.* 2012) and impaired procedural skills (Moorthy *et al.* 2003). Although medical students have been taught distraction handling techniques in simulation with promising results (Thomas *et al.* 2015; Ford *et al.* 2017), they have not been applied to junior doctors navigating the complexities of hospital environments.

Occupational uncertainty and under-confidence can cause stress, anger and frustration. In a survey, one-third of doctors acknowledged that stress-related symptoms affected their patient management (Firth-Cozens and Greenhalgh 1997): sixty percent of these produced lower standards of care including serious, and in two cases fatal, mistakes. There are significant consequences when stressors are not effectively managed.

Self-efficacy is a key target to decrease environmental tensions as when optimized, it increases motivation and job satisfaction (Sadri and Robertson 1993), thus lowering workplace stress (Kushnir *et al.* 2000). Self-efficacy is defined as “people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives,” determining how people “feel, think, motivate themselves and behave” (Bandura 1994, p. 71). High self-efficacy increases the likelihood for success as tasks are perceived as achievable challenges, whereas lower efficacy beliefs cause decreased efforts during difficulty, further eroding one's capability beliefs. Self-efficacy is vulnerable when commencing learning processes (Kaufman 2003) and must be optimized at the beginning of junior doctors' careers to enhance performance and decrease psychological tensions.

The literature lacks evidence of training initiatives targeting awareness and resolution of environmental stressors when managing acutely unwell patients (Church *et al.* 2016). The closest example of this is the use of “diagnostic pauses” in general practice (Atkinson *et al.* 2011), which the doctor initiates at common, scheduled moments, e.g. during hand-washing, to evaluate consultation progression. This strategy invokes metacognition to review, evaluate and implement change to reach the desired consultation outcome.

Medical students demonstrate the skills and knowledge to treat acutely unwell patients, but on graduation report feeling unable to apply these in the real-life clinical context (Tallentire *et al.* 2011). They lack strategies to manage the complexities of the clinical environment (Ford *et al.* 2017), often feeling paralyzed by stress when managing acutely ill patients (Tallentire *et al.* 2011). Such overwhelming emotion will likely reduce focus, impair clinical performance and increase errors.

Features of Competitive Sport Performance Similar to Medicine

Approaches from other industries have often been explored to address medical educational challenges, e.g. aviation (Toff 2010). However, this comparison has been scrutinized (Randell 2003), citing differences in the complexities and fluidity of the two industries (Buck 2016). Sport is a possible area from which fresh ideas could be generated due to the shared need for performance optimization in complex, unpredictable environments. Sport involves rapid fluidity in information load from one moment to the next (Gallucci 2014),

and multiple distractions through opponents' behaviors, audiences and coaches shouting from the sidelines. Compare this with the medical model of rapid patient assessment while answering pagers and being interrupted with requests to complete unrelated tasks.

Insights from Sports Psychology: Pre-Performance Routines

Sport performers contend with multiple distractions while executing complex motor skills. A common approach to enhance skill preparation is the use of PPRs. These are defined as “a sequence of task-relevant thoughts and actions which an athlete engages in systematically prior to his or her performance of a specific sports skill” (Moran 1996, p. 177). Although PPRs aim to optimize competitive performance, they are typically developed during training sessions.

The step-by-step PPR in Figure 1 highlights their bespoke nature. Specific thoughts and actions may be required for different individuals completing specific tasks (Cotterill 2015). A variety of PPRs are evident in the sport psychology literature which facilitate desirable task behaviors and, in turn, performance.

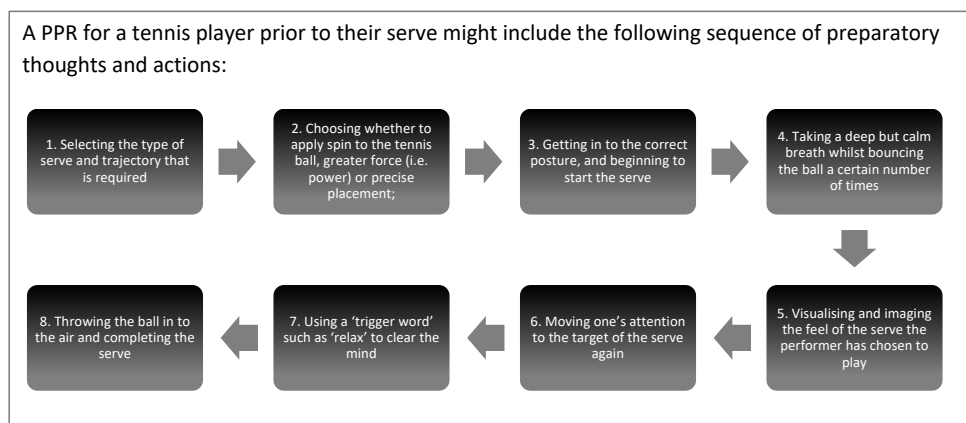


Figure 1: An example of a PPR for a tennis player immediately before their serve (adapted from Moran 2000).

Functions of Pre-Performance Routines

1) **Attentional focus and reducing distraction**

Despite multiple distractions, athletes must concentrate on the “here and now.” PPRs, such as self-talk and visualization, can prevent focus on task-irrelevant concerns (Crews and Boutcher 1986) and also direct attention away from a series of automated movements (Moran 1996) which unravels if “over-thought” (Beilock *et al.* 2002). A routine’s duration is often proportional to task difficulty (Jackson and Baker 2001), e.g. simply taking a deep breath might regain focus quickly during competition (Cotterill 2015).

2) **Regulating arousal and emotional states**

Sport performers who have developed a range of PPRs are less likely to rush the execution of a task under pressure. This “escapist” behavior results from undesirable physiological and psychological symptoms prior to skill execution and lowers success rates (Jordet 2009). A PPR applied here can redirect attention away from uncomfortable symptoms to the task at hand (Marlow *et al.* 1998).

3) **Self-efficacy beliefs and perceptions of control**

Prior to task execution, self-efficacy influences one’s interpretation of their physiological and affective state in both sport and medicine (Hanton *et al.* 2004; Cleary *et al.* 2015). Having a range of PPRs from which to select increases one’s sense of control, minimizing anxiety in pressured situations (Boutcher 1992).

Effectiveness of Pre-Performance Routines

PPRs are utilized in a wide range of discrete motor skills in sport, including golf swing or putt; a basketball free throw; and penalty shots. PPRs are predominantly used in self-paced skills which have a defined beginning and end (Cotterill 2010), but are also applicable to more complex, dynamic tasks, such as skiing, skating and dancing (for a review, see Cotterill 2010).

Successful translation of routines from discrete to complex tasks relies on the athlete's ability to self-regulate their use: learning to assess the situation, choose the most appropriate PPR, implement and evaluate its success aligns with metacognition, which has already been highlighted in recent literature regarding performance optimization in sport (MacIntyre *et al.* 2014).

Metacognition

Metacognition, or "thinking about thinking," is a psychological concept explaining how individuals monitor and regulate their cognitive efforts (Flavell 1979) and contains the facets of Metacognitive Knowledge, Experiences and Skills, which were originally described by Efklides (2008):

1. **Metacognitive knowledge** is an ever-evolving memory bank which influences the course of a cognitive task. Flavell (1979) originally described three components: person, task and strategy. Person encompasses beliefs about one's own or others' cognitive ability. Task includes analysis of available information and the perceived level of difficulty, thus inferring the likelihood of successful completion (i.e. "self-efficacy"). Metacognitive strategies are methods through which the challenge is approached.

2. **Metacognitive experiences** are those a person is aware of during a task (Efklides 2006). They include metacognitive feelings, the emotional responses surrounding a task, which can be positive, e.g. subject familiarization, or negative, e.g. task difficulty. Metacognitive judgments analyze task progression, time required for completion and likelihood of success. Metacognitive experiences are influenced by, and refine metacognitive knowledge, adding, deleting or revising its contents (Flavell 1979).

3. **Metacognitive skills** control and regulate cognitive strategies to achieve desired performance (Efklides 2008). These "executive functions" described by Brown (1987) in Efklides (2008) include:

1. Planning: appropriate strategy selection and allocation of resources for task performance.
2. Monitoring of the task requirements.
3. Evaluation of the completed task and efficiency with which it was performed, including appraising strategies that were used.

During a task, metacognition both monitors and controls. Metacognitive knowledge and experiences monitor how a task is being performed, whereas metacognitive skills implement control (Efklides 2006).

The Use of Metacognition in Sports

Metacognitive processes have been linked to effective cognitive control in elite endurance (Brick *et al.* 2015) and middle-distance (Nietfeld 2003) runners. Metacognitive skills allow application of strategies to focus, maintain motivation and monitor physiological processes to inform tactics during competition.

Applying Metacognition to Pre-Performance Routines

Effective PPR use depends on the athlete's ability to self-regulate their skills with varying task demands (Singer 1988; Moran 1996). Despite its key role in self-regulation, metacognition's contribution to PPR regulation has been largely overlooked. Research examining athletes' metacognitive processes and self-regulation in unison is in its preliminary stages (MacIntyre *et al.* 2014; Brick *et al.* 2015), and their separate examination in sport has a number of limitations regarding performance enhancement to which Medical Education can contribute.

Firstly, there are theoretical inadequacies in explaining how performers regulate their thoughts and behaviors during performance. Some PPR development models apply aspects of self-regulation theory insofar as evaluating and adjusting one's skills after execution (Singer 1988). However, a more comprehensive model underpinned by self-regulation and metacognition would provide stronger theoretical justification and a clearer guide for implementation. This has strong potential to inform clinical performance optimization and, due to its generalizability, other contexts such as postgraduate examinations or extra-curricular activities.

Future research exploring metacognition in PPR development needs to develop a model explaining how individuals regulate their use of routines. Tasks should be conceptualized as dynamic, ever-changing processes upon which the metacognitive monitoring cycle is superimposed to inform PPR implementation.

The Application of Metacognition in Medicine

Metacognitive strategies have been highlighted across many clinical and educational areas. "Diagnostic pauses" (Atkinson *et al.* 2011) are similar to PPRs in the context of closed, self-paced skills where athletes invoke their routine at a prescribed moment. What is absent from the Medical Education literature is a fluid model, applicable to more complex circumstances akin to the open skills of team-based sports and acute clinical scenarios. For clinicians, this would involve an over-arching model of awareness throughout a patient encounter, mirroring a "reflection in action" culture (Schon 1983) with monitoring, evaluation and strategies afforded by metacognition.

In secondary care, metacognition has been highlighted in educational interventions including diagnostic reasoning (Croskerry 2003) and communication (Falcone *et al.* 2014).

One American study used metacognition to teach cognitive error reduction in simulation (Bond *et al.* 2004): while this study demonstrated that metacognitive strategies can be taught, the participant's acknowledgement varied according to their experience, with increased awareness of cognitive forcing strategies by senior clinicians, and more clinically focused assertions expressed by junior participants.

Metacognition as a Future Target for Healthcare Education

The literature demonstrates an interest and willingness to adopt metacognition into Medical Education. The range of contexts in which it has been applied demonstrates the flexibility of the theory, but clear guidance on implementation of metacognitive strategies in the clinical environment is lacking. Sport psychology may offer practical advice to educationalists wishing to implement metacognitive techniques into clinical teaching.

Performance Enhancing Routines For Optimizing Readiness using Metacognition

As the literature has failed to offer solutions to the challenges faced by junior doctors when managing acutely unwell patients in the complex clinical environment, new initiatives must be generated. Our novel conceptual model, PERFORM, transforms PPRs from sport psychology into performance enhancing routines (PERs) using the regulatory processes of metacognition, which has already attracted much interest in both sport (Brick *et al.* 2015) and medicine for performance optimization. This model will become the foundation of an intervention aiming to optimize junior doctors' management of acutely unwell patients.

The PERFORM model (Figure 2) illustrates the regulation of PERs using the metacognitive facets described by Efklides (2008). Figure 3 demonstrates the contextual model where the task (central circle) is surrounded by environmental pressures (arrows) within the complex clinical environment (graduated gray background).

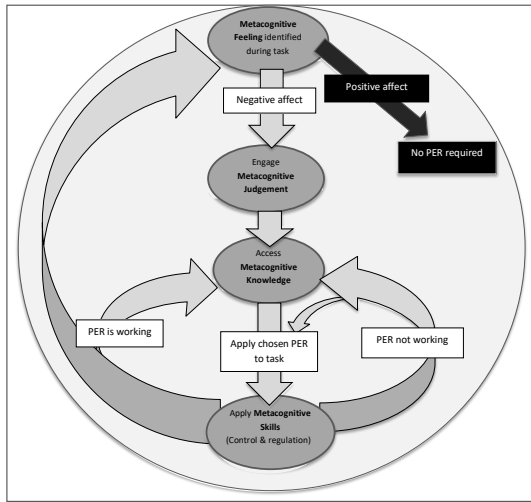


Figure 2: Conceptual PERFORM model

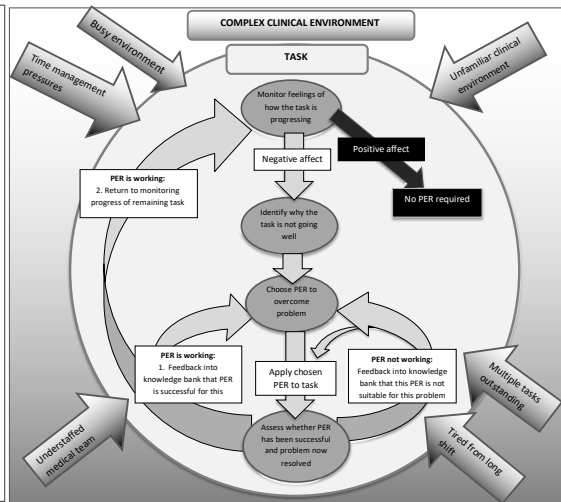


Figure 3: Contextual PERFORM model

The first step in the PERFORM model is the acknowledgement a metacognitive feeling; an affective, non-analytical instinct which can be positive or negative (Efklides 2008). Positive feelings include confidence, familiarity or “feeling of knowing,” indicating that the individual considers the task achievable. Negative metacognitive feelings include “feelings of difficulty,” which should invoke metacognitive judgments to explain why such feelings are present: these might include anxiety due to unfamiliarity, under-confidence resulting from previous failed attempts or decreased focus secondary to distractions. Once identified, a strategy (PER) can be chosen to help reduce the source of performance dysfunction. To select the most appropriate PER, the individual delves into their metacognitive knowledge, containing information regarding previous tasks and strategies (including PER). Once selected, the PER is implemented and evaluated for efficacy using their metacognitive skills.

If the PER is unsuccessful, this information is fed back into the metacognitive knowledge bank to inform and refine future strategy selection. Simultaneously, access to the metacognitive knowledge also allows an alternative PER to be selected for the current task. This cycle continues until a positive outcome, evaluated through metacognitive skills, is reached. The positive PER experience is fed into the metacognitive knowledge bank for future reference, and the individual returns to the entry point of the model, to reestablish the monitoring of metacognitive feelings for the remainder of the task.

The PERFORM Model in Action

Developing PERs for the PERFORM model (Figure 4) mirrors that of PPRs in sport (Cotterill 2011). According to sports coaches, training environments and strategies facilitate optimization of psychological readiness, or “mental toughness” (Gucciardi *et al.* 2009), and both are integral to the PERFORM model.

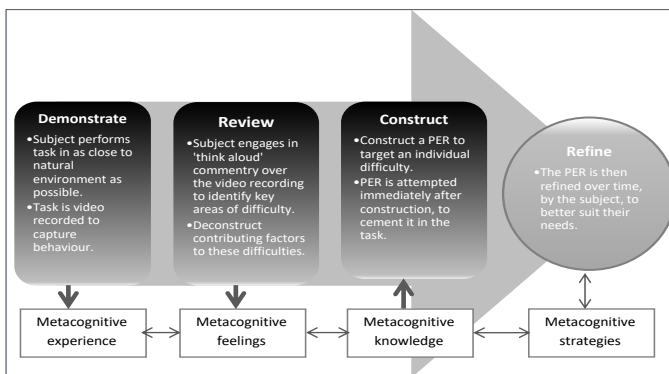


Figure 4: Developing a PER (arrows denote direction of metacognitive processes)

1) Demonstrate

Firstly, the subject is video-recorded while completing the task. This is a metacognitive experience and is used to demonstrate the individual's behaviors within the specific task; thus, the environment should be as authentic as possible (McGaghie *et al.* 2010).

2) Review

The participant and their coach review the video-recording to identify problematic emotions/behaviors within the performance. The individual drives this process, focusing on and exploring their metacognitive feelings; non-analytical, highly affective pieces of feedback highlighting discrepancies between the task progress and the expected outcome (Efklides 2011). Deconstruction of these metacognitive feelings is facilitated by the coach to increase awareness of any contributing factors, such as:

- The use of negative thoughts/self-talk
- Distractions/lack of focus on the task
- Symptoms of anxiety
- Lack of confidence or self-efficacy

3) Construct

The coach provides examples of the different PERs which best address the issues identified in the review phase. Commonly used PERs in sport psychology include:

- Positive self-talk including trigger words (Moran (2004) in Cotterill (2011))
- Visualization (De Francesco and Burke (1997) in Gallucci (2014))
- Deep breathing (Gallucci 2014, p. 271)
- Temporal consistency techniques, e.g. 5-second countdown (Mesagno and Mullane-Grant 2010)
- Centering (Nideffer and Sharpe (1993) in Gallucci (2014))

Alternatively, the individual might offer their own strategy, which should be encouraged. Once agreed, the PER is put into practice immediately with a repeated task of similar difficulty to the initial one. This "trial run" marks the PER's initial integration into the individual's metacognitive knowledge bank.

4) Refine

Practicing the PER both optimizes its physical mechanism and refines decision-making skills regarding when to implement it. Each individual will undertake a unique refinement cycle, which will vary in length and conclude in the PER being perfected and eventually, automatic. Thus, the metacognitive strategy (PER) is embedded into the individual's subconscious stream, undetectably optimizing their performance within more contexts than solely the original task.

PERFORM: Readiness for practice

Psychological "readiness" peaks during the competition stage of the training cycle. This infers that readiness is suboptimal before the start of the competition phase and is enhanced during competition. Thus, the PERFORM model introduces the metacognitive processes which contribute to psychological readiness, but these skills must be honed through real-life experiences (Figure 5).

Scenario 1 - A junior doctor does not use PER

A junior doctor is approached by one of the nurses on the ward, who asks her to gain intra-venous access on a patient. This patient is awaiting an urgent CT scan and requires a cannula to enable the radiographers to administer contrast. The patient cannot attend the radiology suite until they have a cannula in place, and the porters are already on the ward, waiting to take the patient for his scan. The junior doctor feels a sense of dread at this task; having had multiple failed attempts at cannulation on a different patient earlier in the day. She also remembers that the cannula must be of a wide-gauge, which is more difficult to insert than smaller-gauge cannula, to enable intra-venous contrast to be administered. The doctor looks around the ward to see if any of the other doctors on her team are available to help her, hopeful that she can avoid the task altogether. Unfortunately for her, they are not immediately available, and negative thoughts of failing the cannulation, wasting the time of the nurse and porters, and the patient missing the scan and potentially delaying necessary surgery, begin to taunt her. She feels pressured, under-confident and has low self-efficacy of achieving this important task, which will have direct consequences on patient care.

This scenario will likely feel very familiar to many junior doctors.

Scenario 2 – A junior doctor uses PPR.

On a different ward, a junior doctor receives a request from one of the nurses to gain intra-venous access on a patient awaiting an urgent contrast-CT scan. The doctor sees the porters approaching the ward and realises that she must insert a cannula efficiently to avoid the patient missing their scan. Earlier in the day, the junior doctor had been unsuccessful in cannulating a different patient, and had needed senior help. Briefly, she is reminded of this failure, and recognises the negative thoughts clouding her concentration. As she makes her way to the equipment cupboard to gather the necessary items for cannulation, she uses her PPR of taking a slow, deep breath whilst reciting an instructional self-talk to recall the steps involved in this task; "If I follow the key steps then everything will go to plan". Whilst doing this, she is not only able to gather all necessary equipment without forgetting anything, but also distracts herself from the feelings of low self-efficacy and anxiety that were entering her mind before. Focussed on the task, she enters the patient's side-room without the distractions of previous failed attempts, but approaches the task by talking through the steps in her head.

The junior doctor here still feels the pressure of the situation due to the sense of urgency regarding the patient attending their scan, but she is able to better manage her self-efficacy beliefs and block-out negative thoughts and free-up attentional focus for the task at hand.

Figure 5: Worked examples of use of PER in Clinical Scenarios

Summary

This collaborative AMEE Guide introduced the PERFORM model, where performance enhancing routines (PERs) can be utilized by sport coaches and medical educators alike: we discussed the similarities between medicine and sport, and their respective interests in metacognition. A summary of PPRs in sports then led to our conceptual model. The reader is encouraged to use PERFORM for their own educational endeavors, in the hope that this novel collaborative approach successfully optimizes performance in whichever context it is applied to.

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