Safety, Appropriateness and Acceptability of Ambulance Telephone Advice: A mixed methods study

A thesis submitted in partial fulfilment of the degree of PhD

Joanne Coster

School of Health and Related Research

PhD

Jan 2022.

Supervisors:

Jon Nicholl: Professor of Health Services Research

Alicia O'Cathain: Professor of Health Services Research

Student registration number 110251295

Abstract

Background

High demand for ambulance care has led to changes in service provision, with calls identified as low urgency increasingly being dealt with by telephone advice. This study uses linked routine health data and interviews with ambulance service staff to explore the safety, appropriateness and acceptability of telephone advice.

Methods

A mixed-method approach comprising of systematic reviews, analysis of routine linked data and qualitative interviews was used. Definitions of safety, appropriateness and acceptability were developed from a narrative review of concepts and definitions, and evidence around telephone advice was synthesised using a systematic review. Ambulance service call and telephone advice data for 2521 patients was linked with other health-service data and subsequent health contacts and outcomes were identified within 3 days of the ambulance call. Semi-structured interviews were undertaken with staff involved in the telephone advice process.

Results

Linked data analysis identified no subsequent health contacts (Emergency department/Hospital admission/death) for 60% (n=1485/2521) of patients. Sensitivity analyses identified low subsequent event rates for hospital admissions (2.5%–10.5%) and deaths (0.06%–0.24%), and higher rates for ambulance recontacts (7.6%–32.2%) and emergency department attendances (6.2%–26.4%). Service provider interviews identified safety mechanisms at service, team and individual levels that enhance safety, but described potential gaps in service safety relating to under-triage, long waits for a clinical call back and concerns about the triage Concerns Process. Interviewees perceived telephone advice as mostly appropriate but identified mental health calls as particularly challenging. Interviewees described mixed service user reactions to telephone advice and perceived user acceptability was linked to expectations around receiving an ambulance, whether the caller is reassured and length of time to receive a clinical call back.

Conclusion

Telephone advice in EMAS is likely to be safe and appropriate; most patients do not have subsequent health events, multiple methods are used by ambulance services to ensure safety at a service, team and individual level and staff perceive telephone advice was mostly a safe and appropriate way of handling lower urgency calls. However, mental health calls were perceived as challenging and best handled by specialist mental health clinicians. Service providers perceived mixed service user reactions to telephone advice and linked user acceptability to expectations around receiving an ambulance, the caller's need for reassurance, and the length of time to receive telephone advice.

Acknowledgements

I've been lucky to have the support of some wonderful colleagues, ambulance staff, family and friends. Huge thanks and appreciation go to:

My supervisors, Jon Nicholl and Alicia O'Cathain, who have been a source of constant encouragement, and support. Whenever I lacked confidence or doubted myself, they gave me the boost I needed to carry on. Their guidance has been invaluable and I feel very lucky to have been supported by some of the best in the business.

Janette Turner for being an all-round mentor, line manager, friend and general cheerleader and for trying her hardest to give me some study leave (even though hybrid lockdown home school and study leave wasn't quite what she had in mind!).

East Midlands Ambulance Service, especially Niro Siriwardena, Rob Spaight and Louise Shaw, for their help in making the study possible.

Members of the Sheffield Emergency Care Forum for the time and effort they gave to help me to develop the user survey. Whilst the survey didn't get used due to Covid 19, their feedback was useful groundwork for other parts of the study and their help was very much appreciated.

All of the ambulance staff that gave their time to help with the research, through helping to recruit interview participants or by taking part in the interviews. Your support in this, during lockdown and winter pressures, has been amazing and I am so thankful to all who took part.

My work buddies and support group, Maxine Johnson, Fiona Sampson, Sarah Crede and Emma Knowles! Especially since we've been working from home, our WhatsApp group has helped to keep me sane. Special thanks to Fiona for reading through the interview transcripts and discussing interview themes.

All of the colleagues in ScHARR who gave me words of advice, encouragement, cake or helped me along the way.

To all my family and friends who've had to put up with my absence while I do a PhD in my spare time! I've missed you all and am really looking forward to seeing you all again.

To my mum, aka Granny Jilly, for always believing in me and for putting in extra grandparent shifts to help me get it done!

To Steve, who would have been so proud!

To my children, who have had to put up with mummy always working. I have finally finished my PTSD!

Last but not least to my husband Matt, who has been my rock and bringer of cups of tea throughout this experience. I really couldn't have done it without you!

Joanne Coster

May 2021

List of Abbreviations

A&E	Accident and Emergency
AMPDS	Advanced Medical Priority Dispatch System
APC	Admitted patient care
CAD	Computer Aided Dispatch
CINAHL	Cumulative Index to Nursing and Allied Health Literature
ED	Emergency Department
EMAS	East Midlands Ambulance Service
EMS	Emergency Medical Service
EOC	Emergency Operations Centre
ePRF	electronic Patient Report Form
GP	General Practitioner
HES	Hospital Episode statistics
ONS	Office for National Statistics
OOH	Out-of-hours
PhOEBE	Prehospital Outcomes for Evidence Based Evaluation study
PPI	Patient and public involvement
RCT	Randomised Controlled Trial
SOE	Sequence of Event
STROBE	STrengthening the Reporting of OBservational studies in Epidemiology
UEC	Urgent and emergency care
VAN	Variation in Ambulance Non-conveyance study
AOC	Alicia O'Cathain – second PhD supervisor
JN	Jon Nicholl – primary PhD supervisor
HRA	Health Research Authority
NHS	National Health Service
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analyses
ScHARR	School of Health and Related Research
SECF	Sheffield Emergency Care Forum (PPI Group)
IOM	Institute of Medicine
OECD	Organisation for Economic Co-operation and Development
CQC	Care Quality Commission

Glossary

AMPDS	This is the call triage system used by some ambulance services in England, and also internationally. AMPDS is used by the Call Taker to identify the type of health problem, the urgency of the health problem and the type of ambulance response that is needed.
Call Taker	This term is used in this thesis to describe the non-clinical ambulance staff who answer and triage the 999 call. Call Takers use triage software, such as AMPDS, to assess the call and determine the type of ambulance response. Call Takers can also be referred to as Call Handlers or Emergency Medical Dispatchers' (EMDs).
Clinical Advisor	Clinical staff (usually nurses and paramedics) who are based in the EOC. When a call is triaged by the Call Taker as suitable for telephone advice, these calls are sent through to the Clinical Advisor. The Clinical Advisor offers advice over the telephone. This may be to attend the Emergency Department (ED), seek GP or out of hours care, or advice to self-care. The Clinical Advisor will also use their clinical knowledge to identify calls that require an ambulance response and they will send these calls to the ambulance dispatch queue.
Emergency Operations Centre (EOC)	This is the physical location and facility in which the Call Takers (who take and triage the ambulance call) and the Clinical Advisors (who offer telephone advice) are based.
Hear and treat	This is a term used primarily in England to indicate that a call receives telephone advice from a Clinical Advisor. In this thesis, the term telephone advice or clinical telephone advice is used so that the thesis has more international relevance.
NHS 111	A national free to use telephone-based service that is available to the public in and out of hours, each day of the year. NHS 111 offers advice for urgent care health problems.
NHS Digital	NHS Digital is a national information repository for health and health care system information that collects, analyses and reports health care information. As part of their role they collate and link information from multiple health care services relating to patients and their use of services. NHS Digital datasets can be used for research purposes, where the need is clear and the appropriate data security and information governance is in place.
Telephone advice	Telephone advice, or similar terms, such as telephone advice only, clinical telephone advice, ambulance telephone advice, are alternative terms for 'hear and treat'. Telephone advice refers to the calls sent to the Clinical Advisors and that are closed with advice and without an ambulance being dispatched.
Urgent and Emergency Care (UEC) system	The UEC system is a collective term to describe the different services that people can use for urgent and emergency health problems. There may be some local variation to the services that are available, but in England these usually consist of ambulance services; NHS 111; Urgent Care Centres; Walk-in-Centres; GP; and Minor Injury Units.

List of Figures

List of Tables

Contents

1 Introduction

1.1. Background

1.1.1. *Rising demand for ambulance service care*

Rising demand for ambulance services is a cause of concern internationally (Toloo et al. 2013; Larkin et al 2006). In England, demand for emergency ambulance services has increased year on year for over 20 years (Turner, 2017). The number of ambulance service calls per year now stands at approximately 11 million calls, rising from 4 million in 1994/95 and with a sustained 6.5% rise in calls per year for the last five years (Carter 2018; NHS England Ambulance Quality Indicators Dataset). In Australia, a recent study identified that ambulance service demand is exceeding population growth, with demand rising by 29.2% over an eight-year time period (Andrew et al. 2019). Similar rises in demand for ambulance service care have been identified in the US, Canada and Japan (Larkin et al. 2006; Pasma et al. 2020; Kawakami et al. 2007). Rapid, continual increases in demand for ambulance service care can result in negative consequences for service users and service providers, including longer waiting times and overstretched and pressured services (Turner 2017; Coster 2017). This can put the safety of patients at risk and impede the ability of the ambulance service to make a timely response to life-threatening emergencies (Care Quality Commission 2018). With an associated average cost in excess of £200 per face-to-face ambulance response, rising demand for ambulance service care also has a serious impact on the costs of providing a service. (Carter 2018).

1.1.2. *Use of ambulance services for low urgency health problems*

The Ambulance services in England serve a diverse population and receives a wide range of calls about all types of conditions and health problems. Whilst demand for ambulance services has increased, only 10% of calls are thought to be for life-threatening emergencies (Turner et al. 2017; Department of Health, 2009). Internationally, there are concerns that clinically unnecessary service demand, whereby patients seek high urgency care for low urgency health problems, is driving some of the rise in demand (Kawakami et al. 2007; Dejean et al.2016; Snooks et al.1998). Published literature suggests there is potential for a high proportion (between 10-60%) of people who seek urgent and emergency (UEC) care to be treated and better managed through lower urgency health services (Becker et al. 2012; Penson et al. 2012). Given that a high proportion of calls are for non-life-threatening low urgency health problems, a blue light response is therefore not always the most cost effective or clinically appropriate option (Ambulance Service Network 2008) and different, better responses can be given to calls based on the triage urgency of the call (Turner et al. 2017).

1.1.3. *The ambulance service in England and types of call responses*

The Ambulance services in England consists of 11 regional ambulance services. Ten of these are mainland services and they respond to over 99% of all calls. Whilst some calls to the ambulance service are made by health professionals or are calls passed by the NHS 111 service, most ambulance calls are made by patients or members of the public on a patient's behalf. Due to the sustained rise in call volume and demand for ambulance service care, ambulance services have seen increased pressure on the finite resources that they have to deliver care. The traditional view of the ambulance service is of an emergency ambulance conveying a patient to hospital, but the broadening scope of call urgency and types of health problems that the ambulance service now deals with means that policy makers and ambulance services have developed different types of response that are commensurate with the urgency of the call that is made. There are three main types of response: i) an ambulance is dispatched to the patient and patients are conveyed to hospital via ambulance; ii) an ambulance is dispatched to the patient and patients are treated and discharged at the scene of the incident; iii) an ambulance is not dispatched and instead patients receive a call back from a clinician

(usually a nurse or a paramedic) and receive clinical advice over the telephone. Clinical telephone advice can result in the call being closed with advice and no ambulance being sent or in the call being sent back to the dispatch team for an ambulance to be sent.

1.1.4. *Ambulance Quality Indicators*

Ambulance services are monitored by quality indicators (AQIs) and Clinical Quality Indicators (CQIs) that relate to the timeliness of the ambulance response, specific clinical conditions, patient outcomes and patient safety; the statistics for which are published on a monthly basis by NHS England (NHS England Ambulance Quality Indicators Dataset). Most relate to the most urgent types of response that the ambulance service has traditionally given, where patients with very urgent or life-threatening conditions are conveyed to hospital or a specialist treatment centre. However, a small number of the AQIs are concerned with non-conveyance responses for less seriously ill patients, including one AQI which measures the proportion of calls that are resolved with telephone advice (defined as calls resolved with a telephone response) (NHS England Ambulance Quality Indicators Dataset). The inclusion of non-conveyance and telephone responses in the AQIs is indicative of the important role that these types of ambulance response now play in managing ambulance calls, demand and resources.

1.1.5. *Growth of telephone advice*

Coinciding with and due in part to the increase in mobile telephony over the last twenty years, there has been a growth in the number and type of telephone health advice services (e.g. GP urgent care, ambulance, in hours services and out of hours services), both in the UK and internationally (Bunn et al. 2009). In 2005, the report Taking Healthcare to the Patient formally outlined telephone advice, sometimes referred to as *'hear and treat'* in UK health services, as a type of ambulance response, and the report states that more calls could be appropriately dealt with by telephone advice (Department of Health 2005). The follow up report, Taking Healthcare to the Patient 2 in 2011, observed a significant increase in the number of calls referred for telephone advice in the intervening period (Department of Health 2011). However, the increase was not consistent across ambulance service trusts, with variation in the proportion of calls referred for telephone advice (range 3.5%- 10.5%) (NHS Digital, 2013). The most recent AQI data from March 2021 reports a further increase in the proportion of calls closed with telephone advice, with an average 8.3% calls closed with advice, (ranging from 4.3% to 11.9% across the different English ambulance services) (Ambulance Quality Indicator Dataset).

1.1.6. *Ambulance telephone advice*

Ambulance services describe the different types of responses they provide on their websites. This description of the ambulance telephone advice process is taken from the East Midlands Ambulance Service (EMAS) website, but other ambulance services have similar descriptions (East Midlands Ambulance Service https://www.emas.nhs.uk/your-service/999/).

> *"In many cases, such as non-life-threatening situations, a 'blue light' emergency response from an ambulance is not needed. However, our control team can arrange for a paramedic or nurse triage advisor to call you back. They will carry out a full assessment of the patient's condition over the phone and then advise the best treatment, such as being cared for at home, being referred to a GP, pharmacy or community-based care service."*

1.1.7. *Ambulance staff involved in the telephone advice process*

Key ambulance staff roles in the call triage and telephone advice process are the Call Taker, who is the first point of contact when a caller contacts the ambulance service and who triages the call, and

Clinical Advisors, who are clinical staff, usually nurses or paramedics, who provide clinical advice over the telephone to calls triaged by the Call Taker as low urgency. More recently, a small number of specialist clinical staff have been added to some Clinical Advice Teams, such as midwives, mental health nurses and General Practitioners (GPs).

1.1.8. *Call triage process*

Most calls to the ambulance service are triaged by a Call Taker using triage software. There are two triage systems approved for use by English Ambulance services; Advanced Medical Priority Dispatch System (AMPDS) and NHS Pathways. Different ambulance services use different triage systems, with some using AMPDS and some using NHS Pathways. Six of the ten main English ambulances services use AMPDS triage system and four use NHS Pathways. Both AMPDS and NHS Pathways are well-established ambulance call triage systems in England. AMPDS is used internationally, including in the US and Canada, whereas NHS Pathways is specific to this country. Differences in triage software may result in differences in how calls are handled. In calls to the English ambulance service that are triaged by a Call Taker to receive telephone advice from a Clinical Advisor, the call is placed in a call queue that the Clinical Advice Team can access and respond to and a Clinical Advisor will contact the patient by telephone (NHS England 2018). A small proportion of calls may be passed directly from the Call Taker to the Clinical Advisor, if the Clinical Advisor is free to take the call. As part of the national standards developed as part of the Ambulance Response Programme (ARP), Clinical Advisors aim to call within 180 minutes of the call triage in 9 out of 10 cases (Nuffield Trust 2020). Long waits for clinical advice are classed as those waiting over four hours for a Clinical Advisor to call back.

1.1.9. *Which calls receive ambulance telephone advice?*

Telephone advice is provided to calls that are triaged as having low acuity, non-life-threatening health problems. Most of these calls come under the category 4 triage classification, which is defined as "not urgent but needs assessment (face to face or telephone) and possibly transport within a clinically appropriate timeframe" (NHS England 2018). There can be local variation in the types of calls that are triaged to receive telephone advice due to local policies around calls closed by the Call Taker (sometimes termed *'no sends'*). The type of triage software used may also impact on the number and type of calls triaged to receive a clinical call back and those that are closed by the Call Taker.

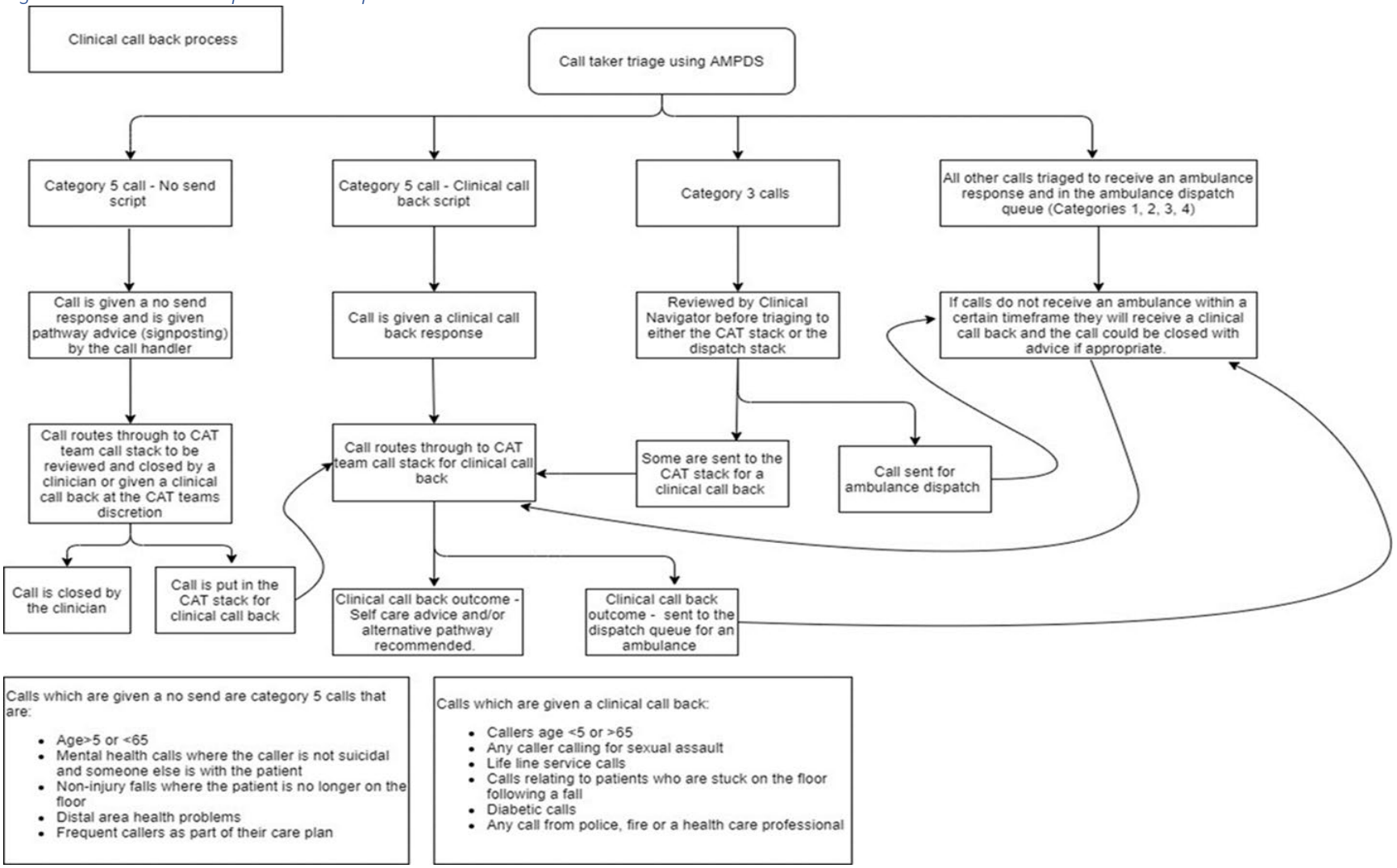
1.1.10. *Telephone advice call outcome*

Clinical Advisors may refer the patient to alternative health care services, such as a GP, community services or NHS 111, they may advise them to make their own way to the ED or they may close the call with self-care advice. Clinical advice can differ by locality, depending on the local services that are available, and also by time of day and day of week, due to the unavailability of some services out-of-hours (OOH). Some calls are referred back for an ambulance response following the discussion with the clinician.

1.1.11. *Ambulance telephone advice process*

The call triage process was mapped out as part of this PhD research, through analysis of the literature and through interviews with ambulance service staff involved in the telephone advice process. Whilst this information is part of the findings of this PhD study, it is also useful to include this information earlier in the PhD, so that the reader has a clear and full understanding of the ambulance telephone advice process. Therefore, the flow chart mapping the ambulance telephone advice process is included here but is also part of the qualitative interview results section (chapter 6).

Figure 1 Ambulance telephone advice process



1.1.12. *Benefits of ambulance telephone advice*

Advice by telephone is an important component of NHS England policy and the Urgent and Emergency Care (UEC) system whereby people with an urgent care problem have their health needs met as close to home as possible (Keogh Review 2013). Whilst NHS 111 is promoted as the main point of care from which to seek urgent care advice, there will always be some calls to the ambulance service that are low urgency, particularly given the acknowledged confusion patients experience when attempting to determine which service to use or in navigating the UEC system (Keogh Review 2013). Telephone advice provides a mechanism to deal with lower urgency ambulance calls and is used both as a demand management tool and to ensure patients receive the most appropriate response for their clinical need. Purported benefits of telephone advice are: more efficient use of resources; reducing pressure and demand on over-burdened services through a reduction in ambulance journeys and more ambulances available to quickly respond to patients with life-threatening emergencies (O'Cathain et al. 2018; Turner et al 2006), In addition, providing patients with a quicker and potentially more appropriate health care through referring to alternative, more appropriate pathways or by closing the call with self-care advice (Department of Health 2011; (Ambulance Service Network 2008). NHS England has identified scope for further increases in the proportion of calls closed with ambulance telephone advice. Figure 1 shows NHS England policy in relation to identifying opportunities where health care needs could be met closer to home (Keogh Review NHS England 2013). These include increasing the number of ambulance service calls resolved with clinical telephone advice.

Figure 2: Opportunities for meeting people's urgent and emergency needs closer to home (Keogh Review NHS England 2013)

1.1.13. *What is known about ambulance telephone advice?*

Whilst there is a lot of evidence about clinical telephone advice in primary care and OOH urgent settings, the evidence base around ambulance telephone advice is more limited, with much of the evidence classed as poor quality (Fisher et al. 2015).

1.1.14. *Systematic reviews*

A systematic review published in 2015 by Fisher and colleagues had a broad focus on reporting evidence about the safety of all types of ambulance non-conveyance. This review identified some evidence of the feasibility of ambulance telephone advice but found little evidence on other dimensions of care quality, such as clinical safety (Fisher et al. 2015). Where outcome measures were used to report on other dimensions of quality, such as safety, acceptability and effectiveness, the review raised concerns about the use of inconsistent definitions and outcome measurement, which made cross study comparisons of limited value. A systematic review of the evidence relating specifically to ambulance telephone advice was undertaken by Eastwood and colleagues and published in 2015 (Eastwood et al. 2015). This review identified a small number of studies (7 papers from 6 studies) relating to ambulance telephone advice and concluded that ambulance telephone advice is mostly safe. The studies included in the review were published between 1981 and 2012 and five of the included studies were published before 2007, highlighting the lack of current evidence. In terms of study quality, no studies included in the Eastwood review defined safety, appropriateness and acceptability and few reported outcomes in the same way, making it difficult to compare the findings across different studies. This has also been identified as a limitation in a systematic review of telephone advice in out-of-hours (OOH) settings (Blank 2012).

1.1.15. *Routine data*

Routinely available data about ambulance telephone advice in English ambulance services suggests that approximately 8% of patients who receive telephone advice re-contact the ambulance service within 24 hours, but that recontact rates can vary by ambulance service (ranging from 5%– 15%) (O'Cathain et al. 2018; O'Hara et al. 2019; NHS England Ambulance Quality Indicator Data Set). Analysis of routine ambulance data as part of the Variation in Ambulance Non-conveyance (VAN) study found that some types of calls had more recontacts. For example, calls relating to older people had higher rates of recontact (>12%). Similarly, recontact rates were higher in rural areas than in urban areas (11.3% versus 8.6%). It can be argued that increased rates of recontacts suggest that telephone advice is not always appropriate or acceptable to service users, or that it may not resolve the patient's health problem (NHS England 2013). In urgent care settings, under-triage (where the urgency of the patient's condition is underestimated) of more serious problems has been highlighted as a concern with urgent care telephone advice systems (Geisen 2011) and high rates of ambulance recontacts after receiving telephone advice could be indicative of under triage. The number of calls received by ambulance services relating to conditions and problems that are best dealt with by primary care and community services are also rising, with increases in calls relating to mental health and social needs (NHS England 2017b). Reasons for the rise in these types of calls are poorly understood as they relate to complex issues. However, due to call triage being based on the urgency of physical health problems, many of these calls will receive a telephone advice response from the ambulance service and it may be difficult to fully resolve these types of complex calls over the telephone.

1.1.16. *The need for additional research*

The review by Fisher et al highlights that much of the early research around ambulance telephone advice related to establishing its feasibility, rather than considering safety or appropriateness. The review by Eastwood identified some important findings around safety, appropriateness and service

user satisfaction (Eastwood et al. 2015). However, given the timings of the review and of the included publications, a more up-to-date synthesis of the evidence around ambulance telephone advice is needed as there has been substantial growth and increased prominence of telephone advice since the review by Eastwood was published. Little research has been identified relating to service user views of the safety and appropriateness and acceptability of ambulance telephone advice. Systematic reviews and studies of service user views of telephone advice focus primarily on urgent care settings rather than the ambulance service (Bunn 2009) and give little insight into service user views of the safety, appropriateness and acceptability of ambulance telephone advice. Therefore, an up-to-date systematic review of these issues is needed both to address the issues identified in earlier research and from routine data and also to update the evidence based with the most current evidence. A systematic review of ambulance telephone advice was therefore undertaken as part of this PhD research study and is reported in Chapter 2 of this thesis.

1.1.17. *Measuring the quality of health services*

When evaluating the quality of health services, researchers usually focus on established dimensions of quality, such as those in the Donabedian structure-process-outcome framework (Donabedian 1966) or the six dimensions of quality identified by Maxwell (Access, relevance, effectiveness, equity, acceptability and efficiency) (Maxwell 1984). Much of the previous evaluations of ambulance telephone advice has been limited due to lack of access to information or poor data linkage capability, meaning ambulances services do not routinely know what happens to patients after they are discharged from ambulance service care (Turner et al. 2019). The consequence of this is that ambulance services have been unable to accurately measure many aspects of service quality (Turner et al. 2019). This lack of access to information has been partly responsible for the focus the ambulance service has had on response time and other time-based performance measures, which are recognised as limited in scope, inadequate for measuring many aspects of ambulance service performance and quality, and not reflective of the range of services and responses that ambulance services provide and the range of patients and urgency of conditions that ambulance services now manage (Pons et al. 2005).

Data and information about English ambulance services is slowly improving and advances in methods for linking information from different parts of the health system means there is scope for evaluating existing services in new ways and to incorporate wider perspectives and more dimensions of quality. Furthermore, the AQIs now include process and clinical system indicators and there are several studies that have linked ambulance data to other health data (Turner 2019; Clarke 2019). However, previous research and the AQIs mainly focus on specific high urgency clinical conditions, such as stroke or cardiac arrest (Pickering et al. 2009; Department of Health Ambulance Quality Indicators) and data linkage often focuses on patients who receive a face-to-face ambulance response or who are conveyed to the ED, due to better quality data for these patients and the resultant ease of data linkage. This means that measurement of ambulance service quality and performance is primarily undertaken for patients with life-threatening or more serious health problems and that for patients who have low urgency health problems, measures and measurement of quality and performance are more limited (Pickering 2009; Coster 2018). Other than measuring and reporting the "Proportion of calls closed with telephone advice or managed without transport to A and E where clinically appropriate" as a system indicator, there are no established measures, outcomes, or quality indicators for ambulance telephone advice and there is little consensus about what should be measured for this group of service users. Consistently defined outcomes are required to improve the quality and comparability of research in this area. For example, in terms of what constitutes a successful 'hear and treat', this could be measured in multiple ways, such as identifying subsequent

ambulance recontacts or identifying subsequent UEC health system contacts. However, the data systems are not in place to facilitate this level of reporting in a timely way.

Several significant issues and gaps in the evidence base have been identified which have not been fully addressed relating to calls to the ambulance service that are closed with clinical telephone advice. It is not possible to fully address all of these gaps within this thesis, therefore the focus is defining and evaluating three areas of ambulance telephone advice for which there is poor understanding. These are the safety, appropriateness and acceptability of ambulance telephone advice.

1.2. Aims and objectives

This thesis aims to explore whether ambulance telephone advice is safe, appropriate and acceptable from an ambulance service and system perspective.

The specific objectives are:

1) To develop definitions for safety, appropriateness, and acceptability in the context of ambulance telephone advice, through reviewing and synthesising ambulance policy documents and research studies
2) To review and synthesise the urgent and emergency care evidence base in relation to telephone advice, with a specific focus on the ambulance service and the outcomes of safety, appropriateness and acceptability
3) To use routine ambulance data to describe which calls receive telephone advice and the clinical advice they are given
4) To use routine data to explore the safety and appropriateness of ambulance telephone advice by identifying what health services patients contact after receiving clinical advice from the ambulance service
5) To explore the views of service providers on the safety, appropriateness and acceptability of telephone advice

1.3. Researcher perspective

I am a social scientist and a health services researcher and have no clinical training or experience of working in the ambulance service. There are advantages and disadvantages to my background when undertaking this research study. Despite not having a clinical background, I have a good understanding of health services and systems from my previous experience of undertaking research as a health service researcher. In terms of working knowledge of the service being evaluated, someone who is working in the ambulance service may bring a depth of understanding, but they may also make assumptions rather than explore and ask questions. It could be argued that someone who is outside of the service and who holds less knowledge may probe more in their enquiry due to holding less assumptions.

1.4. Impact of my previous research experience on this PhD

Chapter 3 of this thesis describes in more detail the justification for the research methods used in this research. However, it is relevant to understand how my experiences as a researcher have influenced my choice of research methods and my approach to data interpretation and analysis. My previous research has mainly related to the evaluation of health services and health policy and this required a very practical approach that could be easily understood by multiple users of research and health services, including patients and the public. I see it as a natural progression of my development as a researcher that the research undertaken as part of my PhD builds on my previous research

experience. In my research projects I have used both qualitative methods such as semi-structured interviews, focus groups and consensus methods, and quantitative methods such as statistical analysis of surveys and routine data. Many of the research studies I have worked on have used a mixed methods approach. My approach to research inquiry is to apply the most appropriate methods in addressing a research question and this is most closely related to the pragmatist philosophy, which is described by Dewey in 1920 as "what works" (Dewey 2008), and by Creswell in 2007 who states that researchers are "free to choose the methods, techniques, and procedures of research that best meet their needs and purpose" (Creswell et al. 2007 p.7) Therefore, I have adopted a pragmatic mixed methods approach to data collection, data analysis and interpretation.

1.5. Research scope

1.5.1. *Telephone triage vs telephone advice*

The terms telephone triage and telephone advice are often used interchangeably in published literature but can have different meanings. Therefore, it is important to clarify the meaning of these terms as they are used this thesis. The term telephone triage is sometimes used as an umbrella term to describe 'telephone services which provide health advice to callers' (Vecellio et al. 2012). Whereas another definition of telephone triage is put forward by Coleman et al as "prioritising clients' health problems according to their urgency, and advising clients and making safe, effective and appropriate decisions, all by telephone" (Coleman 1997).

The definition by Coleman describes two different processes and it is important to differentiate between the two processes because in the ambulance service these processes are handled by different care teams and relate to different elements of the call. The first of these processes is when the call is triaged by the Call Taker (the non-clinical Call Taker who answers the 999 call) to receive clinical advice over the telephone. This relates to the first part of Coleman's definition about prioritising health problems by urgency (Coleman 1997). This initial prioritisation process is sometimes referred to as primary triage in the ambulance service (Vecellio et al. 2012). The second process is when a Clinical Advisor (nurse or a paramedic) provides clinical assessment and advice over the telephone and advises am alternative care pathway or is given advice to self-care. This relates to the second part of Coleman's definition about advising patients and making safe, effective and appropriate decisions. This is sometimes referred to as secondary triage or hear and treat in the ambulance service (Vecellio et al 2012; Eastwood et al. 2015; Department of Health 2005).

This research explores the second process described in Coleman's definition and seeks to explore the safety, appropriateness and acceptability of ambulance telephone advice (secondary triage/hear and treat process). It does not assess or investigate the primary triage process.

Therefore, within this thesis, the terms 'telephone triage' or 'primary triage' refers to the triage process of determining that a call is low urgency and its referral for telephone advice. The terms 'telephone advice', 'clinical telephone advice', 'ambulance telephone advice', 'hear and treat' and 'secondary triage' refer to the clinical telephone consultation with the Clinical Advisors and the care advice and recommendations given by the Clinical Advisor.

1.5.2. *Changes to the research scope during the research process*

In my original proposal I planned to undertake a user survey to explore service user views of the safety, appropriateness and acceptability of ambulance telephone advice. Due to the impact of Covid-19, this was no longer possible, and I had to quickly develop an alternative method of exploring the safety, appropriateness and acceptability from a stakeholder perspective. Working with East Midlands Ambulance Service research department to develop a feasible research proposal that could be

undertaken during Covid-19, I developed a new component of research which used interviews with staff involved in the telephone advice process to explore their views of safety, appropriateness and service provider perceptions of service user acceptability. Whilst this does not obtain service user views of acceptability first-hand, it does allow the exploration of acceptability from a service provider perspective and service provider experiences of the reactions that service users have to telephone advice. Therefore, acceptability in this PhD relates to service provider perceptions of service user acceptability. The limitations of this approach are discussed in the interview chapter (Chapter 6) and the main discussion (Chapter 8)

1.5.3. *Cost effectiveness*

The outcomes explored in this study are safety, appropriateness and acceptability. There are many different outcome measures that could have been explored in this thesis and it was not possible to include them all. Whilst the importance of cost-effectiveness is recognised, establishing the safety, appropriateness and acceptability of a service was considered of primary importance, with cost-effectiveness considered as more relevant if a service is established as safe, appropriate and acceptable. Some preliminary costing work relating to all types of ambulance response was undertaken as part of the Pre-hospital Outcomes for Evidence Based Evaluation (PhOEBE) study, which provided support to this PhD study, and therefore consideration of costs was viewed as within the scope of the PhOEBE study and is not reported within this PhD.

1.6. Timelines of undertaking this PhD

I undertook this PhD as a member of staff, meaning that the work was done on a part-time basis. It is difficult to assign a whole-time equivalent percentage to this as I have done the vast majority of the research and the writing of this thesis in my own time, whilst working 80% on busy research projects and bringing up a young family. In addition, I required several periods of leave of absence for personal and medical reasons, totalling nearly two years of study time. The impact of the Covid-19 pandemic further stalled the research by rendering one planned component of work (a patient survey) impractical and resulting in a change to my protocol and a new component of primary research (staff interviews). This was coupled with the ongoing impact of Covid-19 and lockdown school closures, leaving little personal time to undertake my PhD work. Therefore, the thesis took 8 years and different components were undertaken at different times. For example, whilst the analysis of routine data was undertaken in 2017/18, the semi-structured interviews with ambulance staff were not undertaken until 2020. The limitations of this are discussed in the Discussion chapter (Chapter 8).

1.7. Order of research and presentation of chapters in this thesis

This thesis used a mixed methods approach and a sequential study design. The research was carried out in the following order:

- Systematic reviews
- Data linkage studies
- Interview study
- Triangulation and discussion

The thesis is presented in the following chapters:

2. Systematic reviews

3. Design and Methodological Approach

4. Linkage and analysis of ambulance routine call and telephone advice data

5. Linkage and analysis of linked ambulance and other health service data

6. Interviews with ambulance staff to explore safety, appropriateness and acceptability

7. Triangulation of key findings from the study

8. Discussion

A sub-study is also included in the Appendix section (Appendix 14) which assesses the potential to increase the number of pharmacy referrals made by ambulance telephone advice services.

2 Systematic reviews

2.1. Overview

This chapter presents the methods and findings from two systematic reviews. Review 1 is a review of the conceptual outcomes of safety, appropriateness and acceptability and aims to develop definitions that can be applied to an ambulance service telephone advice setting and in this thesis. Review 2 describes and synthesises the evidence around the safety, appropriateness and acceptability of telephone advice in urgent and emergency care settings, with a specific focus on the ambulance service.

2.2. Review 1

2.2.1. *Background*

This review synthesises the evidence relating to the conceptual outcomes and definitions of safety, appropriateness and acceptability. Before I explore how these outcomes are defined and measured in the review, I first consider the different outcomes used to measure health service quality, justify the use of safety, appropriateness and acceptability as the focus in this thesis and the need for definitions that relate to safety, appropriateness and acceptability.

2.2.2. *Evaluating health services*

There are numerous ways of measuring health service quality and many definitions of health service quality now focus upon the conceptual elements of quality. Donabedian outlined the well-known structure-process-outcome framework, and this has been used as the basis for many healthcare evaluations (Donabedian 1966). Maxwell identified six dimensions of quality, which are shown in Figure 3(Maxwell 1984).

Figure 3 Maxwell's dimensions of quality (Maxwell 1984)

- "**Access** to services (for example, taking a population-based approach, do some sub-groups find services easier to access than other sub-groups? This could be about the physical location of services as well as different attitudes on seeking care)
- **Relevance** to need (for the whole community)
- **Effectiveness** (on an individual patient basis)
- **Equity** (could the service in any way be made more fair?)
- **Acceptability** (is this a procedure which many find too uncomfortable/embarrassing/ painful to undertake and so avoid treatment?)
- **Efficiency and economy**"

In the Department of Health Next Stage Review report, Darzi identifies that the most commonly used definition of quality of care has three equally important components (Department of Health 2008):

- Care that is **clinically effective** – (in the view of clinicians and patients)
- Care that is **safe**
- Care that provides as positive an **experience** for patients as possible

Raleigh and Foot identified the twelve most commonly used domains of quality in their report for the Kings Fund in 2010 (Raleigh et al. 2010), from organisations such as the institute of Medicine, the Care Quality Commission (CQC), the National Health Service (NHS) and the Organisation for Economic Cooperation and Development (OECD) and these are shown in Table 1.

Table 1 Commonly used domains of quality (taken from Raleigh et al. 2010)

Domains	IOM	OECD	Quest for Quality	Performance Assessment Framework	NHS Next Stage Review	CQC
Safety	✓	✓	✓		✓	✓
Effectiveness	✓	✓	✓	✓	✓	
Outcomes of care				✓		✓
Patient-centred/experience	✓	✓	✓	✓	✓	✓
Timely	✓		✓			
Access			✓	✓		✓
Efficient				✓		
Value for money						✓
Capacity			✓			
Equity	✓		✓			
Healthy independent living						✓
Health improvement				✓		

Øvretveit argues that domains of quality and the quality framework used depends on the individual's perspective and that this should be taken into consideration when selecting which framework best represents the viewpoint the study is being undertaken from (Øvretveit 1998). For example, a population perspective or a health care commissioner's perspective. In terms of the perspective of NHS policy, the NHS Five year forward policy review states that "The definition of quality in health care, enshrined in law, includes three key aspects: patient safety, clinical effectiveness and patient experience" (NHS England 2014)

The synthesis by Raleigh and Foot (Table 1) (Raleigh et al. 2010), identifies that safety, effectiveness and patient-centred care/experience are the most frequently measured and reported domains of quality. This finding complements the quality measures identified by Darzi et al and those put forward by NHS policy, and together this provides a strong justification for the use of outcomes relating to or which incorporate concepts of safety, effectiveness and patient experience in health service research.

2.2.3. *Choice of outcomes used in this thesis*

Øvretveit highlights the importance of using outcomes that are applicable and relevant to the service being evaluated (Øvretveit 1998). Whilst patient safety, effectiveness and patient experience have been identified as important and commonly used outcomes in health service research, the view put forward by Øvretveit suggests that the health care setting and stakeholder perspectives should also be considered when selecting a quality framework. Safety is an important outcome that has been used in previous ambulance service research, in previous studies of ambulance and urgent care telephone advice and in NHS policy (Dale et al. 2004; Eastwood et al. 2015; Fisher et al 2015; Huibers 2011; Department of Health 2008; Department of Health 2011). Therefore, exploring the safety of ambulance telephone advice is both highly relevant and important to the ambulance service, to telephone advice services and different stakeholders, such as policy makers, service users and ambulance staff. However, the rationale for using effectiveness and patient experience as outcomes is

less clear, as there are other outcomes used in other evaluations of telephone advice that are important to the ambulance service and telephone advice services which may be more relevant. Previous evaluations of new models of ambulance care and early research into urgent care and ambulance telephone advice services have focused on themes of care being appropriate to clinical need and outcomes relating to appropriateness and acceptability as well as safety (Dale 2004; O'Hara 2012; Munro et al. 2000). Therefore, the relevance of appropriateness and acceptability to ambulance telephone advice is discussed in the following sections.

2.2.3.1. Effectiveness versus appropriateness in an ambulance telephone advice setting

A key focus in NHS policy is to provide ambulance care that is appropriate to clinical need (NHS England 2014; NHS England 2015). Calls to the ambulance service are triaged based on clinical need, with different levels of response designated as appropriate for different levels of health problem acuity. If looking at the effectiveness of telephone advice, an effective telephone advice response to all callers would be to send ambulance or to refer to the highest urgency of care by advising the patient to attend the ED. However, sending an ambulance or advising to attend ED, whilst being effective, may not be proportional to the patient's clinical need. For example, an emergency helicopter response or a blue light ambulance to a very low acuity health problem (Brazier 1996). When considering outcomes that are most relevant to ambulance telephone advice, it could be argued that appropriateness is a more relevant measure. This is because appropriateness can be used for exploring issues that have been identified as important in previous telephone advice research and that are highly relevant to telephone advice in ambulance and wider UEC health service settings (Blank et al. 2012; Geisen et al. 2011; Turner et al. 2006. For example, appropriateness can be used to explore the impact of too much advice or too little (over triage and under triage) whereas to use effectiveness as an outcome measure does not capture the full range of these issues. Previous studies of telephone advice in ambulance and wider UEC settings have used appropriateness as an outcome, with the focus of this outcome being to identify whether care was necessary and sufficient (Snooks et al. 2009; Munro et al. 2001; Munro 2003). Therefore, whilst effectiveness is a highly important outcome in experimental, intervention studies, previous research into telephone advice has identified the specific relevance of appropriateness as an alternative outcome to effectiveness.

2.2.3.2. Patient experience and patient satisfaction versus acceptability

In studies of urgent care telephone advice that consider service user perspectives, most studies report user satisfaction with telephone advice, and this is usually obtained through post-care service user surveys (O'Connell et al 2001; Carriello 2003;Bogdan et al. 2004; Bunn 2004). Some qualitative studies report patient experience (Togher 2015). Patient satisfaction and patient experience are useful indicators of service user views about a service. The limitation of patient satisfaction and patient experience is that these outcomes can be viewed as subjective and emotive and are sometime unrelated to the quality of care that a patient receives. For example, it is possible for a patient to receive care that is safe and appropriate, but for the patient to be dissatisfied. Sometimes dissatisfaction is related to issues external to the health problem. Some of the early research around ambulance telephone advice reported acceptability as a service user outcome (Turner 2006). Using acceptability as an outcome has the advantage of being a less subjective and emotive outcome. Acceptability is also a multi-dimensional outcome. Therefore, as well as acceptability including the patient's views and experiences of a health service, it can also include the patient's views about the safety of the care they receive and the appropriateness of it (O'Cathain 2002).

2.2.3.3. Safety, appropriateness and acceptability in this thesis

Safety, appropriateness and acceptability were therefore chosen as the outcomes to be explored in this thesis because they represent important domains of quality in health services research, they are highly relevant to a telephone advice setting and to policy makers, and they have been used previously in important early research into ambulance telephone advice and in other ambulance service research (Turner 2006; O'Hara 2012; Dale 2004; Snooks 2009).

2.2.3.4. The need for definitions of safety, appropriateness and acceptability

In order for the outcomes of safety, appropriateness and acceptability to be applied in this thesis, it is essential that they are clearly defined, conceptualised and understood. The previous systematic review of early evidence around ambulance telephone advice published in 2015 reported the safety, accuracy and service user satisfaction ambulance telephone advice but did not report definitions or define what these outcomes mean (Eastwood 2015). The authors also identified that better outcomes to measure the appropriateness of ambulance telephone advice were required (Eastwood 2015). Therefore, it is relevant to seek other definitions within the literature or to develop definitions that have more relevance to ambulance telephone advice.

2.2.3.5. Dictionary definitions of safety, appropriateness and acceptability

Safety, appropriateness and acceptability are defined in the dictionary (https://www.merriam-webster.com/dictionary) as follows:

- Safety: the condition of being safe from undergoing or causing hurt, injury, or loss
- Appropriate: especially suitable or compatible
- Acceptability: pleasing to the receiver; satisfactory; agreeable; welcome. meeting only minimum requirements; barely adequate: an acceptable performance. capable of being endured; tolerable

Although the dictionary definitions are generic and therefore not specific to a particular setting or even to healthcare, they include some of the important concepts discussed in this chapter, such as prevention of harm and suitability care. However, there are other issues that are important to ambulance telephone advice that are not captured in the dictionary definitions of safety, appropriateness and acceptability, which mean that the dictionary definitions are not sufficient for use in this thesis. For example, a specific issue relating to safe ambulance care is that care is timely, and issues relating to appropriateness of telephone advice are around whether the care is necessary and sufficient.

2.2.3.6. The research gap

An evidence synthesis of prehospital care settings has identified that there is an insufficiency of research that specifically defines the attributes of prehospital care quality (Pap et al. 2018) Development of specific definitions and outcomes models for prehospital Emergency Medical Services (EMS) is considered to be overdue (Spaite et al 2001). Conceptual clarity is key for creating better outcomes, for consistent approaches to research and for promoting meaningful comparisons across different research studies (Scholl et al. 2014). Previous systematic reviews of telephone advice in urgent care settings have identified that outcomes of safety, appropriateness and acceptability are

not consistently defined or conceptualised and that the different measurement methods used that are often not consistent across different studies, making cross study comparisons challenging (Blank 2012; Turner et al 2015). Therefore, developing clear definitions of safety, appropriateness and acceptability in relation to ambulance telephone advice is necessary to ensure greater consistency and clarity of findings and, in the future, more meaningful between study comparisons. Based on these justifications, this review aims to define and operationalise the conceptual outcomes of safety, appropriateness and acceptability for use in this thesis.

2.2.4. *Aims and objectives*

This chapter aims to define and operationalise the outcomes of safety, appropriateness, and acceptability for use in this thesis, through reviewing key literature and policy documents.

2.3. Methods

The methods section describes and justifies the choice of review method and reports the process of searching the literature, extracting the data and synthesising the results. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart was used to document the results of the searches (Page et al. 2021).

2.3.1. *Summary of types of reviews*

The primary purpose of reviewing healthcare literature is to summarise the evidence on a specific research question or topic area (Noble et al. 2018). This knowledge can be used to inform and support healthcare decision making or to identify knowledge gaps and drive and inform research priority agendas. Key principles of systematic review methodology are that the search methods and evidence synthesis are explicitly reported so that reviews are reproducible (Booth et al. 2012). Commonly used types of reviews are meta-analyses to synthesise the results of quantitative studies, rapid evidence reviews to synthesise evidence within narrower resource constraints than a systematic review, narrative reviews to synthesise qualitative and textual information and umbrella reviews, which are a review of systematic reviews (Grant 2009; Centre for Reviews and Dissemination 2009; Pawson et al. 2005; The Joanna Briggs Institute 2014).

2.3.1.1. Determining the which types of review to use in this review

Due to the range of review types available, it is important that the most suitable review approach is identified to meet the aim of the review (Grant et al. 2009). In their research paper to describe the most commonly used types of review, Grant and Booth identified fourteen distinct review types (Grant et al. 2009). They applied the SALSA framework (search, appraisal, synthesis and analysis) to identify the key attributes and advantages and disadvantages of each review typology. The SALSA framework was applied to this review to identify the review type best suited to the aim of this review and this identified that a narrative literature review with a conceptual analysis was most suited to the aim of this review (Grant et al. 2009). This is because evidence is likely to be conceptual qualitative or textual, some of the key evidence may lie outside academic publications, such as in policy or strategy documents, and the narrative review approach facilitates the inclusion of a broad range of information. Therefore, the narrative review approach is also a useful approach for synthesising definitions, concepts and viewpoints from a wide range of information sources and stakeholders.

2.3.2. *Search strategy*

Three different methods were used to identify information to include in this review. These were:

- searches of electronic database
- searches of policy documents
- inclusion of documents identified through other sources

The reason for using different methods to identify documents for inclusion in the review was that key information may be included in other types of publications than in peer review journal papers. In addition, as it has been identified that there is inconsistency in the terminology and definitions used in previous studies, this means that a search of electronic databases with a pre-defined search strategy may miss important information. Furthermore, the inclusion of policy documents is important because ambulance telephone advice is a key part of NHS England UEC policy and it is possible that definitions of safety, appropriateness and acceptability have already been identified as part of this policy.

2.3.2.1. Search process

The search results and search process are outlined in the PRISMA flow chart (see Figure 4, page 34). Table 2 reports the sources searched, the timings of the searches and the inclusion and exclusion criteria for the three different searches and specific details around each of the search methods are reported in the sections below.

2.1.5.4.1 Electronic database searches

Electronic database searches were carried out using search terms related to each of the outcomes of safety, appropriateness and acceptability. Searches were carried out on Medline and Google scholar. The use of two broad electronic repositories was sufficient due to the broad focus of the review and that other methods of searching were also undertaken. The search strategy used a specific approach and searched for studies using the search terms of 'definition' and 'safety', 'appropriateness' or 'acceptability' or their synonyms within a prehospital telephone advice setting. Searches were initially undertaken in 2019 and were updated in March 2021.

2.1.5.4.2 Policy document review

Policy documents were identified based on the researcher's own knowledge and expertise of the subject area, through a Google search of policy documents including the words 'telephone advice', ambulance service', 'prehospital', 'safety', 'appropriateness' and 'acceptability'. Due to lack of conceptual clarity around appropriateness, the terms 'patient experience' and 'satisfaction' were also searched. In addition to the Google search, relevant institutional webpages were also searched, such as NHS England and DHSC. Policy documents were included if there was a specific focus on the outcomes of safety, appropriateness and acceptability. Searches were originally undertaken in 2016 and were updated in 2019 and in 2021.

Table 2 Search information

Type of search method	Database/ document source	When searched	Inclusion criteria	Exclusion criteria
Electronic database searches	Medline and Google scholar	2019 and updated in March 2021	Prehospital studies that define safety, appropriateness or acceptability. Conceptual articles were considered Published in English	Not prehospital Does not report a definition of safety, appropriateness or acceptability
Policy documents	Google search; NHS England and DHSC webpages; Researchers own knowledge	2016 and updated in March 2021	English prehospital policy documents that focus on safety, appropriateness and acceptability Published in English	Not prehospital Does not consider safety, appropriateness or acceptability
Other sources	Papers identified from Review 2 (next review in this chapter)	2016 and updated in March 2021	Systematic reviews of UEC telephone advice Published in English	Not a systematic review Not UEC telephone advice

2.1.5.4.3 Other sources

Systematic reviews from the second review presented in this chapter (Review 2, which is a review of published evidence relating to the safety, appropriateness and acceptability of ambulance telephone advice) were identified from searches of MEDLINE (via Ovid SP), EMBASE (via Ovid), The Cochrane Library (via Wiley Online Library), Web of Science (via the Web of Knowledge) and the Cumulative Index to Nursing and Allied Health Literature (CINAHL; via EBSCOhost), and were included in this review. The rationale for including systematic reviews was because systematic reviews are more likely to report a definition of an outcome, and much of the early research relating to ambulance telephone advice was included in the review by Eastwood and colleagues.

2.3.3. *Study selection and assessment*

Search results were imported into Endnote and duplicates were removed. The papers identified from the searches were first screened for relevance using the citation and abstract, or in the case of policy documents the executive summary and the contents page. Thirty-nine papers were included and the full paper or document was assessed against the inclusion and exclusion criteria, as reported in the PRISMA diagram (Figure 3). A total of 30 papers or reports were included.

2.3.4. *Data extraction*

Included studies and policy documents were searched to identify how safety, appropriateness and acceptability were defined and operationalised and this information as extracted into a data extraction table (Appendix 1). Data were extracted under the following headings: study details; study

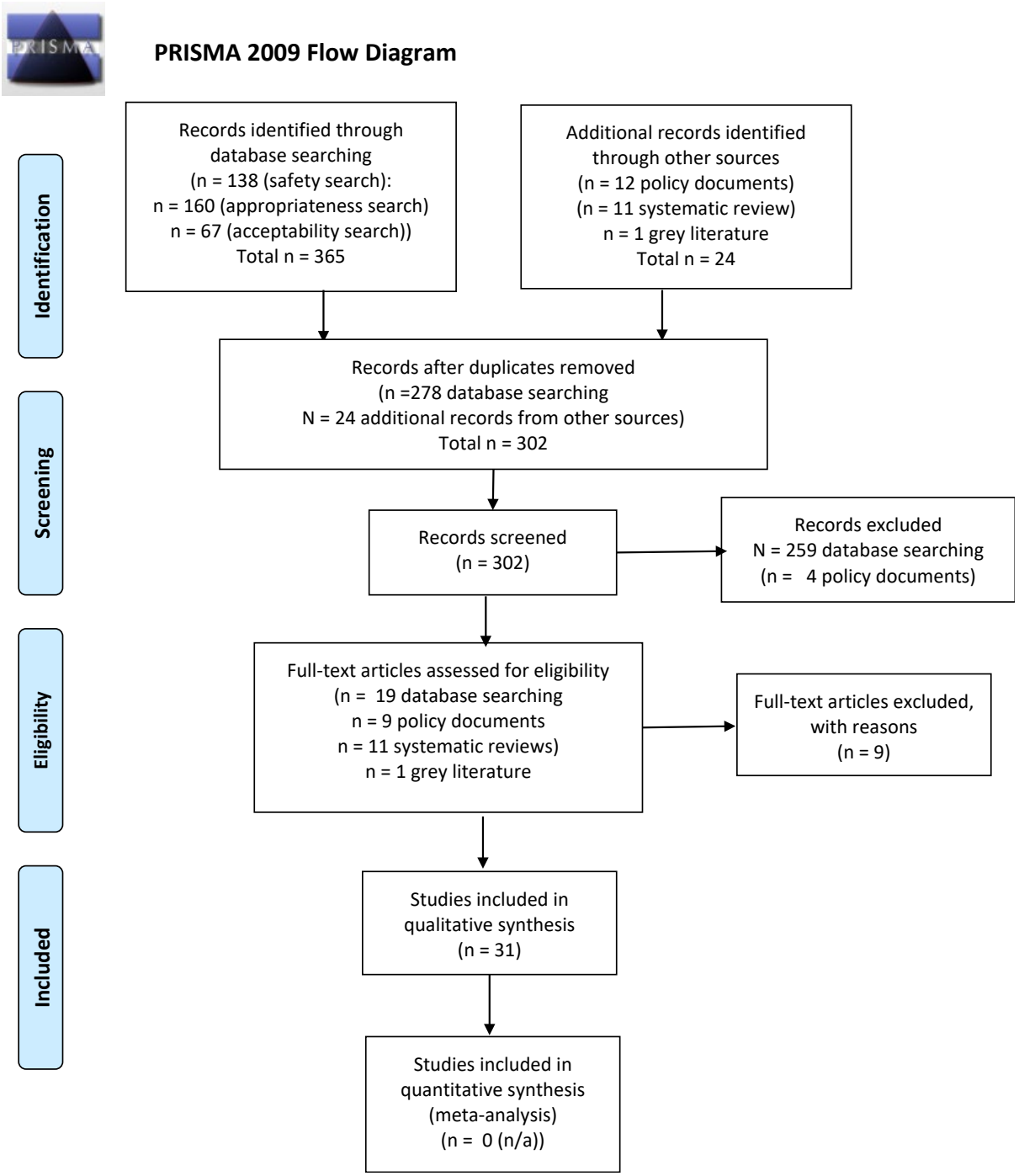
design; setting; study overview/aim; safety definition/outcome measures/attributes; appropriateness definition/outcome measures/attributes; acceptability definition/outcome measures/attributes.

This was then categorised into either a definition, a description of how the concept was operationalised within the ambulance service, or an outcome measure. See Appendix 1 for Review 1 data extractions. These findings were then synthesised thematically and narratively based on the themes of safety, appropriateness and acceptability.

2.3.5. *Synthesis*

The aim of the synthesis was to explore the concepts of safety, appropriateness and acceptability through bringing together information about each conceptual outcome. The synthesis process involved the identification and assessment of relevance of existing definitions of safety, appropriateness and acceptability, identification of the measures used to measure each of the outcomes, identification of the key concepts relating to each outcome, and to use this information to inform definitions of safety, appropriateness and acceptability for this study.

Figure 4 Review 1 PRISMA flow diagram (Page et al. 2021)



2.3.6. *Results*

31 documents were included in the review and were narratively synthesised under the themes of safety, appropriateness and acceptability. Included documents consisted of 9 policy or strategy documents, 10 papers that contained definitions of safety, appropriateness or acceptability and 11 systematic reviews of telephone advice from UEC settings. Results are reported under the theme headings of safety, appropriateness and acceptability.

2.3.7. *Safety*

Of the 31 documents included in the review, 26 reported definitions, or measures of safety relating to safety and the findings from these 26 papers are synthesised here.

2.3.7.1. Definitions of safety in published research

Seven included documents reported a definition of safety, (5 journal papers, 1 PhD thesis and 1 policy document) and these are shown in Table 3. Some of the definitions are definitions of safety that were developed for use within a research study and some of the definitions are more generic definitions of safety in healthcare that were applied to a prehospital research study. Most of the definitions referred to the prevention of harm in some form, such as prevention and protection from harm or a reduction of risk or unsafe acts. Two studies applied the Institute of Medicine definition of safety to prehospital research, and this definition is primarily about the prevention of harm to patients. Some of the definitions included concepts associated with appropriateness, such as the definition by Wheeler et el which defines safety as "appropriate referrals (AR) – (right time, right place with the right person)" (Wheeler et al. 2014) The definition used in the study by Huibers could be considered as the most relevant to ambulance telephone advice as the definition by Huibers considers safety issues that are specific to telephone advice, such as under triage and treatment delay (Huibers et al. 2011).

2.3.7.2. Measures and attributes of safety in published research

Twelve studies reported measures or attributes of safety. As well as defining safety, the review by Huibers also identified that attributes associated with safety or used to measure safety (Huibers et al 2011). Appropriateness, adequacy and under-triage were attributes associated with safety, whilst errors/mistakes, near misses, deaths, unplanned subsequent ED attendances or admissions were used to measure safety. Huibers also identified some other outcomes used to measure safety that could be considered to relate more to appropriateness. These were the proportion of patients where the advice or the outcome was appropriate or inappropriate or where the urgency was correctly assessed. Safety outcomes in the Huibers review were most commonly reported within 24 hours to 7 days of telephone advice, but one study reported outcomes at two weeks. The review by Wheeler (Wheeler et al. 2014) considered safety using a Donabedian model of structure, process and outcome and reported safety in terms of appropriate referral rates and impact of staff type on safety decisions and was more limited in scope than the Huibers review. Appropriate referrals were considered as right time, right place with the right person. An Australian study by O'Meara reported the development of a prehospital performance framework using a Donabedian framework (O'Meara 2005). This identified that key components of safety at a structural level are monitoring systems, at a process level safety procedures and quality of care, and in terms of outcomes, accreditation and complications. Adverse events, medication errors and clinical judgement were themes identified in a review of safety in the EMS environment by Bigham et al (Bigham et al. 2012). The NAO 16-17 report identified that ambulance trusts collected data relating to clinical effectiveness and patient safety through collecting information about the number of serious complaints and concerns (National Audit Office 2017). A review by Pap and colleagues in their scoping review of prehospital care quality

identified that safety is one of the most commonly reported attributes of prehospital care quality (Pap et al. 2018). There were a further 6 systematic reviews that considered safety and these reported measures and attributes relating to safety such as adverse events, deaths, under triage, ED admissions, delayed care, litigation rates and patient outcomes following telephone advice. The measures and attributes relating to safety from all studies included in this review are reported in Appendix 2.

Table 3 Definitions of safety used in prehospital research, identified in the review

Study information	Definition of safety
(Patterson et al 2014)	Defined a component of safety (adverse event). "An adverse event in EMS is a harmful or potentially harmful event occurring during the continuum of EMS care that is potentially preventable and thus independent of the progression of the patient's condition."
(Elden et al. 2020)	Uses IOM definition of safety – Patients should be safe from injury caused by the care system. Reducing risk and ensuring safety require greater attention to systems that help prevent and mitigate errors. [IOM]
(Atack et al. 2010)	Uses the Royal College of Physicians and Surgeons, Canada definition of safety "Patient safety is defined as "the reduction and mitigation of unsafe acts within the health-care system, as well as through the use of best practices shown to lead to optimal patient outcomes"
(Shepard KC. 2019)	Uses IOM definition "prevention of harm to patients"
(Huibers et al 2011)	Huibers defined unsafe performance as triage which could harm patients because of under-triage, under-estimation of urgency, or under-referral. These triage outcomes could lead to delay in treatment and thus pose risks to patients.
(Wheeler et al. 2014)	Defined safety as appropriate referrals (AR) – (right time, right place with the right person).
(NHS England, 2018 b.)	"Treating and caring for people in safe environment and protecting them from avoidable harm"

2.3.7.3. How is safety conceptualised in NHS UEC policy?

Safety was primarily conceptualised as avoiding harm/safe management of patients. In policy documents this was operationalised through all aspects of care, (triage accuracy, care decisions, care implementation, conveyance, environment) and safety was measured in terms of the number of safety incidents, such as adverse events, mortality and recontacts. The attributes and measures of safety identified from policy documents is shown in Appendix 2 and data extractions are in Appendix 1.

Four main NHS policy themes were identified in relation to safety.

1. Care is provided in a safe environment and may be provided outside of a healthcare setting (safe environment) *(e.g. "Opportunities to safely treat more people at home or using telephone advice") (Healthcare Commission 2008))*
2. Triage systems err on the side of caution when prioritising and triaging patients (risk management and triage) (e.g. *"Clearly there is a need to over-prioritise in order to provide a safe response and manage risk" (Department of Health 2005, Taking healthcare to the patient)*
3. Care and advice avoids harm and is appropriate (safe and appropriate care and advice*) (e.g. create a comprehensive system of care across a network that will deliver good outcomes for all patients in a safe and effective way" (NHS England 2017 b)*

4. Safe non-conveyance and safe reductions in avoidable conveyance *(e.g."Developing common protocols and models of support for paramedics on scene to safely reduce avoidable conveyance." (NHS England 2018 c)*

All policy documents identify key attributes of safety and safety measurement methods/outcomes that related specifically to the ambulance service but only one reported a definition to safety. Some of the attributes of safety identified were similar to attributes of appropriateness. This increases the importance of developing definitions to ensure clarity and consistency of meaning and measurement.

2.3.7.4. Summary of safety evidence

Whilst safety was widely discussed, it was rarely clearly conceptualised and defined in relation to telephone advice or the ambulance service. The most commonly referenced attribute of safety was the prevention of risk of harm or adverse outcomes. However, in the two studies that defined safety specifically for a telephone advice population, both included aspects of appropriateness in their definitions of safety (Huibers 2011; Wheeler 2015). This is indicative of lack of conceptual clarity around what is meant by safety and appropriateness in telephone advice. This view is supported in the review by Lake which states that *"clearer definition of adverse events or safety issues related to the service would be of benefit to further research in this area" (Lake et al 2017).*

Most reviews and policy documents reported methods by which safety can be measured and there was consistency between the different types of included studies, in that similar measures and concepts were repeatedly referred to. These can be used to inform a definition of safety in relation to ambulance telephone advice.

2.3.8. *Appropriateness*

Of the 31 included studies/policy documents 22 reported attributes or measures of appropriateness.

2.3.8.1. Definitions of appropriateness in published research

None of the included studies in this review reported definitions of appropriateness. Several systematic reviews report that the lack of definition and consistency of meaning makes it difficult to interpret and compare appropriateness across different studies (Blank et al. 2012; Eastwood et al 2015). The review by Eastwood considered the appropriateness of ambulance telephone advice but did not define or set out how appropriateness should be measured (Eastwood et al. 2015). The review by Blank reported that

> *"Although the concept of appropriateness is frequently used in health care, there is no agreement on a standardised operational definition or uniform understanding" (Blank et al. 2012)*

2.3.8.2. Measures and attributes of appropriateness in published research

There were 13 research studies included in this review that reported attributes or measures of appropriateness, including several studies undertaken in Australia. The Australian studies included a cohort study by Eastwood and colleagues which investigated the appropriateness of cases presenting to ED following ambulance telephone advice (Eastwood et al 2017). Eastwood measured appropriateness using an ED suitability definition that assesses whether the health problem can be dealt with using lower urgency community-based health services. O'Meara's paper discusses the development of a performance framework for measuring ambulance service performance in Australia and identified key components of appropriateness based on a Donabedian structure, process

outcome formulation (O'Meara 2005). Staff configuration, staffing level and the evidence base were key components of appropriateness at a structure level, time at scene and research activities were related to process and new knowledge and adverse events were identified as key components of appropriateness at an outcomes level. An evidence synthesis by Pap and colleagues aimed to describe the literature on indicators used to measure the quality of prehospital care and identified that appropriateness was one of the most commonly reported or used quality attributes in prehospital care (Pap et al 2018). The final study originating from Australia was the review of early ambulance telephone advice studies by Eastwood and this review reported appropriateness in terms of under triage, referral to the most appropriate service, managed by the most appropriate health care staff for the health need and appropriate managing of resources (Eastwood et al. 2015).

Outside of the Australian studies, the most relevant study of appropriateness was the systematic review by Blank et al, which identified that there was variation in the outcomes used to measure appropriateness and in the meaning given to appropriateness (Blank et al. 2012). For example, some studies focussed solely on the under-triage aspect of appropriateness whereas others focused on both under triage and over triage in their assessment of appropriateness. Other included studies considered the appropriateness of telephone advice in UEC settings and the following measures were used to report appropriateness: appropriate referrals, inappropriate or avoidable attendances, appropriate advice, rate of accuracy, adequacy of triage and appropriate level of care. These are reported in Appendix 2, which reports the different outcomes and attributes of appropriateness identified from this review.

2.3.8.3. How is appropriateness conceptualised in NHS UEC policy?

All of the included policy documents reported information relating to measures and attributes of appropriateness, but none reported definitions. From thematically synthesising the relevant evidence from the policy documents, five main themes were identified in relation to appropriateness.

1. Appropriate ambulance response or referral
2. Appropriately qualified staff to provide telephone advice
3. Treatment in an appropriate location
4. Care appropriate to clinical need
5. Appropriate use of the ambulance service by the public

Evidence relating to the first 4 of these themes is included in Appendix 1 data extractions. The fifth theme, 'appropriate use of the ambulance service by the public' is outside the scope of this thesis and therefore this evidence has not been synthesised.

Appropriateness was primarily conceptualised as relating to the appropriateness of the assessment and the identification of the most appropriate care pathway or response, treatment or referral. Appropriateness was often considered in relation to clinical need, with an appropriate response or referral being one which is appropriate to clinical need and an inappropriate response or referral being one which utilised higher urgency health services than were necessary to treat the health problem. Therefore, appropriateness is related to both the effectiveness of a response or a referral and the necessity of it. One policy document identified attributes of inappropriate care and these were related to unnecessary and inappropriate delays to appropriate care and duplication of steps or unnecessary steps in the care pathway that were not of benefit to the patient. All of the measures and attributes of appropriateness that were identified in this review are reported in Appendix 2.

2.3.8.4. *Summary of appropriateness evidence*

Appropriateness was not defined in any of the included studies or policy documents, despite being widely reported. There was some variation in the way in which appropriateness was interpreted by different studies and stakeholders, in part due to the lack of clarity over the definition of appropriateness and how it is interpreted in a telephone advice context. Policy makers took a system perspective of appropriateness whereby a wide range of services are coordinated to ensure that patients are treated by the most appropriate service. In research studies and policy documents appropriateness was usually measured or reported as appropriate response, referral or care or treatment in an appropriate location/service. The findings from the policy documents and published research papers were used to inform the development of a definition of appropriateness in relation to ambulance telephone advice (Table 4 Definitions of safety, appropriateness and acceptability p.43).

2.3.9. *Acceptability*

In the searches for acceptability, it was more difficult to identify information about acceptability and this was due to other terms with similar meanings often being used that overlap with acceptability. This necessitated in searches containing words that are related to acceptability, as highlighted in the dictionary definition below:

A dictionary definition of acceptability is:

"adequacy, fitness, suitability, propriety, appropriateness, admissibility, permissibility, acceptableness, satisfactoriness

opposites: inadequacy, impropriety, unsuitability, inappropriateness, unacceptability, inadmissibility, unsatisfactoriness" (https://www.collinsdictionary.com/)

Due to the overlap between acceptability, satisfaction and patient experience, information about satisfaction and patient experience was also examined as part of the conceptual analysis.

Twenty-three of the 31 included studies reported information relating to acceptability and were included in this synthesis, including 9 policy documents.

2.3.9.1. *Definitions of appropriateness in published research*

None of the 18 research studies or the 9 policy documents that reported information relating to acceptability reported a definition of acceptability.

2.3.9.2. *Measures and attributes of acceptability in published research*

Eighteen studies reported measures or attributes of acceptability and there was variation in the measures and attributes reported and also the extent to which studies reported acceptability, with some studies reporting very little information and other reporting a detailed analysis. Peculo-Carrasco identified that safety is an important component of patients views of the acceptability of prehospital and emergency care (Peculo-Carrasco et al. 2020). They identified a number of factors that led to increased service user perceptions of safety, such as trust, calmness and protection. Service factors associated with positive service user views around care and safety are reported as

information and communication, person centred care, professional competency, accessibility and response times. The study by O'Meara notes that a key component of acceptability is related to expectations. In a Donabedian level analysis of acceptability (O'Meara et al 2005). O'Meara identified process attributes such as respect for patient autonomy and accountability, and that satisfaction and complaints related to outcomes. A report by the National Audit Office identified that some of the outcomes identified by O'Meara are collected by ambulance trusts that ambulance trusts collect information relating to complaints, concerns and compliments (National Audit Office 2017). The systematic review by Bunn et al (Bunn et al. 2004) focussed in detail on satisfaction with telephone advice services and reported measurement methods relating to the proportion of patients that were satisfied with the telephone advice they received and the proportion that would be happy to receive the service again. Whereas the review by Turner and colleagues included studies that reported acceptability in several ways, including whether patients found it acceptable not to be sent an ambulance, whether referral or transportation to a non-ED health service was acceptable, patient preferences and the acceptability of waiting times and response times (Turner et al. 2015). The review by Kirkland (Kirkland et al. 2018) looked at refusal of telephone advice and whether patients found ambulance alternatives acceptable.

The review by Fisher included some evidence that relates to acceptability and some of this was contradictory, with included studies reporting the acceptability of non-conveyance ambulance responses to service users, overall caller satisfaction and aspects of care that patients were not satisfied with (Fisher et al. 2015). One study included in the Fisher review identified that some patients were advised to seek healthcare that was not required or necessary and it is possible that this would affect patient's views on the acceptability of telephone advice (Fisher et al. 2015).

2.3.9.3. How is acceptability conceptualised in NHS UEC policy?

Information about service user acceptability of UEC telephone advice was mostly reported as what patients want and should expect and how this will be measured, e.g. appropriate care, improved care, or methods of measuring patient outcomes and experiences. Synthesis of this information identified the following three themes:

1: Policy maker's views of what patients want; *(e.g. Patients want "effective resolution of their problems through the provision of appropriate care or treatment and reassurance, delivered by competent and professional staff" (Healthcare Commission 2008))*

2. Policy maker's views of how this should be measured; *(e.g. "Patient outcomes and experiences should be adopted as a measure of success." (Ambulance Service Network 2008)*

3. Patient centred care and patient choice. *(e.g. Ambulance services should "Provide high quality patient centred care" (Taking healthcare to the patient) and "Services should evolve to reflect patients' choices." (Healthcare Commission 2008))*

Some policy documents discussed using patient's experience and outcomes to measure success (Ambulance Service Network 2008). Most policy documents discussed patient experience instead of patient satisfaction, and this is due to service experience part of the set of ambulance national quality indicators and therefore a focus of policy documents. However, policy documents recognised that collecting information about patient experience is challenging and service experience can be

demonstrated by ambulance services in different ways. For example, through focus groups or interviews with service users. Several policy documents stated the importance of patient's confidence in health care staff and services and also the importance of delivering care that is patient centred. There was some overlap between acceptability and appropriateness, with policy documents equating patients receiving more appropriate care with a better patient experience and this does not factor in patient expectations, patient preferences or patient choice.

2.3.9.4. Summary of acceptability findings

The analysis of policy documents and included studies show that acceptability is not well defined that there is a broad interpretation of acceptability and that there is variation between different studies in how it is reported. Policy documents equated patients receiving care from the most appropriate service with a better patient experience, but this did not take into account service user expectations around receiving an ambulance or patient preferences or choice. Research studies and systematic reviews focussed primarily on patient satisfaction and experience, with few studies reporting specifically about acceptability.

Conceptually, acceptability is more complex than satisfaction or patient experience, as the relevance and suitability of the advice, the patient's views of the safety of the advice and of not being sent an ambulance are also components of acceptability and these need to be taken account of when developing a definition of appropriateness for use in an ambulance telephone advice setting. The findings of the review are used to develop a definition of acceptability and this is discussed and presented in the following sections.

2.3.10. *Main findings*

Safety was mostly defined and conceptualised as avoidance of harm and providing care safely and in safe settings. Prevention of harm and providing care safely was measured by outcomes such as mortality, adverse events and patient safety incidents. Outcomes relating to safe triage were measured by ED attendances, hospital admissions, mortality and under triage rate.

Appropriateness was mostly conceptualised as the right level of care or advice, or care that is appropriate to need and delivered in an appropriate setting. Whilst no definitions of appropriateness were reported by the included studies, the same attributes or measures of appropriateness were reported by policy documents and research studies, and these related to appropriate referrals, actions or services, under and over triage and appropriateness of subsequent service use.

It is clear from this review that safety and appropriateness are both important conceptual outcomes in prehospital research and this is supported by the evidence synthesis by Pap and colleagues which concluded that:

> *"Access to appropriate, safe and effective care, which is responsive to patients' needs and efficient and equitable to populations are the key quality attributes in the prehospital context." (Pap et al. 2018)*

There was less conceptual clarity around acceptability, with satisfaction and patient experience most commonly used to report service user views of a service, and this would benefit from the development of a clear definition to clarify the scope and extent of its meaning. As well as satisfaction

and patient experience, other attributes and measures identified from the review were improvements in patient experience, timeliness of care and response times, patient views of the safety of care, patient centred care, patients views of the appropriateness of care, patient preferences and patient choice.

2.3.11. *Other considerations*

In order to assess whether a service is appropriate to clinical need or urgency, this implies a hierarchy of services based on the level of care they provide and the acuity of patients they are able to treat. In their study of the appropriateness of NHS Direct advice, Munro and colleagues outlined and applied several assumptions, which are shown in Figure 5 below.

Figure 5 Hierarchy of care (taken from Munro 2003)

"That a ranking of care can be defined." E.g a hierarchy based on urgency
That patients should normally be directed to the "lowest" level of care able to meet their needs.
That services are assumed to do all that is necessary (including referral, if need be) and nothing which is not necessary, to meet the patient's needs.
That a patient will seek further help if their problem remains unresolved or worsens.

The assumptions developed by Munro et al were applied to the development of the definitions for this thesis and the interpretation of the analysis.

2.4. Defining safety, appropriateness and acceptability

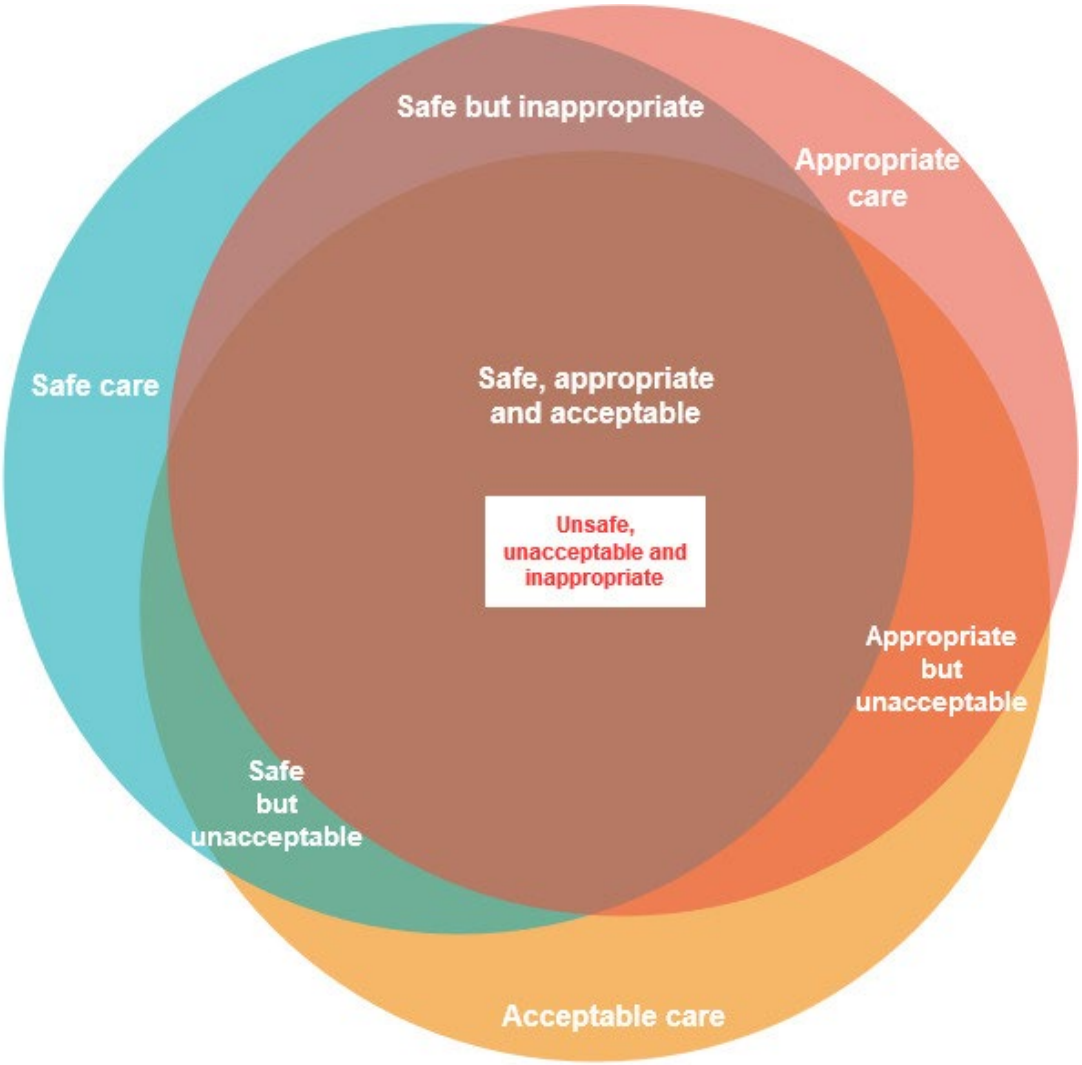
Other definitions, views of policy makers, published measures and attributes relating to safety, appropriateness and acceptability were discussed with PhD supervisors to develop definitions for use in this thesis that were relevant to ambulance telephone advice and incorporated the key findings of the review. The definitions and the rationale for each definition is shown in Table 4.

Table 4 Definitions of safety, appropriateness and acceptability

Outcome	Definition	Rationale
Safety	Timely and effective care that delivers more benefit than harm	• Harm or the potential for harm can occur when there is a delay in receiving treatment or the right level of care • Under-triage or under estimation of the urgency of a health problem can lead to potentially unsafe care • If care is not effective, this can also lead to a delay in accessing the right care and has potential for harm • It is possible for care to be safe but also inappropriate when too much resource or care is used proportionately to the patient's health problem • It is possible for care to be effective but also for care to be unsafe. The most notable example of this is thalidomide when prescribed for morning sickness • Therefore, safe care is a balance of the potential harms and benefits, with safe care being timely care that works and does more good than harm
Appropriateness	Care that is proportional to the health problem (necessary and sufficient)	• Care can be safe but inappropriate, if too much care or resource is used to treat a health problem. This type of care is sufficient to treat a patient's health problem, but the level of care used is not necessary. Overuse of healthcare resources is not cost-effective and may result in resources not being available for patients with more serious health needs • Care can also be inappropriate when too little care is used to treat a health problem. This type of care is unsafe and inappropriate and the care that is given is not sufficient to treat the health problem. • Therefore, care is appropriate when the right level of care is used or advised for the patient's health need – The Goldilocks Principle, which uses the concepts of just the right amount. (https://en.wikipedia.org/wiki/Goldilocks_principle)
Acceptability	The patient's views on the safety and appropriateness of care and their care experience	• Service user views and experiences of care are important, but consideration should also be given to the patients views of the safety and appropriateness of care and advice • Satisfaction can be impacted by factors external to the safety and appropriateness of care • It is possible for the patient to be dissatisfied with the care they receive whilst also perceiving that the care is safe and appropriate. • It is also possible for a patient to be satisfied with the care they receive, whilst also perceiving that it is inappropriate. For example, if a patient is taken to ED for a minor health problem • Therefore, acceptability of care is a balance of the patients experience and their views on the safety and the appropriateness of care

There is some overlap in the definitions of safety, appropriateness and acceptability as these conceptual outcomes are not mutually exclusive. This has been represented in Figure 6 below. Further examples of safety, appropriateness and acceptability are reported in the Appendix 3.

Figure 6 conceptual map of outcomes



2.5. Discussion

This review addresses objective 1 of this thesis which aimed to develop definitions of safety, appropriateness, and acceptability in the context of ambulance telephone advice, through reviewing and synthesising ambulance policy documents and research studies. The review findings affirmed the important attributes and measures relating to safety, appropriateness and acceptability and also the absence of definitions of safety, appropriateness and acceptability that are relevant to an ambulance telephone advice setting. The review findings were used to develop definitions of safety, appropriateness and acceptability for use in this thesis. These definitions are important for ensuring that the concepts of safety, appropriateness and acceptability are clearly understood within this thesis, and may also benefit other relevant research, as the lack of clear definitions has hindered comparison of findings from across different studies (Blank et al 2012; Fisher et al 2015; Eastwood et al. 2015; Pap et al 2018).

2.5.1. *Strengths*

A key strength of this work is that it addresses a clear research gap, as lack of conceptual clarity around what is meant by safety, appropriateness and acceptability has been detrimental to advancement of knowledge in this area (Blank et al 2012; Fisher et al 2015; Eastwood et al. 2015; Pap et al 2018). A further strength specific to this PhD, is that the review defines the key terminology and overall framework used in this PhD and the definitions developed from the review are used to ground and interpret the PhD findings. The narrative review method used meant that a broad range of literature could be included in the review, and the inclusion of policy documents means that the review findings and definitions are representative of key stakeholder views. In addition, grey literature was also included, and this adds to the comprehensiveness of the review by reducing the impact of publication bias and through ensuring greater balance in the included evidence (Paez 2017). This is particularly relevant for reviews that are more qualitative or descriptive in nature. A further methodological strength of this review is that the PRISMA reporting guidelines were used and this aids transparency, review quality and consistency in the undertaking of the review and the reporting of the review methodology (Page et al. 2020). Scientific integrity and information accessibility are important when determining the quality of narrative literature reviews, and the issues that Byrne et al identified as important were considered during the review process (Byrne 2016). These include the importance of the topic, reporting how searches were conducted, summarising information correctly, using tables, diagrams and figures and whether the review expands the body of knowledge (Byrne 2016). Finally, whilst definitions were scare or not fully relevant to ambulance telephone advice, there was consistent evidence relating to the key attributes of safety, appropriateness and acceptability across the different evidence sources, meaning that the definitions developed are reflective of and relevant to a wide evidence base.

2.5.2. *Limitations*

A potential limitation of the review method is that it was undertaken by a single researcher, and it is possible that researcher bias has had an impact on the study. This is countered by undertaking a range of different searches of different types of documents and through discussing the findings with PhD supervisors. Whilst a range of different evidence sources were searched, this was not exhaustive and other electronic databases could have been included to further enhance the comprehensiveness of the review. The decisions on included databases and evidence sources was taken pragmatically and aimed to include those sources that were most likely to contain relevant information. As this was a narrative review, a quality assessment of the included studies was not undertaken. The definitions have been developed in relation to an English ambulance telephone advice setting. They may not be as relevant to ambulance services that configure their services in different ways or to other health care settings.

2.6. Conclusion

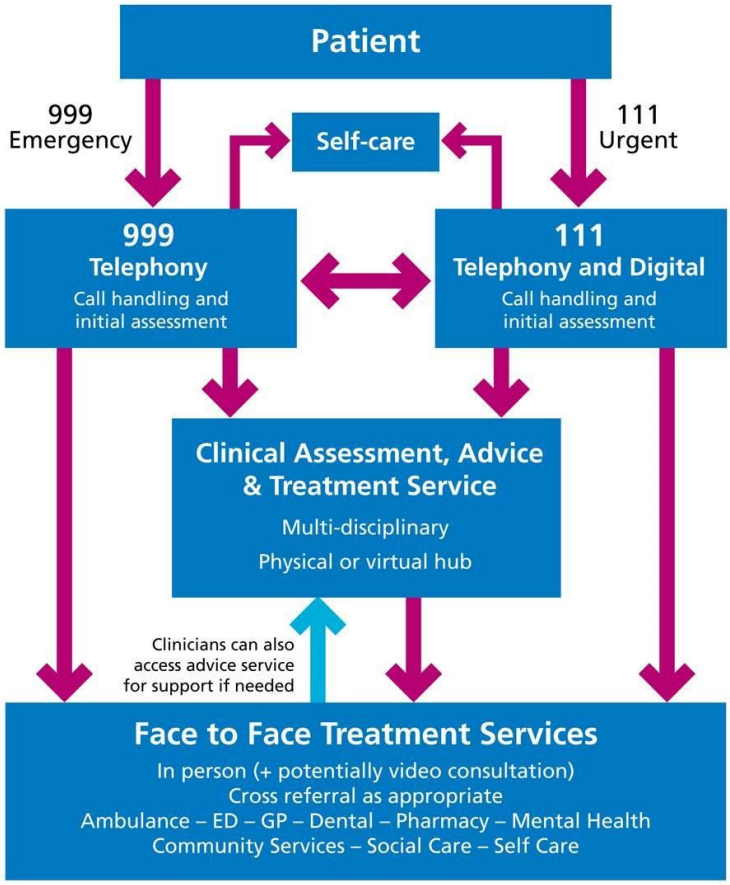
There were no suitable definitions of safety, appropriateness or acceptability identified from this review, therefore key attributes of safety, appropriateness and acceptability that are relevant to an ambulance telephone advice setting were used to inform definitions. The definitions developed as part of this review synthesis will be applied to the findings in this thesis.

2.7. Review 2

2.7.1. *Background*

The introduction chapter highlighted the following issues that are faced by the ambulance service, including: rising demand for ambulance service care; the confusion that service users sometimes experience when trying to choose which emergency or urgent care service to access; and that some calls to the ambulance service are made for very low acuity health problems. These factors have resulted in the implementation of clinical telephone advice within the ambulance service and are part of an NHS policy drive for patients to receive more appropriate care closer to home. In the context of this, ambulance telephone advice has become a key method of both managing ambulance demand and providing an alternative response to callers who contact the ambulance service with low urgency health problems. Figure 7, below, shows the pathways to telephone advice provided by the ambulance service and NHS 111 (formerly NHS Direct) which are the main providers of UEC telephone advice, as part of an integrated urgent care pathway.

Figure 7 Flow chart of 999 and 111 patient pathway (Keogh Review Urgent & Emergency Review 2013)



2.7.2. *Rationale for this review*

Whilst the case for referring ambulance service calls triaged as low urgency for telephone advice is clear in terms of demand management, the evidence relating to the safety, appropriateness and acceptability of ambulance telephone advice is less clear. Since the publication of a systematic review in 2014 of evidence relating to ambulance telephone advice, described in section 1.1.8.3 of Chapter 1, and which reviewed research published between 1981 and 2012, further key research has been published that is relevant to the safety, appropriateness and acceptability of ambulance telephone advice. This includes the review by Fisher et al which found little evidence of the safety of ambulance

telephone advice (Fisher et al 2015), and the review by Huibers et al which identified the safety of telephone advice decreased for higher urgency patients in urgent care settings (Huibers et al. 2011).

As identified in Review 1 earlier in this chapter, comparing the appropriateness of ambulance telephone advice across different studies has proved challenging, due to the different interpretations of what appropriateness means and how it is measured in different studies (Blank et al. 2012). A study of the Australian ambulance telephone advice system identified that following telephone advice, over 25% of patients were sent an ambulance and taken to the ED. However, this study also identified that there is scope for over 70% of the calls that receive ambulance telephone advice to be referred to alternative care providers, such as GPs or OOH. Nevertheless, there are still concerns that telephone advice may not be appropriate for some types of calls and callers. For example, a high proportion of elderly calls were identified as receiving telephone advice in England (O'Cathain et al. 2018) and this patient group has been identified as having high ED referral rates, with 62% of elderly callers who received telephone advice referred to the ED (Vincent et al. 2018). This suggests that telephone advice may not be appropriate for all callers.

Finally, research exploring service user views of ambulance telephone advice undertaken by Picker Institute and published by the Care Quality Commission (Care Quality Commission, 2014) identified that whilst most callers viewed telephone advice positively, some callers either did not agree with the triage decision to send the call for telephone advice or did not agree with the clinical advice they were given. Variation in compliance with ambulance telephone advice has also been identified in earlier research and may be indicative of variation in service user views of acceptability (Turner et al. 2015; Krumperman et al. 2015).

As the previous review of ambulance telephone advice was published in 2015 and includes mainly very early research on this topic (Eastwood et al. 2015), a review of current evidence would be both timely and beneficial to explore the issues relating to the safety, appropriateness and acceptability of ambulance telephone advice and to identify current issues now that telephone advice is an embedded part of the ambulance system. As there is more evidence relating to telephone advice from an urgent care setting and issues relating to safety, appropriateness and acceptability have been identified in the urgent care telephone advice literature, this review also synthesises the evidence around the safety, appropriateness and acceptability of urgent care telephone advice and compares this to the findings from an ambulance setting. Therefore, the review reported here is both a broad review of UEC telephone advice and a specific focus on studies from an ambulance setting. This offers the opportunity to compare the ambulance service findings to wider UEC settings and is relevant due to the similarity between the types of calls and health problems that service users receive telephone advice from UEC and ambulance services for. This approach also recognises the large amount of literature that has been reviewed as part of this thesis whilst ensuring that focus is given to the most relevant literature. Therefore, this review synthesises the published evidence relating to the safety, appropriateness and acceptability of telephone in an ambulance setting and compares this to the evidence from wider UEC settings.

2.7.3. *Aims and objectives*

Review 2 aims to review and synthesise the urgent and emergency care evidence base in relation to telephone advice, with a specific focus on the ambulance service and the outcomes of safety, appropriateness and acceptability.

2.7.4. *Review history and timings*

This review describes and compares the findings from searches of UEC telephone advice studies and searches of ambulance telephone advice studies.

I initially undertook a systematic review of telephone advice in UEC settings as part of the work towards my PhD confirmation review. Subsequent to that, I was given the opportunity to use this review in the context of another research project. As I was doing my PhD as a staff member, I had to look for ways of funding my time that complemented my PhD research. Therefore, I led a review about telephone advice as part of a wider review of effectiveness of different models of delivering urgent care (Turner et al. 2015) and I wrote the chapter in the report about telephone advice using my PhD research. The full report can be accessed here (chapter 4: telephone triage and advice services) https://www.ncbi.nlm.nih.gov/books/NBK327599/

Following this, I updated the UEC telephone advice review in April 2019. This review is referred to as the *'UEC telephone advice review'* in this thesis.

I also undertook a more specific review aimed at identifying evidence relating to ambulance telephone advice. The ambulance telephone advice review was initially undertaken in 2019 and updated in March 2021. This review is referred to as the *'ambulance telephone advice review'* in this thesis.

Therefore, this review synthesised and compared findings from the UEC telephone advice review and the ambulance telephone advice review. In doing so, this brings together key evidence on this important topic area and creates a single source of synthesised results that will be of use to wider stakeholders (clinical staff, policy makers, commissioners).

2.7.5. *Methods*

This section justifies the choice of review method and describes the process of searching the literature, extracting the data and synthesising the results. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart (Page et al. 2020) was used to document the results of the searches.

2.7.5.1. Determining the which types of review to use in this review

In the earlier review (section, 2.2.3.1) I described the primary purpose of undertaking reviews of the literature, the importance of choosing the appropriate review method and the different types of review methodology. There were several factors that influenced the choice of review method for this review, including the pragmatic stance that underpins this PhD thesis.

Firstly, the UEC telephone advice review was published as part of a larger rapid review to identify the evidence on the effectiveness of different models of delivering urgent care in 2015 (Turner et al 2015, chapter 4). Rapid review methods were used in the larger review due to the large quantity of low-quality published literature review, which contained few randomised controlled trials (RCTs) or multi-centre studies. Given the large quantity of low-quality evidence, the focus was on identifying the key evidence rather than all evidence.

Secondly, the scope of this review was very broad, due to the wide range of services that fall within and also deliver care within the UEC system, which means that multiple conditions and populations are included. This resulted in a vast amount of potential literature. Therefore, due to the size and scope of the review component in this thesis and for comparability with the UEC telephone advice review, the same methodological approach was applied to the ambulance telephone advice review. This means that rapid review methods were applied throughout to ensure timely and efficient identification of evidence. The next section describes how the review uses rapid review methods whilst aiming to maintain the rigour, transparency and reproducibility of a systematic review.

2.7.5.2. Rapid reviews

Rapid reviews are used to assess the evidence and what is known about a topic, practice issue or policy (Khangura et al. 2012). They can be used when time or resources are limited, or as a method of reducing the number of papers included where the evidence base is very broad (Tricco et al. 2015). This can prevent a review from being unwieldy whilst still maintaining methodological rigour. From a pragmatic view, a rapid review was suited to this review as this PhD had no external funding attached. Using a rapid review method also meant that the two elements of this review, the UEC telephone advice review and the ambulance telephone advice review, could be synthesised more meaningfully.

The key to a successful rapid review approach is to carefully assess which aspects of the review are limited in order to ensure that rigour is maintained within the methods. For example, the searches can be limited by publication year or the number of databases searched.

The following criteria were implemented for this rapid review and these recognise the practical challenges of this review whilst maintaining the rigour of the review methodology:

- A structured search strategy was used to identify the most relevant evidence
- Studies identified from the ambulance telephone advice search were screened by a single reviewer
- Data extraction was limited to key information about safety, appropriateness and acceptability, rather than all of the outcomes reported
- The quality of included studies was summarised narratively, rather than through undertaking an individual study quality assessment.

2.7.6. Review methods

Both the UEC telephone advice review and the ambulance telephone advice review included relevant systematic review and primary research papers identified from systematic searches of multiple databases and aimed to provide a broad overview of the UEC telephone advice evidence relating to safety, appropriateness and acceptability.

2.7.7. Database searches

2.7.7.1. UEC telephone advice searches

The UEC telephone advice search was first undertaken in November 2014 and searched the following databases: MEDLINE (via Ovid SP), EMBASE (via Ovid), The Cochrane Library (via Wiley Online Library), Web of Science (via the Web of Knowledge) and the Cumulative Index to Nursing and Allied Health Literature (CINAHL; via EBSCOhost). Search results were imported into an Endnote database for review. Update searches for the UEC search were undertaken in March 2019 using the same databases and the same search terms. Search strategies are reported in Appendix 4. Relevant terms relating to the following were combined: urgent care; out-of-hours; telephone advice services; ED attendances; emergency admissions; safety: mortality; adverse events; appropriateness; under triage; over triage; patient outcomes; acceptability; patient experience and satisfaction.

2.7.7.2. Ambulance telephone advice search

The ambulance telephone advice searches were undertaken in March 2019 and updated in March 2021. The following databases were searched: Medline via Ovid SP and EMBASE via Ovid. Only the databases that identified the most relevant results from the UEC telephone advice searches were used for the ambulance telephone advice searches, and this search strategy also recognises that there is some overlap between the two reviews, with the possibility that ambulance studies may be identified from the UEC telephone advice search. Studies have shown that when searches are

restricted to the most relevant databases, this does not negatively impact the results (Watt 2008) and Booth et al have identified that 85% of search results can be identified from a Medline search alone (Booth 2016). Search strategies are reported in Appendix 4. Relevant terms relating to the following were combined: ambulance service; prehospital; EMS; hear and treat; telephone advice; ED attendances, emergency admissions, ambulance recontacts, safety; mortality; adverse events: appropriateness; under triage; over triage; patient outcomes; acceptability; patient experience and satisfaction;

2.7.7.3. Supplementary search methods

The same approach was used for the supplementary searches in both the UEC and the ambulance telephone advice reviews. The reference lists of included studies were examined to identify other potentially relevant studies. This has been identified as a valuable search method when used in topic areas which have poor consistency of terminology (Janssens et al. 2015). As Review 1 identified inconsistencies in the use of definitions and the outcomes measured, this was an appropriate search method in this review. Grey literature was not included as this would require significant quality assessment due to the lack of peer review (Adams et al. 2017).

2.7.7.4. Inclusion and exclusion criteria

Table 5 below presents inclusion criteria for the review. Inclusion criteria were similar across the UEC and ambulance telephone advice searches. Ambulance searches were limited to those published between 2000 and 2021, to ensure results were relevant to current services. Exclusion criteria were the same for all parts of the review.

Table 5 inclusion exclusion criteria

Inclusion criteria	UEC review	UEC update search	Updated ambulance search
Empirical data (all study designs)	✓	✓	✓
Systematic review; literature review; rapid review; meta-analysis; realist synthesis	X	✓	✓
Emergency and urgent care services	✓	✓	x
Ambulance/prehospital emergency services only	x	x	✓
Published in English	✓	✓	✓
Published between Jan 1995 and November 2014	✓	X	x
Published between July 2010 and March 2019	X	✓	x
Published between 2000 and March 2021	x	x	✓
Telephone triage/advice/consultation	✓	✓	✓
Reports outcomes related to: • Safety e.g. health service recontacts; adverse events, deaths, patient outcomes, delays to appropriate treatment • Appropriateness e.g. appropriateness and accuracy of clinical advice; compliance with advice; inappropriate ED attendance • Acceptability e.g patient experience; satisfaction; acceptability; appropriateness; experience)	✓	✓	✓
Exclusion criteria			
Descriptive reviews with no assessment of outcome	✓	✓	✓
Opinion pieces and editorials	✓	✓	✓
Non-English language publications	✓	✓	✓
Conference abstracts	✓	✓	✓
Telephone services for single or specific conditions	✓	✓	✓
Telephone services for non-urgent advice	✓	✓	✓

2.7.7.5. Screening

Search results were screened using the title and abstract for potential inclusion. Whilst double screening is a gold standard of review methodology, it is resource intensive and can affect the timeliness of a review (Waffenschmidt et al. 2019). Single screening has been identified as an 'appropriate methodological shortcut in rapid reviews, as long as it is conducted by an experienced reviewer' (Waffenschmidt et al. 2019). In the UEC telephone advice review, 10% of titles and abstracts were double screened to compare the validity and consistency of the screening process. No difference was observed between the two reviewers. In the ambulance telephone advice review, my experience and knowledge of the evidence base and the review process was sufficient for single screening to be effective. Where papers were identified as potentially relevant, the full paper was obtained and considered for inclusion.

2.7.7.6. Data extraction

Data extraction was approached from the principle of ensuring the most relevant evidence was extracted and synthesised, rather than extracting and synthesising all of the findings from each research paper, and this follows principles established in other rapid reviews (Turner et al. 2014). Data was extracted using the following headings: Author; year; country; study design; aim; type of call handler; study population; setting; sample size; main outcomes (safety, appropriateness and acceptability).

2.7.7.7. Quality assessment

As per the review criteria set out above and in keeping with methods used in other published rapid reviews (Turner et al. 2014), the quality of included studies was summarised rather than reviewing the quality of included studies individually (Grant et al. 2009). The quality summary is reported in the results section and describes the type of studies included and main quality issues identified. The quality issues considered in this assessment were methodological limitations and issues relating to the consistency of outcome measures and measurement.

2.7.7.8. Synthesis

Narrative synthesis is commonly used to synthesise rapid reviews because included studies can use different methodologies, meaning that included information can be qualitative or qualitative and not suited to a meta-analysis. Where relevant to do so, data was categorised and presented in tables. Analysis is presented by setting, with a more detailed analysis of the ambulance telephone advice search findings and a summary of the findings from the UEC telephone advice settings. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was used to guide the reporting of the search results and the review (Page et al. 2020).

2.7.8. Results

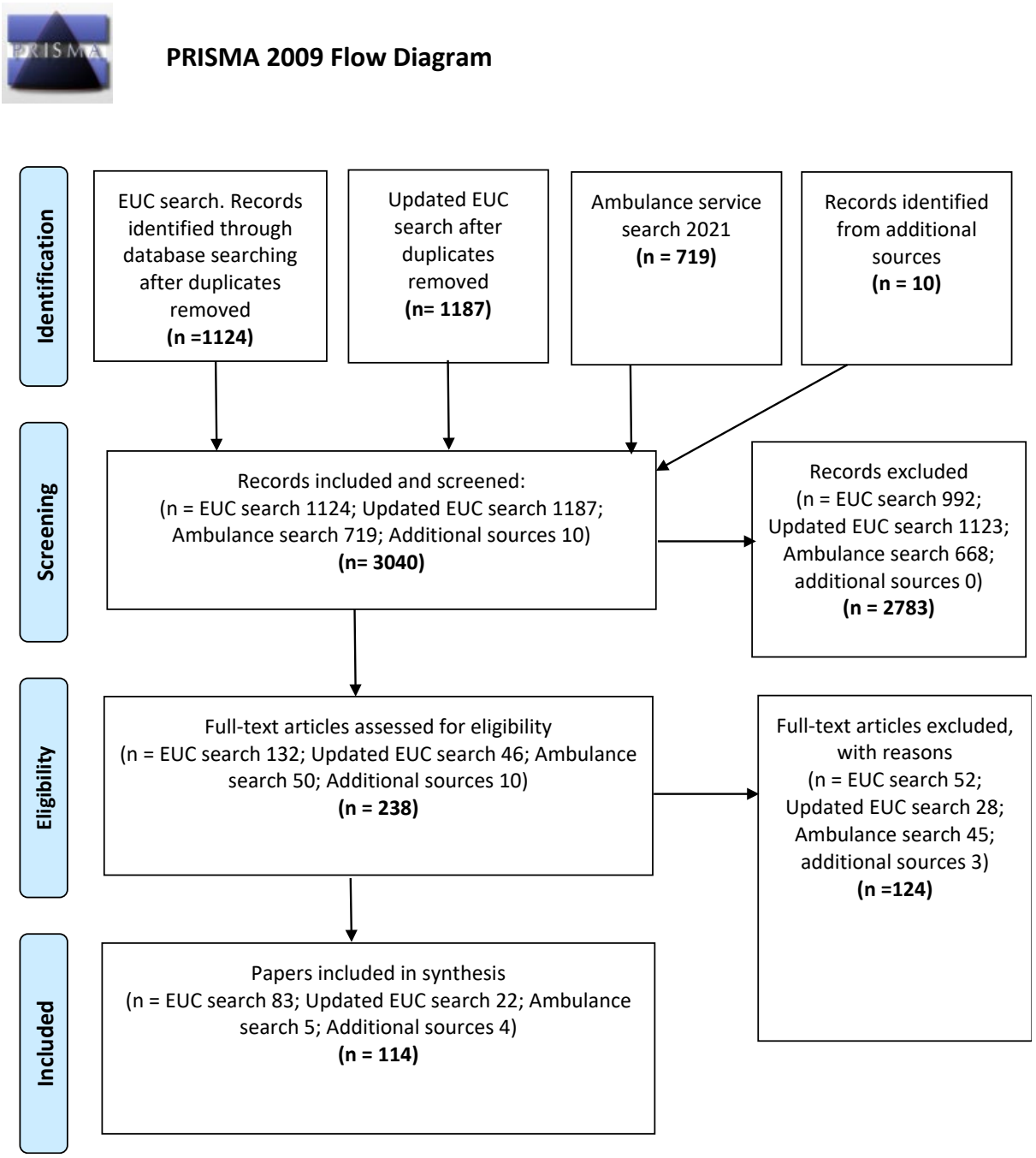
2.7.8.1. Included studies

3040 studies were assessed, and 114 studies were included across both the UEC telephone advice review and the ambulance telephone advice review. There were 24 studies included from an ambulance setting and 90 from a wider UEC setting. Ten of the included studies were reviews of the literature (systematic review, literature review or narrative review).

2.7.8.2. Differences in the number of studies included in the thesis review and the published version

There are differences in the number of studies included in the published review of UEC telephone advice (Turner et al. 2015) and the review reported here. This is because the specific focus scope of this review has on safety, appropriateness and acceptability. This means that some studies included in the published UEC review were excluded from this review, such as studies that focussed solely on cost. The search results at each stage in the screening process are reported in the PRISMA diagram (Figure 8).

Figure 8 Review 2 PRISMA Flow Diagram



2.7.8.3. Data extraction process for primary research studies that are also included in systematic reviews

Ten systematic reviews were included in this review and this means there was potential for double counting results, whereby results were considered within a systematic review and also as an individual research study. Mapping of the research papers against the papers included in the 10 systematic reviews identified that 30 of the UEC telephone advice review studies from the early 2000's were included in multiple systematic reviews. A table in Appendix 5 reports the results of the mapping of research studies against the systematic reviews. To ensure that findings of UEC studies that were included in systematic reviews were not double counted in the analysis, and therefore given additional weight in the synthesis, I did not data extract studies from the UEC telephone advice review that were also included in a systematic review or include these studies individually. Therefore 84 studies (including 24 ambulance studies identified across all of the search methods) were data extracted and the results analysed in this review. Data extractions are reported in Appendix 6 Review 2 data extractions.

2.7.8.4. Process of reporting the findings of this review

The synthesis in this review brings together a review of UEC telephone advice and a review of ambulance telephone advice. The results are reported as focusing on ambulance telephone advice studies first and then widening out to the UEC telephone advice to see if the findings from the ambulance telephone advice differ to those of the UEC telephone advice review.

2.7.8.5. Characteristics of included studies

Characteristics of 74 research studies (22 ambulance and 52 UEC) are reported in Table 6. In addition, there were 10 systematic reviews included (including 2 ambulance systematic reviews), bringing the total number of included studies to 84.

Ambulance studies were undertaken between 2004 and 2021 and a quarter of them were undertaken in Australia. Most of the Australian ambulance studies were undertaken by one research group and the studies relate to different analyses of a linked data cohort. Twenty per cent of the ambulance studies were undertaken in the UK and 21% in the US. All of the ambulance telephone advice studies reported findings from ambulance telephone advice services. However, there may be differences in the ambulance telephone advice process in studies from different countries.

UEC studies were undertaken between 2000 and 2017. Most of the UEC studies were undertaken in the UK (35%) or other European countries (27%). In the UEC telephone advice studies, most were undertaken in services providing 24 hour urgent or OOH urgent care (89% combined). Some of the UEC telephone advice studies reported findings from paediatric settings.

2.7.8.6. Staff types providing telephone advice

In the ambulance telephone advice studies, all of the studies reported ambulance telephone advice systems where either a combination of clinical staff types (either a nurse or paramedic) or a single staff type (nurse) (45% and 50% respectively) provided clinical telephone advice. No ambulance studies looked at paramedic only telephone advice services and no other types of staff other than nurses and paramedics were reported as providing ambulance telephone advice in the included studies.

In the UEC telephone advice studies, telephone advice was also primarily provided by nursing staff, but there was a wider range of other types of staff who provided telephone advice in included UEC

studies. For example, some studies reported systems where nurses gave telephone advice but had the support of a doctor and 5 studies reported systems where only doctors provided telephone advice. There was also one study that reported finding of a telephone advice system that used non-clinical staff, and another that used non-clinical staff but with Doctor support. None of the UEC telephone advice studies reported studies where paramedics gave telephone advice.

Study designs were primarily observation or retrospective in both ambulance UEC and settings. Retrospective studies sometimes reported routine analysis of call data or analysis of call data linked with other health data, but this category also includes studies using case note review and comparisons of retrospective data from more than one type of service. Whilst the number of RCTs is low in both settings, a number of the mixed method studies also had a randomised component. However, overall there were few studies that use an experimental, controlled comparison and this is indicative of the overall quality of the evidence base.

Table 6 Main characteristics of included studies on telephone triage and advice

Characteristics	Number of included ambulance research studies (n = 22) *n* (%)	Number of included UEC research studies (n = 52), *n* (%)	Total number of primary research studies (n = 75) *n* (%)
Country			
USA	5 (21)	10 (20)	15 (20)
UK	5 (21)	17 (35)	23 (31)
Australia	6 (25)	6 (11)	12 (16)
Other Europe	2 (8)	14 (27)	16 (21)
Other	4 (17)	5 (10)	9 (12)
Study design			
RCT	1 (4)	1 (2)	2 (3)
Observational	1 (4)	21 (40)	22 (29)
Qualitative	1 (4)	7 (13)	8 (11)
Retrospective	16 (73)	12 (23)	28 (37)
Controlled	0	0	0
Before and after (uncontrolled)	1 (4)	3 (6)	4 (5)
Before and after (controlled)	0	1 (2)	1 (1)
Mixed-/multimethod	2 (10)	5 (9)	7 (9)
Other	0	3 (6)	3 (4)
Staff			
Nurse or paramedic	10 (45)	0	10 (13)
Nurse	11 (50)	34 (64)	45 (60)
Doctor	0 (0)	5 (9)	5 (7)
Nurse or doctor or nurse with doctor support	0	9 (17)	9 (12)
Multiple clinical	0	2 (4)	2 (3)
Non-clinical	1 (5)	1 (2)	2 (3)
Non-clinical or doctor	0	1 (2)	1 (1)
Not stated	0	1 (2)	1 (1)
Setting			
24-hour urgent	0	27 (51) (paediatric=1)	26 (65)
OOH urgent	0	20 (38) (paediatric=1)	20 (75)
Primary care	0	4 (8) (paediatric=1)	4 (75)
EMS/ambulance	24 (100)	0	24 (32)
ED	0	2 (paediatric=1)	2 (3)

EMS, emergency medical service; RCT, randomised controlled trial.

2.7.8.7. Mapping conceptual outcomes of safety appropriateness and acceptability

Using the extracted data, the outcomes reported in included studies were mapped as relating to safety, appropriateness or acceptability. Table 7 reports the total number of studies reporting outcomes in the categories of safety, appropriateness and acceptability.

Table 7 Studies reporting outcomes relating to safety, appropriateness and acceptability (including systematic reviews)

Study outcome	Included ambulance studies (n=24) n (%)	Included UEC studies (n = 60), n (%)	Total studies (including systematic reviews) (n = 84) n (%)
Safety	10 (42)	11 (18)	21 (25)
Appropriateness	22 (92)	38 (62)	60 (71)
Acceptability	6 (25)	22 (37)	20 (24)

Over 40% of ambulance telephone advice studies reported outcomes related to safety. These included outcomes relating to the incidence of patient harm, such as adverse events or death. Outcomes relating to safety and the ambulance telephone advice studies in which they were reported are mapped in Table 8 on the following page. In contrast, only 18% of the UEC telephone advice studies reported outcomes related to safety.

Most (92%) of the ambulance studies reported outcomes relating to appropriateness. Whilst this figure seems high, some of the outcomes reported represent 'implied appropriateness'. For example, ED attendances within 3 days of the ambulance call was sometimes used to indicate that telephone advice did not fully resolve the health problem and therefore may not have been appropriate. A higher number of outcomes were reported relating to appropriateness than for safety and acceptability. The outcomes used to measure appropriateness in ambulance studies are reported in Table 8 on the following page. A high proportion (62%) of the UEC telephone advice studies also reported outcomes relating to appropriateness.

Only 25% of the ambulance telephone advice studies reported findings related to the acceptability of ambulance telephone advice. This may be reflective of the difficulty in obtaining user views from ambulance service users. The types of outcomes reported in relation to acceptability include whether the patient's needs were met, satisfaction and whether the patient complied with telephone advice. A higher proportion (37%) of the UEC studies reported outcomes related to the acceptability of telephone advice and most of these were reports of patient satisfaction using a follow up surv

Table 8 Map of outcomes identified from the systematic review

Outcome categories	Included ambulance studies (see legend on the following page to identify studies)																							Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Safety																									
Safety of telephone advice decisions														✓											1
Deaths																			✓						1
Adverse events/outcomes											✓		✓			✓									3
Hospital admissions (inc unplanned)	✓	✓				✓		✓		✓	✓				✓	✓			✓					✓	10
Under triage																	✓								1
Appropriateness																									
ED referrals/attendances	✓							✓	✓						✓	✓									5
Planned and unplanned ED attendances	✓	✓																							2
Proportion of ED attendances assessed as appropriate/admitted		✓													✓										3
Appropriateness of decisions	✓		✓		✓													✓		✓			✓		6
Characteristics of calls associated with appropriateness			✓																						1
Proportion of calls resolved that did not require an ambulance				✓	✓				✓		✓	✓			✓	✓									7
Proportion of calls passed back for an ambulance response after telephone advice						✓			✓		✓					✓					✓				5
Reduction in inappropriately sent ambulances				✓																					1
Acceptability																									
Staff perceptions of appropriateness																						✓			1
Recontacts				✓	✓																			✓	3
Frequent callers	✓										✓														2
Patient satisfaction							✓				✓		✓			✓									4
Acceptability											✓	✓													2
Patient's needs met											✓	✓													2
Compliance with advice/disposition	✓						✓				✓	✓													4

Table 8 Legend

Study number in Table 8	First author and year
1	Spangler D, 2018
2	Eastwood K et al, 2017
3	Eastwood K et al, 2018
4	Crowther L et al, 2009
5	Pernas MP et al, 2016
6	Morimura N et al, 2009
7	Krumperman K et al, 2015
8	Vincent A et al, 2019
9	Eastwood K et al, 2016
10	Studnek J et al, 2012
11	Turner JK et al, 2006
12	Infinger A et al 2013
13	Smith WR, 2001
14	Dale J et al, 2004
15	Dale J et al, 2003
16	Eastwood K, et al 2015
17	Palma E et al, 2014
18	Kirkland SW et al, 2018
19	Katayama Y et al, 2020
20	Eastwood K et al, 2020
21	Eastwood K et al, 2019
22	O'Hara RA et al, 2019
23	Eastwood K et al 2018
24	Mackenhaeur J et al, 2021

2.7.9. *Main findings relating to safety*

Twelve ambulance studies reported outcomes related to safety and this includes 2 systematic reviews (Wheeler et al. 2015; Eastwood et al 2015). Outcomes reported relating to safety were: the safety of telephone advice decisions; deaths; adverse outcomes and complications; and hospital admissions. The most frequently reported safety outcome was hospital admissions after receiving telephone advice. Eleven UEC studies reported outcomes related to safety and 7 of these were systematic/literature reviews (Huibers et al. 2011; Lake et al. 2017; Carrasquiero et al. 2011; Stacey et al. 2003; Bunn et al. 2005; Chapman et al. 2004). Evidence from systematic reviews is considered first and then the main findings from research studies are reported under the outcome headings reported in Table 8 on page 59.

2.7.10. *Ambulance telephone advice safety*

2.7.10.1. Safety of telephone advice reported in systematic reviews

A review by Eastwood and colleagues considered the safety of ambulance telephone advice and included 7 of studies (Eastwood et al 2015). These 7 studies are also included in this review as individual research papers so that the findings can be explored in the detail required for this thesis. However, the summary information reported in the Eastwood review is useful for reporting an overview of these findings. The Eastwood review concluded that adverse events were infrequent for calls that were triaged to receive telephone advice and that this was possibly due to calls having already undergone primary triage and been identified as low urgency. A review by Wheeler et al compared different staff types identified that telephone advice was less safe during OOH when it was undertaken by either non-clinical staff or doctors, than by nurses, and that this was due a less complete decision-making system (composed of guidelines, documentation, training and standards) being used by non-clinical staff and doctors (Wheeler et al. 2015).

2.7.10.2. Safety of telephone advice decisions

A study by Dale and colleagues in 2004 undertook a reassessment of data from a pragmatic RCT and used an expert panel to review the safety of decisions where an ambulance was not sent and the call received telephone advice from a nurse or a paramedic (Dale et al. 2004). Whilst this study did not report mortality information, it did use expert review to assess cases according to whether there was a risk to life if an ambulance was not sent within 14 minutes. The study found that nearly all of the expert panel agreed with the telephone advice decisions made by the nurses or paramedics, except in 4 cases a life risk was identified by at least one reviewer. Further investigation of the 4 cases where at least one reviewer identified a life risk revealed that data entry errors meant that 2 of the cases had the wrong information recorded and that there were no cases where there was a consensus view about life risk.

2.7.10.3. Deaths

Deaths are thought to be a rare event for this patient group, given that the ambulance telephone advice population consists of service users who have already been triaged as low urgency (Turner et al. 2006). However, it is possible a patient could die within a short time of receiving telephone advice if the seriousness of a patient's condition is not recognised and this results in a delay to receiving effective and timely care. No studies reported deaths for patients whose call was closed with telephone advice. One study reported deaths following ambulance telephone advice for a sub-group of patients whose call was initially referred for telephone advice but which was then referred back for an ambulance response by the Clinical Advisor and the patient was conveyed by ambulance to ED

(Katayama et al. 2020). This study identified that 0.2% (8/4293 patients) died in an undisclosed timeframe.

2.7.10.4. Adverse outcomes and complications

Two studies reported adverse events following ambulance telephone advice. These were a two-phase prospective study undertaken by Smith et al in the US in 2001 and a mixed method study including a pragmatic RCT undertaken in by Turner in the UK in 2006. The study by Smith et al reported that no patients experienced an adverse event following ambulance telephone advice. Data about whether the patient experienced an adverse event was collected from follow up calls with patients or for patients who attended the ED from a review of the ED discharge diagnosis. However, information about which to judge whether an adverse event occurred was only obtained 1 of the14 ED patients who attended the ED and for 85/133 (63.9%) patients who took part in a follow up call and it is possible that adverse events are under reported due to incomplete reporting and because of small sample of 133 patients. In a mixed-method prospective evaluation of the costs and benefits of referring low urgency in hours ambulance calls to NHS Direct nurse advisors, Turner and colleagues identified 2/3975 (0.0005%) cases which were classified as serious adverse events. Serious adverse events were identified through patient/family self-reporting/complaint mechanisms to the ambulance service, therefore there is a possibility that these are under-reported. A further 4 adverse events (4/1552; 0.25% cases) were identified through identifying hospital admissions after ambulance contacts, thereby using admission to hospital as a proxy for an adverse event. None of the adverse events identified in the study by Turner resulted in an unexpectedly worse clinical outcome for the patient. The authors concluded that they identified a small number of serious adverse events, but that a larger study may be required to identify all adverse events.

2.7.10.5. Hospital Admissions

Information about hospital admissions following telephone advice were reported by 9 research studies and 1 systematic review (Eastwood et al. 2015). One of the studies (Morimura et al. 2009) did not report the rates of hospital admission for patients whose call was closed with telephone advice, but stated that they identified an increase in the overall rate of emergency hospital admissions by ambulance following the introduction of the telephone advice service, and that this was due to a decrease in the population of non-urgent cases. Hospital admission rates following ambulance telephone advice for the research studies are reported in Table 9 on page 64.

Directly comparing the rates of hospital admissions after receiving ambulance telephone advice is challenging due to the different focus of individual studies and the differences in the samples included. For example, the study by Vincent only included elderly callers, the study by Turner (Vincent et al. 2019; Turner et al. 2006) only included in-hours calls, the study by Mackenhaur (Mackenhaur et al. 2021) specified that only unplanned hospital contacts within 7 days of telephone advice were included, whereas the study by Spangler (Spangler et al. 2018) included calls that were advised non-emergency care and attended ED within 72 hours, and the study by Eastwood (Eastwood et al. 2018) reported the proportion of patients admitted to hospital after unplanned ED attendances within 48 hours.

The studies by Vincent and Mackenhauer report high rates of hospital admissions of 33% and 49% respectively, but these relate to specific sub-groups of patients (elderly patients and those with severe mental health problems) (Vincent et al, 2019; Mackenhaur et al. 2021). The lowest hospital admission rate of 0.3% was identified in the study by Turner, but this study did not include any OOH callers (Turner et al. 2006). The remaining studies report a range of 6.5% - 25% of patients admitted to hospital following ambulance telephone advice. Of these studies only Eastwood and colleagues

report the number that were admitted after unplanned ED presentations (6.5%) and reported that planned ED attendances were significantly more likely to result in hospital admissions than unplanned (53.8% vs 43.5%; OR 1.5, 95% CI 1.4 to 1.6; p<0.001) (Eastwood et al. 2018). Dale reported that patients who were not advised to seek ED care and who were advised to seek care from alternative pathways or to self-care were less likely to be admitted to hospital than those patients whose calls were returned for an ambulance response (Dale et al. 2003). The study by Studnek, which reported the highest subsequent hospital admission rate for a general population (25%), identified that hospital admissions were more frequent for patients who were triaged as having health problems related to pregnancy, falls, sick person and psychiatric conditions (Studnek et al. 2012). The paper by Studnek also reported that 2.2% of patients were admitted to ICU after receiving telephone advice.

Table 9 Hospital admissions after telephone advice

	Study							
	Turner 2006	Studnek 2012	Spangler 2018	Eastwood 2017	Vincent 2019	Dale 2003	Katayama 2020	Mackenhauer 2021
Proportion of patients admitted to hospital after receiving ambulance telephone advice	0.3% (4/1552) admitted after telephone advice	25.3% (134/530)	37%, (78/215; 95% CI = 30.4 – 43.9)	6.5% (306/4703) admitted for unplanned ED presentations	33% (228/692) admitted to hospital and 3% (21/692 to ICU	9.2% (30/635)	29.2% (1255/4293)	40.7% (2887/7093)minor mental health history - 49% (3061/6247)severe mental health history
Information about calls/patients included in the analysis	Only included in hours calls. Excluded OOH calls	Included low-acuity Omega classification calls	Included calls referred by the Clinical Advisor to non-emergency care who ED within 72 hours	Included planned and unplanned ED presentations within 48 hours of a secondary telephone triage	Included 692 calls of elderly people	Excludes children <2, callers with language or comprehension difficulties	Includes patients conveyed by ambulance after telephone advice	Includes unplanned hospital contact within 7 days of telephone advice

This synthesis shows that there is uncertainty around the rate of subsequent hospital admissions for patients who receive telephone advice. The study by Turner identified the lowest rate of hospital admissions for in-hours calls that receive telephone advice (Turner et al. 2006), and this may indicate that the rate of hospital admissions may differ for in and OOH telephone advice calls. The differences in study inclusion criteria and the different rates of subsequent hospital admissions reported may be indicative of different rates of hospital admissions for different types of telephone advice calls. There is some evidence that hospital admissions are more likely after planned ED attendances (if they were given telephone advise to seek ED care or the call was returned back for an ambulance response and the patient conveyed to ED by ambulance).

2.7.10.6. Findings from UEC telephone advice studies

There were 7 systematic or literature reviews and 4 primary research studies that reported safety in UEC telephone advice settings, with one systematic review published in 2011 concluding there was a lack of research about the safety of telephone triage and advice systems. Four of the reviews identified no difference in or very low rates of hospital admissions and deaths after telephone advice (Stacey et al. 2003; Lake et al. 2017; Bunn et al. 2005; Chapman et al. 2004).

Several studies compared the safety of different types of staff, of face-to-face versus telephone care, or of different types of services. The systematic review by Chapman in 2004 considered the safety of GP led telephone advice services and identified that nurses were able to safely manage most OOH calls when compared with face-to-face consultations. This is supported by a finding in a 2012 study in Switzerland which investigated the safety of nurse telephone triage and identified that nurses were competent at safely carrying out telephone triage (Meer et al. 2012). Whereas another primary care-based study identified that NHS Direct, GP practices and walk-in-centres had comparative safety performance (Grant et al. 2002).

There were several reviews or studies that did identify safety concerns in UEC telephone advice settings. A study by Snooks of telephone advice in NHS Direct in Wales identified that in a small number of cases an expert review identified concerns that telephone advice resulted in insufficient actions (Snooks et al. 2009). A systematic review by Huibers reviewed the evidence on safety in an OOH telephone advice setting and identified that a high proportion (97%) of OOH telephone triage contacts were safe but that levels of safe contacts decreased for higher urgency patients. Some studies in this systematic review used high-risk simulated patients and for this group of patients levels of safe contacts were much lower at only 46%, raising the question of safety of telephone advice for patients with higher urgency health problems. A study in this review identified that safety issues occur more for specific types of calls and callers (children and calls after 11pm) and this links in with the findings from the ambulance telephone advice studies that safety issues may be more prevalent for certain types of calls and OOH. However, one of the first studies of telephone advice in English primary care-based services reported no differences in the rates of poor outcomes for patients with higher urgency health problems.

Finally, Turnbull's UK study in 2017 was an ethnographic study that explored themes related to the management of risk in NHS 111. Risk was identified as a substantial part of everyday practice and that technologies were used to redistribute, remove or to eliminate risk and to improve safety (Turnbull et al. 2017).

2.7.11. *Appropriateness*

Sixty of the 84 studies included in this review reported information relating to appropriateness and within the ambulance studies alone, there were twelve different types of outcome measures that were used to report findings related to appropriateness. The most frequently reported outcomes were the appropriateness of decisions and the proportion of calls passed back for an appropriate response (Dale et al. 2004; Vincent et al. 2019; Spangler 2018; Eastwood et al. 2016). Some appropriateness outcomes are ones that imply appropriateness. For example, a high rate of patients who attend ED or recontact the ambulance service after receiving telephone advice implies telephone advice may not have been appropriate. Whilst there were a large number of studies that reported appropriateness, few considered the appropriateness in terms of over or under triage to other health services and comparing results from different studies was challenging due to the different ways in which outcomes were measured and reported (Dale et al. 2004; Vincent et al. 2019; Spangler 2018; Eastwood et al. 2016).

2.7.11.1. Ambulance appropriateness studies

In Review 1 earlier in this chapter, I defined appropriateness as care that is proportional to the health problem (that the level of care was both necessary and sufficient) and identified different attributes and measures of appropriateness. Twenty-two ambulance studies in this review reported information relating to the appropriateness of telephone advice, and these often related to the care that patients were advised to seek or the subsequent health contacts that the patients' made. Some studies measure appropriateness explicitly, such as the appropriateness of telephone advice decisions as reviewed by an expert panel, or assessed the appropriateness of subsequent health contacts whereas others measure appropriateness implicitly, such as reporting outcomes that may be affected by the appropriateness of the advice e.g. the proportion of ambulance recontacts with no assessment of the appropriateness.

2.7.11.2. Appropriateness of telephone advice reported in systematic reviews

The systematic review by Eastwood of ambulance telephone advice concluded that further research is necessary to determine the most appropriate set up for the delivery for ambulance telephone advice and that appropriateness can be measured by the impact that telephone advice has on ambulance demand, such as the number of calls returned back for an ambulance response and the proportion subsequently conveyed to the ED (Eastwood et al. 2015). However, this does not take into the system impact of ambulance telephone advice, as whilst telephone advice may result in a decrease in ambulance service responses, it could increase other types of UEC contacts, such as ED attendances. The systematic review by Wheeler and colleagues identified that nurses had the most appropriate referral rates, when compared to other staff types (Wheeler et al 2015).

2.7.11.3. Appropriateness of triage advice and referrals: ED referrals, planned and unplanned attendances and appropriateness of ED attendances

Four studies reported subsequent ED attendances (Dale et al. 2004; Vincent et al. 2019; Spangler 2018; Eastwood et al. 2016), however, different time frames were used to report ED attendance, which makes comparing the results from different studies challenging (e.g. 24, 48 and 72 hours). Two of the studies (Spangler 2018; Eastwood et al. 2016) assessed the appropriateness of ED attendances. This is important because a patient may receive telephone advice not to attend ED, but still attend. An

attendance at ED may result in treatment, investigations, and or hospital admission or it may result in discharge back to the normal residence without any treatment or investigations. Whether the patient received treatment or investigations whilst in the ED or was admitted to hospital is sometimes used to determine if the ED attendance was appropriate. However, different criteria can be used by different studies to assess the appropriateness of ED attendances, leading to further difficulty in making between study comparisons.

Of the two studies that assessed the appropriateness of subsequent ED attendances, one reported appropriateness within 72 hours and one reported appropriateness with 48 hours. A study from Sweden identified that 20% of call closed with telephone advice attended ED with 72 hours and that 57% of the ED attendances received specialist care in the ED, suggesting that ED attendance was appropriate in those 57% of cases (Spangler 2018). This study also identified that elderly patients were less likely to be referred to the ED as a result of telephone advice, but if they did attend the ED older patients were more likely to be admitted to hospital. Further evidence around the appropriateness of ambulance telephone advice was that ambulance callers who were given advice to self-care were identified as likely to attend ED within three days. An Australian data linkage study reported ED attendances within 48 hours for patients who received ambulance telephone advice for cases that were advised to attended ED (reported as planned ED attendances) and for cases that were advised to seek care from other health services but attended ED (unplanned) (Eastwood et al. 2017). Nearly 15% (705/4703) of patients that were advised to seek non-emergency care attended ED and 9.5% (447/4703) of the patients who were advised to seek non-emergency care were classified as appropriate ED attendances by the study.

Of the two studies that reported potential appropriateness, one was a UK RCT undertaken in 2004 and this reported that of the 330 patients who received telephone advice, 63.4% (211/330) subsequently attended ED (Dale et al. 2004). Whilst this does not look explicitly at whether these patients were advised to make their own way to ED or not, or state the timeframe in which the ED attendance occurred, it is a comparatively high rate of ED attendance for cases that were triaged as 'non-serious'. However, this study was undertaken in the very early stages of ambulance telephone advice implementation in England and Wales and therefore the telephone advice system was less embedded at the time of this study. A retrospective observational study was undertaken in France and considered what happened to elderly patients following ambulance telephone advice (Vincent et al. 2019). This study identified 62% of callers were referred to the ED and that of these 56% were admitted to hospital. As nearly half of ED attendances were discharged home from the ED, the authors concluded that more appropriate triage for this patient group could reduce ED referrals.

2.7.11.4. Calls resolved by telephone advice/returned for an ambulance response

Four of the ten studies reported the proportion of calls that were resolved with telephone advice with no further ambulance contacts (Pernas et al. 2016; Turner et al. 2006; Eastwood 2016 and 2019). In terms of appropriateness, high rates of referral back to the ambulance service or recontacts with the ambulance service as a new call would indicate that telephone advice was not appropriate. A Spanish study identified that 92% (of 37533 calls) were resolved with telephone advice and did not result in an ambulance response or a new call to the ambulance service (Pernas et al. 2016). Other studies identified a higher rate of calls returned for an ambulance response. A US study reported that nearly 40% of calls were not resolved with telephone advice this was due to transport issues and identifying

more complex health problems than had been identified through the primary triage process. A UK study by Turner reported a high return rate of calls back to the ambulance service (66.9%) and suggested that although calls are initially classified as non-urgent, they may still require a face-to-face assessment (Turner 2006). An Australian routine data linkage study identified that 27.6% of calls were referred back to the ambulance service for an emergency ambulance (Eastwood et al 2016). Overall, the proportion of calls that were resolved with telephone advice ranged from 8% - 66.9% and this variation may be due to the differences in study designs, inclusion criteria and international differences in the way that services are run, with the four studies reporting this data being undertaken in Australia, Spain, US and the UK.

A further study by the Australian research group assessed the appropriateness of cases sent back for an ambulance response following ambulance telephone advice (Eastwood et al. 2019). In this study, the authors measured appropriateness by identifying whether advanced life support was provided by a paramedic and whether the patient was transported to hospital by the ambulance service. They identified that of the 27.6% telephone advice cases that were returned back for an ambulance response, 82% were subsequently transported to hospital and 66.5% also received advanced life support. This suggests ambulance telephone advice can appropriately identify cases which require more urgent care but raises questions about the primary triage assessment.

2.7.11.5. Call characteristics associated with appropriate telephone advice decisions and referrals

A separate paper by the Australian group analysed the characteristics of calls that were sent back for an ambulance response following telephone advice (Eastwood et al. 2018). Characteristics of calls and callers where the sending of an ambulance resulted in no paramedic treatment were pain; age; time of day, triage guideline group and comorbidities. Patients who were age <4 and patients who were calling for mental health related problems were less likely to receive treatment from paramedics, whereas patients with increased levels of pain was associated with increased level of paramedic treatment. This suggests that patients with mental health issues or young children could be referred to alternative pathways rather than the call being returned for an ambulance response. An Italian study identified characteristics of calls that were under triaged, and these were calls where the caller was not the patient, calls that were shorter and calls where the caller reported low urgency health symptoms (Palma et al. 2014).

2.7.11.6. Staff perceptions of appropriateness

A UK based study undertook interviews with staff to identify their views of the operational factors that influence how telephone advice is delivered (O'Hara et al. 2019). This study identified that staff viewed telephone advice as a means of managing demand and as a method for delivering appropriate care. Services varied as to their primary view of the purpose of telephone advice, and in some services it was felt primarily to be a demand management method, whereas other services were identified as more risk adverse and in these services there were higher rates of calls sent back for an ambulance response. This indicates that the organisational view of the purpose of telephone advice and the safety culture of the organisation may impact on the way in which telephone advice functions within an ambulance service.

2.7.11.7. High volume service users and recontacts

Some types of calls may be more difficult to resolve with telephone advice. Some callers may recontact the ambulance service if their health problem worsens or if they were not happy with the response they received, and some other callers are more habitual and phone regularly for very low urgency health problems. Only one study specifically reported recontact rates and they identified 3% of callers as recontacting within 24 hours of receiving telephone advice (Pernas et al. 2016). Several studies reported information relating to frequent callers. A Swedish data linkage study categorised ambulance callers into frequent, moderate and low users of emergency ambulance services. People who contact services frequently were more likely to be referred to non-emergency care services and they also had increased odds of a subsequent ED attendance (Spangler 2018). An Australian study reported nearly 10% of patients in their sample called more than once and also identified a group of very high frequency callers, with 36 patients calling more than once per month and one patient who called more than 1000 times (Eastwood et al. 2016).

2.7.11.8. UEC appropriateness studies

There were 38 UEC studies identified in the UEC telephone advice review that considered appropriateness, including 5 systematic/literature reviews (Lake et al. 2017; Carrasquiero et al. 2011; Stacey et al. 2003). Due to the volume of studies reporting appropriateness, only the most relevant studies were summarised here. Some of the systematic reviews included the same studies and therefore reported similar findings. For example the reviews by Stacey and Bunn considered the same studies and the main findings were that that over 50% of calls could be handled by telephone advice alone (Stacey et al. 2003; Bunn et al. 2004). The review by Bunn also reported most studies included in the review found that introducing a telephone advice line did not result in an increase in ED attendances. However, the review by Carrasquiero concluded that where studies assess the adequacy of advised care, it was not possible to establish high rates of advice appropriateness (Carrasquiero et al. 2011). The systematic review by Blank identified variation in the proportions of triage decisions rated as appropriate and that these varied between 44% and 98% (Blank et al. 2012). Two reviews identified that individual studies used different methods of measuring appropriateness and this meant that comparing results across individual studies was challenging (Blank et al. 2012; Lake et al. 2017).

In UEC studies that assessed the appropriateness of ED attendances and referrals, most reported high rates of appropriate referrals (Kempe et al. 2000; Huibers et al. 2012). Triage advice was identified as over cautious rather than insufficient, meaning that advising a higher level of care than the health problem needed (over triage), was the main issue relating to advice appropriateness (Snooks et al. 2009). For example, the study by Anderson in 2015 used GPs to review NHS 111 nurse telephone advice decisions to refer to ED and identified that 73% of 1474 ED referrals would have been given alternative dispositions (Anderson et al. 2015). A study by Huibers and colleagues in Denmark examined OOH primary care telephone calls that were referred for a face-to-face appointment and found that whilst the majority of referrals were appropriate (84%), 12% could have been closed with telephone advice (Huibers et al. 2012). However, one study that assessed medical scenarios and compared with national guidelines, found that patients that required more urgent care were less likely to be correctly classified. Relevant findings from other included studies were a study that identified no difference between patients who were referred by telephone and those who self-presented (Ng et al. 2011) and a study that identified that patients referred by doctors were the most

appropriate referrals (Al-Abdullah et al. 2009). Furthermore, a paediatric based study identified that 33% of referrals to ED are non-essential (Doctor et al. 2013) and expert review of NHS 24 referrals found over 20% of cases could have been handled in primary care (Cook et al. 2010).

2.7.12. *Acceptability*

Acceptability was reported by 22 studies overall, but by only 6 of the ambulance studies (Turner et al 2006; Infinger et al. 2013; Smith et al. 2001; Eastwood et al. 2015; Spangler 2018; Krumperman 2015). Acceptability is defined in this thesis as the patient's views on the safety and appropriateness of care and their care experience. Acceptability was rarely reported as an outcome itself and components of acceptability, such as the patients views on their care experience or satisfaction were more commonly reported. Compliance is included in this section because patients may be less likely to comply with telephone advice if they do not find the advice acceptable, appropriate or safe. Other outcomes reported were patient's needs met and patient satisfaction.

2.7.12.1. Ambulance acceptability studies

Six studies reported outcomes related to acceptability and the findings are grouped under the following headings: satisfaction; acceptability; patient's needs met and compliance (Turner et al 2006; Infinger et al. 2013; Smith et al. 2001; Eastwood et al. 2015; Spangler 2018; Krumperman 2015).

2.7.12.2. Satisfaction

Three studies and one review reported user satisfaction with telephone advice. Data for these studies was collected using postal or telephone surveys. A US based study used telephone follow up to assess service user satisfaction of patients who were discharged at scene or who received telephone advice and found high rates of service user satisfaction for both responses (>93%) (Krumperman et al 2015). This is similar to another US study that found 96% of callers were satisfied with ambulance telephone advice service and only 4 callers (4%) who were not satisfied (Smith et al, 2001). A UK study by Turner conducted a telephone survey two days after the ambulance call telephone advice call and found most callers were satisfied with telephone advice (84.9%), but this was less than the proportion who were satisfied when an ambulance was sent (94.8%) (Turner et al. 2006). This study identified that callers particularly valued the reassurance and advice that they were given but were less satisfied with the amount of questions they were asked by the clinical advisor or about whether they received the right amount of advice.

2.7.12.3. Acceptability

Two studies reported acceptability as an outcome, in terms of whether callers accepted or refused for calls to be dealt with by telephone advice or whether they would accept telephone advice in the future (Turner et al. 2006; Infinger et al. 2013). A US study used a patient survey and 58% of patient responded (Infinger et al. 2013). Of these, 91.5% said they would accept telephone advice again. In the other component of this study, which reviewed routine call data, almost 5% (16/345) patients refused telephone advice. A UK patient survey reported the reasons why patients accept or refuse telephone advice following a call to the ambulance service (Turner et al. 2006). Reasons for accepting telephone advice included feeling an ambulance was not needed (8%) not being aware of the service (22%), previously used the service (22%), happy to talk to the nurse (22%). Most patients (62%) felt that an ambulance was required but were happy to talk to a nurse first. The main reason for refusing advice was feeling that an ambulance was needed (74%), but other reasons included not wanting to talk to a nurse (9%); not viewing telephone advice as a good service (6%) and that it was a possible waste of time (11%).

2.7.12.4. Compliance

Three studies reported information about compliance with ambulance telephone advice, two of which collected data using service user surveys (Turner et al. 2006; Infinger et al. 2013) and one which used routine linked data (Krumperman et al. 2015). One survey reported a compliance rate of 60%, whereas another reported that 80% of respondents felt the advice they were given worked well in practice. The routine data study identified that patients were more likely to follow instructions in the telephone advice system than for patients who were treated and discharged on-scene (95% vs 82% <0.001) (Krumperman et al. 2015). The experience of people who had limited language understanding was identified as a factor in the likelihood of following advice, with those with poor English language proficiency being nearly 10% less likely to comply with telephone advice (Krumperman et al. 2015).

Patient's needs met

The same two studies using a service user survey also reported whether patient's felt their needs were met by ambulance telephone advice, for example, whether they found the advice helpful (Turner et al. 2006; Infinger et al. 2013). The US survey reported 88% of respondents stated telephone advice met their healthcare needs. The UK patient survey by Turner identified 54.5% found the advice helpful and 27.2% found the advice quite helpful. However, 18.3% (51 patients) reported that the advice was either not very helpful or not helpful at all. Reassurance was identified as a factor related to helpfulness, because where patients found the advice helpful, most of these patients also felt reassured by the clinical advisor. Whereas half of the patients who did not find telephone advice helpful also did not feel reassured. Where patients found the advice helpful, a third of these patients reported that it helped them to contact the right service. But where patients did not find the advice helpful, nearly a third of these patients felt that either it did not help them to contact the right service, or that it stopped them from contacting a service. Nine patients reported that they sought other health care in order to get a second opinion about their health problem, due to their being dissatisfied with the advice they were given. The UK survey also reported findings related to a subgroup of frequent callers in nursing homes. This sub-group had positive views of telephone advice and felt it was useful in using the ambulance service more appropriately.

2.7.12.5. UEC acceptability studies

Twenty-two UEC studies reported data relating to acceptability and six were systematic reviews (see appendix 6, review 2 data extractions). Across the six reviews the same studies were included multiple times. Therefore, the main findings from the reviews are summarised in the following section, followed by findings from more recent studies that were not considered in the reviews.

2.7.12.6. Systematic reviews

Four of the systematic reviews reported patient satisfaction with telephone advice services and all reported that patient satisfaction was generally high. The review by Bunn reported that services users had equivalent satisfaction with face-to-face and telephone services, but the review by Carrasquiero identified that patients were less satisfied if telephone advice was given instead of care that the patient usually received, such as a home visit (Carrasquiero et al. 2011). The review by Stacey reported that caller satisfaction ranged from 55%-90% for nurse triage service, but for doctor led triage patient satisfaction was around 70% (Stacey et al 2003). The review by Lake was a review of reviews and reported high patient satisfaction levels across the included reviews (Lake et al. 2017). Two of the six systematic reviews reported compliance with telephone advice. The review by Blank et

al. reported compliance across all telephone advice service types and found that this ranged from 56%-98% (Blank et al. 2012). The review by Purc-Stephenson identified the mean compliance rate across included studies was 62%, but also reported that compliance rates varied depending on the type of clinical advice given and that compliance rates were higher when advice was to seek ED care than for primary care (63% versus 44% respectively) (Purc-Stephenson et at. 2012). However, the highest compliance rate was for self-care, with 78% of patients complying with self-care advice.

2.7.12.7. Call and caller characteristics that impact on patient's views of telephone advice

Qualitative studies identified key aspects of the call that are important to patients and may influence their views about the acceptability of telephone advice. These include including callers in the decision-making process, the politeness of the call handler, friendliness and respect (Strom et al. 2009). Telephone advice was also viewed as helpful for service users who were concerned about using a service inappropriately and to find out which level of service they needed to use (O'Cathain et al. 2014). One study used a cross-sectional survey and identified that calls there were not answered promptly or were delayed or that had shorter consultations were associated with lower service user satisfaction (Kelly et al. 2010). A UK study of the NHS 111 service identified that satisfaction was affected by the relevance of the question they were asked and the appropriateness of the advice they received (O'Cathain et al. 2014). In addition, callers who were automatically transferred from another service to a telephone advice service were less satisfied than callers who had intended to contact a telephone advice service directly.

2.7.12.8. Impact of expectations and reassurance

A study from Sweden identified that where patient expectations were not met in terms of the level of care or where they disagreed with the advice, these service users were less satisfied than the service users who agreed with the disposition or level of care (Rahmqvist et al. 2011). These service users were identified as more likely to have unplanned attendances at other services within 3 days of the telephone advice call. Another Swedish study in 2016 reported that callers who were younger and those who received advice to self-care were significantly less satisfied than other service users, but that reassurance was key in increasing satisfaction (Gustafsson et al. 2016).

2.7.12.9. Compliance

More recent studies undertaken since the systematic reviews were published have continued to report high compliance rates. A study of compliance with NHS 111 in 2014 identified that 86% of patients complied with the advice they received (O' Cathain et al. 2014). An Australian study published in 2017 reported that compliance rates varied by type of advice, with 69% complying with advice to attend ED, 65% complying with advice to see a GP and 78% complying with advice to self-care (Tran et al 2017). This echoes the finding of the review by Stacey which identified the same proportion complying with self-care advice. Another Australian study from 2016 reported a similar finding for ED compliance, with 67% complying with advice to attend ED (Mckenzie et al. 2016). These studies both reported similar unplanned ED attendance rates following nurse telephone advice, of 7% and 6% respectively. The study by McKenzie compared caller's original intentions to their intentions post telephone advice, and identified that nearly 4% of callers changed their intention to attend ED following telephone advice.

2.7.12.10. Reasons for non-compliance

A Canadian study reported that non-compliance may be unintentional as callers may misinterpret the advice they are given (Leclerc et al. 2003). They compared user recollection of the advice against the recording and found 27% disagreement. An Australian study identified that lower compliance was associated with calls where the caller was not the patient, OOH calls and calls made from disadvantaged areas (Tran et al. 2017). In addition, calls made from rural areas were less likely to follow advice to attend ED (Tran et al. 2017; Mckenzie et al 2016). Finally, a Swedish study undertaken in 2018 identified that compliance with nurse telephone triage was dependent on several factors including the type and level of care advised, whether the care matched the patient's prior intention and the accessibility of the advised care (Martinsson et al. 2018). Perception of risk was also felt to be a factor, as compliance rates were 7 times higher for calls that were advised to seek the highest level of care.

2.7.13. *Discussion and conclusions*

The output from Review 1 is the definitions of safety, appropriateness and acceptability that will be used throughout this thesis. Further relevance and importance of these definitions has been identified through Review 2, which mapped the outcomes used by published studies and highlights the wide variation and inconsistency of measurement of these outcomes. Review 2 reported the evidence around safety, appropriateness and acceptability from an ambulance perspective and from a UEC perspective, and in doing so identified several key findings.

2.7.14. *Main findings*

2.7.14.1. Safety

No ambulance studies explicitly reported mortality outcomes for calls closed with telephone advice. Some studies reported adverse events but did not define what was meant by this, and in some cases very few patients were included in the assessment of adverse events (Smith et al. 2001). Only a small number of ambulance studies considered patient safety related outcomes where harm is identified and, such as adverse events, but due to the small number of patients included, may not have been powered to detect rare events. Furthermore, studies that report adverse events were undertaken over 15 years ago and due to the changes in scope and delivery that ambulance telephone advice has undergone in that time, results from these studies may have little relevance (Smith et al 2001; Turner et al. 2006; Dale et al. 2004). Some studies noted that whilst telephone advice is safe for most patients, there is less evidence about safety for higher urgency patients. Subsequent hospital admission rates after ambulance telephone advice were reported as ranging from <0.3% – 25.3% and these are often used as a proxy for safety. However, directly comparing hospital admission rates from different studies is difficult due to the variation in the sample inclusion criteria used by individual studies, as well as contextual ambulance service factors of different triage software, staff skill-mix and variation in the way in which services are commissioned. Some UEC studies reported that higher urgency calls are sometimes under triaged and that telephone advice may be less safe OOH (Wheeler et al. 2015).

2.7.14.2. Appropriateness

Lack of clear definitions was most problematic in studies reporting appropriateness due to the variation in the approaches used to report appropriateness. When reporting appropriateness some studies use an ambulance service perspective, others consider the appropriateness of referrals by different staff types and very few studies take a system wide view. Ambulance telephone advice is

most frequently reported as appropriate where there are few calls passed back for an ambulance response or where a high proportion of calls are closed with advice and few studies considered the appropriateness of telephone advice in terms of over or under triage to other health services. Studies identified variation in the number of calls closed with advice (8% - 66.9%), with some studies reporting high rates of calls returned for an ambulance response. Services that have a more risk adverse view of telephone advice were identified in qualitative studies to have higher call return rates. Few studies reported recontact rates after telephone advice, but those that did mostly reported low rates. Comparing subsequent ED attendance is difficult as studies use different ways of reporting this information. Few studies reported the appropriateness of subsequent ED attendances, but the two that did reported slightly higher rates of appropriate ED attendances for those that received telephone advice to attend, indicating that ambulance telephone advice to attend ED is mostly appropriate. Of patients who were advised to seek non-emergency care and who subsequently attended ED, one study identified that very few of these patients were 'appropriate attenders' and this suggests ambulance telephone advice to seek care other than ED is appropriate. The appropriateness of telephone advice for certain types of ambulance calls was highlighted, such as the potential for people with mental health problems or young children to be referred to alternative pathways rather than an ambulance response. However, people who call frequently were identified as more likely to attend the ED if their call is closed with advice. In comparison, although around half of UEC telephone advice calls were closed with advice, triage decisions in UEC were sometimes identified as over cautious, with some evidence suggesting that more calls could have been closed with advice or referred to lower urgency services. For example, one study identified that 73% of 111 referrals to ED could have been advised alternative care pathways (Anderson et al. 2015).

2.7.14.3. Acceptability

Only a small number of ambulance telephone advice studies reported acceptability or components of acceptability, and this was mostly reported using user surveys which were limited by small samples sizes and low response rates. Most studies found high overall rates of satisfaction, but few studies looked at the factors that drive satisfaction. One study found that most users would accept telephone advice again, but that a small proportion did not agree with the decision for the call to receive telephone advice, or felt an ambulance was needed or that telephone advice was a waste of time (Turner et al. 2006). Compliance with ambulance telephone advice varied between 60 – 95% and the helpfulness of the advice and the extent to which patients were reassured were key factors in whether callers were satisfied. Where patients did not agree with ambulance telephone advice this could lead to more unplanned ED attendances within a short time frame of receiving telephone advice. In contrast, components of acceptability were more frequently reported in the UEC studies and these also identified high patient satisfaction with UEC telephone advice. Qualitative studies offered more insight into satisfaction and identified what callers' value and this was feeling involved in the decision making process and polite, friendly and respectful staff. Service user surveys identified reasons for dissatisfaction were delays to calls being answered or where the telephone consultation was too brief, perceived irrelevance of questions asked and being transferred from another service could be associated with dissatisfaction. Compliance rates varied more widely than in ambulance telephone advice (56 – 96%) and in UEC telephone advice may be affected by the type of advice, user recollection or understanding of the advice, calls where the caller is not the patient, and factors such as calls from rural areas. The caller perception of risk was also identified as important when making decisions to seek unplanned ED care after telephone advice.

2.7.14.4. Design and quality of included studies

Higher quality evidence was identified in the ambulance review, with more prospective, comparative designs or retrospective studies with larger sample sizes. Within the UEC setting, the quality of evidence in relation to telephone advice was generally low and most studies were retrospective observational studies. Only a small number of studies in both settings used randomised or comparative methods, and this may be reflective of the practical and ethical difficulties in conducting experimental research designs in this setting. Most studies were single site. However, the more recent suite of studies from Eastwood et al in Australia were large retrospective cohort studies using routine call data and that linked ambulance data with routine data from other health services. The included systematic reviews reported a range of quality issues relating to included studies and these were reflective of the UEC and ambulance evidence base included in this review. Quality issues identified were

- Inconsistent and/or poorly defined outcome measures. This was particularly relevant to appropriateness, where there were multiple definitions, meanings and ways of measuring and operationalising this outcome measure.
- Inconsistency in the methods used to measure acceptability of telephone advice.
- The use of different clinical decision support software to triage calls.
- The reality of multiple and different models of service delivery makes comparison of outcomes more challenging. For example, 24 hours, in-hours, out-of-hours.
- Different health service availability in different locations. Local variation of services means that generalisability of studies may be poor if a service only operates in one locality.
- The impact of the differences in measurement methods, study design, definitions, outcome measures, means that where systematic reviews have been able to compare outcomes across different studies, there is usually a wide variation in the results reported and this leads to difficulties in interpreting the strength of the evidence and the overall conclusions

The variation in outcome measurement methods is problematic for comparing results from different studies. As with the definitions of safety, appropriateness and acceptability, there is a need to report outcomes at consistent time points in order to meaningfully compare results from different studies. This review identifies there is a need to identify the best time point at which to measure patient outcomes following ambulance telephone advice. Different studies have reported outcomes measured at 24 and 72 hours, 7 days, 30 days and 1 month.

Whilst retrospective expert review is considered to be the gold standard method of determining the accuracy of triage decisions or identifying the frequency of adverse events, it is also methodologically subjective and differences between reviewers can exist within and between studies, meaning that it can be difficult to generalise the results outside of the study setting (refs).

2.7.14.5. Strengths and limitations of this review

The scope of this review was broad and there was a high volume of evidence that was assessed for inclusion and included in the review itself and evidence was included from ambulance and UEC settings. Therefore, rapid review methods were used to manage the quantity of literature whilst still undertaking the key components of a systematic review and reporting these using PRISMA. This method does mean that potentially some studies may not have been included. However, this is unlikely to be key evidence as due to the high number of systematic reviews that were included.

Given that this was a rapid review, a detailed quality assessment of each individual study was not undertaken and instead a summary of the design and quality of the evidence base was reported. As this review included multiple systematic reviews, it was possible to report the main methodological issues and limitations that were identified in the included reviews, as well as reporting gaps in the literature and inconsistency in measurement methods

The review concentrated on the thesis focus of safety, appropriateness and acceptability. There may be other evidence that exists relating to other dimensions of quality such as cost-effectiveness, but this was outside the scope of this review.

Since the early evaluations of ambulance telephone advice were undertaken, telephone advice has now become embedded practice, with an average of 8% of calls per year closed with telephone advice. This means that service users may be more aware of this service option and service providers may have introduced changes to the telephone advice service that serve to enhance its safety, appropriateness and acceptability. For example, including a wider range of clinical staff types who provide telephone advice. Furthermore, the landscape of UEC telephone advice has changed significantly in the last 20 years, moving from NHS Direct to NHS 111 and with rapid technological developments and policy led changes to services around care provided closer to home. Very few of the studies in this review assess the NHS 111 urgent care telephone line, therefore the relevance of some of the older UEC literature may be limited.

2.7.14.6. Knowledge gap

There are several knowledge gaps identified from this review.

- The group of emergency ambulance callers who can best benefit from telephone advice needs to be more clearly defined through further evaluation and research. (Dale et al. 2004)

- Most studies took an ambulance service view of outcomes and impact rather than a system wide view. The impact of ambulance telephone advice on other health services and the UEC system needs to be better understood.

- Few studies considered the safety of ambulance telephone advice by reporting mortality outcomes. Whilst mortality following telephone advice is considered to be rare, it is important to ascertain the level of rare safety events.

- There is some evidence that more urgent conditions are more difficult to assess during a telephone consultation than non-urgent or very low urgency health problems. Therefore, exploring the safety and appropriateness of ambulance telephone advice for the most urgent types of calls that receive telephone advice is important. For example, calls relating to older people who may have more health problems and calls that are more complex to handle over the telephone.

- Better understanding of the ambulance telephone advice service is needed, given that much of the literature relates to pre-service or early service implementation. Future research can explore how telephone advice services have developed and improved and how these changes impact on safety, appropriateness and acceptability from a service provider and service user perspective.

- There is some evidence that telephone advice and referral to non-emergency care pathways is a more appropriate service option for people who call frequently or people with mental health problems and this requires further exploration.

- There are no standards from which to assess ambulance telephone advice or policy view about what level is safe, acceptable and appropriate. For example, some callers will always find telephone advice unacceptable, but what level is unacceptable? This could be explored qualitatively with service users and service providers.

2.7.15. *Conclusions*

Based on the definition of safety as timely and effective care that delivers more benefit than harm, it is not possible to identify that ambulance telephone advice is safe as there is not enough evidence reported about deaths following telephone advice and there is significant variation in subsequent hospital admissions reported from different studies. UEC telephone advice is mostly safe but requires further investigation of the safety of higher urgency calls.

Using the definition of appropriateness of care that is proportional to the health problem (necessary and sufficient) the limited data available indicates that ambulance telephone advice is mostly appropriate. For UEC studies there is some evidence that advice can be inappropriate, in terms of over triage to a level of care that is not necessary to treat the health problem.

Acceptability was defined in this thesis as the patient's views on the safety and appropriateness of care and their care experience. There is limited evidence around acceptability in ambulance telephone advice particularly in regard to patient's views on its safety and appropriateness. There is more UEC evidence, which points towards telephone advice being acceptable in UEC settings. However, in both settings evidence was of low quality and mainly focused on satisfaction.

3 Chapter 3: Design and methodological approach

3.1. Chapter summary

This chapter sets out the research questions and describes the research approach, including the justification for the chosen research methods. It also discusses how the methods are used to assess the study outcomes of safety, appropriateness and acceptability and the different data sources used for the study.

3.2. Thesis aims and objectives

This thesis aims to explore whether ambulance telephone advice is safe, appropriate and acceptable. The previous chapter (Chapter 2) used systematic review and synthesis methods to develop definitions of safety, appropriateness and acceptability to apply to this research study (objective 1) and also described and synthesised the ambulance and wider UEC evidence around safety, appropriateness and acceptability (objective 2). The review of UEC evidence of safety, appropriateness and acceptability identified poor understanding of the health services that patients seek following telephone advice, and of patient outcomes, with much of the data relating to what patient's do next collected from follow up surveys with service users. Consequently, there is a research gap as there are no UK studies that use linked health data to identify which health services that patients contact after receiving telephone advice and subsequent patient outcomes. Without this information it is challenging to assess the safety and appropriateness of telephone advice. Furthermore, acceptability is rarely reported in relation to an ambulance setting and understanding the factors that lead to service user acceptability are important for policy makers, service providers and service users.

The remaining objectives of this research study are:

3) To use routine ambulance data to describe who calls and receives telephone advice
4) To use routine data to explore the safety and appropriateness of ambulance telephone advice by identifying what health services patients contact after receiving clinical advice from the ambulance service
5) To explore the views of telephone advice service providers on its safety, appropriateness and acceptability

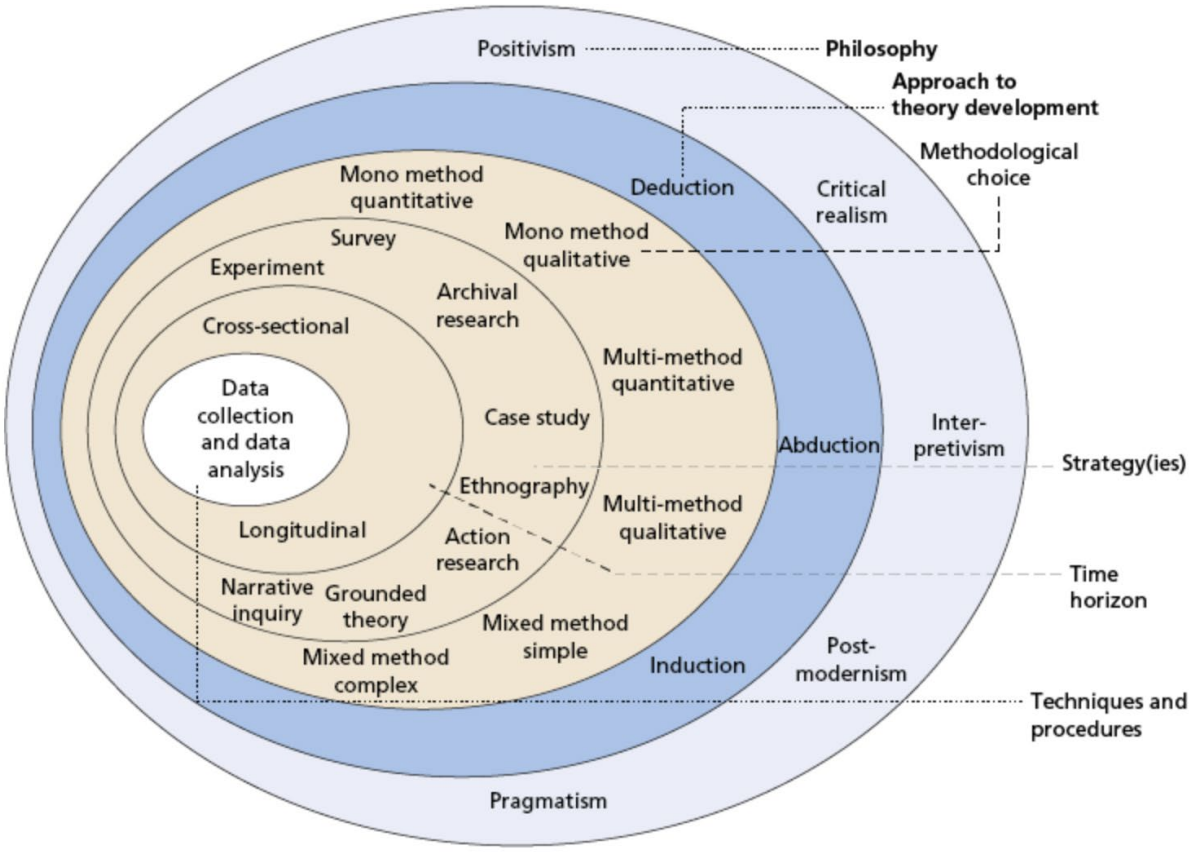
3.3. Research approach

This is a health services research (HSR) study. There are several definitions of health services research, however a commonly used definition by the Agency for Healthcare Research and Quality is that health services research:

> *"examines how people get access to health care, how much care costs, and what happens to patients as a result of this care. The main goals of health services research are to identify the most effective ways to organize, manage, finance, and deliver high quality care; reduce medical errors; and improve patient safety." (Agency for Healthcare Research and Quality 2002, https://www.ahrq.gov/)*

In constructing a health service research design such as that required to meet objectives 3 to 5, there are multiple different factors to consider, such as the philosophical approach, the approach to theory development, methodological decisions and the methods of collecting the data. These considerations are mapped in Figure 9 below, which sets out the different layers of research considerations that are needed to put together an effective research design (Saunders et al. 2016).

Figure 9 Considerations for effective research design (Saunders et al. 2016).



Source: ©2018 Mark Saunders, Philip Lewis and Adrian Thornhill

3.3.1. *Research philosophy*

In social research and social medicine, specifying the researcher's ontological and epistemological standpoint is viewed as essential when conducting good social research as it provides a foundation upon which to base the research (Young et al. 2015). Ontology is concerned with what constitutes reality (Gray 2009) and measurement of this, whereas epistemology is the basis of "how phenomena come to be known" (Giacomini 2013 p.131). Different epistemological perspectives underpin and are aligned with different types of research methods and can influence the choice of research method. A researcher's ontological and epistemological perspective can influence not only how they understand research, but also how they view and understand the world. Whilst the choice of perspective is not always acknowledged, it is fundamental to the way that research data is collected and interpreted (Alderson 1998). There are many different epistemological perspectives and Creswell identifies the four most commonly held world views and key aspects of them (See Figure 10) (Creswell 20014, p. 9)

Figure 10 Four worldviews (taken Creswell 2014 p.9)

Post-positivism	Constructivism/interpretivist
• Determination • Reductionism • Empirical observation and measurement • Theory verification	• Understanding • Multiple participant meanings • Social and historical construction • Theory generation
Transformative	Pragmatism
• Political • Power and justice oriented • Collaborative • Change-oriented	• Consequences of actions • Problem-centered • Pluralistic • Real-world practice oriented

Post-positivist perspectives are underpinned by a realist ontology (a belief in observable, objective, value free facts and universal principles). Research undertaken from the post-positivist perspective is interested in measurement, correlation and verification and uses experimental or quantitative methods and techniques, such as surveys or random sampling, in its pursuit of objective knowledge. Studies underpinned by a post-positivist perspective in HSR often look at cause and effect, and the development of explanatory/working theories that explain systems or behaviours (Popper 1959). Whereas research undertaken from the constructivist/interpretivist perspective is underpinned by a more subjective ontology (individual perceptions, beliefs and socially constructed meanings) (Giacomini 2013 p 131) and tries to understand the how and the why, through generating theories and meaning. It uses ethnographic study, such as in-depth interviews, observation and focus groups alongside methods of textual analysis to generate and elucidate meaning. In HSR, qualitative methods are often used in evaluations of healthcare services or policies to generate in-depth understanding about health services and user or provider views (O'Cathain et al. 2010).

The pragmatist philosophy, first described by Dewey in 1920 as "what works" (Dewey 2008), has seen a resurgence since the advent of mixed-methods research. It is seen as a flexible approach as it supports the adoption of mixed and multiple methods to address a research question (Creswell 2008 p. 27; Johnson et al. 2010). The pragmatic research approach identifies and uses the most appropriate method to best address the research question (Snape et al. 2008), and also allows the use of multiple perspectives to address research questions (Rossman et al. 1985). Pragmatism has gained popularity as a research paradigm that is particularly suited to HSR, as it gives researchers methodological freedom of choice; researchers are "free to choose the methods, techniques, and procedures of research that best meet their needs and purpose" (Creswell 2007 p27) It is particularly suited to mixed and multi-method studies, due to its underlying principle of using or generating the best evidence to address a specific research question (Shaw J 2010).

A pragmatic stance was adopted for this study because it focusses on the most practical approach to addressing the research question and enables a fuller exploration of safety, appropriateness and acceptability from different perspectives and by using different but complementary data sources. This approach is further justified as an intention of this research was to generate results that are relevant and applicable to ambulances services and understandable by multiple stakeholders, including patients and the public. It has been argued that research which takes a highly theoretical standpoint or is less applicable within the real world may be one reason why it has been difficult for research to translate into practice (Hastings 2008). This is important as the Health Research Authority (HRA) sets out that health care research should service the public interest (https://www.hra.nhs.uk/).

Pragmatism allows "the perspective of the user [of the research] to take precedence over other considerations. Frequently this means above all being brief enough and understandable enough to be administered, scored, and the results interpreted and acted on in the context of usual care and in low resource settings" (Hastings 2008)

3.3.2. *Research scope*

The study is concerned with three conceptual outcomes: safety, appropriateness and acceptability and using a pragmatic approach means that multiple perspectives can be considered through the collection of data in the most practical way. Review 1 in Chapter 2 developed the definitions of safety, appropriateness and acceptability (see page 43).

It could also have included other important aspects of care such as the cost effectiveness of telephone advice, but researchers have to make decisions about limiting the questions they address in a single study.

3.4. Methodological choice

Many pragmatic studies use a mixed method approach. Mixed method studies use multiple research methods so that the "whole is greater than the sum of its parts." Mixed methods research is defined as follows:

> *"As a method it focusses on collecting, analysing, and mixing both quantitative and qualitative data collection and analysis in a single study or series of studies" (*Creswell & Plano Clark 2007 p5)

Mixed method research is suited to the pragmatic stance which underpins this study, where the choice of research method is based on its suitability to address a research question. Where research studies aim to incorporate the perspectives of multiple stakeholders or to explore research questions using different but complementary types of research method, these are also ideally suited to a mixed method approach. In this study's exploration of the safety, appropriateness and acceptability of ambulance telephone advice, a number of different data sources have been used to explore the study outcomes from multiple perspectives, such as staff perspectives and service and care pathway process and patient outcome data. Objectives 3 and 5 are best addressed by quantitative methods as they use routine data to explore the safety and appropriateness of ambulance telephone advice by identifying what happens to patients after they have received telephone advice. Whereas objective 4 aims to understand and explore the safety, appropriateness and acceptability of ambulance telephone advice from a service provider and staff perspective, and this is best addressed by a qualitative form of inquiry. A mixed methods approach enables the use of these different but complementary research methods within the framework of one study, and in doing so increases the value of the findings from the study through undertaking a more comprehensive study and also by generating greater insight through integrating the findings.

3.5. Study design

3.5.1. *Original study design*

The original study design was a multi-method study consisting of three concurrent quantitative methods. The first was a linkage study of two sets of routine data *within* an ambulance service to describe who uses telephone advice (the CAD-TAS dataset). The second was a linkage study of ambulance routine data (the CAD-TAS dataset) with data from other services (the PHOEBE plus dataset) to explore safety and appropriateness of telephone advice. The third was a postal survey of users of telephone advice to explore appropriateness and acceptability. As explained in the

introduction to this thesis, the third method was abandoned when I was ready to draw a sample and send the survey, as COVID 19 meant that it was no longer possible to conduct the research. The questionnaire is in Appendix 7 for information. Due to this I had to develop a new design.

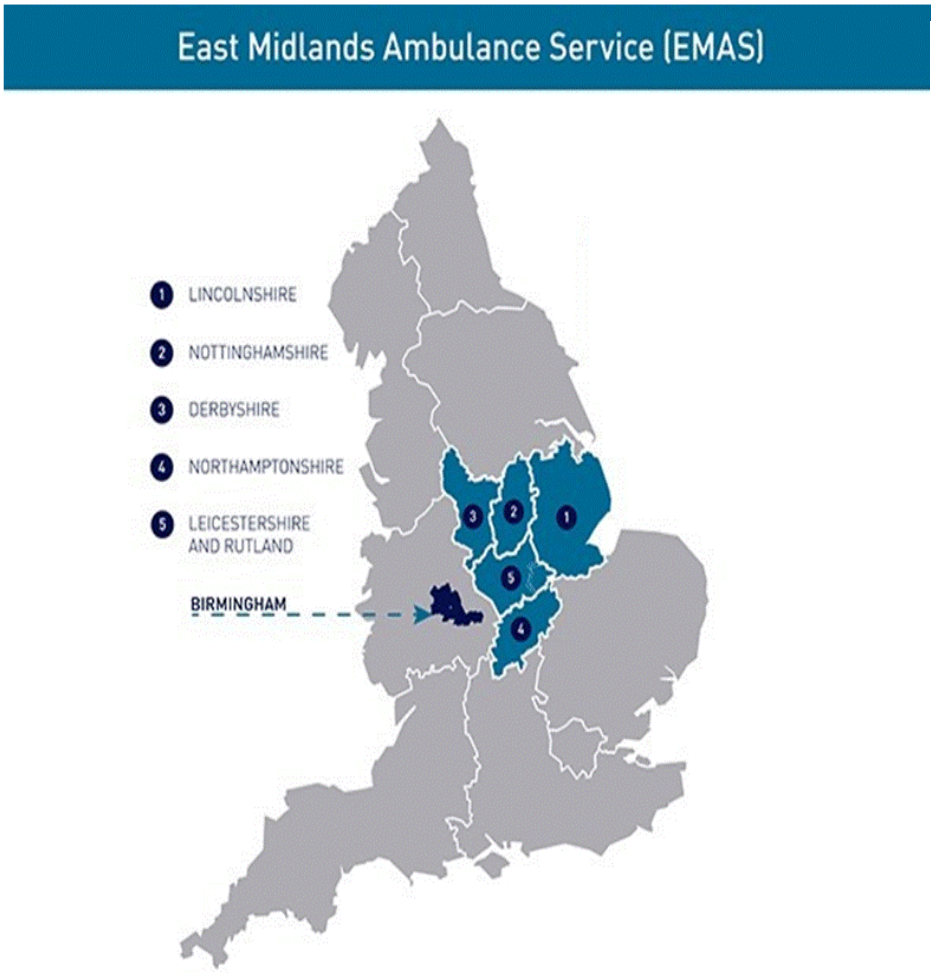
3.5.2. *Revised study design*

The new design was a sequential mixed methods study (Creswell, Plano and Clark 2007). The first two methods were the same as the original design, but the survey was replaced by a qualitative interview study of staff involved in telephone advice to explore their views of safety, appropriateness and acceptability. The sequencing was helpful in that I had analysed the first two datasets before undertaking the interviews and these results helped to shape and inform the topic guide. The timing and methods are displayed in Figure 12 Diagram of study methods and timings at the end of this chapter. The quantitative and qualitative study components are of equal importance and emphasis in this mixed methods study, with no dominant approach (O'Cathain 2009 p.135-138; Timans et al. 2019).

3.5.3. *Context*

EMAS is a large regional ambulance service which covers six English counties (Lincolnshire Nottinghamshire, Derbyshire, Northamptonshire, Leicestershire and Rutland, see Figure 11). It receives approximately 1 million ambulance calls per year, at a rate of 2,700 per day. The geographical area covered by EMAS is a mix of urban and rural populations of approximately 4.8 million people. As well as one ambulance service provider, there are 8 NHS Trusts, over 600 general practices and 19 Clinical Commissioning Groups (CCGs). During the time period of the study, EMAS had average hear and treat rates when compared with other English ambulance services. (O'Cathain et al. 2018)

Figure 11 Map of ambulance service location



3.5.4. *Data sets and how they address safety, appropriateness and acceptability*

Qualitative and quantitative data were used to explore the safety, appropriateness and acceptability of ambulance telephone advice. The types of data used, the different datasets from different health services linked together and how they were used to explore safety, appropriateness and acceptability are described in Table 10 PhD data sources (page 86). The different data sources are described in their subsequent chapters, but it is important to set out the data sources included in this PhD and how they address safety, appropriateness and acceptability.

This PhD made use of an existing data source that was developed for the Prehospital Outcomes for Evidenced Based Evaluation (PhOEBE) research programme. Using routinely available data in HSR is important for informing health policy and decision making (Abouzahr et al. 2005) in evaluating new and established health services and systems (Lemma S 2020) . The use of timely and good quality data to evaluate health systems and services has been described as *'the foundation of all health systems'* (Nutley et al. 2013). Making better use of routine data sources is a research priority that has been identified internationally, with the view that focusing research and analysis on these established collections of data and data registries is important for delivering improvements in healthcare and for

outcome, quality and performance measurement. This is because routine administrative data is a rich data source and reusing this data, which is often collected for large populations, can be a cost and time efficient way of undertaking health research on a large scale. The possibilities for using linked health data are considerable. For example, tracking patient journeys through multiple health services evaluating existing healthcare provision and services to identify poor outcomes, assessing the feasibility or effects of new interventions or longitudinal analysis or monitoring of trends and variation in demand, service use and service users.

However, whilst the PhOEBE dataset linked patient level ambulance data with subsequent health service use and outcome data, the PhOEBE dataset did not contain any information about telephone advice calls other than the initial triage with the Call Taker. This meant that a vital part of the telephone advice process was missing from the PhOEBE dataset and this limited the exploration of safety and appropriateness of telephone advice with the PhOEBE dataset. Therefore, in order to explore the safety, appropriateness and acceptability of ambulance telephone advice using linked data, it was necessary to firstly obtain telephone advice consultation data from the ambulance service. Once the data was obtained from the ambulance service, a two-stage data linking process took place. The first stage was to link the ambulance telephone advice service (TAS) data with ambulance Computer Aided Dispatch (CAD, information about the original ambulance call). In doing so, further CAD data than was used in the PhOEBE dataset was sought from the ambulance service, as the text notes made by the Call Taker about the reason for call were identified as containing potentially relevant information and therefore this information from CAD was obtained and was linked to the Telephone Advice Service (TAS) data to create the CAD-TAS dataset. This is explored in Chapter 4 to identify the types of call that receive telephone advice and the telephone advice they receive from the Clinical Advisor. The second stage was to link the CAD-TAS data with the PhOEBE data and create a new linked multiple health service dataset for use in this PhD that contains information about the telephone advice consultation and enables the exploration of the telephone consultation outcome, the subsequent services that the patient sought and patient outcomes. This second dataset is referred to as the 'PhOEBE plus' dataset in this thesis and is explored in chapter 5 of this thesis.

3.5.4.1. How the data is used to explore safety, appropriateness and acceptability

From the PhOEBE plus dataset, it was possible to look at outcomes related to safety, such as whether patients were admitted to hospital after their call was closed with telephone advice or whether patients died within a short time of receiving telephone advice. Safety was also explored through interviews with ambulance staff involved in the telephone advice process to explore service provider views of ambulance telephone advice safety.

Appropriateness was explored in the PhOEBE plus dataset through identifying whether patients attended ED after receiving ambulance telephone advice, whether patients were advised by the Clinical Advisor to attend ED and the appropriateness of the ED attendance. The appropriateness of the advice, determined by whether the advice given to patients resulted in care that was necessary and sufficient, was also explored using this data. This includes exploration of under triage (when the patient seeks and requires care or treatment from a more urgent level of care than the advised level, for the same health problem) and over triage (too much resource is advised to treat the health problem). The appropriateness of telephone advice was also explored in the interviews with ambulance staff, and also considered calls that are potentially difficult to handle with telephone advice, such as mental health calls.

Acceptability was explored through interviews with ambulance staff and explored service provider perceptions of service user acceptability, such as staff perceptions of how service users react to telephone advice. Routine data in the CAD-TAS data was sometimes recorded by Call Takers and Clinical Advisors that could be used to assess acceptability. Such as if the caller was recorded as being angry or the caller ended the call. Compliance with ambulance telephone advice to attend ED was also explored using the PhOEBE plus data.

Table 10 PhD data sources

Data	Data setting	Data description	How this is used to assess safety, appropriateness and acceptability	New linked datasets for this PhD
Computer Aided Dispatch data (CAD)	Ambulance	Incident level data from the original ambulance call. Contains free text notes made by the Call Taker about reason for call	Identifies information about the reason for call and the advice given by the Clinical Advisor.	Linked with TAS to create **CAD-TAS data set**
Telephone Advice Service (TAS)	Ambulance	Patient level data. A record of the telephone advice consultation with the Clinical Advisor. Contains text notes about the reason for call and the clinical advice given.	Identifies further information about the reason for call and the advice given by the Clinical Advisor. Some data recorded about the caller's reaction to telephone advice.	Linked with TAS to create **CAD-TAS data set**
PhOEBE data Links ambulance CAD, HES A&E, HES APC and ONS mortality data	Ambulance/ED/ Hospital/Mortality	Patient level data. Ambulance call and caller characteristics; ED attendances, treatment, investigations and disposition; Hospital admission diagnosis, investigations and disposition; death	Identifies whether the patient attended ED, was admitted to hospital or died after receiving ambulance telephone advice.	Linked with CAD-TAS to create **PhOEBE plus dataset** (Ambulance call, telephone advice, ED attendance, Hospital Admission, Death dataset)
Qualitative interview data	Ambulance	Interviews with ambulance staff involved in the telephone advice process	Service provider views of safety and appropriateness of telephone advice Service provider perceptions of service user acceptability of telephone advice	N/A

3.5.5. *Research benefits of using linked data*

Early evaluations of ambulance telephone advice were mainly pragmatic controlled trials or observational studies using retrospective case note reviews or hospital data systems to access individual level patient data (Dale 2004; Smith 2001; Studnek 2012). Since these studies were undertaken in the late 1990s and early 2000s, there have been advances in information storage, retrieval and linkage that means that individual patient data can be used in research without the large amounts of resource that was previously needed to collect or access it. The availability of routine data was advantageous to this PhD as this incurred minimum resource whilst at the same time including data on a large number of service users and their subsequent health contacts.

3.5.6. *Advances in data linkage capability*

With increasing use of technology for storing and recording clinical data, as opposed to paper records, much of the data used in this study was already recorded, albeit by different service providers and data registry services. It was possible to link administrative health datasets together using commonly held identifiers, such as NHS number, to map patient pathways and service use and therefore undertake system wide analysis instead of single service-based research. It was therefore practical to try and make best use of these existing data sources.

3.5.7. *Disadvantages of using routinely collected data*

The benefits and challenges of data linking and data linking methods are explored and discussed in subsequent chapters. However, there are two disadvantages of reusing the PhOEBE dataset in this PhD that need to be addressed here, as they affect the scope of this study. The first disadvantage relates to the availability of primary and community care datasets, as despite the intention of the PhOEBE study to include primary care data, it transpired within the course of the PhOEBE study that it was not possible to obtain or include GP or urgent care data. The knock-on effective for this PhD is that it is not possible to use the PhOEBE plus data to identify whether patients sought GP care after receiving telephone advice. The second disadvantage of reusing the PhOEBE dataset in this PhD is that there were significant delays in obtaining the data approvals and the data for the PhOEBE study, meaning that the PhOEBE study did not receive the linked data until 4 years after the initial application and once the data was obtained it required a further year of data management and cleaning before the dataset was ready for analysis. As the lead for the data linkage workstream within the PhOEBE study I was well aware of the challenges and delays in the PhOEBE study and the delay this would cause to my PhD study.

3.5.8. *Qualitative data*

This study also set out to assess the safety, appropriateness and acceptability of telephone advice from a service user perspective. Qualitative research has previously been used to explore telephone advice in ambulance services and identified that there is variation in the way ambulance services configure and deliver clinical telephone advice. Previous qualitative work has attempted to identify what service users' value about the emergency ambulance service, including clinical telephone advice, and found that users were often anxious and valued the reassurance and clinical advice that the ambulance service provided. Qualitative interviews would be a useful approach to explore whether service user views of the acceptability of ambulance telephone advice. However, more quantitative methods of obtaining patient perspectives, such as a service user survey also have strengths, as they can identify what happens to patients after they receive telephone advice and results can be generalised to a population. User surveys are useful methods of data collection when collecting attitude and experience data about a sample of the population and this sample (assuming any bias has been accounted for) can be used to extrapolate and infer to a population. User surveys have been

successfully used in urgent care settings in previous evaluations to assess acceptability of urgent health care telephone systems and the evaluation of the 111 urgent care telephone system, which used a postal survey to collect data to explore users' acceptability of NHS 111 (O'Cathain, 2014). An initial decision was made to explore safety, appropriateness and acceptability from a service user perspective using patient survey, and the necessary ethics, survey design and piloting were undertaken. However, this research method became impractical due to the Covid-19 pandemic, as the study ambulance service did not have capacity to assist in the administration of the survey during the pandemic and also that the pandemic itself may have changed service users views of telephone advice due to the risks associated with face-to-face contacts. Therefore, other options were explored for obtaining other perspectives of safety, appropriateness and acceptability and that did not involve recruitment of service users through the ambulance service.

Interviews with ambulance staff involved in the telephone advice process was identified as a pragmatic option for exploring wider perspectives of the safety, appropriateness and acceptability of ambulance telephone advice. This has the advantage of obtaining a service provider perspective of safety, appropriateness and acceptability of telephone advice as well as service user reactions and responses to telephone advice at different stages in the telephone advice pathway. For example, the views of non-clinical call handlers who inform the caller that they will receive a call back from a nurse and the views of the clinical advisors about the caller's response to the clinical advice they are given. This method will also generate important information about the safety, appropriateness and staff views of acceptability of telephone advice from an ambulance service perspective.

3.5.9. *Understanding the different timings for the different research components*

Due to the delays experienced by the PhOEBE study (Turner and Siriwardena, 2019) in obtaining the PhOEBE linked data, this meant that the data from the different research methods used in this PhD related to different time points. The PHOEBE dataset covered the first 6 months of 2013, but a usuable dataset was not available for use in this PhD until 2018. The additional data sought for the CAD-TAS dataset was requested for the same time period as the PhOEBE dataset, so that the CAD-TAS data could be linked to the PhOEBE data to create the PhOEBE plus dataset. The interview study was undertaken in 2021. This is because this was a sequential study design, with the routine data analysis undertaken first and used to inform the qualitative interviews. Furthermore, the changes to the original research plan described in 3.4.1, a leave of absence for personal reasons and the impact of Covid-19 also resulted in delays to the interview study.

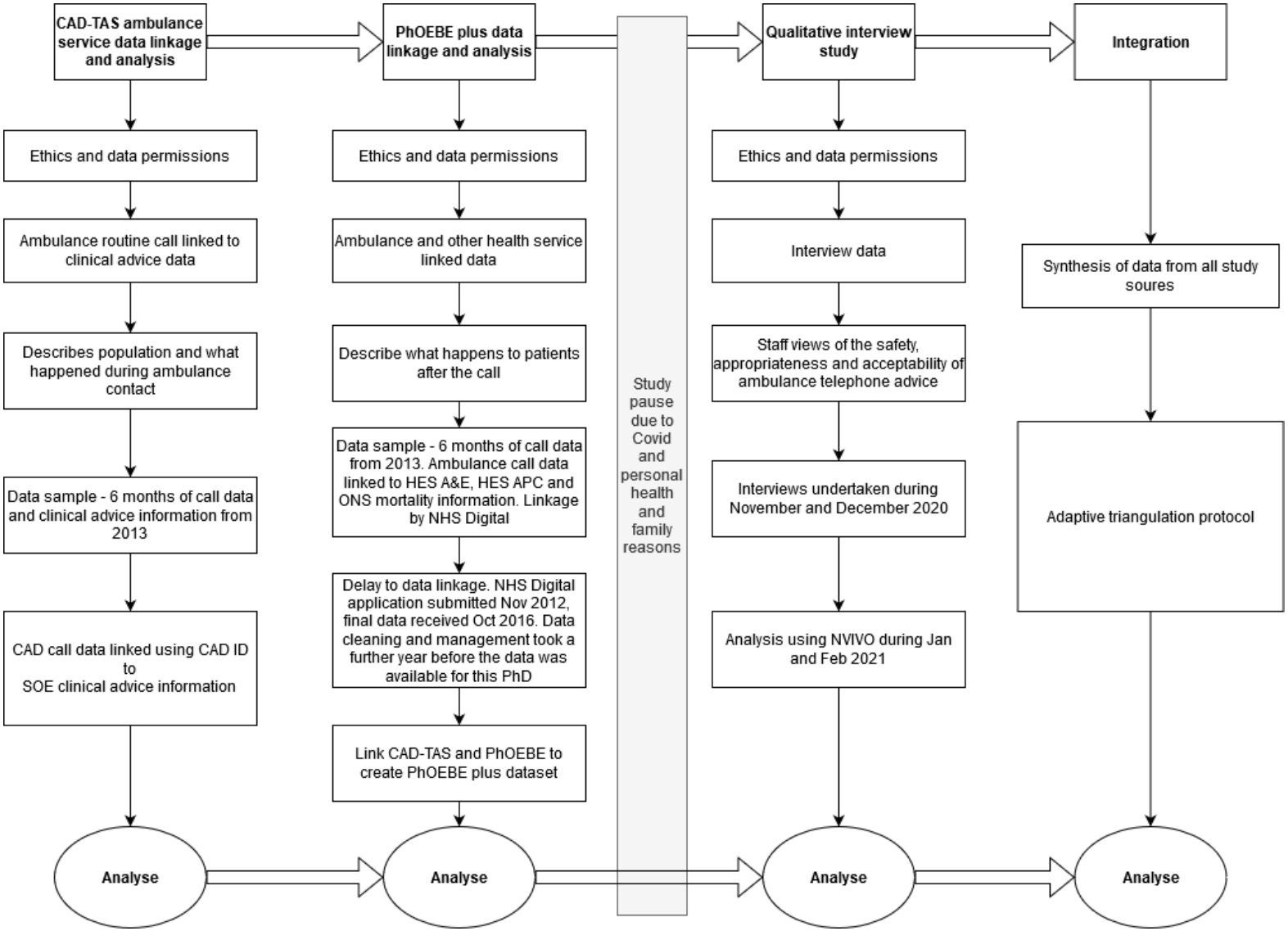
3.5.9.1. Reporting CAD-TAS and PhOEBE plus methods and findings

The study is presented in a sequential order of the CAD-TAS data analysis, the PhOEBE plus data analysis followed by the qualitative interview study. However, the order creating the PhOEBE dataset and the CAD-TAS dataset was different because the PhOEBE dataset was developed first. Despite the PhOEBE dataset being created first, I have decided to present this work as CAD-TAS first followed by PhOEBE, because the CAD-TAS analysis describes who receives telephone advice and the advice they are given, and it makes logical sense to present the chapter that describes the population and the characteristics and clinical advice outcomes first. This does present an issue of needing to report the methods of CAD-TAS first, when inclusion in the CAD-TAS dataset relies on inclusion within the PhOEBE dataset and which is described in a later chapter.

3.5.10. *Work undertaken but not used in this PhD*

The original study design for this PhD used a user survey to explore appropriateness of ambulance telephone advice. The survey was developed after the initial systematic review was done and the first ethics approval was obtained. The survey was developed, refined and changed using the information from the systematic review, piloting with PPI and cognitive interviews. A substantial amendment to the ethics application was obtained for the final version of the survey. It was at this point that the Covid-19 pandemic occurred, and this caused a pause to the PhD research due to the impact of home schooling. When the PhD study resumed the user survey was no longer feasible, despite the huge amount of work that had gone into its development. Therefore, a new research plan was developed and successfully carried out. However, the delays mean that there is a gap between the data linkage sample and the interview data, and the impact of this is discussed further in the discussion section of this thesis.

Figure 12 Diagram of study methods and timings



3.5.11. *Patient and public involvement*

As this PhD was undertaken as a member of University staff and therefore with no funded support, the costs to support PPI engagement were not available. A local PPI group that focusses on providing PPI support to UEC projects, Sheffield Emergency Care Forum (SECF), were able to provide advice to student projects and provided advice on the original study protocol and development of research materials for ethics applications. Wider engagement with PPI was primarily undertaken through links with other research projects which had PPI support and through which the researcher was involved in complementary research to this PhD. During this process PPI members attended a meeting where research findings related to a complementary study were presented (O'Cathain 2018). As part of this the PhD researcher was able to present the findings from this PhD from the analysis of the PhOEBE plus dataset. This presentation and discussion highlighted some PPI concerns and the best ways of reporting the findings. Therefore, through PPI led discussions, the final approach used in this thesis to report the findings from the PhOEBE plus data analysis, which uses a sensitivity analysis to report the main findings, was identified by PPI as the most meaningful way of presenting the data. Further PPI and service involvement will be sought prior to the publication of the findings from the qualitative interviews.

3.5.12. *Summary*

This is a mixed methods study that uses a pragmatic research approach to explore the safety, appropriateness and acceptability of ambulance telephone advice. This research took advantage of an existing linked ambulance service that I had a significant role in creating as part of an NIHR Research Programme Grant PHOEBE. By linking in additional CAD-TAS data I created a new dataset, called the PhOEBE plus dataset and used this to explore the safety and appropriateness of ambulance telephone advice. Interviews with ambulance service staff involved in the telephone advice process were used to explore staff views of safety and appropriateness of telephone advice and service provider perceptions of service user acceptability.

4 Routine data analysis to describe the calls that receive telephone advice and the advice they are given

4.1. Summary

The aim of the chapter is to describe the type of calls that receive ambulance telephone advice and the advice that callers are given by the Clinical Advisor. This chapter reports the linkage of two types of routinely recorded ambulance information, routine data from the original ambulance call (CAD data) and routine data from the telephone advice call (TAS data), and the analysis of the linked CAD-TAS dataset. Methodologically, this chapter is original and important, as uses a data source that has been rarely used for research (TAS) and develops a method of categorising and coding this data so that it can be more easily analysed. This chapter focusses on ambulance data only; in subsequent chapters the CAD-TAS ambulance data is linked with other health service and event information.

4.2. Introduction

4.2.1. *Which calls receive telephone advice?*

Telephone advice offers calls triaged as low acuity a response that is deemed to be clinically appropriate to the patient's health care need. This helps to ensures more resources are available for calls that are higher urgency or life-threatening and that require a rapid ambulance response (Turner et al. 2017). The types of calls that are triaged to receive telephone advice are defined in England as

> *"Category 4 is for less urgent calls. In some instances you may be given advice over the telephone or referred to another service such as a GP or pharmacist." (NHS England 2017)*

However, there may be local policies in place that influence the number and type of call that are sent for telephone advice. For example, local variation around 'no send policies' (where a call is closed by a Call Taker without receiving advice from a Clinical Advisor) or differences in the calls that are sent for telephone advice from different triage systems. It is possible that the safety, appropriateness and acceptability of telephone advice is affected by the type of health problem, whether the call occurs in-hours or OOH, the patient's characteristics such as age, and other factors such as whether the call is from an urban or rural area. Therefore, understanding the characteristics of calls and callers that receive telephone advice and the telephone advice population is the first stage in exploring its safety, appropriateness and acceptability.

4.2.2. *What advice do calls receive?*

Telephone advice calls receive clinical advice from a Clinical Advisor (usually a nurse or paramedic.) The outcome of the telephone advice consultation is usually advise to seek care from a more appropriate alternative care pathway (e.g. make own way to ED, seek GP care, contact NHS 111) self-care advice, or to return the call for an ambulance to be sent. However, referral pathways may vary depending on the services that are available locally and the time of day or day of week of the call, as calls made OOH may receive different advice to calls made in-hours. In addition to health care advice and information, the following referral pathways are usually available for telephone advice calls (Association of Ambulance Chief Executives 2015):

- GP (in and OOH)
- Social care
- Community care teams
- Social Services
- Specialist teams (falls, mental health, alcohol intervention)
- Allied Health Professionals

4.2.3. *What is reported in the literature about telephone advice call and patient characteristics?*

The systematic review reported in Chapter 2 of this thesis identified 24 studies that reported information relating to calls that were triaged by the ambulance service to receive telephone advice.

Despite identifying a large number of published studies, not all studies included in the review reported information about the characteristics of calls and service users, and some studies considered patient groups not relevant to this thesis, such as calls that were returned by the Clinical Advisor for an ambulance response. The UK studies included in the review mainly consisted of early research into ambulance telephone advice that was undertaken pre implementation or during early implementation. Since this time ambulance telephone advice has undergone may changes. For example, the scope of telephone advice has widened, it has become more embedded within ambulance service practice, there are more specialist clinical staff operating as Clinical Advisors (such as mental health specialists) and the referral pathways have expanded to include a broader range of referral options. Therefore, the findings from these very early studies may have less relevance to the characteristics of service users and calls made today.

From the studies included in the systematic review, it was not possible to identify with clarity the characteristics of service users and calls, and this is because studies did not consistently report this information. Some studies excluded key demographics of service users from their research study such as in the study by Turner et al (Turner et al. 2006) that excluded OOH calls and some studies did not report characteristics information at all.

Where studies did report information about service users, this data was focused primarily on gender, age and clinical codes for reason for call. Due to the inconsistency in the way this information was reported by different studies it was difficult to compare the findings from different studies and to understand the service user population and their reason for calling the ambulance service.

From the studies included in the systematic review in Chapter 2, four studies reported that 'sick person' or 'sick unknown' accounted for the most frequent type of health problem/reason for call (range 27% – 56%) (Turner et al. 2006; Dale et al. 2004; Infinger et al. 2013; Studnek et al. 2012). The AMPDS definition of sick person (protocol 26) is a patient who does not have a categorisable chief complaint or an identifiable priority symptom (Braunschweiger et al. 2015). Protocol 26 has been described as a 'medical catch all'. Continued study of this diverse patient group is ongoing to improve triage methods for this category (Braunschweiger et al. 2015). Clawson et al recognises that whilst this patient group may have non-priority symptoms, these symptoms may be distressing for the patient.

> *"Someone with any of the listed non-priority complaints may be anguished. To callers, these conditions may seem terrible and unbearable. However, there is little prehospital emergency providers can do for them that warrants a hot, or worse, a maximal response."(Clawson et al. 2015 p.24)*

Falls and abdominal pain were also commonly reported reasons for call.

Few of the studies included in the systematic review reported the clinical advice that was given to the patient and where studies do report this information the disposition categories reported often differ. For example, the US study by Smith reported the following telephone advice disposition categories: self-care; referral to primary care provider; referral to 911; referral to community resource; referral to ED; and referral to an urgent care clinic (Smith et al. 2001). Whereas the study by Eastwood reported

the following different disposition categories: returned back for an ambulance response; self-present at ED; and alternative service providers. Other included studies did not report the clinical advice disposition and were undertaken from the point of view of evaluating the impact of telephone advice on the ambulance service (Dale et al. 2004; Turner et al. 2006; Infinger et al. 2013), identifying subsequent health events (Studnek et al. 2012) or determining the accuracy of the decision not to send an ambulance (Turner et al. 2006; Dale et al. 2004), rather than the wider impact on the UEC system.

Identifying the clinical advice that the patient received from the Clinical Advisor can be used to obtain a wider perspective of the potential impact of telephone advice on patient pathways and on other health services. Clinical Advice disposition information can improve research potential by broadening the research questions that can be investigated, such as exploring whether patients complied with telephone advice by comparing the advice given with subsequent service use. Therefore, including this information in a dataset about ambulance telephone advice service users is important.

4.2.4. *Variation in calls that receive telephone advice*

A recent UK study called Variation in Ambulance Non-conveyance (VAN) (O'Cathain et al. 2018), aimed to explain variation in rates of non-conveyance for patients not transported to hospital, (including those who received telephone advice only) and was completed in 2018. Using routine data from 10 English ambulance services, the VAN study identified that people aged <60 received clinical telephone advice from the ambulance service more frequently than people aged >60 (6%-9% versus 4%-5% in the over 60s), except for children aged under 2 (perhaps due to ambulance services policies that may require children aged under 2 to be transported to hospital). The VAN study also reported that lower telephone advice call rates were identified for people who do not have English as a first language (5% compared with 9%) and for people who live in areas with lower rates of severe long-term health problems (5% v 8%).

In terms of reason for call, the VAN study identified abdominal pain as accounting for the highest proportion of calls receiving telephone advice (25.9%), followed by sick, unconscious (12.9%), other (9%), psychiatric (9.4%) and injury (8.7%) (O'Cathain et al. 2018). Whilst this is a useful analysis and reports routine data from 10 ambulance services, the VAN study does not report what patients were advised to do after the call. Furthermore, the reporting of reason for call information is based on the triage categories assigned by the ambulance call operator and patient reported reasons for call may be more complex and specific.

4.2.5. *Ambulance service data*

Within the same organisation it is possible for different information about the same person to be held in different data systems. In the English ambulance service, the Computer Aided Dispatch (CAD) system holds information about the call and caller characteristics, the electronic Patient Report Form (ePRF) holds information about the clinical contact with the patient when an ambulance is sent, and at the time of this study, information from the telephone advice consultation with the Clinical Advisor was held in the Telephone Advice Service (TAS) data system. These different data systems are not routinely linked or used together to describe and explore the care and advice that is given to people who contact the ambulance service.

4.2.6. *Using Telephone Advice System (TAS) data for research*

At the time of the study ambulance data relating to the clinical advice call that was held in the TAS data system was rarely used for ambulance research or routine data analysis. The is because the information in the TAS system was not recorded and stored as easily analysable data and was recorded and stored as text data in what was described by ambulance service information analysts as

a ‘text dump’. This has limited the application of TAS data in research studies. However, TAS is an important data source that contains the advice from the Clinical Advisor to the patient. Methods to facilitate the use of this data are required so that the clinical telephone consultation and the advice given can be better understood.

4.2.7. *Rationale for this research*

In summary, the information from the systematic review does not provide clear information about telephone advice call and caller characteristics, including, the reason for call, the context of the call and the clinical advice that is given. In order to explore the safety, appropriateness and acceptability of telephone advice, it is important to describe and understand the population that receive telephone advice. This chapter links together two sources of ambulance data (CAD and TAS) to create the CAD-TAS dataset. In doing so, existing data about the telephone advice consultation (TAS data) that has not previously been used in research was used in this analysis and a unique linked dataset (CAD-TAS) was created. The CAD-TAS dataset was used to explore the characteristics of calls and callers and the clinical advice that was given by the Clinical Advisor.

4.2.8. *Aims*

The chapter sets out to:

- Describe who called in terms of service user and call characteristics (age, gender, deprivation, chief complaint, geographical location (urban or rural), reason for call)
- To describe when people called, in terms of demand characteristics (in or out of hours; day of week; month)
- To describe why people called the ambulance service
- To describe what people were advised to do, in terms of looking after their health problem and seeking additional health care

4.3. Methodology

4.3.1. *Research design*

This is a retrospective cross-sectional study which links two sets of routinely recorded ambulance service information obtained from East Midlands Ambulance Service. To ensure study information, methods and results are reported fully, the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines for cross-sectional studies were applied (Von Elm et al. 2007).

This study links together different ambulance service data sources. The data sources are the emergency ambulance call dataset (Computer Aided Dispatch, CAD) and clinical telephone advice call information (Telephone Advice Service, TAS) and these are linked to create the CAD-TAS dataset. Different analytical approaches have been used in the analysis as some of the data is quantitative and therefore lends itself to summary descriptive statistics presented in tables and graphs, whereas some of the data is recorded as text notes and required more qualitative analysis techniques.

4.3.2. *Order of research*

The order in which the datasets used in this thesis were created is different to the order in which they are reported in this thesis. This is because it makes logical sense to understand the telephone advice population, advice and patient outcomes from the CAD-TAS dataset before exploring the health care patients sought after their call was closed with telephone advice (through linking CAD-TAS to the PhOEBE dataset to create the PhOEBE plus dataset). Therefore, although the PhOEBE dataset was created first, the CAD-TAS dataset is reported first and the next chapter in this thesis describes the linkage of the CAD-TAS dataset with the PhOEBE dataset. This does present an issue of needing to

report the methods of CAD-TAS first, when inclusion in the CAD-TAS dataset relies on inclusion within the PhOEBE dataset and which is described in a later chapter.

Due to the PhOEBE dataset being created first, the same decisions around inclusion criteria were applied to the CAD-TAS dataset as had been applied to the PhOEBE dataset in order that the two datasets contained information about the same patients. Furthermore, any challenges experienced in the creation of the PhOEBE linked dataset had the potential to have consequential effects to the CAD-TAS dataset.

4.3.3. *Requesting and obtaining data*

A data request was sent to EMAS to obtain CAD and TAS data. This data was requested for the same time period as the sample included in the PhOEBE data set reported in chapter 5, as the intention in my PhD was to link in the data about the ambulance telephone advice consultation to the PhOEBE dataset and To use this to explore the safety and appropriateness of subsequent service use and patient outcomes.

In order to facilitate linkage between the CAD and TAS datasets, and also future linkages with the PhOEBE study, a unique identifier was required that was present in all of the datasets. The CAD ID was identified as being present in all datasets. This is a unique ID number assigned to each call at the time of the call. Further data, such as time and date of call was also requested as this would be used in the analysis and also to verify the data linkage.

4.3.3.1. Data request

I had discussions with an Information Analyst at EMAS about type of information that was held by EMAS about telephone advice calls. I also visited EMAS main headquarters to view the different data systems. I then requested the following data:

CAD data: CAD ID; Date of call; Time of call; Resource allocation; Reason for Call; What's the problem (including text notes made by the Call Handler about the reason for call); Call stopped; Time stopped; CCG; Incident LSOA; Chief complaint; Dispatch code; Dispatch code description; Government standard at the time of call; Method of call; Age; Gender.

TAS data: CAD ID; Date of call; Time of call; TAS notes; Call stopped; Time stopped.

Data requested from the TAS data related to the outcome of the telephone advice consultation and the notes made by the Clinical Advisor during the consultation, as well data such as the CAD ID and the date and time of call for linkage purposes.

4.3.4. *Data security considerations*

As some of the data from CAD and TAS was recorded as text notes, there was a chance that the data could contain personal or sensitive information. I did not require or want patient identifiable data for the linkage or analysis of the CAD-TAS data. Through discussions that I had with an Information Analyst at EMAS, a method to minimise accidental transfer of patient identifiable information was developed. As part of this process, Information Analyst at EMAS identified the data fields in TAS that contained the most relevant information for this thesis and that were unlikely to contain personal identifiable information. The Information Analyst at EMAS extracted those data fields and then scanned these data fields for personal or sensitive information, such as names (patients and staff) and address information and removed this information from the dataset prior to providing me with the data.

EMAS supplied the data to the University of Sheffield using secure encrypted email and password protected files. The password to unlock the encrypted data was sent separately to the data file to

further enhance data security. Data was stored on the university network drive, which requires the user to input log in details to access the file and was stored in a password protected file. Only the researcher had access to the raw data files. Data was supplied in Microsoft Excel.

Prior to sending the full dataset, a test data extract of a small sample of data was sent to ensure that the data extract contained useful information and that the process of transferring the data worked in practice. The data from the test data extract is shown in Table 11 below and demonstrates the richness of this data source.

Table 11 Test data sample

What's the problem text data	Clinical advice text data
shoulder pain from recent trauma, fell last week and dislocated shoulder since then the pain has been increasing, today it is unbearable	"pt ref to gp re advise re analgesia amb stood down,"
back pain, water infection, can hardly walk, water infection	gent diagnosed with water infection and given antibiotics yesterday. very frequent, urination. urine is dark and strong, smelling. lower abdo pain. no other, symptoms. pt alert and talking. not alone., advised to contact ooh GP service for, further assessment at home. Call back advice, given
Male 80yr, catheter blocked – in pain in his bladder When caller had rang previously she thought the nurse had arrived but it was a carer. Nurse is still not on scene.	Referred to OOH GP for DN to attend.

4.3.5. *Data cleaning and processing*

TAS data for each patient was split across multiple rows of the Excel database provided by EMAS. Using the CAD ID number, I reformatted the data so that each patient had one row of data. This was to aid the data linking process with the CAD data and the subsequent analysis. However, this did not result in a perfectly formatted data set, as some text data was split across multiple cells when it should be contained within one cell. Therefore, I manually checked each data row to ensure the data was formatted correctly and organised logically. By reading, checking and re-reading each row of data as part of the database preparation process, this also acted as data checking and cleaning stage, as sometimes data was written in shorthand or abbreviations.

As part of this data management process, commonly used abbreviations were identified in the TAS text data and also in the CAD 'what's the problem' text data notes and I clarified their meaning with the ambulance service. Some examples of these are shown in Table 12 below.

Table 12: Commonly used abbreviations and their meaning

Abbreviation	Meaning
Pt	Patient
DN	District Nurse
DIB	Difficulty in breathing
SOB	Short of breath
Abdo	Abdominal
?	Query
h/o	History of
NKI	No known infections
t/n	Triage nurse
s/b	Seen by
Canx	Cancel
Ref	Refer
MOW	Make own way
Pv	Pelvic
F	Female
M	Male

4.3.6. *Data linking*

After the data was formatted and cleaned, the CAD data and TAS data were exported to SPSS 24 for linking. These were linked by the CAD ID using the linking function in SPSS to create the CAD-TAS dataset and the linkages were checked for feasibility using the date and time of the original ambulance call and the telephone advice consultation. All of the CAD data supplied by EMAS was linked with a corresponding TAS data record, which meant that the CAD-TAS data contained linked ambulance call and telephone advice information for 2521 telephone advice cases. However, only patients that were included in the PhOEBE dataset were included the CAD-TAS dataset and the limitations of this are discussed in the discussion section of this chapter.

The variables included in the CAD-TAS data set are shown in Table 13 on the following page.

Table 13 Data included in CAD-TAS dataset

Variable	Data source	Data descriptive	Data type
Call ID	CAD/TAS	Unique ID for each case	Quantitative
Date of call	CAD	Date of call	Quantitative
Time of call	CAD	Time of call	Quantitative
Resource allocation	CAD	Timestamp data if a resource was allocated to a call. These were stood down for calls triaged to hear and treat	Quantitative
What's the problem	CAD	Text notes about the patient's reason for calling the ambulance service	Qualitative
TAS notes	TAS	Text notes about the advice given to the patient during the telephone advice call	Qualitative
Call stopped	CAD/TAS	The outcome of the call (hear and treat by nurse triage or refer and treat nurse triage referred to other provider)	Quantitative
Time stopped	CAD/TAS	Timestamp data when the call ended	Quantitative
CCG	CAD	Clinical commissioning group	Quantitative
Incident LSOA	CAD	This was calculated from CAD data	Quantitative
Chief complaint	CAD	A description of the chief complaint, based on the AMPDS coding	Quantitative
Dispatch code	CAD	The AMPDS dispatch code	Quantitative
Dispatch code description	CAD	The AMPDS dispatch code description	Quantitative
Government standard at the time of call	CAD	The level of urgency assigned to the call	Quantitative
Method of call	CAD	Whether this was by 999 or other methods	Quantitative
Age	CAD	Age of patent	Quantitative
Gender	CAD	Gender of patient	Quantitative

4.3.7. *Analytical approach*

The data identified as quantitative data in Table 13 (page 99) was analysed using SPSS version 24. Descriptive analyses were undertaken to identify number and proportions in each data category and results were reported in tables to describe the characteristics of service users.

As some of the data were text data, a quantitative approach could not initially be applied to this data. The text needed to be coded for quantitative description. Qualitative analysis techniques for coding were relevant for this. Patton identifies three types of qualitative data: interviews; observations and

fieldwork; and written materials or documents from organisational, clinical or program methods (Patton 2002 p.4). The telephone advice text data was comparable to the third type. By coding and categorising this data, it was possible to explore the reason for the call, the context and circumstances of the call, the telephone advice call process (through identifying what advice was given to patients) and to look at individual stories and to make comparisons across different cases or groups of cases. Therefore, a coding framework was developed to analyse this data and the development of the coding framework is described below.

4.3.8. *Developing a coding framework*

Coding is a method of data organisation and helps to make sense of text data. Strauss identifies the importance of coding in qualitative research.

> *"Any researcher who wishes to become proficient at doing qualitative analysis must learn to code well and easily. The excellence of the research rests in large part on the excellence of the coding." (Strauss et al. 1987 p.27)*

Saldana identifies five stages of coding, and these were used as the overarching method in the development of this coding framework (Saldana 2016 p.4).

Figure 13 Coding method stages (Saldana 2016)

- Create a 'code book' – a list of codes and what they mean
- Combination of present codes and emergent codes
- Systematically categorise data
- Refine
- Make notes about reactions and emerging ideas, new interpretations and connections with other data

4.3.8.1. Creating a code book

Following a data familiarisation stage where data was formatted, read and re-read, a coding framework or code book was developed that identified and grouped key aspects of the telephone advice call and process. As part of this process, understanding the meaning of unfamiliar language and abbreviations was important. Codes were developed relating to the following factors outlined by Hatch 2002 (Hatch J 2002 p155):

- similarity (things happen the same way)
- difference (they happen in predictably different ways)
- frequency (they happen often or seldom)
- sequence (they happen in a certain order)
- correspondence (they happen in relation to other activities or events)
- causation (one appears to cause another)

Codes were developed both inductively, (codes that emerge from the data) and deductively (defined a priori as potential key issues prior to the analysis) (Pope et al. 2000). For example, based on the findings from the systematic review in Chapter 2, pain was identified deductively as a 'reason for call'.

The first draft of the coding framework was tested on a sample of 50 cases and this was reviewed by one of my PhD supervisors (AOC). It is good practice to use more than one researcher to test and develop the coding framework, as this can help to improve the reliability of the coding and ensure the

meaning of the codes is consistent and well-defined (Pope et al. 2000). Through discussion with supervisors, the coding framework was further developed and refined. Some codes were refined, for example, if the categories were fuzzy, in that they were poorly defined or could be merged with other categories (Pope et al. 2000). The coding framework was tested on a further 50 cases and this was finalised through discussion with PhD supervisors, until my PhD supervisors and I were agreed that the coding framework accurately captured and categorised the key components of the telephone advice call

4.3.8.2. Applying the final coding framework to the CAD-TAS data

The final coding framework was systematically applied to all 2521 cases in the CAD-TAS dataset. Some codes required further refinement following the initial coding. For example, the reason for call code required modification as the initial coding identified a large number of codes accounting for very small number of patients, meaning there were too many small categories to undertake a meaningful analysis. Therefore, after discussion with supervisors, I decided to merge some similar categories, to facilitate meaningful analysis. The revised reason for call categorisation has 15 categories, compared to 27 categories in the previous version, and is reported in Appendix 8.

The codes were manually applied to the data in Microsoft Excel. If data was missing or incomplete, a specific code for missing data was applied. Some codes were revised during the coding process, as categories were expanded or further developed to include relevant information (Pope et al. 2000). For example, the sub-code for 'leave in care of family', became 'leave in care of family or carer'.

After completion of the coding, the data was exported to SPSS version 24. The total number of times a sub-code occurred within each code was calculated and frequency distributions were generated to explore the distribution of the data. Following this provisional classification and analysis, further revisions to some coding categories were made. For example, where themes had too many codes or categories, or where it made intuitive sense to merge similar codes.

The final coding framework is shown below in Figure 14.

Figure 14 Final coding framework

Code number	Code heading/Main theme	Sub-codes
1	Reason for call	sub-codes identify specific reasons e.g. pain, falls or injury, self-harm, abdominal symptoms etc
2	Comorbidities	sub-codes identify specific co-morbidities e.g. dementia, cancer etc
3	Long standing health problem	sub-codes identify whether the call relates to a long-standing injury or illness
4	Context	sub-codes identify contextual issues from the call e.g. mental health, anxiety or panic attacks, alcohol or domestic problems
5	Frequent, duplicate or multiple calls	sub-codes identify whether the caller is identified by the ambulance service as a frequent caller, or whether they have recently received health care or have a health care appointment arranged
6	Hear and Treat (HAT) requested or imposed	sub-codes identify whether the patient expected to receive an ambulance, if they would refuse to travel in an ambulance or whether they phoned for advice only
7	Welfare call	sub-codes identify welfare calls
8	Who is the caller?	sub-codes identify whether this is the patient, health professional, carer etc
9	Patient views	Sub-codes identify whether the caller expresses satisfaction or dissatisfaction with the telephone advice call
10	Call outcome	sub-codes identify specific advice e.g. refer to GP, refer to 111, patient refuses or ends call, given self-care advice etc

4.3.9. *Results*

Data was included from 2521 patients who were included in the PhOEBE dataset and who had linked CAD-TAS data. Data are presented relating to call and caller characteristics and the clinical advice that was given to the patient.

4.3.9.1. Caller characteristics

Table 14 reports the call and caller characteristics information of 2521 patients who received telephone advice and who were included in the CAD-TAS dataset. The mean age of the study population was 58, but most patients were from older age groups aged between 61 – 80 (30.3%) or between 41 – 60 (25.3). However, the age range was from 0 to 104.

Table 14 Call and caller characteristics from CAD data for calls closed with telephone advice

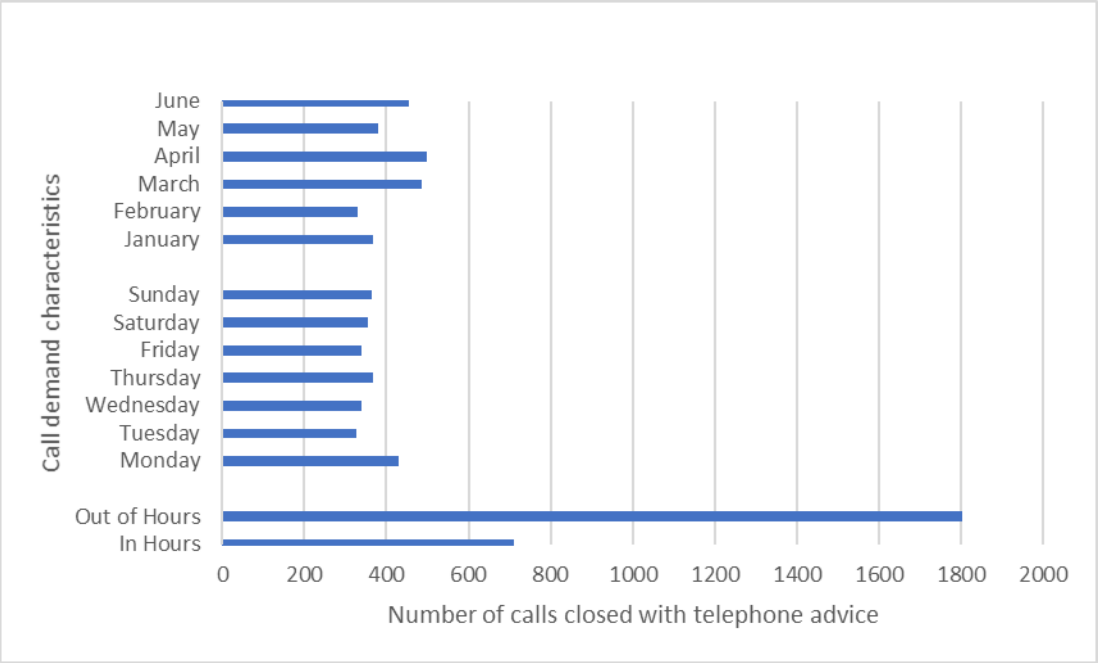
	Telephone advice only n	Telephone advice only %
Age		
0–2	58	2.3
3–10	29	1.2
11–20	90	3.6
21–40	421	16.8
41–60	637	25.4
61–80	764	30.3
81–90	406	16.2
>90	102	4.1
Missing	14	
Gender		
Female	1501	59.8
Male	1010	40.2
Missing	0	
Time of call		
In hours	712	28.3
Out of hours	1802	71.7
Missing	0	
Reason for call		
Abdominal Pain	465	18.5
Breathing	233	9.3
Cardiovascular	101	4.0
Falls	108	4.8
Seizure	19	0.8
Injury	254	10.1
Other Condition	301	12.0
Psychiatric	105	4.2
Sick Person	765	30.4
Unconscious	65	2.6
Missing	98	3.9
Urban/rural		
Rural	383	15.2
Urban	2,131	84.8
Missing	0	0.0
IMD Quintile		
1 (least deprived)	208	8.3
2	527	21.0
3	409	16.3
4	493	19.6
5 (Most deprived)	877	34.9
Missing	0	0.0

*In hours is 08:00 to 18:00, Monday to Friday.

There were more females than males (59.8% versus 40.2%) who received telephone advice in the CAD-TAS dataset. Reason for call was reported using clinical categories applied to the dispatch code from the CAD data. Nearly a third of calls were coded as 'sick person' or 'sick unknown' and over 70% of calls were OOH. A high proportion of calls were from areas with the highest levels of deprivation (35%).

Further exploration of when the call was made was undertaken to explore whether the number of calls varied by day of the week or by month and this also highlights the difference in the number of calls received OOH compared to in-hours. There was slight variation in the total number of calls closed with telephone advice and included in the CAD-TAS dataset by day of the week and month.

Figure 15 Call demand characteristics (in or out of hours; day of week; month)



4.3.9.2. *Further exploring reason for call*

Within the CAD-TAS data there was text information recorded by the Call Taker about the patient's reason for call and health problem Most patients who called did so because they were in pain. Health reasons for call are explored by caller characteristics (See Appendix 9) Pain was the most common health reason for call in both in hours and OOH calls and was a reason for call in almost 40% of calls. More female callers reported pain symptoms than did males (43.2% versus 35.8%) and pain was highly reported across all age groups. When looking at other health reasons for call, most were consistent across in hours and OOHs calls and there was little difference by gender. See Figures 16, 17 and 18 on the following pages for health reason for call by age, in and OOH and gender.

Other reasons for call recorded as text notes by the Call Taker were Diarrhoea, vomiting or nausea 11.42%; Other 12.69%; Minor health problems 9.12%; Mental health, alcohol, drugs or crisis support problems 8.45%; Difficulty in breathing 8.57%.

Figure 16 Health reason for call by age group

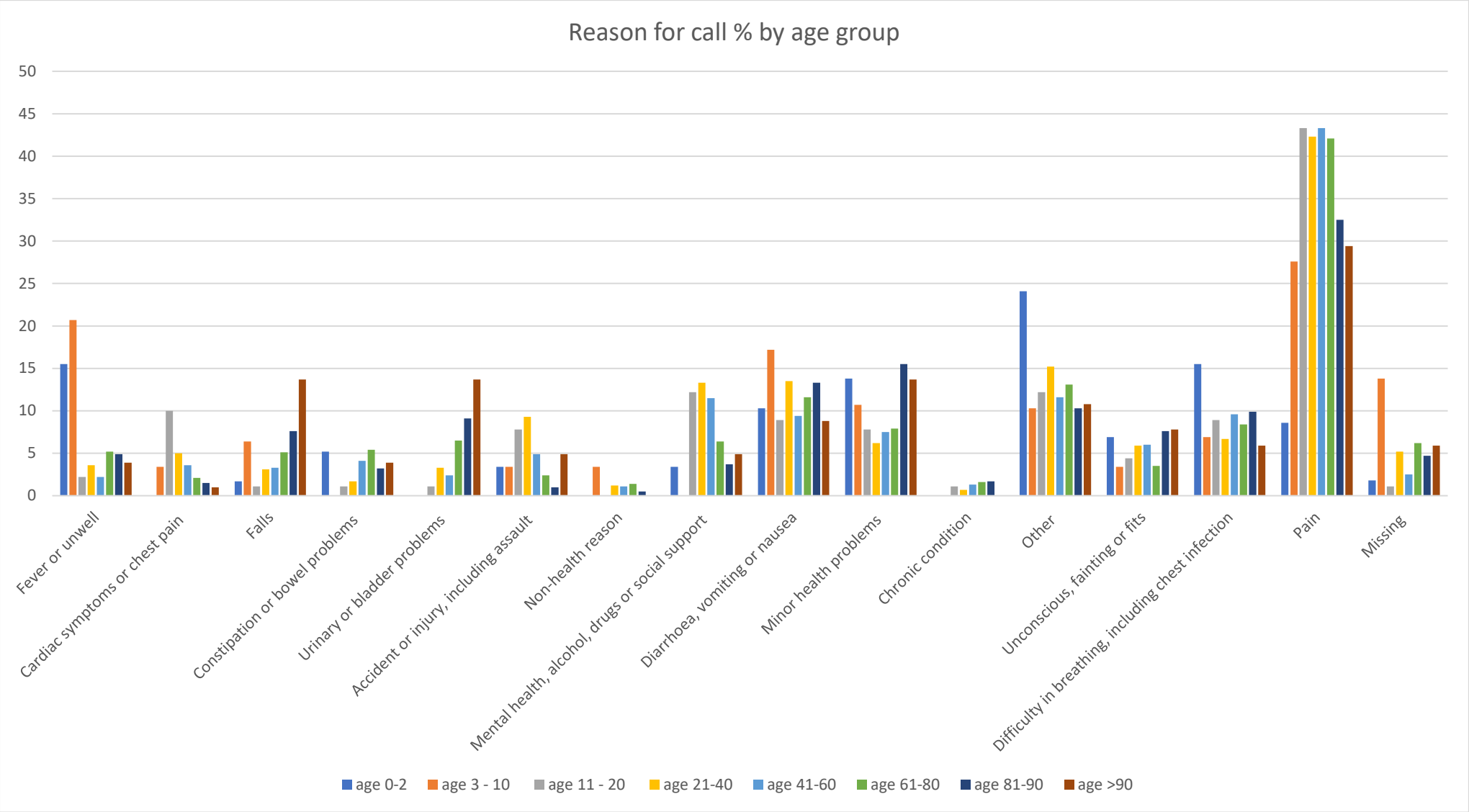


Figure 17 Health reason for call by in and OOH

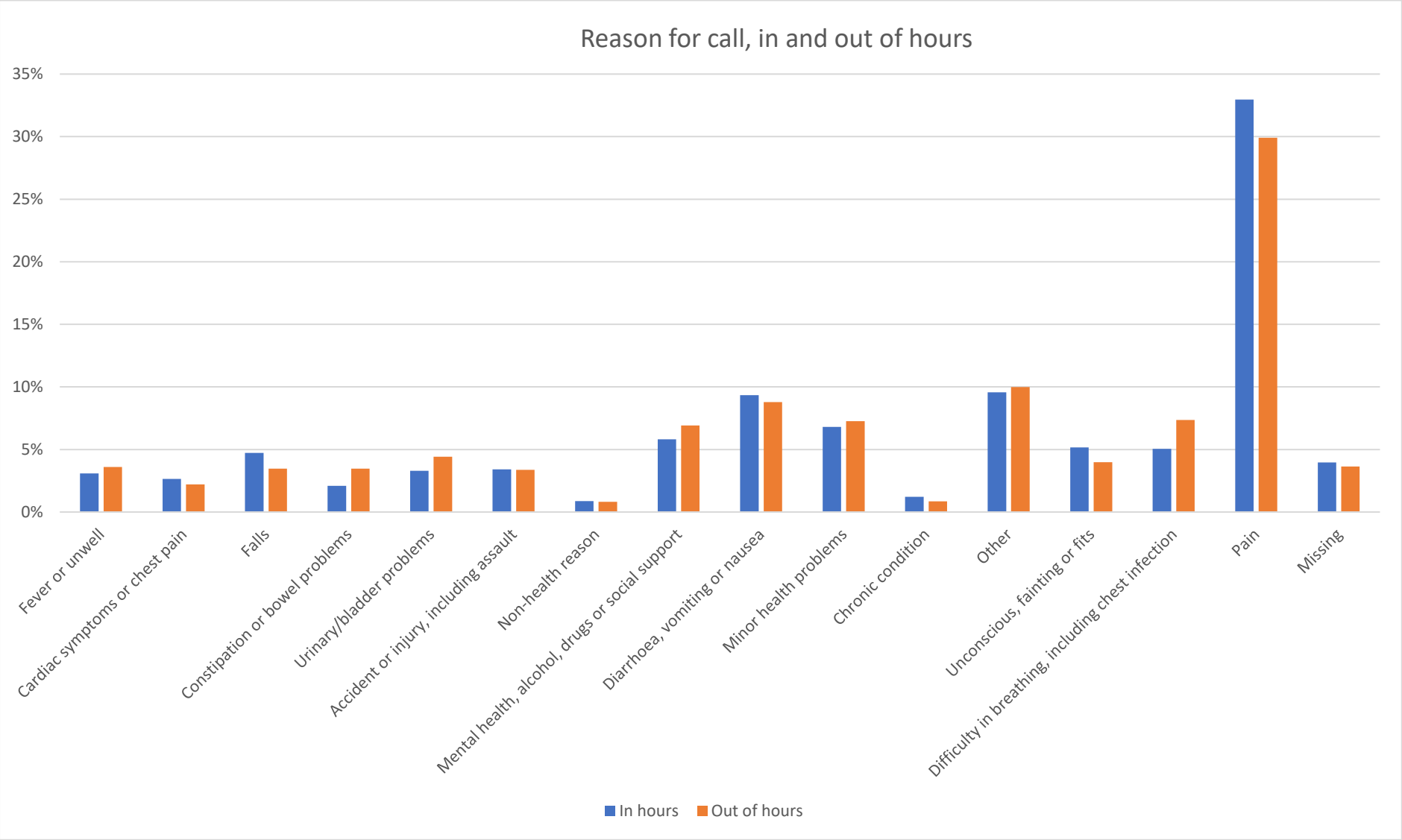
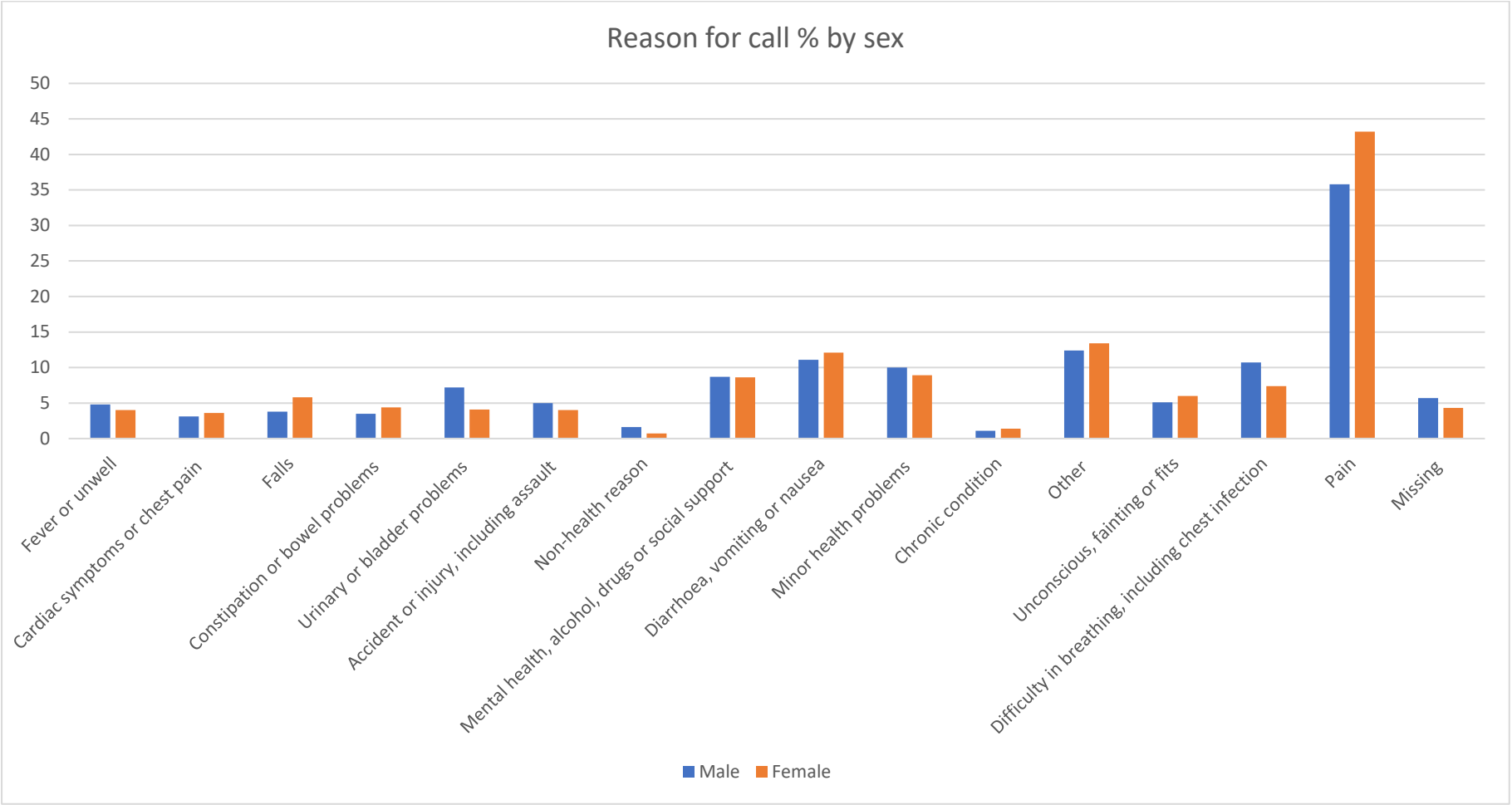


Figure 18 Health reason for call by gender



Some calls had more than one reason for call and it was not feasible to identify a primary reason for call by deciding if one reason had more clinical urgency than another reason. 646/2521 calls had two or more reasons for calling and 58/2521 had 3 reasons for calling or described three symptoms. In all, 3225 reasons for call were identified for the 2521 calls, with 120 calls having missing data for reason for call.

4.3.9.3. Who is the caller?

Coding the CAD-TAS data was used to explore whether the patient was the caller or whether someone else was calling on the patient's behalf. For the purposes of coding and categorising this data, an assumption was made that calls were made by the patient, unless it was explicitly stated in the call data that the call was made by someone other than the patient. Based on this assumption, nearly 89% (2243/2521) of calls were made by the patient. 5% were made by family or friends and 2.5% were made by carers or support workers.

4.3.9.4. Comorbidities

Coding the CAD-TAS data was also used to explore other recorded information about the patient's health history and comorbidities (other medical conditions or health problems that the patient may have in addition to the health problem they are calling about). Co-morbidities are usually long-term chronic conditions, such as diabetes or COPD. The presence of co-morbidities is important as they can be a factor in clinical decision making, for example, affecting prognosis and selection of treatments or care pathways (Piccirillo et al. 2004). People with co-morbidities may be sicker or have more complex health problems and this may make giving clinical advice over the telephone more challenging or less appropriate. The coding process identified that 11.7% (295/2521) of cases in the CAD-TAS dataset were recorded as having one or more comorbidities, and the most commonly recorded co-morbidities are shown in Table 15. The accuracy of this data depends mainly on two factors. Firstly, whether the patient or caller stated that the patient had a co-morbidity and secondly whether this was recorded by the Call Taker or the Clinical Advisor.

Table 15 Type and frequency of co-morbidities

Co-morbidity	Frequency	% of calls
Arthritis	5	0.2
Cancer	35	1.4
Dementia	26	1.0
Depression	7	0.3
Epilepsy	12	0.5
Multiple co-morbidities	25	1.0
Other	66	2.6
Renal	8	0.3
Respiratory	53	2.1
Stroke	7	0.3
Total	297	11.7%

4.3.9.5. Context of the call

Context relates to the circumstances and background to the call and can provide further understanding of the events or situation leading to the call. For example, calls made by people who are experiencing mental health problems or who are intoxicated and the reason for call may be driven

by these contextual factors rather than a physical health problem. Calls may have more than one contextual factor and an increase in contextual factors may increase the complexity of the call.

Coding the CAD-TAS data identified that 15% of calls closed with telephone advice had contextual factors that could increase the complexity of the call (Table 16). It is possible that other calls had contextual factors but that these were not recorded. Nearly 5% of contextual factors were related to alcohol and a further 4% related to mental health.

Table 16 Type and frequency of contextual factors

Context	Frequency	%
Mental health	101	4.01%
Anxiety, panic attack or in distress	91	3.61%
In drink/alcohol related	120	4.76%
Aggressive/domestic	66	2.62%
Drug related	9	0.36%
Total calls	340	15.36%

4.3.9.6. People who contact the ambulance service regularly

Some people may contact the ambulance service regularly and these callers were sometimes identified in the text notes in the CAD-TAS data. Where calls are identified as frequent, this gives more insight into the types of calls that are made by frequent callers and how the ambulance service responds to these. Box 1 describes some examples of data relating to frequent callers. These show frequent callers calling again after having ambulances sent and refusing to travel, calling despite having GP visits arranged and calling again without there being any change in their condition.

Box 1 Examples of frequent caller contacts

- Patient frequent caller, had resource this morning did not travel. Self and worsening advice given.
- Back pain and sick twice. TAS already spoken with pt. GP visit already arranged.
- Pt triaged earlier by myself. Nil changes in pt condition. Pt alert. Shouting down the phone. Nil DIB. Husband ringing GP surgery, I explained this has already been arranged by myself.

Only 1.5% of calls were identified from people who call regularly in the CAD-TAS data. However, it was also possible to identify calls that had had other recent input from the ambulance service or from other health services and the type of other recent health contact is described in the table below.

Table 17: Proportion of calls identified as frequent, duplicate or using other health care services

	Frequency	%
Frequent caller	37	1.5
Call identified as duplicate or repeat	93	3.7
Received TAS/111 in the past few hours	10	0.4
Ambulance attended within the past few hours	30	1.0
Seen by a health professional in last 24 hours	45	1.7
Health appointment within the next 24 hours	30	1.2
Has a home visit arranged for within the next 24 hours	18	0.6
Recently discharged from hospital	52	2.0
Total	305	12.1
No indication of frequent call	2216	87.9
Total	2521	100.0

4.3.9.7. Expectations around wanting an ambulance

It can be argued that people who contact the ambulance service expect an ambulance to be sent rather than receive clinical advice over the telephone. Expectations may also impact on whether someone will follow the advice they are given and future health seeking behaviour. In the CAD-TAS data it was recorded that some callers stated that they were only phoning for advice or did not want an ambulance to be sent whereas others clearly expected to be taken to hospital or stated that they wanted an ambulance but that they did not want to be taken to hospital/travel (Table 18). Where expectations were recorded in CAD-TAS, most (3.4%) were from people who did not want an ambulance. A further 2% of cases were recorded in the CAD-TAS data as stating they did not wish or would not go to hospital.

Table 18: Patient expectations identified using the coding framework

	N*	% (of the total sample)
Does not want an ambulance	85	3.37%
Phoned for advice only	27	1.07%
Does not want to go to hospital or refuses to travel	48	1.9%
Wants to be taken to hospital	16	0.6%
Total	176	6.94%

* this table only includes CAD-TAS records where patient expectations could be identified

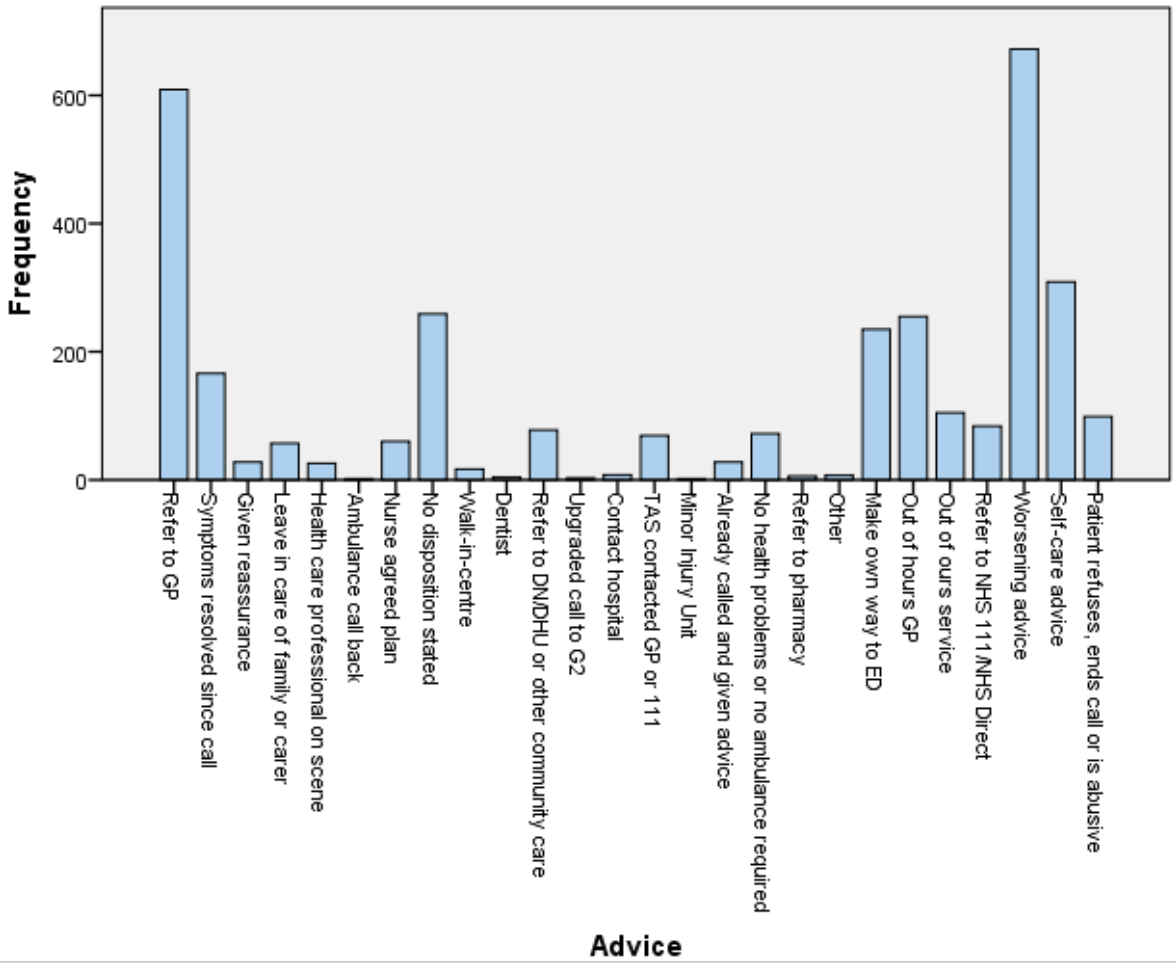
4.3.9.8. Welfare calls

Welfare calls occur when there is a delay in an ambulance being sent and a Clinical Advisor will call a patient to gain a better understanding of their health situation and urgency. Sixty-four calls were identified as welfare calls. These calls are included here because they are closed with telephone advice. However, these may represent a sicker sub-group of patients because these calls had initially been triaged to receive an ambulance response. In addition, some telephone advice calls may receive a welfare call shortly after their clinical advice, to check that symptoms are abating (e.g. after taking pain relief) or that symptoms have not become worse.

4.3.9.9. Clinical advice

Using the coding framework, it was possible to identify and systematically categorise the health care advice that was given to patients. This identified that many different types of advice were given, for example, refer to GP, given reassurance, make own way to ED, refer to pharmacy. In addition, contextual understanding was given around calls where no advice was given. For example, symptoms resolved since call; no health problem; or patient refuses, ends the call or is abusive. Justification for decisions or lack of advice was also provided where relevant, for example, leave in care of family, or already called and given advice. In some cases, more than one type of advice was given. It was common practice for clinical advisors to give advice on what to do if the health problem got worse, in addition to other advice such as to seek a GP appointment or to self-care. In all, 26 different types of advice were identified through the coding process and these are shown in Figure 19 below.

Figure 19 Types of advice given to patients



These codes were further refined into four distinct triage categories, so as to facilitate comparisons across groups of cases in this analysis and also to aid other analyses when using the linked data to identify what the patient did after the call and comparing this to the advice they received. This process involved merging and refining codes based on the level of health care that was advised and was undertaken by asking a series of questions of the data.

- Was the patient advised to attend ED, Y or N?
- Was the patient advised to seek care from an OOH urgent care service? Y/N
- Was the patient advised to seek in-hours care from their own GP service or primary or community care? Y/N
- Was the patient advised some form of self-care only? Y or N

This resulted in four telephone advice outcome categories, based on the highest level of care the patient was advised. These were: attend ED; seek GP OOH care; seek GP care; and self-care.

Self-care is an amalgamation of multiple categories, including advice to see a pharmacist, advice, left in care of family, symptoms resolved since call, no health problem or symptoms, reasurrance and dentist. Advised GP out of hours or an out of hours service includes 111, GP OHH, urgent care centres and WiCs.

Table 19 (following page) reports the outcome of the telephone advice consultation coded into the 4 main advice groups. Information about the advice given to patients was missing in 25% of cases. In some cases, this was because no data had been entered or provided to the study and in other cases some information had been entered but did not clearly state what advice was given. Under 10% of patients were advised to go to the ED and 49% percent of patients were advised the least urgent care options of self-care or in-hours community care. Almost 18% of calls were advised out of hours urgent care.

Using information from CAD, it was possible to consider whether advice trends are the same for different call or caller characteristics. Table 19 also considers the advice given for in and out of hours calls, with the rationale that the advice given could be different for OOH calls due to the unavailability of GP and community services. Proportionately, in hours callers were more frequently advised to seek GP care than OOH callers. In hours callers were seldom advised to seek OOH urgent care, when compared to out OOH callers (7.1% versus 22.2%). Similar proportions were advised to attend ED and to self-care for both in and OOH groups. The Figures 20 and 21 on the following pages reports clinical advice by age groups and shows that a higher proportion of younger patients were advised to attend ED, whereas a higher proportion of older patients were advised to seek GP or community care.

Table 19 What advice was given by the Clinical Advisor

	N (%)	In hours	Out of hours	Male	Female	Age bands							
						0-2	3-10	11-20	21-40	41-60	61-80	81-90	>90
Advised to go to ED	235 (9.3)	74 (10.3)	161 (8.9)	85 (8.4)	150 (10.0)	14 (24.1)	11 (37.9)	24 (26.7)	78 (18.5)	54 (8.5)	36 (4.7)	15 (3.7)	3 (2.9)
Advised to seek OOH urgent care	451 (17.9)	51 (7.1)	400 (22.2)	186 (18.3)	265 (17.6)	7 (12.1)	2 (6.9)	15 (16.7)	70 (16.6)	107 (16.8)	139 (18.2)	91 (22.4)	139 (18.2)
Advised to seek own GP or community in hours care	697 (27.6)	348 (48.3)	349 (19.4)	276 (27.2)	421 (27.9)	7 (12.1)	3 (10.3)	18 (20.0)	87 (20.7)	169 (26.5)	245 (32.1)	132 (32.5)	35 (34.3)
Advised self-care or no further care	540 (21.4)	136 (18.9)	404 (22.4)	228 (22.5)	312 (20.7)	19 (32.8)	8 (27.6)	14 (15.6)	83 (19.7)	140 (22.0)	159 (20.8)	84 (20.7)	24 (23.5)
Missing/advice not provided	629 (25.0)	115 (16.0)	514 (28.5)	250 (24.7)	379 (25.1)	11 (19.0)	5 (17.2)	22 (24.4)	105 (24.9)	177 (27.8)	196 (25.7)	89 (21.9)	20 (19.6)
Total	2552*	724	1828	1014	1507	58	29	90	421	637	764	406	102

**The total is more than total sample (n=2521) because some patients were advised more than one type of care. For example, they were told to go to the ED or to contact the OOH GP*

Figure 20 clinical advice by age groups

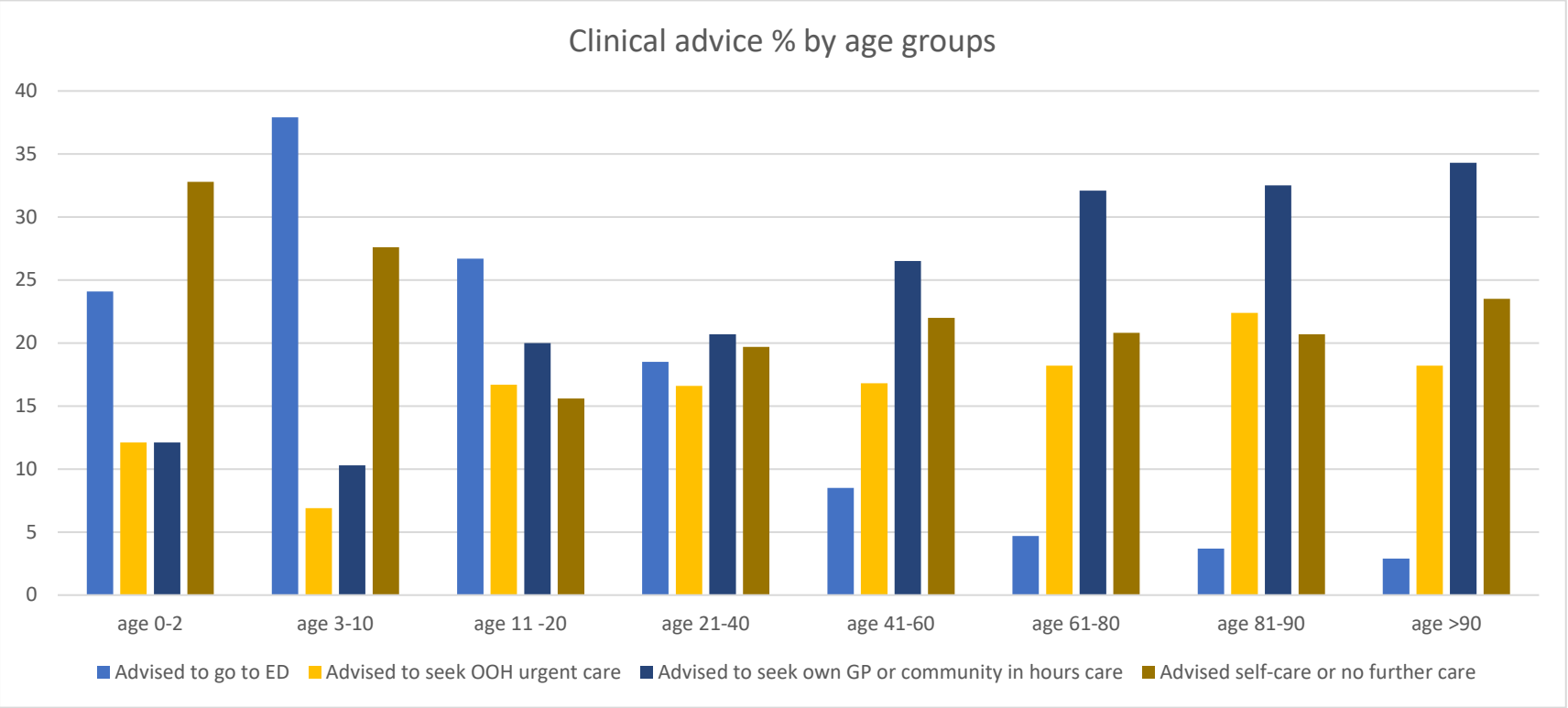
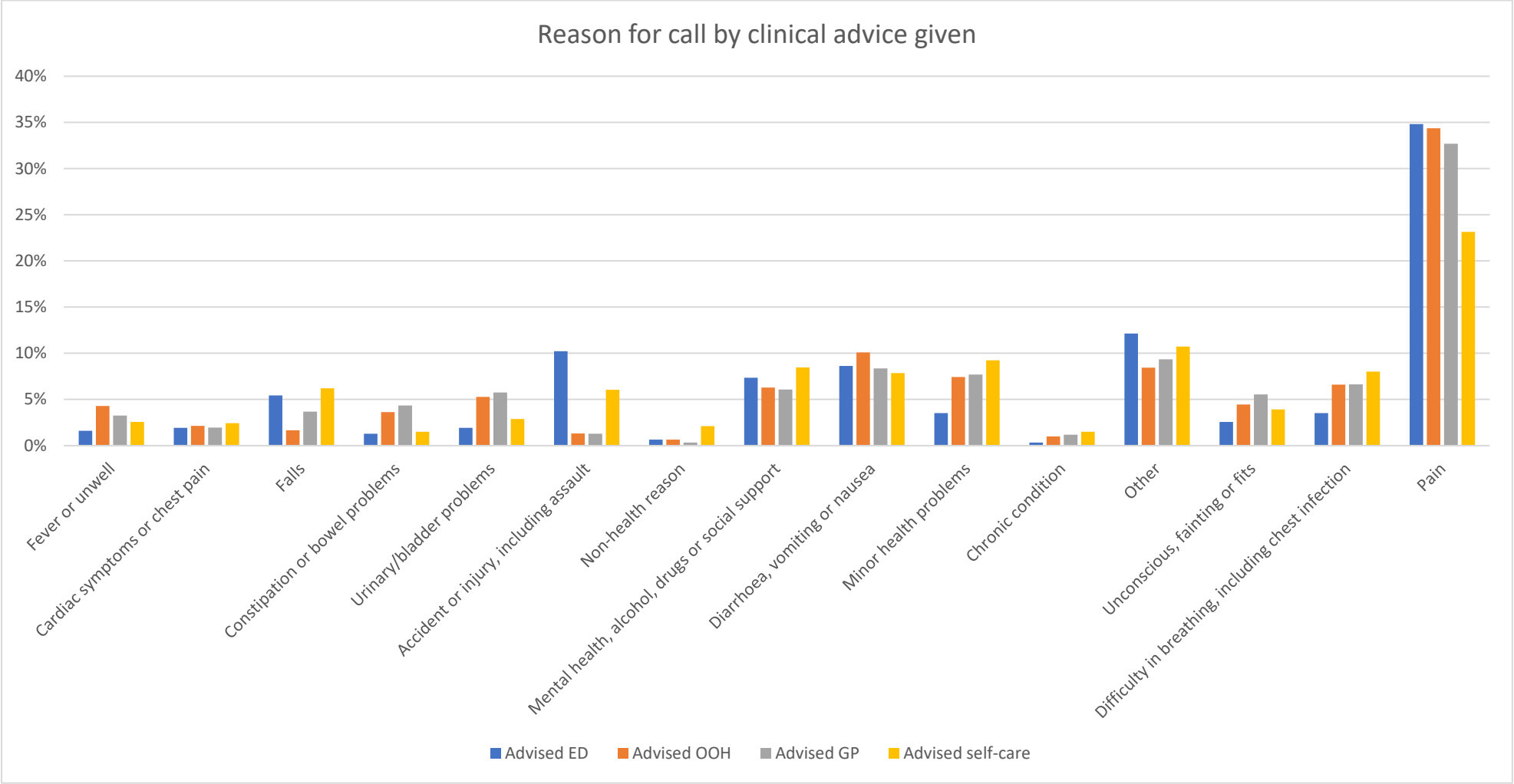


Figure 21 reason for call by clinical advice given



4.3.9.10. Cross tabulating reason for call and clinical advice given

Reason for call cross tabulations are included in the Appendix 10.

In Table 20 (page 118) clinical advice cross tabulation, the proportion of patients advised to attend ED decreased with increasing age and this difference was significant. 36.3% of age 0 -16 were advised to attend ED, compared to just 5% of >80. There were no significant differences in advice to attend ED by sex or by in or OOH calls. Differences in advice to seek OOH care and advice to seek GP were both significant and this is not surprising because calls that are OOH may be less likely to be advised in hours care and vice versa. There was a trend in advice to seek OOH which decreased by age, with more older people advised OOH care compared to younger people, but this trend was not significant. There was the same trend for GP in hours care, but this was statistically significant. The 0-16 age group had the highest proportion of patients advised to self-care, but rates of self-care advise were fairly consistent across all of the age groups and accounted for between ¼ and 1/3 of all telephone advice dispositions.

The final table, Table 21 reason for call and clinical advice crosstabulation, reports the cross tabulated results for reason for call and clinical advice given. Due to multiple responses in the reason for call category (where some patients had more than one health reason for call) the pearson chi-square could not be calculated. Pain was the most common health reason for call across all of the clinical advice categories. Nearly 50% of patients who were advised to self-present at ED had symptoms of pain. Comparatively, the proportion of patients with pain who were advised self-care was less than for the other types of advice. A higher proportion of ED attendances was advised for accidents and injuries, mental health, alcohol or drugs. diarrhoea and vomiting and the 'other' category, and this was similar for those advised OOH care. Proportionately, more patients with difficulty in breathing or with minor health problems were advised GP OOH or GP care.

Table 20 clinical advice crosstabulation

	Age groups										Sex				Time of call			
	0-16		17-40		41-60		61-80		>80		Female		Male		In hours		Out of hours	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Advised to attend ED	33	36.3	94	25.8	54	11.7	36	6.3	18	4.5	150	13.3	85	11.1	74	12.2	161	12.5
Not advised to attend ED	58	63.7	270	74.2	406	88.3	532	93.7	381	95.5	978	86.7	679	88.9	531	87.8	1126	87.5
Total	91	100	364	100	460	100	568	100	399	100	1128	100	764	100	605	100	1287	100
Pearson Chi-Square	.000*										.160				.864			
Advised to attend GP OOH	13	14.3	81	22.3	107	23.3	139	24.5	111	27.8	265	23.5	186	24.3	51	8.4	400	31.1
Not advised to attend GP OOH	78	85.7	283	77.7	353	76.7	429	75.5	288	72.2	863	76.5	578	75.7	554	91.6	887	68.9
Total	81	100	364	100	460	100	568	100	399	100	1128	100	764	100	605	100	1287	100
Pearson Chi-Square	0.68										.669				.000*			
Advised to attend GP (in-hours)	16	17.6	99	27.2	169	36.7	245	43.1	167	41.9	421	37.3	276	36.1	348	57.5	349	27.1
Not advised to attend GP (in-hours)	75	82.4	265	72.8	291	63.3	323	56.9	232	58.1	707	62.7	488	63.9	257	42.5	938	72.9
Total	91	100	364	100	460	100	568	100	399	100	1128	100	764	100	605	100	1287	100
Pearson Chi-Square p-value	.000*										.596				.000*			
Advised to self-care	31	34.1	93	25.5	140	30.4	159	28.0	108	27.1	312	27.7	228	29.8	136	22.5	404	31.4
Advised to seek care from a health service	60	65.9	271	74.5	320	69.9	409	72.0	291	72.9	816	72.3	536	70.2	469	77.5	883	68.6
Total	91	100	364	100	460	100	568	100	399	100	1128	100	764	100	605	100	1287	100
Pearson Chi-Square	.379										.302				.000*			

*.000 indicates significant difference in the results by sub-group

Table 21 reason for call and clinical advice crosstabulation

Reason for call	Advised ED		Advised OOH		Advised GP in hours		Advised self-care	
	N	%	N	%	N	%	N	%
Fever or unwell	5	2.3	26	5.9	30	4.4	17	3.3
Cardiac symptoms or chest pain	6	2.7	13	3.0	18	2.6	16	3.1
Falls	17	7.7	10	2.3	34	5.0	41	7.9
Constipation or bowel problems	4	1.8	23	5.3	40	5.9	10	1.9
Urinary or bladder problems	6	2.7	32	7.3	53	7.8	19	3.7
Accident or injury, inc assault	32	14.4	8	1.8	12	1.8	40	7.7
Non-health reason	2	0.9	4	0.9	3	0.4	14	2.7
Mental health, alcohol, drugs or social support	23	10.4	38	8.7	56	8.2	56	10.8
Diarrhoea, vomiting or nausea	27	12.2	61	14.0	77	11.3	52	10.0
Minor health problems	11	5.0	45	10.3	71	10.4	61	11.8
Chronic condition	1	0.5	6	1.4	11	1.6	10	1.9
Other	38	17.1	51	11.7	86	12.6	71	13.7
Unconscious, fainting or fits	10	4.5	27	6.2	51	7.5	26	5.0
Difficulty in breathing inc chest infection	11	5.0	40	9.2	61	9.0	53	10.2
Pain	109	49.1	208	47.6	301	44.3	153	29.5
Total	222		437		680		518	

4.4. Discussion

4.4.1. *Main findings*

This chapter uses ambulance data that is rarely used in research (TAS) and links it to ambulance call data to create a unique ambulance call and telephone advice dataset. A method was developed to code the textual TAS data to identify telephone advice outcomes and more information about the reason for call. Analysis of this data found the most common reason for calling was that the patient was in pain (39.4%). Other reasons included diarrhoea, vomiting /nausea (11.4%), minor health problems (e.g. wound dressing, nosebleeds) (9.1%), and mental health, alcohol/drugs or crisis problems (8.5%). A paramedic or nurse advised patients what to do next and most patients were advised to seek in-hours GP care (27.6%) or to self-care (21.4%). 17.9% were advised to seek out-of-hours urgent care and 9.3% were advised to attend ED. Nearly half of the patients who were advised to self-present at the ED had called the ambulance service because they were experiencing pain.

The patients in the CAD-TAS dataset had been initially triaged as having a low acuity health problem by AMPDS, and most patients were also given low urgency advice, (advised primary care or self-care), which indicates that that the ambulance service was correctly identifying and appropriately advising low urgency callers in their first triage. Almost 1 in 10 patients were advised to make their own way to the ED, however this dataset does not contain information about whether the patient went to the ED, whether patients went to the ED that were advised other care pathways, or whether ED attendances were appropriate. This dataset also does not include patients whose call was referred for telephone advice but was returned for an ambulance response.

4.4.2. *Comparison with other literature*

Although a large number of studies were included in the systematic review in Chapter 2 because they report information relating to calls that are triaged by the ambulance service to receive telephone advice, it was not possible to identify with clarity the characteristics of service users and calls, and this was because studies did not consistently report this information. There were two main findings from this analysis. The first was that pain is a key factor in calls to the ambulance service that receive telephone advice, and the second is identifying the what advice the Clinical Advisor gave to the caller. The initial coding of the TAS-CAD data identified 26 different types of health care advice or factors that affect the advice that was given, including refer to GP; make own way to ED; self-care advice; worsening advice; given reassurance; symptoms resolved since call; leave in care of family and carer; and health care professional on scene. These were then categorised into 5 overall categories of ED, own GP or primary care; OOH urgent care; Self-care; Other. Several of the studies included in the systematic review reported the dispositions or advice given to patients who received ambulance telephone advice (Smith et al. 2001; Dale et al. 2004; Turner et al. 2006; Eastwood et al. 2016) and one study stated whether patients required immediate or delayed care (Studnek et al. 2012). However comparisons are hindered due to the different categories used to report the advice/disposition in each study and that some studies categorised the disposition into level of urgency rather than a service level disposition.

4.4.2.1. The impact of pain on service users

As callers contacted the ambulance service for their health problem rather than contacting their GP or an out of hours urgent care service, it was likely they felt the need for immediate help/ treatment e.g. to relieve pain or symptoms. This analysis identified that in the CAD-TAS dataset, pain was the most commonly recorded reason for calling the ambulance service, and pain accounted for nearly

40% of calls. Other research about why patients use UEC services for low acuity health problems is relevant to this finding. A recently published realist synthesis (O'Cathain 2020) identified why people make clinical unnecessary use of emergency and urgent care services and found that the need for immediate pain relief was identified as a key mechanism in choosing to use an urgent or emergency care service. Leventhal's Common Sense Model (Leventhal et al. 2003 p42-65) identifies that unmanageable levels of pain cause people to seek health care and Hodgins and Wuest identified that a person's perception of the seriousness of their health problem was a key driver in their choosing emergency health care services (Hodgins et al. 2007). The realist synthesis also identified that responsibility for others was as a mechanism for clinically unnecessary use of emergency care services and this also linked to pain.

4.4.2.2. Clinical Advice disposition

In the systematic review by Eastwood, which reported early research into ambulance telephone advice, the proportion of patients advised to attend ED ranged from 9.3% to 17% (Eastwood et al. 2015). Findings from this PhD are within the lower range. There was wide variation in the proportion of patients that were advised OOH or urgent care reported in the Eastwood review, with the ranging from 5% - 47%. This PhD identified that 17.9% of patients were advised OOH or urgent care (Eastwood et al. 2015). These differences may be due to different service provisions in different countries, for example, the US study reported the lowest rate of urgent care advice (Smith et al 2001), differences in the categories that were used to report clinical advice disposition, and the relevance of the studies included in the Eastwood review, with most being undertaken in the late 1990s and early 2000s (Eastwood et al. 2015).

The proportion of patients advised GP or community care was fairly consistent across other studies in the systematic review with the proportion ranging from 14% - 29% (Smith et al. 2001; Turner et al. 2006; Studnek et al. 20012; Dale et al. 2004). This study identified that 27.6% of patients were advised GP or community care, which sits within this range. The proportion of patients advised selfcare advice was reported by 4 studies included in the systematic review and this ranged from 2.2% - 31% (Turner et al. 2006; Eastwood et al. 2016; Dale et al. 2004; Smith et al. 2001). This study reported that 21.4% of patients were advised self-care, which also is comparable with other studies. Finally, analysis of the CAD-TAS data identified that data about advice or disposition was missing in 25% of cases. This is similar to the missing data rate reported in the study by Turner, which had 31% of data missing (Turner et al. 2006).

4.4.3. *Strengths and limitations*

This is the first study to analyse routine text data from an English ambulance service about the telephone advice ambulance call and the clinical advice information. This research has developed and tested a method for coding and analysing this data. This has potential for use in other research studies and was subsequently used in a recent grant application to the NIHR.

There were five main limitations to this research. Firstly, the analysis is retrospective and undertaken using data that was available from routinely recorded ambulance sources. Data was sometimes missing or required large amounts of formatting or coding to use this data as an analytical resource. Secondly, inclusion in the CAD-TAS dataset is dependent on inclusion in the PhOEBE dataset, and as such was subject to the limitations and challenges experienced by the PhOEBE study (Turner and Siriwardena et al 2019). These are reported in the next chapter. However, due to this, the CAD-TAS data was only from one ambulance service. Ideally, data would be included from multiple ambulance service providers, and indeed it was the case that the PhOEBE study attempted to obtain and link data from more than one ambulance service. If this had been successful, then data from more than one

service would have been available for reuse in this study. However, problems with the data linkage and secondary data provider meant that this was not possible within the timescales of the PhOEBE project (Turner and Siriwardena et al. 2019). The knock-on effect to this project was that only data from one ambulance service was available and this could affect the generalisability of the results. This may affect the generalisability of the findings from the CAD-TAS analysis to other ambulance services.

A further challenge experienced by the PhOEBE study that impacts on this analysis was around the success of the linkage of telephone advice data with subsequent health contacts and outcomes. After a first NHS Digital data match rate of 0% for telephone advice calls, due to missing ambulance information about date of birth (required for NHS Digital data linkage), to improve the data, the ambulance service sought date of birth information from their records of other ambulance service contacts, thus enabling linkage to occur for the patients who had date of birth stored in other ambulance service records. The effect this has on the CAD-TAS dataset was that all of the patients have other experiences of receiving ambulance service care. Whilst I could have done this analysis on all patients who received telephone advice, the intention was to create a dataset that matched the patients included in the PhOEBE dataset. as the primary analysis was the exploration of subsequent health events after receiving telephone advice, which is reported in the next chapter.

The implications of this are that the patients included in the CAD-TAS dataset may be sicker than those with non-linked data or they may be more likely to use the ambulance service as a consequence of the way date of birth data was identified and used for a second linkage attempt. These patients may also have a higher possibility of requiring or contacting other health services after receiving telephone advice or re-contacting the ambulance service. In the next chapter, the CAD-TAS dataset was linked with the PhOEBE dataset and the new dataset (called PhOEBE plus), was assessed for bias by comparing the call and caller characteristics of patients who have linked data versus those patients that were not linked. However, for this chapter, it is sufficient to identify and describe the study sample.

4.4.4. *Concluding summary*

This was a descriptive chapter that aimed to describe the calls that received telephone advice and the advice they were give. Most calls that were included in the CAD-TAS linked dataset were made because the patient was experiencing symptoms of pain. Less than 1 in 10 patients were advised by the Clinical Advisor to make their own way to the ED and lower urgency care pathways, such as GP and self-care were the most frequently advised by the Clinical Advisors. Subsequent chapters explore the safety and appropriateness of telephone advice through linking the CAD-TAS data with routine data about other health events.

5 What healthcare do patients use after receiving ambulance telephone advice?

5.1. Overview

This chapter links together routine data from multiple health care services to identify future health events for ambulance service calls that are closed with telephone advice. The data used in this analysis comprises of the CAD-TAS dataset (described in the previous chapter), which was linked to the Prehospital Outcomes for Evidence Based Evaluation (PhOEBE dataset) to form a new dataset called PhOEBE plus. The PhOEBE plus dataset therefore contains a unique linkage of the original ambulance call and the telephone advice consultation (from the CAD-Tas dataset) linked to Hospital Episode Statistics (HES) data for A&E and hospital admissions and national mortality data (from the PhOEBE dataset). The safety of ambulance telephone advice was explored using the PhOEBE plus dataset through identifying the number of hospital admissions and deaths that occur shortly after the ambulance call was closed with telephone advice. Appropriateness was explored through identifying the number of ED attendances and the number of ambulance recontacts and also by comparing the telephone advice disposition with the health care the patient subsequently sought and through exploring compliance with advice to attend the ED and the appropriateness of ED attendances.

5.2. Background

Currently, English ambulance services receive little information about what happens to patients once they have left their care. This lack of information makes it difficult to evaluate the safety and appropriateness of the care provided, patient pathways, patient outcomes and the impact of different types of service provision or the impact of new services. Most English ambulance services have now implemented electronic patient report forms (ePRF) across the majority of their service enabling electronic capture of patient information; previously all information was collected using paper forms. The move towards digital data capture has not been straightforward and it was only recently that services have fully transitioned to digital data capture and to start to routinely link ambulance data systems with that of other services, such as GP services. As ambulance providers now collect a unique identifier for NHS patients (NHS number) at the time of or shortly after the ambulance contact, this improved routine collection and recording of data and patient identifiers, coupled with a move away from paper based patient records brings new opportunities for research and audit, including linking ambulance data to patient information post ambulance discharge and increasing the potential to evaluate services. Further potential for data linkage and exploring ambulance routine data will occur through the development of the new Ambulance Data Set (https://www.england.nhs.uk/urgent-emergency-care/improving-ambulance-services/ambulance-data-set/). However, collecting and recording more data can lead to what is called a data dump, whereby lots of data is stored but little is done with it to explore improvements into patient care and service delivery (Porter et al. 2020). Therefore, it is important that best use is made of sources of routine data and that they are used for research and evaluation.

5.2.1. *Routinely available health information*

Data and information relating to a single person are often held across different services and data about individuals is often unconnected across different services and systems. Some administrative information systems are event based rather than person based, meaning that the same person can have multiple and different unconnected event records in the same database. Data linking matches commonly held data from different information systems in order to bring together different sources

of information within one dataset. This was defined in the 1970s as 'the bringing together in a single file, of records derived from different sources, but relating to the same individual or event' (Hobbs et al. 1970).

5.2.2. *Advantageous and disadvantages of linked routine data in HSR*

Within healthcare, there is a drive to make better use of existing information sources by bringing together information about the same person for research purposes, particularly for the purpose of outcome, quality and performance measurement (NHS Digital 2017). Linked health data is particularly advantageous for assessing quality and performance, as patient pathways often involve multiple service providers or service contacts. If assessments of healthcare quality are based only on a single health provider's data, this provides a "partial view" of quality and performance and does not capture the range of services or complex care pathways available in today's health care (Bureau of Health Information 2015) and that the patient may seek care from. Whilst data obtained from a single source can generate useful information, using data from multiple sources to investigate safety and appropriateness provides a more reliable assessment of system performance (Public Health Data Forum 2015). It is possible to link administrative health datasets together using commonly held identifiers, such as NHS number, or a combination of identifiers, and to use the linked data to map patient pathways or subsequent service use, and in doing so undertake multi-service or system wide analysis rather than single service-based research. However practical issues, such as complex data permission processes, the length of time taken to link data or complicated data linkage, poor data quality and limited roll-out of electronic data collection software can impede this type of research (Clarke et al. 2016; Christian et al. 2007). Furthermore, complex linked datasets require a significant data management resource, in terms of preparing, cleaning and understanding data prior to its use in a research project (Christian et al. 2007).

5.2.3. *Data linkage in ambulance service research*

In order to measure the impact of prehospital care on patient outcomes, information about what happens beyond the prehospital phase of care is required. Despite advances in data linking capability and in the use of linked data in HSR, in England there have been few attempts to link patient level ambulance service data to data from other health services when compared to countries such as Australia (Holman et al. 2008). This may be due to the complexity of ambulance data and that electronic data systems are a recent development in England through the ePRF.

5.2.4. *Ambulance service data linkage studies*

A study to assess the feasibility of linking ambulance service data to ED data for assault patients was published in 2005 (Downing et al. 2005). This used a three-step probabilistic method of data linking, and identified several barriers to data linking, including problems with data quality and lack of a common identifier. Whilst the study encountered problems with data quality, for example missing data (postcode of residence only available in <30% of cases), the study highlights the additional value that increasing information through data linkage brings and the opportunities for audit, evaluation and analysis that are not available to ambulance services due to lack of data. The study by Crilly and colleagues assessed the accuracy of data linking methods when linking ambulance and ED data in Australia and used this information to assess ED outcomes (Crilly et al. 2011). They assessed different methods of data linking and compared linkage rates from the two methods. Even with the lack of a unique identifier common to both the ambulance and ED datasets, they found that deterministic linking, whereby selected variables are exactly matched, was sufficiently accurate to link ambulance and ED data. A recent study that linked ambulance data to ED data was the Pre-Hospital Emergency Department Data (PHED dataset) Linking Project which undertook routine linkage of ambulance and

ED data for all ambulance service patients who were conveyed to ED (Clarke et al. 2016). This project developed a linkage method which had a high overall data linkage rate of 81% of ambulance ED conveyances linked to subsequent ED records. However, there was variation across the different sites involved in terms of the success of the linkage, with some trusts having a much lower match rate of 50% and the data linkage process was sometimes hindered by lack of access to identifiable data for the purpose of linkage and linkage validation. Despite the success of this method, this method was not applicable to this study as it focused on a different population of ambulance service users, as only patients who were conveyed to the ED were included in the PHED dataset (Clarke et al. 2017).

5.2.5. *Regional based data linkage studies*

5.2.5.1. Australian data linkage systems and studies

Australia has a long history of data linkage, most well-known of which is the Western Australia data linkage branch, which has been in operation for over 20 years and holds demographic and service data relating to 60 different systems (both public and private) that can be linked using a probabilistic model (Hodges et al. 2020). Data is held for approximately 10% of Australia's population. However, most of the studies involving ambulance telephone advice data have originated from Australian state of Victoria and this uses the state-wide Victorian emergency minimum dataset containing ED records and the Victorian Admitted Episode Dataset containing admission records (Department of Health and Human Services 2020). A series of Australian prehospital studies by Eastwood has focused on the linkage of ambulance secondary telephone advice calls (referred to as secondary triage in the Australian studies) with other health service data and is made possible by the state-wide data linking system. The research by Eastwood and colleagues has been published across several papers, with the focus on describing the model of secondary triage used, the appropriateness of ED attendances, the appropriateness of decisions to return a telephone advice call back for an ambulance response and identifying those cases that were referred back for an ambulance response and received no paramedic treatment (Eastwood et al. 2016; Eastwood et al. 2017; Eastwood et al. 2018; Eastwood et al. 2019). These studies did not report mortality outcomes and were undertaken in a health system that primarily views ambulance clinical advice as a secondary triage process, and undertaken from the an ambulance service perspective, in that they focus on the impact of telephone advice on ambulance service resources and systems rather than the wider UEC system. The Eastwood studies identified important findings within an Australian ambulance secondary triage system that can be explored and compared with the findings from this PhD thesis about telephone advice in an English ambulance service system. However, there are key differences between the studies undertaken by Eastwood and colleagues and the scope of this PhD. For example, much of the research by Eastwood considered the appropriateness of the telephone advice decisions to refer back for an ambulance response. This PhD study does not consider these patients and focusses only patients whose call was closed with telephone advice and their future health events. This PhD study also reports more information about future health events in the UEC system.

5.2.5.2. UK data linkage systems

In Scotland use of designated data safe havens have facilitated the linkage of ambulance data with data from other health services and has led to studies exploring the epidemiology and future health events of people who contact the ambulance service for mental health related issues (Duncan et al. 2019) and the Scottish Out of Hospital Cardiac Arrest (OHCA) data linkage project (The Scottish Government 2017). In Wales, the Secure Anonymised Information Linkage (SAIL) databank holds over 500 million records from different health and social care services and is used as a data source for a wide range of studies (Lyons et al. 2009), such as in the Support and Assessment from Fall Emergency

Referrals (SAFER2) cluster randomised trial to anonymously follow up participants using linked data (Snooks et al. 2012).

Whilst Wales and Scotland have developed systems to easily link routine health data from different health services, in England the system is much more complex and time-consuming as large scale data linkage between different services using patient identifiable data for linkage is mostly carried out through NHS Digital, as they hold a repository of HES data, and the complexity and cost of data applications and length of time the data approvals process takes can be prohibitive to research. Other, less comprehensive datasets exist, such as the CUREd dataset (Kuczawski et al. 2019), which uses individual service-based data to create a data repository and contains 111, ambulance, ED data. However, within the CUREd data repository the ambulance data was limited to only include CAD data. The CUREd dataset takes a similar approach to that in the study by Clark where the research team are responsible for sourcing, cleaning and linking the data. Whilst this approach means that data linkage is more within the control of the research team, it does introduce additional work in terms of data cleaning and management.

Creating a linked dataset that includes all ambulance service users and that links to other UEC services datasets (for example, a linked GP, 111, ED, hospital inpatient and national mortality dataset) would facilitate better monitoring of quality, safety and performance and the opportunity to develop more meaningful outcome and performance measures, and was a recommendation from recently published research (O'Cathain et al. 2018). As nearly half of patients who contact the English ambulance service are not conveyed to the ED, but instead are treated and discharged on scene or have their call closed with telephone advice, it is important that a linked dataset includes these patients so that the safety and appropriateness of ED non-conveyance and non-transport practices and policies can be explored.

5.2.6. *Research gap*

The report by Fisher et al identified that the most common reasons for legal action against ambulance services are as a result of the safety of non-transport decisions, including delayed treatment, failed or delayed admission to hospital and delays or failures in diagnosis. In addition, non-transport decision making has been identified by an expert group as an area where there could be improvements in patient safety (Fisher et al. 2015). Assessing patient pathways following ambulance telephone advice is complex as there are multiple different services that patients could seek care from, including recontacting the ambulance service or attending ED. Patients may be admitted to hospital and, in what is perceived to be rare cases, may die shortly after receiving ambulance telephone advice. Assessing these outcomes is not straightforward, and previous studies have not defined what was meant by safety and appropriateness and use different outcome measures or different variations of measures, meaning that it is difficult to compare findings. Assessing appropriateness was a potentially contentious issue, as decisions that seemed appropriate at the time may be retrospectively judged as inappropriate. For example, patients who self-present at ED or recontact the ambulance service can be judged to do so appropriately or inappropriately and there are different methods used by different studies to assess appropriateness. Whilst exploring safety and appropriateness using more than one type of measure can lead to more evidence, it is also important that measures are applied consistently across studies.

Although countries such as Australia have advanced data linking systems, in England it has not been possible to assess the safety and appropriateness of ambulance telephone advice outside of a research study that collects primary data, due to the lack of linked data resource available. This PhD was linked to the Prehospital Outcomes for Evidence Based Evaluation (PhOEBE) NIHR Programme

Grant for Applied Research, which links ambulance call and ePRF data with HES A&E, HES APC and national mortality data. As such I was able to utilise the linked dataset created for the PhOEBE study and create a unique dataset by linking data about the telephone advice consultation (CAD-TAS data) to the PhOEBE data and using this to identify future health events for calls closed with telephone advice. By creating this new data source (called the PhoEBE plus dataset) and through assessing the appropriateness of ED attendances, this is the first study of the English ambulance service that explores both the safety and appropriateness of health events following ambulance telephone advice.

5.2.7. *Aim and objectives*

The aim was to investigate the safety and appropriateness of the ambulance telephone advice, using a linked routine dataset developed for the PHOEBE study and a unique extra linkage for this study.

The objectives are:

- To identify the rate of future health events for ambulance calls closed with telephone advice, in terms of ambulance recontacts, ED attendances, hospital admissions and deaths through linking ambulance data to other health care date.
- To undertake a sensitivity analysis using the linked and non-linked data and explore the effect of bias in the sample
- To identify whether patients complied with the advice to attend ED or not to attend ED
- To explore the appropriateness of ED attendances
- To describe the reasons why patients were admitted to hospital within <3 days of receiving ambulance telephone advice and their hospital disposition
- To describe cause of death for people who died shortly after receiving ambulance telephone advice

5.3. Methods

This section describes the creation and analysis of a patient level linked multiple health service data set, which was based on ambulance service call and telephone advice data (CAD-TAS dataset) linked with the PhOEBE dataset (ambulance data linked with nationally held data about ED attendances, hospital admissions and mortality) to create the PhOEBE plus dataset.

5.3.1. *My role in this data collection and analysis*

The linked dataset created as part of the PhOEBE study was used by the PhOEBE study to develop ambulance service quality and performance measures. I was a co-applicant on the PhOEBE study and led the data linkage work package and it was because of this that I had the opportunity to analyse this data as part of my PhD thesis. Subsequently there was an opportunity to use the data in a workpackage in the VAN study (which reused the PhOEBE data to understand variation on ambulance non-conveyance), and I was a co-applicant on the VAN project and I led the workpackage on assessing the safety and appropriateness of non-conveyance. I had to take advantage of relevant funded studies because I undertook this PhD as a member of staff, with no external funding and no formal time to undertake the work. As part of my PhD work I also obtained additional data related to the ambulance telephone advice (CAD-TAS data) and linked this to the PhOEBE data, which means that this chapter also contains analysis that was not used as part of the PhOEBE study or the VAN study, about whether patients complied with the telephone advice they were given and assessing the appropriateness of the ambulance telephone advice.

5.3.2. *Study design and setting*

This was a data linkage study linking routine ambulance service data from a single ambulance service in England (EMAS) to national routine health service data and national mortality data.

5.3.2.1. Setting and context

The setting and context for this study was described in Chapter 3 of this thesis. Within the study ambulance service, calls are triaged using an AMPDS triage system by a non-clinical Call Taker. Calls that are identified by AMPDS as suitable for telephone advice are referred to the Clinical Advice Team (CAT) who are based within the Emergency Operating Centre (EOC). After being triaged to receive telephone advice, a patient was contacted by telephone by one of the CAT members and was given clinical advice over the telephone that was based on the urgency of the health problem. The advice may be for the patient to make their own way to the ED, to seek care from their own GP, to seek OOH care through NHS 111 or patients may receive self-care advice. Some calls are returned back for an ambulance response. During the time period from which the routine ambulance data was obtained, the number of calls to the ambulance service closed with telephone advice was approximately 9%.

5.3.3. *Data sources*

Table 22 below describes the different data sources that were linked and used in this analysis, and the different datasets and linkage methods are described in more detail in the following sections.

Table 22 data sources and linkages in this study

CAD-TAS data	PhOEBE data	PhOEBE plus data
Computerised Aided Dispatch (CAD) data contains routinely recorded information about the original ambulance call. Telephone Advice Service (TAS) data contains information recorded by the Clinical Advisor during the telephone consultation. CAD data was linked to TAS data to form the CAD-TAS dataset and this was described in Chapter 4.	PhOEBE data contains routine ambulance CAD and ePRF data which was linked via NHS Digital using a deterministic algorithm to the following datasets: • Hospital Episode Statistics Accident and Emergency data (HES A&E) • Hospital Episode Statistics Admitted Patient Care data (HES APC) • Office of National Statistics mortality data (ONS)	CAD-TAS linked to PhOEBE plus data to create a new and unique data source that links ambulance telephone advice data to subsequent health events

No electronic Patient Report Form (ePRF) was used in this data linkage and analysis, as this was not used as a method of recoding information for patient's whose call is closed with telephone advice.

5.3.3.1. Hospital Episode Statistics

Hospital Episode Statistics (HES) (https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics) data was held by NHS Digital for all ED attendances and hospital admissions in England. The advantage of sourcing data from NHS Digital was that data is subject to strict quality controls, in terms of coverage, completeness and validity. Two types of HES data were used in this linkage and analysis. These were HES Accident and Emergency (A&E) and HES Admitted Patient Care (APC). HES records contain information about each episode of patient care and include clinical information, such as diagnoses and procedures or investigations, patient characteristics and geographical information and administrative and process information about the

admission and discharge. These are further described in Figure 22 below. Because HES data is a national data set, this means that by linking ambulance data to HES data, it was possible to identify all ED and hospital records that occur nationally within a specific time period and not just those that are from attendances or admissions at specific hospitals.

5.3.3.2. Office of National Statistics (ONS) Mortality Data

ONS mortality data is a national data registry that houses data on all people who die in the UK. (https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths) Office of National Statistics mortality data is thought to be of good quality, as death registration is compulsory. At the time of the data sample, bereaved relatives registered the death within 5 days of the death occurring. Documentation from the registration of the death is required for the cremation or burial to go ahead. NHS Digital was able to link ONS mortality data to HES data. The advantage of using ONS mortality data instead of deaths recorded in the HES APC data, was that ONS mortality data contains both deaths that occur in hospital and deaths that occur outside of hospital. This means that any analysis of deaths using ONS mortality data was more accurate than using hospital data alone. In addition, ONS mortality data also contains more specific and more reliable information about cause of death than HES APC data.

Figure 22 description of each data set within the linked data

Data source	Description
CAD	Information from the 999 call. Calls are handled by non-clinical staff and information from the call is routinely recorded for every call received. The type of information recorded relates to timings, reason for call, patient demographic information, information from the triage assessment (assessment of call urgency) and call outcome. For this analysis only calls closed with referral to the telephone advice service were included. The CAD ID is a unique ID number assigned to each call.
Telephone Advice Service (TAS)	Information from the telephone advice call. Where patients call the ambulance service with health problems that are triaged as low urgency, the call may be sent for telephone advice. Telephone advice is provided by a nurse or a paramedic. Information is recorded in sequence of event (SOE) database and is recorded mainly as text data. Text data contains the clinical notes made at the time of the advice being given and usually includes more information about the reason for call and what advice was given e.g. to self-care or to seek GP care.
HES A&E	Information from individual ED records. HES A&E records contain information about all ED attendances in England. The HES A&E record has information on the patient's health problem and investigations or treatments that were undertaken, patient characteristics, admission and discharge process and administrative information including dates and times and the patient's disposition e.g. discharged to usual place of residence or admitted to hospital.
HES APC	Information from hospital records. The HES APC records contain information about all hospital admissions in England. The type of information recorded includes diagnosis, length of stay, admission to ICU or other specialist wards, treatments including operations, medical specialty and administrative information about admission and discharge.

ONS mortality	Information about people who die, taken from death certificates and death registrations. This includes cause of death, date and time of death and place of death.

5.3.4. *Developing a data linkage method*

It is important that linking different sources of health data together is done in a way that is ethical, secure and acceptable to patients and service users whilst meeting the requirements of General Data Protection Regulations (GDPR) and other relevant legislation (Harron et al. 2016). Data linkage studies must balance individual concerns against research benefits for the general population and take suitable measures to manage risk and safeguard personal health information (Odekirk et al. 2013). These include information governance frameworks, data approval procedures, secure data access and data management measures (e.g. encryption, data minimisation, small number suppression and data audits) and data management plans.

So as to comply with the necessary data security standards and regulations and also to develop a data linking method that was acceptable to patient and public representatives, within the PhOEBE study I led the development of a data linkage method that was purposefully devised to ensure that no patient identifiable data was transferred, processed or handled outside of the NHS. In doing so, a data linking method was developed whereby patient identifiable data was used only for linkage, and also that patient identifiable data was only transferred between NHS organisations (ambulance services and NHS Digital).

Once the data linkage process and method were finalised, the required NHS ethics, data and governance permissions were sought.

5.3.5. *Ethics approval*

I led two separate ethics applications that related to this PhD study. The first NHS Ethics application related to the data linkage process used in the PhOEBE study (Research Ethics Committee reference 12/EM/0251) and the second NHS Ethics application related to the use of the PhOEBE dataset in this PhD study (National Research Ethics Committee reference 12/EM/0022. HRA approval and local research sign off from the ambulance service was also obtained for the PhD study as a whole.

5.3.6. *Approval to use identifiable patient data for linking*

I led the application to the Confidentiality Advice Group (CAG) as part of the suite of approvals required for the PhOEBE dataset. CAG approval was necessary in order to use patient identifiable data without patient consent to create the linked PhOEBE dataset (CAG reference: EEC 3-03 (d)/2012). This was required as it was not feasible to obtain individual patient consent for data linkage due to the large number of patients in the sample.

5.3.7. *NHS Digital approval*

NHS Digital Data Access Request Service (DARS) permission was required to link, receive, and process NHS Digital data (Study code: DARS-NIC-315175-P8X6Z-v2 MR1357). I led the application to NHS Digital for the PhOEBE dataset data linkage, and this required an assessment of the proposed data management and data security arrangements. However, there were significant delays in this process which affected the timelines of this PhD. Following approval of the first NHS Digital application and whilst awaiting the final sign off of contracts, significant internal problems at NHS Digital came to light that resulted in a 6 month pause on data applications whilst NHS Digital undertook a major internal

reorganisation. This resulted in a new application process and I was required to make a second application to NHS Digital, as the first application became null and void. The new application process required additional information and data security assurances, and this included a new requirement of an organisational Information Governance Toolkit that was accredited at level 2. Due to my involvement and knowledge of the NHS Digital process and requirements, I became the HSR Section representative for Information Governance and together with colleagues from other sections in ScHARR, led the development of an Information Governance Toolkit. Once the IG toolkit was developed to a sufficient level, a new application was submitted to NHS Digital for the PhOEBE linked data. The resultant impact on timings was such that the first application was submitted to NHS Digital in January 2013, but it wasn't until nearly 4 years later in October 2016 that the first set of data containing linked information for ambulance calls closed with telephone advice was received. See Appendix 11 timescales of data linkage. The implications of this delay are discussed in the limitations section of this chapter. Furthermore, the original application to NHS Digital was focussed on the aims the PhOEBE study, which aimed to use the linked data to develop ambulance quality and performance measures. Therefore, additional permission was obtained from NHS Digital for the specific data use purpose in this PhD, which was to identify the rate of future health events for patients whose call was closed with telephone advice.

5.3.8. *Additional training and information governance*

In addition to the above approvals process, I undertook data security and IG training to comply with ScHARR and University policies. This required me to undertake specific training relating to protecting information; protecting personal data; protecting research data; training for cyber essentials and assured computing; and ScHARR Information Governance training. During the time of this PhD study, I was a member of the ScHARR Information Governance committee and I helped to develop the IG training and the acceptable standards for the handling, receipt and storage of NHS Digital information, including the IG toolkit, which was a new requirement for the NHS Digital application.

5.3.9. *Obtaining and linking data*

The PhOEBE dataset was an individual patient level dataset that contained 6 months of ambulance service call and clinical data from one ambulance service that was linked with future health event data from national datasets. The data used for linkage was provided directly to NHS Digital by the ambulance service. NHS Digital applied their standard data linking algorithm to link the ambulance data to HES A&E and HES hospital admission data, and also to mortality data from the ONS. The method used by NHS Digital is based on a deterministic linkage method (rather than probabilistic method) and links the following variables progressively in a series of steps: NHS number, date of birth, sex and postcode.

The stepwise data linking process is described in the Box 2 below.

Box 2 Stepwise data linking process (Turner and Siriwardena et al. 2019)

- Study ambulance services selected and extracted the data sample based on all ambulance calls meeting the inclusion criteria within a specific time period.
- Study ambulance services linked the CAD and ePRF records (except for calls closed with telephone advice which do not have ePRF) and produced a linked CAD/ePRF dataset.These datasets contain a large number of variables that include details of the patient, the call processes, response provided, clinical assessment, treatment and disposition.
- The ambulance service assigned a unique ID to each individual patient record.
- The ambulance service creates a version of the dataset that contains ony the clinical data from the ePRF, the non-identifiable emergency call and dispatch data from CAD and the unique ID number. This annonymised file is encrypted within microsoft excel and sent by secure email to the UoS.
- The ambulance service create a second version of the dataset that contains only the variables required for data linking, including patient identifiable data. These included date, time, location of incident, patient name, date of birth, address, hospital attended, the unique number assigned by the ambulance service, and, where available, NHS number. This dataset was sent by the ambulance service to NHS Digital as a password protected excel spreadsheet via NHS Digital's secure electronic file transfer system. For cases where NHS number was not available NHS numbers were traced by NHS Digital.

For data confidentiality and security reasons and to ensure that patient identifiable data was not transferred outside of the NHS, NHS Digital removed the variables used for linkage before the linked data set was returned to the University of Sheffield. As well as data deletion, this process also involved transforming some identifiable data into a pseudonymised form that would be used in the analysis. For example, date of birth was transformed into age. The unique ID number assigned by the ambulance service was retained, meaning that it was possible to link the HES and ONS data to the ambulance call and clinical data that was held in the separate CAD-TAS data set.

5.3.10. *Challenges associated with this approach*

A potential drawback of the NHS digital data linking algorithm was that without the presence of each if the four variables, NHS digital were unable to link a case. Therefore, it was important to ensure that missing data was at a minimum for all of the variables used for data linking. Several steps were taken to maximise data completion for these variables, including using NHS Digital's NHS number tracing service to identify missing NHS numbers. This was particularly important for telephone advice calls, which contained less information about the patient due to their being no ePRF record for these calls and which meant they were less likely to have an NHS number attached in the ambulance data.

When NHS Digital originally provided the linked data, the initial linking rate for telephone advice patients was 0% and this meant that none of the calls closed with telephone advice were linked to subsequent health contact information held in HES or ONS. This was despite information such as NHS number being available in these patient records. Non-linkage occurred because NHS Digital required four separate variables data for data linking and if one of these was missing or incomplete in the ambulance record it was not possible for NHS Digital to link the data using their algorithm. Further investigation of this identified that date of birth was missing from the ambulance data for calls closed with advice, as at the time of sample date of birth was not routinely recorded in CAD data by EMAS.

5.3.10.1. *How the challenges were addressed*

The main cause of non-linkage for ambulance calls closed with telephone advice was missing date of birth data. The study ambulance service was subsequently able to provide more complete data for calls closed with telephone advice, by sourcing this information from other ambulance records, such as previous contacts with the ambulance service, and using this to improve the date of birth information. A consequence of this was that date of birth information was only available for patients

who had other experiences of contacting the ambulance service and an ambulance was sent, and this is discussed in the discussion section. In rerunning the linkage and providing NHS Digital with improved date of birth data, it was possible for NHS Digital to link some of the calls closed with telephone advice to other health event data.

5.3.11. *New data linkages for this PhD*

I built on the PHOEBE dataset by obtaining and linking additional ambulance data about the ambulance call and the telephone advice consultation (CAD-TAS dataset) to the PhOEBE dataset, to create the PhOEBE plus data set. CAD and TAS data was obtained from an information analyst at EMAS for the same time period as the PhOEBE dataset and for the same patients that were included in the PhOEBE dataset. This enabled direct linkage between the CAD-TAS dataset and the PhOEBE dataset, using a unique ID that was common to both data sets (CAD ID). Linkages were checked for accuracy using date and time of call. The result was the creation of first dataset that contains patient level information about ambulance telephone advice consultations linked to subsequent ED, hospital admission and national mortality data. This new dataset is referred to as the PhOEBE plus dataset in this thesis.

5.3.12. *Ambulance data inclusion and exclusion criteria*

Data was obtained from one ambulance service (EMAS) and related to six months (January – June) in 2013. Some calls were excluded, either because they were not relevant to this analysis (e.g. calls that were passed to other ambulance services or calls related to hospital transports) or because they would reduce the validity of the final data set in terms of linkage with other health events (e.g. duplicate calls for the same incident).

The full list of exclusions that were applied to the telephone advice sample was as follows:

- Calls passed to other ambulance services
- Duplicate calls for the same incident
- Telephone advice calls where the call was not closed with advice or did not receive input from a clinician, or were dealt with by a call handler only
- Calls that were automatically closed calls
- Calls dealt with by other services

5.3.13. *Data availability and implications for data linking*

Data from calls that did not receive telephone advice from a clinician were excluded from this analysis, therefore any calls that were closed by non-clinical call handlers were excluded as including these calls could introduce bias into the analysis of rates of subsequent health contacts. This resulted in approximately 5,000 calls being excluded from the ambulance telephone advice data. The impact of this was that the calls included in the analysis for this study are not directly comparable with the calls included in the AQIs, because the calls included in the AQIs also included calls which did not receive input from an ambulance service clinician, including 'automatically closed calls'. In addition, further differences between the way in which the AQI data set was calculated (as a call based data set) and the way in which this data set is calculated (as an individual patient-based data set), mean that it was not possible to directly compare the number of calls included in each data set.

5.3.14. *Data management*

Data was stored on a Virtual Machine to comply with NHS Digital information governance and data security requirements. Data processing involved data cleaning, creating new variables required for the study analysis, linking the clinical ambulance data to data supplied by NHS Digital using the unique study ID and calculating time intervals. A data-file containing Lower Supra Output Area (LSOA) data was used to calculate rural and urban data variables. Linkage of the HES and ambulance call data was undertaken in R and this was linked to the ambulance telephone advice data using Excel and SPSS. The reason the second linkage was done using different software was because the ambulance telephone advice data contains large amounts of text data and this was better handled in excel. Analysis was undertaken in Excel, SPSS and R.

5.3.15. *Outcomes*

Future health event data was calculated for four outcome categories. These were: ambulance service recontacts; ED attendances; hospital admission; and death.

5.3.16. *Analytical decisions*

There were several key analytical decisions, and these are described below.

5.3.16.1. Timeframe in which outcomes are reported

The systematic review in Chapter 2 identified that a range of different time points can be used to measure and report subsequent health contacts. Outcomes can be reported within a very short time of the original ambulance contact (e.g. hours) or at a much longer time point (e.g. months or years) (Anderson et al. 2002; Cain et al. 2003). Commonly used outcome reporting time measures included outcomes measured at 24 hours, 48 hours, 72 hours, 7 days, 30 days and 1 month. A review of outcome measures used by the ambulance services identified that survival following ambulance service care can be measured in intervals from <1 day to up to 5 years (Turner and Siriwardena et al. 2019). The timepoint at which outcomes were measured in this PhD was determined based on several factors. Firstly, relevance to the ambulance service. Events which occur within a short time of the original ambulance call are more likely to relate to the same health problem as the ambulance call and be more attributable to the care provided by the ambulance service. Yet a too short event window may miss some health events that relate to the telephone advice consultation. Secondly, the views of stakeholders around what time point ambulance service subsequent outcomes should be measured was considered. Consensus work with multiple stakeholders (including PPI) within the PhOEBE project identified a preference for measuring outcomes within 3 – 7 days of an ambulance call. Based on these considerations, 3 days was used as the time frame for measuring outcomes in the primary analysis of the PhOEBE plus dataset, but an additional scenario analysis considers outcomes at 7 days. In reporting outcomes at both 3 and 7 days this also enhances the comparability of the results with other published literature. As the HES APC hospital data is only date stamped and not time stamped this means that all times have been reported in days for consistency of reporting.

5.3.16.2. Identifying recontacts

Using the PhOEBE plus dataset it was possible to identify people who recontacted the ambulance service within a short time of their call being closed with telephone advice and to calculate the timing of recontacts with more precision than was routinely done by the ambulance service. Ambulance services use a broad method of identifying recontacts, as the ambulance service calculation of a recontact is based upon whether the call is from the same postcode and from someone of the same gender within 24 hours. If, for example, the same person calls again from another location this is not counted as a recontact within ambulance data systems. Therefore, there was an opportunity to

calculate a more accurate recontact rate for calls closed with telephone advice using the PhOEBE plus dataset. The encrypted HES ID was a unique patient identifier assigned to each patient in the sample by NHS Digital, and this was used to identify recontacts. As only one ambulance service was included in this study, it was not possible to identify recontacts that were routed through to another ambulance service.

5.3.16.3. Method for determining appropriate ED attendance

Attendance at ED is sometimes used as a proxy for assessing the appropriateness of telephone advice, with attendance at ED indicative of inappropriate advice. However, there are several factors that need to be considered when assessing the appropriateness of subsequent ED attendance. The first was whether the attendance was planned or unplanned. In terms of ambulance telephone advice, a planned attendance means the patient was advised to seek ED care by the Clinical Advisor. It is possible to identify the clinical advice given to the patient and ED attendances from the PhOEBE plus dataset, therefore ED attendances can be categorised as planned and unplanned.

A second consideration was whether the ED attendance was clinically appropriate or whether other lower urgency services could have treated the patient's health problem. This PhD reuses a method for identifying patients whose ED attendance was potentially inappropriate, which was initially developed as part of a study into the appropriateness of ED attendances by Nicholl et al (Nicholl et al.2011). This method identified a list of investigations and treatments that did not require the facilities of a fully staffed ED and that could routinely be provided by a primary or urgent care service. The treatment, investigation and disposal HES codes taken as indicating non-urgent ED attendance are shown in Table 23 on the following page. In addition, a definition of non-urgent attendance was applied to the data, based on the following criteria:

1. Not investigated in ED (except by urinalysis, pregnancy test or dental investigation)

2. Not treated in ED (except by prescription, recording vital signs, dental treatment or guidance/advice)

3. Discharged completely from care in ED or referred to their GP

This group of ED attendances were described as

> *"first attendance with some recorded treatments or investigations, all of which may have been reasonably provided by within primary care, followed by discharge home or to GP care." (Nicholl et al. 2011)*

Table 23 List of investigations and treatments identifying inappropriate ED attendance with corresponding HES A&E Codes

Code	Investigation
24 or blank	None
06	Urinalysis
21	Pregnancy test
22	Dental investigation
Code	**Treatment**
07	Prescriptions
22	Guidance/advice only
30	Recording vital signs
56	Dental treatment
57	Prescription
99 or blank	None
Code	**Disposal**
02	Discharged – following treatment to be provided by GP
03	Discharged – did not require any follow-up treatment
12	Left department before being treated

This method of identifying potentially inappropriate and appropriate ED attendances was used in this thesis due to the relevance to the cohort of patients, the topic area of this PhD and the definition of appropriateness developed for this PhD. The method used in this thesis was developed and refined with input from a large multi-disciplinary working group with both clinical and methodological expertise and has been tested in previous research. Other methods of identifying appropriateness of ED attendances have been used in the literature. The Australian study by Eastwood also assessed the appropriateness of ED attendances after telephone advice and this used a similar definition to this study, which was based on the 'potentially avoidable GP-type presentation measure' used to assess ED appropriateness by the Australian Government (Eastwood et al. 2017; Australasian College for Emergency Medicine 2013). The definition applied by Eastwood included similar factors to this study's definition, such as not admitted to hospital. However, some data used in the Eastwood definition were not available in UK datasets, such as the Australian Triage Scale, therefore it was not possible to use the same approach in this study.

5.3.17. *Missing data*

This analysis uses information that was routinely recorded in the clinical records for each of the healthcare settings included in this analysis (prehospital, ED, Hospital and national mortality data). Data obtained from NHS Digital have been through a quality checking process that includes data cleaning, deletion of duplicate data, checks on the validity and the quality of the data and a process of deriving new variables once data quality and completeness checks have been completed and are assured (NHS Digital 2020). Providers of data to NHS Digital are given regular reports of the quality and completeness of data and there are well-established processes for dealing with missing HES data.

5.3.17.1. Missing ambulance data

Within this study, some of the data was sourced directly from the ambulance service and therefore this data was not subject to the same checks and processes as the HES data. If missing data is identified, it is important to identify why data is missing because this may have implications for the analysis, depending on whether or not data was missing at random (Read et al. 2013). For example, data may be missing by mistake, which is assumed to be missing at random, missing because of

difficulties in recording information in high pressure environments e.g. time pressures in the call taking process, and finally because of non-response bias in data entry where no value is entered for clinical items that are assumed to be either normal or not relevant to the patient's condition.

5.3.17.2. *Sensitivity analysis*

The first stage of investigating missing data was to summarise the number of missing values for each variable and to investigate potential reasons for missing data values. I had discussions with clinical academic colleagues from ED and ambulance settings to discuss why certain variables had higher levels of missing data than other variables. Different strategies for handling missing values were considered (e.g. multiple imputation, sensitivity analysis) taking into account the trade-off between using the most appropriate statistical methods, the amount and type of missing data, the potential reasons for missing data and the communication of results to stakeholders. Because of the type of analysis being undertaken here, and because there are a number of different ways in which the population in this study was potentially biased (biases due to the linkage method and biases in the sample) I undertook a sensitivity analysis, whereby the impact of missing outcomes being events or non-events are examined within different scenarios. Using this method assesses the robustness of the findings and reports a range of values within which the true value lies (Thabane et al. 2013). This can often have more practical value to stakeholders than a single value based on imputed data, as it can be more easily understood by PPI and it can be used by service providers and policy makers to incorporate scenario assessments based on different types of patient and call characteristics.

Sensitivity analysis was also used to assess other scenarios and potential biases within the data, including using different time frames to report outcomes and the impact of excluding people who call the ambulance service frequently and very elderly patients. This allows a wider set of information to be disseminated and stakeholders can more easily evaluate the results based on their own service population. I discussed this approach with PPI colleagues and their advice was taken on the best way to communicate and disseminate these results.

5.3.17.3. *Frequent callers*

Frequent callers often have a care plan in place so that their calls are firstly dealt with by clinical telephone advice to assess whether the call is a frequent call or a new health emergency. It is possible that high rates of frequent callers to the ambulance service may skew the ambulance recontact rate. Therefore, the sensitivity analysis looks at the impact of frequent callers in the scenarios. The first of these scenarios includes frequent callers within the analysis and the second excludes frequent callers. The definition used to identify frequent callers in the PhOEBE plus dataset was the same as that used by the ambulance service, and frequent callers are defined as "a frequent caller to the ambulance service is defined nationally by the Ambulance Frequent Caller National Network as an adult (18 years +) who makes five or more emergency calls in a month, or 12 or more emergency calls in three months from a private dwelling " (https://www.swast.nhs.uk/welcome/hcps/frequent-callers-1) As the data for this analysis relates to 6 months, it is possible that some frequent callers are missed if they had other ambulance contacts that fell outside of 6 months of ambulance contacts included in this study.

5.3.18. *Analysis*

A descriptive analysis was undertaken to identify what health care patients sought after receiving clinical advice from the ambulance service. The proportion of patients recontacting the ambulance service, attending ED, having a hospital admission or dying within three days were calculated as the primary outcome. A sensitivity analysis was calculated to adjust for unlinked calls, frequent callers,

patients aged over 90 and to investigate the effect of using different time points to measure the study outcomes. To comply with NHS Digital's data reporting policy small numbers were suppressed in the reported data tables (<5 are suppressed).

5.4. Results

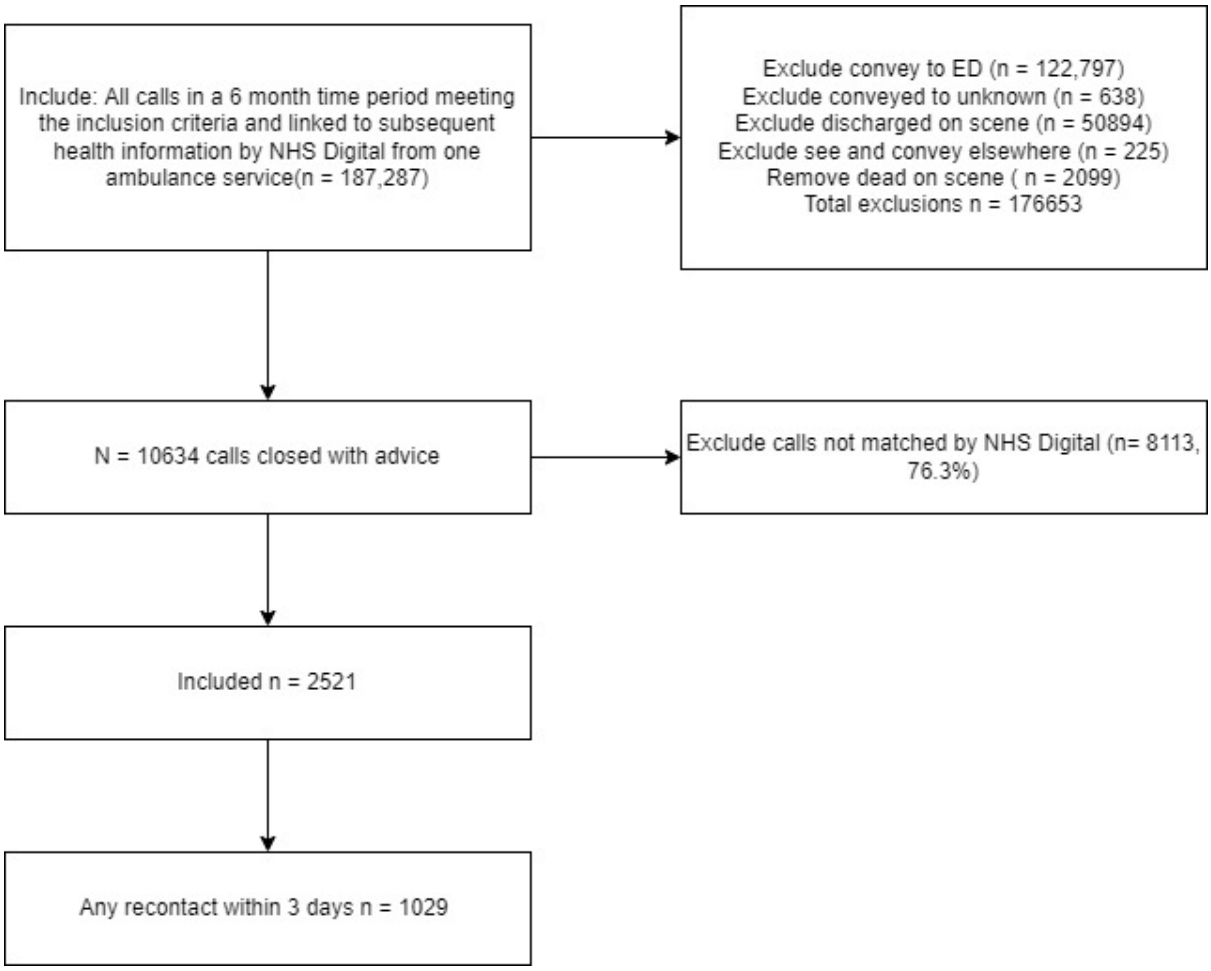
5.4.1. *Data linkage results*

The overall data linkage rate achieved in the PhOEBE study was 83% (154,927/187,287) of patients successfully linked through the NHS Digital data linking process. However, the linkage rates varied by type of ambulance response and those patients who received ambulance telephone advice had the lowest match rate, despite attempts by the ambulance service to obtain better quality data and subsequently re-running the data linkage process through NHS Digital.

The dataset supplied by the ambulance service of calls closed with telephone advice contained 10634 calls. However, due to missing date of birth information only those with other experiences of ambulance care had date of birth information and could be linked by NHS Digital to other health events. Therefore, the final data linkage match rate for callers who received telephone advice was 23.7% (2521/10634) in the PhOEBE study. (see Figure 23 flow chart of included calls). This meant that the number of patients with linked data in the PhOEBE plus dataset was also 2521.

The number of patients with linked data in the PhOEBE plus dataset (2521) and the total number of patients in the sample of all ambulance calls closed with telephone advice (linked and unlinked data, 10634) were used as the denominators for the sensitivity analysis to explore the impact of the linkage rate on the results.

Figure 23 Flow chart of included calls



5.4.1.1. Comparison of linked and unlinked data

The patients with linked telephone advice were likely to be different from those that were not linked due to the method used by the ambulance service to obtain date of birth information required for NHS Digital data linking. The linked patients all had other experiences of using the ambulance service and an ambulance being sent either before or after the 6-month period covered by this dataset. This introduces potential bias as patients who have other experiences of contacting the ambulance service are likely to be sicker or have more health problems than patients who have no previous experiences of contacting the ambulance service. Table 24 (page 141) shows the characteristics of calls and callers with linked data (included in the PhOEBE plus dataset) and without linked data (not included in the PhOEBE plus dataset) and can be used to identify the resulting bias in the data sample. The data in Table 24 confirms that there was potential for bias within the PhOEBE plus linked dataset. Table 24 shows that patients with linked data in the PhOEBE plus dataset are older than patients who do not have linked data, and this difference was evident across all age groups. There was also some evidence of bias in relation to deprivation, with patients with linked data included in the PhOEBE plus dataset having a higher proportion of patients with the highest rate of deprivation. Differences between other call and caller characteristics for PhOEBE plus linked data and the unlinked data were less evident.

Due to the potential bias within the PhOEBE plus data, results relating to subsequent health contacts and mortality outcomes are reported as a range using a sensitivity analysis, with the linked PhOEBE plus data as the denominator for the upper range and all calls closed with advice (linked and unlinked calls) as a denominator for the lower range.

Table 24 Comparison of call characteristics of calls with linked data compared to unmatched calls

	Calls closed with telephone advice			
Variables	Linked data	N	(%)	No link N (%)
Age				
0-2	58		(2.3)	576 (7.1)
3-10	29		(1.2)	490 (6.0)
11-20	90		(3.6)	1095 (13.5)
21-40	421		(16.7)	2465 (30.4)
41-60	637		(25.3)	1457 (18.0)
61-80	762		(30.3)	1204 (14.8)
81-90	402		(16.0)	564 (7.0)
>90	101		(4.0)	141 (1.7)
Missing	14		(0.6)	121 (1.5)
Gender				
Female	1,504		(59.8)	4386 (54.1)
Male	1,010		(40.2)	3665 (45.2)
Missing	0		(0.0)	
Time of call[1]				
In Hours	712		(28.3)	13733 (32.1)
Out of Hours	1,802		(71.7)	29063 (67.9)
Reason for call				
Abdominal Pain	465		(18.5)	1229 (15.1)
Breathing	233		(9.3)	532 (6.6)
Cardiovascular	101		(4.0)	334 (4.1)
Falls	108		(4.8)	461 (5.7)
Fitting	19		(0.8)	56 (0.7)
Injury	254		(10.1)	1379 (17.0)
Other Condition	301		(12.0)	1189 (14.7)
Psychiatric	105		(4.2)	177 (2.2)
Sick Person	765		(30.4)	2112 (26.0)
Unconscious	65		(2.6)	382 (4.7)
Missing	98		(3.9)	262 (3.2)
Urban/Rural				
Rural	383		(15.2)	1302 (16.0)
Urban	2,131		(84.8)	6808 (83.9)
Missing	0		(0.0)	• (***)
IMD Quintile				
1 (Least)	208		(8.3)	822 (10.1)
2	527		(21.0)	1302 (16.0)
3	409		(16.3)	1231 (15.2)
4	493		(19.6)	1926 (23.7)
5 (Most)	877		(34.9)	2829 (24.9)
Missing	0		(0.0)	• (***)
Total	2,521		(100)	8113 (100.0)

*/(***)Small number suppression

5.4.1.2. Subsequent event rates within 3 days, by call and patient characteristics

Subsequent event rates for calls closed with telephone advice were calculated for four types of event rate using the PhOEBE plus dataset, within 3 days of the original ambulance call: ambulance recontact, 32.2% (n=809); ED attendance rate, 26.4% (n=664); hospital admission rate 11.2% (n=281); and mortality rate, 0.23% (n=6). These are the raw subsequent event rates and do not account for any potential bias in the data sample. Subsequent event rates are reported in Table 25 within 3 days of the original ambulance call by patient and call characteristics. Table 25 can be used to see where the subsequent events occurred in the table, in terms of the patient and call characteristics. The spread of subsequent events in Table 25 shows that more events occurred in older ages groups, in deprived areas and occurred OOH. This may be related to the bias in the sample.

Table 25 Subsequent event rates within 3 days, by patient and call characteristics

	N	Ambulance re-contact N	(%)	ED attendance N	(%)	Hospital admission N	(%)	Died N	%
Age									
0-2	58	7	(12.1)	14	(24.1)	*	(***)	0	(0.0)
3-10	29	*	(***)	*	(***)	0	(0.0)	0	(0.0)
11-20	90	15	(16.7)	20	(22.2)	6	(6.7)	0	(0.0)
21-40	421	132	(31.4)	146	(34.7)	49	(11.6)	0	(0.0)
41-60	637	248	(38.9)	185	(29.0)	57	(8.9)	*	(***)
61-80	762	289	(37.9)	183	(24.0)	89	(11.7)	*	(***)
81-90	402	84	(20.9)	82	(20.4)	60	(14.9)	*	(***)
>90	101	28	(27.7)	25	(24.8)	16	(15.8)	0	(0.0)
Missing	14	5	(35.7)	5	(35.7)	0	(0.0)	0	(0.0)
Gender									
Female	1,504	562	(37.4)	418	(27.8)	158	(10.5)	*	(***)
Male	1,010	247	(24.5)	246	(24.4)	123	(12.2)	*	(***)
Missing	0	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Time of call[1]									
In Hours	712	230	(32.3)	191	(26.8)	83	(11.7)	0	(0.0)
Out of Hours	1,802	579	(32.1)	473	(26.2)	198	(11.0)	6	(0.33)
Reason for call									
Abdominal Pain	465	220	(47.3)	144	(31.0)	53	(11.4)	*	(***)
Breathing	233	73	(31.3)	61	(26.2)	40	(17.2)	*	(***)
Cardiovascular	101	38	(37.6)	28	(27.7)	9	(8.9)	0	(0.0)
Falls	108	29	(26.9)	27	(25.0)	12	(11.1)	0	(0.0)
Fitting	19	*	(***)	7	(36.8)	*	(***)	0	(0.0)
Injury	254	72	(28.3)	79	(31.1)	25	(9.8)	0	(0.0)
Other Condition	301	78	(25.9)	89	(29.6)	33	(11.0)	0	(0.0)
Psychiatric	105	39	(37.1)	32	(30.5)	14	(13.3)	0	(0.0)
Sick Person	765	217	(28.4)	161	(21.0)	78	(10.2)	*	(***)
Unconscious	65	14	(21.5)	12	(18.5)	*	(***)	*	(***)
Missing	98	24	(24.5)	24	(24.5)	13	(13.3)	0	(0.0)
Urban/Rural									
Rural	383	101	(26.4)	95	(24.8)	52	(13.6)	0	(0.0)
Urban	2,131	708	(33.2)	569	(26.7)	229	(10.7)	6	(0.28)
Missing	0	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
IMD Quintile									
1 (Least)	208	51	(24.5)	52	(25.0)	32	(15.4)	0	(0.0)
2	527	248	(47.1)	135	(25.6)	58	(11.0)	0	(0.0)
3	409	112	(27.4)	113	(27.6)	58	(14.2)	0	(0.0)
4	493	94	(19.1)	104	(21.1)	45	(9.1)	*	(***)
5 (Most)	877	304	(34.7)	260	(29.6)	88	(10.0)	*	(***)
Missing	0	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Total	2,514	809	(32.2)	664	(26.4)	281	(11.2)	6	(0.2)

*/(***)Small number suppression

5.4.1.3. Sensitivity analysis

The sensitivity analysis in Table 26 below reports the rates of subsequent health care event and outcomes within three days of the original ambulance call and uses the linked calls from the PhOEBE plus dataset and all calls (linked and unlinked calls) as the maximum and minimum denominators. Additional scenarios were considered within the sensitivity analysis and these are also reported in Table 26. These included the impact of excluding very elderly patients from the analysis, the impact of removing frequent callers from the analysis and the impact of reporting event rates at 7 days rather than at 3 days.

Table 26 shows that removing patients age >90 years had little impact on event rates. Reporting event rates at 7 days instead of 3 days resulted in a small increase in all types of event, of approximately 5%, excluding subsequent deaths which were 0.16% when reported at 7 days. Removing people who call frequently from the analysis had more impact on subsequent event rates and this could be due to frequent caller protocols meaning that people identified as high-volume service users are more likely to receive telephone advice. For example, subsequent ambulance recontacts reduced from 32.4% to 19% when comparing the scenarios that included and excluded frequent callers. Using linked plus not linked calls as the denominator had the biggest impact on subsequent event rates and this highlighted that there was less robustness and stability in the results if considering the results using the PhOEBE plus linked data alone. The linked plus not linked denominator scenario identifies the minimum event rate, so the minimum subsequent ambulance recontact rate was 7.6%, the minimum subsequent ED attendance rate was 6.2%, the minimum subsequent hospital admission rate was 2.6% and the minimum mortality rate was 0.06%.

Table 26 Sensitivity analysis for calls closed with telephone advice

Calls closed with telephone advice						
	Linked + Not linked calls as denominator N = 10,627 (%)	Linked Calls only as denominator (PhOEBE plus data) N = 2,514 (%)	Events within 3 days patients>90 years old removed N = 2,413 (%)	Events within 3 days deaths in patients aged > 90 removed N = 2,514 (%)	Events within 3 days Frequent Callers+ removed N = 1,770 (%)	Events within 7 days N = 2,514 (%)
Ambulance re-contact	809 (7.6)	809 (32.2)	781 (32.4)	809 (32.2)	337 (19.0)	938 (37.3)
ED attendance	664 (6.2)	664 (26.4)	639 (26.5)	664 (26.4)	387 (21.9)	791 (31.5)
Hospital admission	281 (2.6)	281 (11.2)	265 (11.0)	281 (11.2)	206 (11.6)	354 (14.1)
Death	6 (0.06)	6 (0.24)	6 (0.25)	6 (0.24)	6 (0.34)	10 (0.40)

5.4.1.4. Mapping patient pathways

At the time of the data linkage, linkage with GP systems and OOH was not possible, therefore some patients may also have had other urgent care contacts. Where patients recontacted the ambulance service, attended ED, were admitted to hospital or died within 3 days of the original ambulance call,

these events were mapped in future event pathway. This is shown in Table 27 Pathway analysis. The following findings were identified:

- Most patients did not seek additional health care from emergency care providers (n=1485).
- 346 patients had a recontact with the ambulance service within 3 days but did not seek any other care from emergency health services.
- Some patients had multiple types of subsequent health events (see Table 26 telephone advice pathway). For example, 192 people subsequently had 3 different health events, as they re-contacted the ambulance service, attended ED and were admitted to hospital, within 3 days of receiving ambulance telephone advice.
- There were 209 patients who attended ED without re-contacting the ambulance service.
- This table does not identify whether subsequent ED attendances were planned or unplanned or whether patients were following the advice given by the clinical advisor, e.g. to call back if the health problem worsened.
- The table also does not report information about the assessment of appropriateness of subsequent contacts. For example, of the 209 patients who attended ED within 3 days of the ambulance call some may not be appropriate (using an established method of identifying the appropriateness of ED attendances)

Table 27 Telephone advice – Pathway Analysis (recontacts/subsequent contacts on day 0-3)

Ambulance recontact	ED	Hospital Admission	Died	N
×	×	×	×	1,485
✓	×	×	×	346
✓	✓	×	×	261
✓	✓	✓	×	192
×	✓	×	×	137
×	✓	✓	×	72
×	×	✓	×	8
✓	×	✓	×	7
×	×	×	✓	*
×	×	✓	✓	*
✓	×	×	✓	*
✓	✓	×	✓	*
✓	✓	✓	✓	*

*Small number suppressed in line with NHS Digital Policy on reporting of data

5.4.1.5. Identifying the timing of recontacts and subsequent events

Table 28 on the following page reports the different time intervals at which subsequent events occurred after the original ambulance telephone advice call. Due to the potential for bias in the data,

the table reports this information using both the PhOEBE plus maximum event denominator and the all calls (linked plus non-linked) minimum event denominator. Because of the potential bias in the sample, the PhOEBE plus data column represents the event rate for a sicker, older population of telephone advice patients and the all calls denominator represents a more conservative estimate of the event rate in the general telephone advice population. This table shows that whilst most patients do not have future health events, when they do they occurred within a short time of the original ambulance call, with the majority of health events occurring within 3 days of the ambulance call.

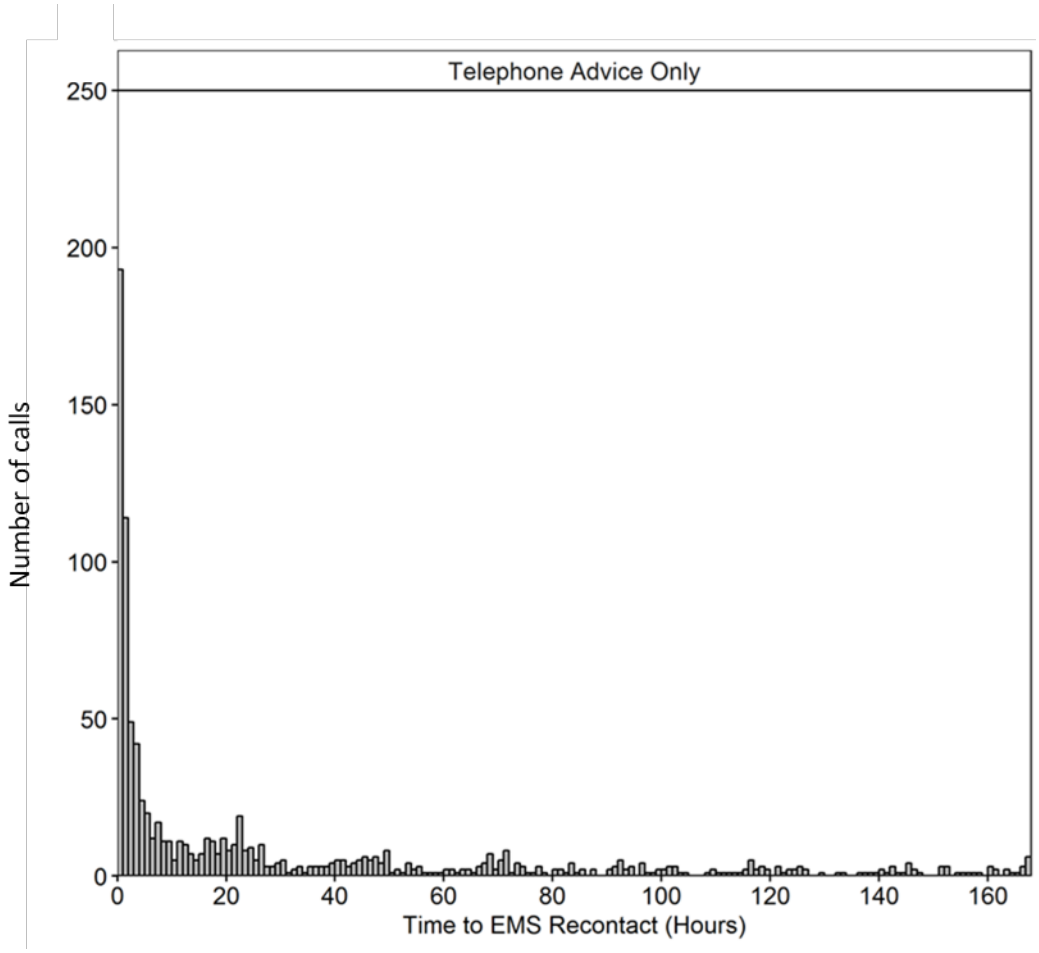
Table 28 Time to ambulance recontact, ED attendance, hospital admission and mortality rates

Time to first EMS recontact	PhOEBE plus linked telephone advice calls denominator n	PhOEBE plus linked telephone advice calls denominator %	All calls (PhOEBE plus linked and non-linked) denominator %
0 Days	468	18.6	4.4
1 Day	202	8.0	1.9
2 Days	88	3.5	0.8
3 Days	51	2.0	0.5
4-7 Days	129	5.1	1.2
No Recontact	1,576	62.7	-
Time to first ED contact			
0 Days	357	14.2	3.4
1 Day	173	6.9	1.6
2 Days	85	3.4	0.8
3 Days	49	1.9	0.5
4-7 Days	127	5.1	1.2
No Recontact	1,723	68.5	-
Time to first hospital admission			
0 Days	112	4.5	1.0
1 Day	109	4.3	1.0
2 Days	32	1.3	0.3
3 Days	28	1.1	0.3
4-7 Days	73	2.9	0.7
No Recontact	2,160	85.9	-
Time to death			
0 Days	1	0.04	0.01
1 Day	3	0.12	0.03
2 Days	1	0.04	0.01
3 Days	1	0.04	0.01
4-7 Days	4	0.16	0.04
Did not die	2,504	99.60	
Total	2,514	100.0	10627

5.4.1.6. Ambulance recontacts

Table 28 above shows that most recontacts with the ambulance service happen within 24 hours of the original ambulance call. Using the PhOEBE plus data it was possible to report the exact timing of recontacts with the ambulance service. The distribution of ambulance recontacts in relation the timepoint of the original calls is displayed in the graph below and is reported in hours. Figure 24 shows that most recontacts occur within the first few hours after the original call.

Figure 24 Ambulance recontacts after receiving telephone advice (hours)



5.4.2. Compliance with advice to attend ED

Using the PhOEBE plus data, which contained information about the advice given from telephone consultation (CAD-TAS data) linked to future health event data, it was possible to explore compliance with advice to attend. As no data was available for GP or other OOH settings at the time of the study, compliance with other types of advice could not be assessed. In the previous chapter, I identified that 9.3% (n=235) of the PhOEBE plus dataset received telephone advice to go to ED. However, an assessment of compliance with ambulance telephone advice to attend ED could not be undertaken on all patients as clinical advice data was missing for ¼ of patients and these patients have been excluded from this exploratory analysis.

Table 29 on the following page reports that of those who received telephone advice to attend ED, 44% attended within 3 days, a further 1% attended between 4 and 7 days and 55% did not attend. Table 29 also reports that where patients did not receive telephone advice to attend ED, 25% attended within 3 days, a further 4.2% attended within 4 – 7 days, and 71% did not attend.

Table 29 Compliance with advice to attend ED

Advice given	Total number attended ED within 3 days N (%)	Attended ED between 4 and 7 days N (%)	Did not attend ED N (%)	Total N (%)
Advised to attend ED	103 (43.8)	3 (1.3)	129 (54.9)	235 (100)
Not advised to attend ED	419 (25.3)	70 (4.2)	1168 (70.5)	1657 (100)
Total	522	73	1297	1892

Further exploration of cases where the patient was not advised to attend ED but did attend identified that most had received advice to contact their own GP (43%), nearly a third were advised to seek OOH care (30.8) and 27.2% were advised to self-care.

Caution should be taken when interpreting these results for several reasons. Firstly, all the ED attendances may be appropriate and secondly, it was possible that these patients complied with the ambulance telephone advice, sought other care and the other care advised them to attend ED. Whilst it was not possible to identify subsequent GP or OOH attendances or dispositions in this dataset, it was possible to assess the appropriateness of the ED attendances and this will be considered in the following section.

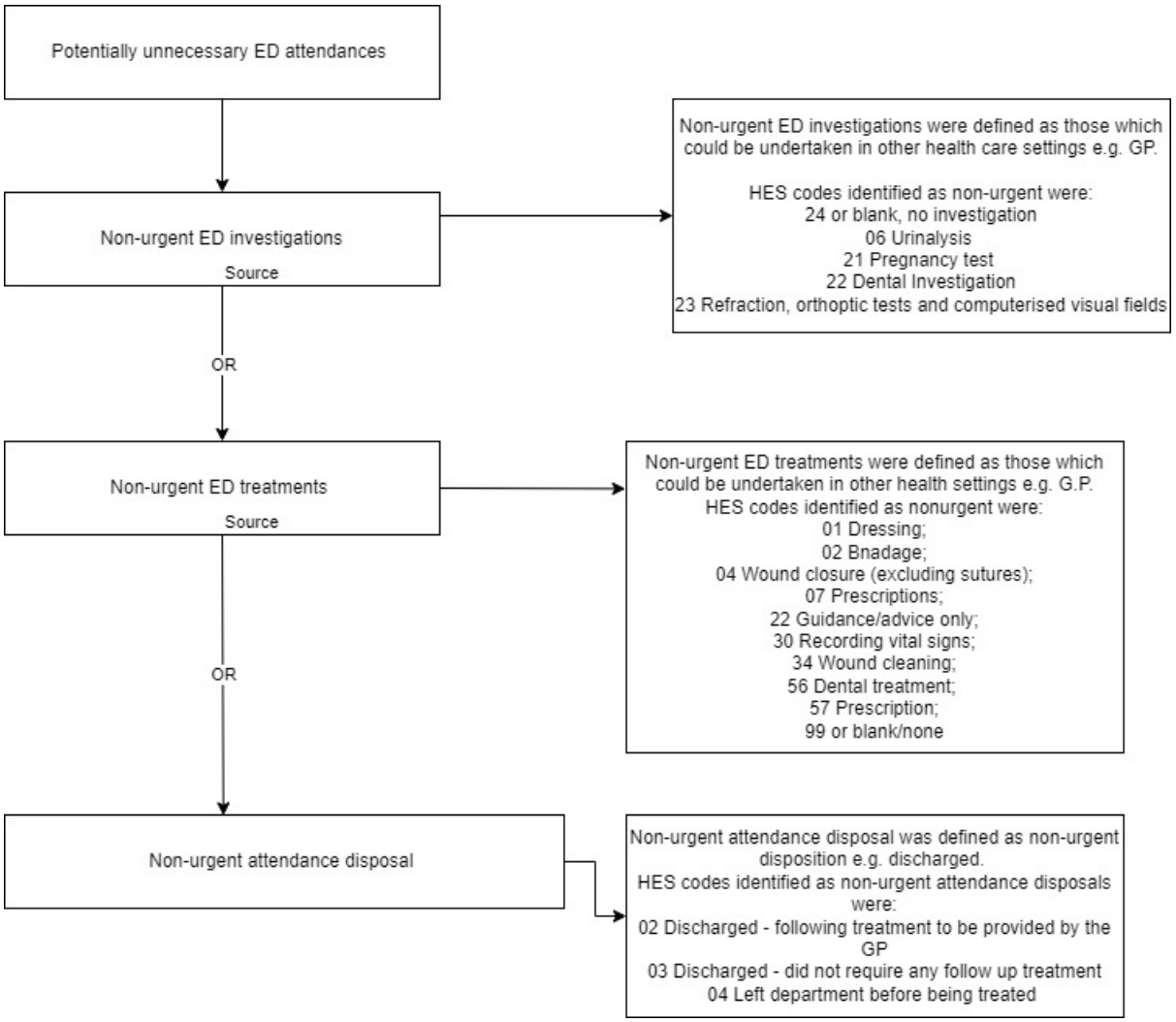
5.4.2.1. Appropriateness of ED attendance

The total number of patients in the PhOEBE plus data that attended ED within 3 days of the call was 664. The appropriateness of these calls was assessed through identifying whether the patient had any necessary urgent treatments or investigations whilst in the ED or whether they were admitted to hospital following the ED attendance. Appropriateness was defined in this study as care which is proportional to the health problem and that is both necessary and sufficient. Some ED attendances can be identified as potentially unnecessary using this approach.

> *Potentially unnecessary ED attendances = no urgent treatments or no urgent investigations or no hospital admission*

Potentially unnecessary ED attendances were identified using the definitions set out by Nicholl and colleagues (Nicholl et al. 2011) in their development of emergency and urgent system indicators and is described in Figure 25 Identifying potentially unnecessary ED attendances.

Figure 25 Identifying potentially unnecessary ED attendances (Nicholl et al. 2011)



The above definition was applied to ED attendances that occurred within 3 days and the findings of this are shown in Table 30, Assessment of ED attendances.

Table 30 Assessment of ED attendance (at 3 days)

	Necessary		Unnecessary or none		Total	
	N	(%)	N	(%)	N	(%)
ED treatments	398	(58.0)	288	(42.0)	686	(100)
ED investigations	471	(68.7)	215	(31.3)	686	(100)
ED disposal	343	(50.0)	343	(50.0)	686	(100)
Total urgent attendance or non-urgent attendance	560	(81.6)	126	(18.4)	686	(100)
Received clinical advice to attend ED	87	(84.5)	16	(15.5)	103	(100)
Not advised to attend ED	347	(82.8)	72	(17.2)	419	(100)

Using the definition of appropriate ED attendances, over 80% of ED attendances were identified as necessary and therefore appropriate. There was little difference in appropriateness of ED attendance in those who received advice to attend ED and those who were advised other care (84.5% and 82.8). As with the analysis of compliance, this data should be interpreted with the caveat that the patient may have sought additional GP or OOH care and received other advice to attend ED, or their condition may have worsened from the point at which they receive ambulance telephone advice.

5.4.2.2. Hospital admissions

Using the PhOEBE plus data it is possible to explore the reasons why patients were admitted to hospital shortly after their ambulance call was closed with telephone advice. In the PhOEBE plus data sample, 11.2% (n=283) patients received telephone advice and were admitted to hospital within 3 days of the ambulance call. Of these, 279 were admitted via the ED. Table 31 on page 150 reports the ICD 10 codes of patients who were admitted to hospital. The most common ICD 10 code for patients admitted to hospital was related to abnormal clinical and laboratory findings, followed by diseases of the digestive system.

Table 31 ICD 10 coding

ICD10 Chapter	N (%)
Systems, signs and abnormal clinical and laboratory findings, not elsewhere classified	62 (22.1)
Diseases of the digestive system	52 (18.5)
Injury, poisoning and certain other consequences of external causes	37 (13.2)
Diseases of the respiratory system	28 (10.0)
Diseases of the genitourinary system	21 (7.5)
Mental and behavioural disorders	16 (5.7)
Diseases of the circulatory system	14 (5.0)
Diseases of the musculoskeletal system and connective tissue	14 (5.0)
Certain infectious and parasitic diseases	12 (4.3)
Endocrine, nutritional and metabolic diseases	7 (2.5)
Diseases of the skin and subcutaneous tissue	6 (2.1)
Diseases of the nervous system	5 (1.8)
Neoplasms	4 (1.4)
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	2 (0.7)
Pregnancy, childbirth and the puerperium	1 (0.4)
Diseases of the ear and mastoid process	0 (0.0)
Factors influencing health status and contact with health services	0 (0.0)
Congenital malformations, deformations and chromosomal abnormalities	0 (0.0)
Diseases of the eye and adnexa	0 (0.0)
Total	281 (100)
Missing	3

5.4.2.3. Deaths

A small number of people died within 3 days of receiving ambulance telephone advice. Deaths from expected causes were identified by a medical practitioner and removed from this analysis. Deaths that were removed relate to the following:

- Cancer
- Old age/senility
- Dementia/Alzheimer's
- Motor neurone disease
- Idiopathic pulmonary fibrosis
- End-stage renal failure

Due to small numbers, the individual numbers in each underlying cause of death category are suppressed and it was not possible to undertake or report a detailed analysis. The call and caller characteristics of people who died are reported in Table 25 Subsequent event rates within 3 days, by patient and call characteristics. People who died were in older age categories and all contacted the ambulance service OOH. The underlying cause of death descriptions are reported below.

5.3.20.3.1 Underlying Cause of Death Description

- Abdominal aortic aneurysm, ruptured
- Acute vascular disorders of intestine
- Agranulocytosis
- Chronic obstructive pulmonary disease with acute lower respiratory infection
- Chronic obstructive pulmonary disease, unspecified
- Megacolon, not elsewhere classified

5.5. Discussion

5.5.1. *Main findings*

Poor quality information about patients who received telephone advice from the ambulance service meant that linkage was only possible for a sample of patients who have other experiences of using the ambulance service (24% 2,514/10,634). To account for the bias within the sample, results relating to subsequent event rates are reported as a sensitivity analysis. Subsequent events were reported at 3 days as the primary outcome as there was little difference in events that occurred after 3 days and up to 7 days. Four types of event rate were reported (ambulance recontact, ED attendance, hospital admission and death). Most patients did not have subsequent health care contacts after their call was closed with telephone advice, suggesting that calls can be safely and appropriately dealt with by telephone. Between 7.6% - 32.2% of patients recontacted the ambulance service, the ED attendance rate was between 6.2% - 26.4%, 2.5% - 10.5% of patients were admitted to hospital, and deaths were identified in 0.06% - 0.24% of patients. An assessment of compliance with ambulance telephone advice to attend ED could not be undertake on all patients as clinical advice data was missing for ¼ of patients. Exploratory analysis identified that where patients were advised to attend ED, 43.6% attended but that a quarter of the patients who did not receive advice to attend ED attended an ED. Most ED attendances (>80%) were assessed as appropriate and there was little difference in the appropriateness of attendances that were advised to seek ED care and those that were not.

5.5.2. *Findings in relation to definitions of safety, appropriateness and acceptability*

Safety was defined in this thesis as timely and effective care that delivers more benefit than harm. Most patients did not have a subsequent health event within 3 days of receiving telephone advice and very few patients died. Between 2.5 – 10.5% of patients were admitted to hospital within 3 days of receiving ambulance telephone advice and it was possible that some of these cases were under triaged. Discussion with PPI colleagues from SECF identified methods of expressing the results about mortality that were more meaningful to the general public and service users. This was that for every 1000 people who are given telephone advice only from the ambulance service, around one person will die within 3 days of the telephone advice call. This is encouraging given that the population of patients included in the PhOEBE plus linked dataset represent the oldest and sickest patients to receive telephone advice. Therefore, based on the definition of safety used in this thesis, ambulance telephone advice is mostly safe and deaths following telephone advice are rare.

Appropriateness was defined in this thesis as care that is proportional to the health problem (i.e. necessary and sufficient). Most patients did not have subsequent health care contacts after their call was closed with telephone advice, suggesting telephone advice for low acuity ambulance calls is appropriate. Moderate rates of ambulance recontacts (7.6% - 32.2%) and ED attendances (6.2% -

26.4%) were identified from the PhOEBE plus data, and this suggests that telephone advice may not always resolve the patient's health problem. Analysis around compliance with telephone advice was limited due to availability of data. Most ED attendances were classified as appropriate. There are multiple reasons why future health care events occur and these could be related to the patient's health condition worsening, patient views about the acceptability of telephone advice, the appropriateness of the telephone advice decision or receiving other health advice from health providers not included in the PhOEBE plus dataset. Therefore, it was not possible to fully know from this data whether future health events were related the appropriateness of the telephone advice the patient received. Based on the definition of appropriateness used in this thesis, ambulance telephone advice was mostly appropriate, but further investigation of the reasons why people recontact the ambulance service or attend the ED after receiving telephone advice may help to understand the reasons for this.

Acceptability was defined in this thesis as the patient's views on the safety and appropriateness of care and their care experience. The PhOEBE plus dataset did not contain this information, therefore it was not possible to assess acceptability as part of this analysis. However, ambulance recontacts accounted for the highest proportion of future health events, and this may be indicative of telephone advice being unacceptable for some callers.

5.5.3. *Comparison of findings with the literature*

The systematic review reported in chapter 2 of this thesis identified that it is difficult to compare the findings of different studies in this subject area because of the different focus and approaches used by different studies. For example, the vast array of different time measures used to report subsequent events and even very similar outcomes can be reported in ways which makes direct comparison complex and challenging (Jensen et al. 2015; Blank et al. 2012).

In terms of safety, very few other ambulance studies reported outcomes where harm was identified and where they did they reported low rates of events. The small sample sizes of these studies and the age of these studies (Dale et al. 2004; Smith et al. 2001; Turner et al. 2006) means that larger and more recent evidence is needed of the safety of ambulance telephone advice. The findings from this study support the finding that there are low rates of harm after telephone advice. Previous studies identified subsequent hospital admission rates of between <0.3% – 25.3%. This study identified that between 2.5% – 10.5% of patients are admitted to hospital shortly after their call is closed with telephone advice, which falls within the range identified by previous studies.

Comparison of outcomes relating to appropriateness was most problematic across other research studies as appropriateness was reported with the most variation. Timeframes for reporting subsequent ED attendances were different in different studies meaning that direct comparison of subsequent health events cannot be conclusive. Other studies of ambulance telephone advice have reported subsequent ED attendance rates of between 20% - 63% (Eastwood et al 2016; Spangler et al 2018; Turner et al. 2006; Dale et al. 2003; Vincent et al. 2019) and where appropriateness of ED attendances was assessed this identified little difference with those advised to attend or who were advised alternative care pathways. This study identified that the subsequent ED attendance rate was between 6.2% - 26.4%, suggesting that the ED attendance rate was lower than that reported in the published literature, but with the caveat that some of the published literature reported ED attendances at 48 hours and this study reported ED attendances at 3 days, and also that some of the research is part of the early research undertaken to establish the feasibility of ambulance telephone advice or looks at very specific populations of patients.

5.5.4. *Strengths and limitations*

5.5.4.1. Strengths

This is one of the first studies of ambulance telephone advice that links ambulance telephone advice consultation information to subsequent health event data. This is a unique dataset and has been used to undertake the first large scale assessment of the outcomes of patients whose ambulance call was closed with telephone advice in England. This study was able to reuse data from the PhOEBE study and to build on this by including a unique linkage of telephone advice information. Whilst there are benefits of reusing linked datasets, this can result in limitations, as any limitations and challenges experienced by the PhOEBE study would have a knock-on effect for this PhD thesis and the analysis.

5.5.4.2. Limitations

The mains limitations related to the timescales, generalisability and the data linkage match rate.

The issues experienced by the PhOEBE study around the data linkage approvals process and with time taken to obtain the linked dataset impacted on the timescales for this PhD. The data for the PhOEBE study was obtained four years after the initial data application was submitted and following this, the dataset required a significant amount of data management, meaning that it was another year before the dataset containing telephone advice patients was available to this PhD. This caused a significant delay to this PhD and resulted in larger than anticipated time gap between the different study components.

The PhOEBE study initially intended to link data for two ambulance services, however within the PhOEBE study it was only possible for one site to be included, and this was due to the challenges experienced in linking the data through NHS Digital and problems obtaining the ambulance data from one ambulance service (Turner and Siriwardena et al. 2019). The impact of this on this PhD was that it was only possible to include one ambulance service in this analysis and this limits the generalisability of this analysis because it is based on data from one ambulance service and on one type of ambulance triage system (AMPDS).

A third limitation related to the specific challenge of linking data for telephone advice patients, and this was due to less information being routinely recorded in ambulance data systems about this patient group at the time of the study. As date of birth was not routinely recorded in the CAD system for telephone advice callers at the time of the study and it was a key linking variable for NHS Digital, this meant that data linkage was only successful for a specific population of ambulance service users; those that had other experiences of contacting the ambulance service and receiving a face-to-face response. Through comparing the characteristics of patients with and without linked data, those with linked data were identified as more likely to be older, and sicker. This was most likely because older people were more likely to have had other contacts with the ambulance service and that they were more likely to be ill. This means that the population of patients in this analysis represent the most-sick patients group of patients who receive telephone advice from the ambulance service, and this potentially means that if data could be linked for all ambulance telephone advice patients that subsequent event rates would be lower than are identified by using the linked data alone. To account for this in the analysis and reporting of data, event rates were therefore reported as a range using a sensitivity analysis, by calculating the minimum and maximum subsequent event rates for the four different types of events. It is likely that the true event rate lies between the minimum and maximum rates and this is reassuring in terms of safety and appropriateness as the event rates are generally low, especially for more serious event rates such as hospital admissions and death.

5.5.5. *Conclusion*

Most patients whose call was closed with telephone advice did not have subsequent health events and deaths were rare. Based on the definitions developed for this thesis, ambulance telephone advice is mostly safe and appropriate.

6 Interviews with ambulance service staff to explore safety, appropriateness and their perceptions of service user acceptability

6.1. Summary

Chapter 6 reports the findings from interviews with ambulance service staff involved in the telephone advice process and pathway. Semi-structured interviews were carried out to explore service provider views and experiences of the safety and appropriateness of telephone advice and to explore provider perceptions of service user acceptability. For example, exploring provider perceptions of service user reactions to telephone advice. This chapter also explores the telephone advice process, and how potentially challenging calls are handled safely and appropriately, such as calls from people who call frequently or calls about mental health. Because the research was undertaken during the Covid-19 pandemic, the opportunity was taken to explore the impact of this on the telephone advice service.

6.2. Introduction

6.2.1. *What is known about safety, appropriateness and acceptability of ambulance telephone advice?*

Findings from the systematic review of the UEC evidence base, reported in Chapter 2, are relevant to the interviews with ambulance staff and were explored within the interviews. The review identified that telephone advice was generally reported as safe, but there were concerns about the safety of higher urgency or more complex calls. There was little information about the appropriateness of telephone advice in the ambulance service from the perspective of service users or service providers, with most studies of appropriateness using routine data to assess appropriateness in light of the subsequent health contacts made or not made. The review identified a lack of studies that consider the acceptability of telephone advice in an ambulance setting. Most studies included in the review involved wider UEC health services and service users and these reported high rates of satisfaction overall but did not always take into account service user views and experiences at the different stages in the telephone advice process. Patient satisfaction was commonly reported in lieu of acceptability and despite being a commonly used outcome measure, satisfaction was often poorly defined and inconsistently measured. Overall, there were few qualitative studies identified or included in the systematic review and very few studies involving the experiences of service providers.

6.2.2. *Methods for exploring safety, appropriateness and acceptability*

Safety and appropriateness of ambulance telephone advice tends to be explored or assessed using quantitative methods. For example, using routine data or RCTs (Eastwood et al 2015 and 2016; Spangler et al. 2018).

Qualitative research can be used to explore the perspectives and attitudes of service providers and service users, and to obtain richer, more detailed information about experiences and understanding of safety, appropriateness and acceptability (Al-Busaidi 2008). For example, qualitative interviews can be used to identify what is important to service users or to understand how services can improve (Pope et al. 2000).

A qualitative approach can give further insight and understanding of the clinical telephone advice process and this in turn can be used to inform understanding of how clinical telephone advice is made

safe, appropriate and acceptable. Understanding how calls that are higher urgency or more complex to handle over the telephone are dealt with is beneficial to the overall understanding of safety, appropriateness and acceptability of clinical advice. For example, mental health calls are thought to be more challenging for staff to handle over the phone (O'Hara et al. 2019) and may negatively impact on staff well-being (Blue Light Programme 2018. Understanding how staff deal with these challenges and move on to the next call is important for the safety and appropriateness of these calls and also for staff psychological well-being and staff training.

Ambulance service staff involved in the telephone advice process have often handled thousands of calls of all urgency and outcome and therefore have an excellent overview of the safety and appropriateness of ambulance telephone advice and also the overall pathway and processes that are in place to support its safety. Telephone advice service providers may be able to identify insights into the perceived acceptability of ambulance telephone advice for service users. For example, service provider perceptions of service user reactions to telephone advice at the call handler and clinical advisor stages.

6.2.3. *Aim*

The aim of this research is to explore service provider views of the safety and appropriateness of telephone advice for calls triaged by a Call Taker to receive advice from a Clinical Advisor, and to explore their views of the acceptability of that advice to service users (called 'perceived acceptability' from now on).

6.2.4. *Objectives*

- To explore ambulance service staff views on the safety, appropriateness and perceived acceptability of clinical telephone advice to callers, through undertaking qualitative interviews with staff who are involved in the telephone advice process.
- To identify through qualitative interviews with ambulance staff, how potentially complex calls are handled safely and appropriately (complex calls are identified in a previous component of this research and include calls relating to mental health, recontacts, callers that call frequently and callers with multiple health conditions).
- To obtain staff views about how clinical telephone advice is made safe and appropriate or could be made more safe and more appropriate.
- To explore the impact of the Covid-19 pandemic on ambulance telephone advice and whether this has impacted on the safety, appropriateness and perceived acceptability of telephone advice.

6.3. Methods

The methods are reported using the consolidated criteria for reporting qualitative research (COREQ) as a guide, which is a 32-item checklist used to ensure that the methodology of qualitative studies (interviews and focus groups) is reported explicitly and comprehensively (Tong et al. 2007). The COREQ checklist is included in the Appendix as Appendix 12. Therefore, the reporting includes the following three domains:

- Study design
- Research team and reflexivity
- Analysis and findings

6.3.1. *Study design*

This is a qualitative interview study with people who have experience of delivering telephone advice in the ambulance service in England (Patton 2015). This is a phenomenological study due its emphasis

on lived experience and the intention to collect data relating to the perspectives of interviewees about the phenomena of safety, appropriateness and service provider perceptions of service user acceptability (Kvale 1996). It is part of a sequential study, as the interviews draw on the findings from the previous systematic review and linked routine data analysis to inform the interviews.

Qualitative research is best suited to address the aims of this component of the study as it generates richer information than that obtained by quantitative methodologies, due to the emphasis on understanding and experiences (Pope et al. 2002). Pope and colleagues report that qualitative research is particularly suited to investigating health service quality by identifying salient features of care to inform the delivery of care services and exploring organisation factors and organisation change (Pope et al. 2002).

Semi-structured interviews are one of the most commonly used methods in qualitative research and are semi-structured because they use a topic guide to facilitate the interview. The topic guide aims to ensure that the interviews are focussed around the research topic and that the same or similar key questions are asked to all participants, whilst still allowing for the opportunity for probing or exploring new or relevant information that may come up during the interview (Creswell et al. 2007).

6.3.2. *Telephone interviews*

Telephone interviews are a commonly used method for undertaking semi-structured interviews and have several benefits, including allowing easier access to geographically disparate and busy research participants, and greater flexibility for interview participants than the more traditional face-to-face interview method (Block et al. 2012). Telephone interviews are perceived as a cost and time efficient research method and these factors are important considerations within a PhD research study. Possible disadvantages of telephone interviews are reported as not being able to observe the body language and reactions of the interviewee, that the absence of visual cues can impact on the level of depth reached in the interview and lack of face-to-face contact may affect the rapport between the interviewer and the interviewee (Novick 2008; Smith 2005)). However, there is little evidence supporting whether these factors actually have a disadvantageous effect on the interview. The pragmatic benefits and concerns over safety of the research environment and minimising Covid-19 risk for the interviewer and the interviewee meant that telephone interviews were the most appropriate interview method.

6.3.3. *Ethics and research permissions*

Ethics permission was obtained for this component of the study from ScHARR University of Sheffield Ethics Committee and additional research permissions were obtained from EMAS. Research approvals were sought in October 2020 and granted in November 2020, resulting in a recruitment start date of the 8th November and interviews commencing on the 24th November. Discussion at the ScHARR ethics committee meeting was held about what would happen if participants became distressed during the interview. Committee members thought this was a possibility if, during the course of the interview, the participant talked about an experience about which they had concerns or found upsetting. Information was added to the participant information form to clarify the process if this occurred, and the approach agreed within the ethics committee discussions was that the interviewee could choose not to answer certain questions if they were upset by anything. In addition, the interview could be stopped at any time and resumed at a time of the interviewee's choosing. It was also discussed that information that was disclosed as part of the interview relating to unsafe delivery of ambulance telephone advice would be fed back to the study ambulance service.

6.3.4. *Obtaining informed consent*

Informed consent is a key process within health research, and it is important that consent is well considered and that participants have been given the appropriate information and time to give informed consent. In order for consent to be considered as well informed and valid, and therefore legal and ethical, it must be

- "Given by a person with capacity
- Voluntarily given, with no undue influence
- Given by someone who has been adequately informed
- A fair choice" (http://www.hra-decisiontools.org.uk/consent/principles-general.html)

Given that the interviews were to be undertaken by telephone, it was particularly important that a clear process for obtaining informed consent was developed as part of the ethics application to ensure that informed consent could be achieved and the process for this is detailed in section 6.4.3 Recruitment procedure.

6.3.5. *Sampling framework and sample size*

To generate results which could be integrated and compared with the findings from the other components of this PhD, interview participants were recruited from the same ambulance service as the routine data study (EMAS). As described in Chapter 3, EMAS is a large ambulance service which covers 5 English counties and serves approximately 5 million people. There are two control rooms which are based at Nottingham and Lincoln and staff were recruited from both control rooms in case control rooms had different cultures around clinical advice provision. The objective was to recruit between 12 and 18 staff who were currently involved with or had recently been involved with (during the previous two years) the ambulance telephone advice process.

6.3.5.1. Purposive sampling

A purposive sampling approach was used with the purpose of including different staff groups involved in the telephone advice process (Palinkas et al. 2015). Participants were selected based on their job role and knowledge of the telephone advice process (Creswell et al. 2007). The sample was drawn from a range of staff involved in clinical advice: clinical staff who provide clinical advice (Clinical Advisors), ambulance call takers who take the 999 call and who triage the call to receive clinical advice (Call Takers), and managerial staff overseeing clinical advice staff and processes. Recruiting from both non-clinical and clinical groups, the sample aimed to include representation of different characteristics of staff involved in the telephone advice process. Views on the safety, appropriateness and service provider perceptions of service user acceptability of ambulance telephone advice may be understood or experienced differently by different staff at different stages of the ambulance telephone advice process. On that basis, interviewing a range of different staff types can help to understand how and why the same process or views of the same process are understood or perceived in different ways (Sofaer 1999). Potential participants were categorised as clinical (Clinical Advisors) or non-clinical (Call Takers or managerial) in a first stage of sampling.

One of the main staff types involved in the clinical advice process are the Clinical Advisors. These are clinical staff that have previously worked as autonomous practitioners, usually as nurses in community or ED settings or as paramedics in the field. More recently, mental health nurses and GPs have become part of the Clinical Advice Team (CAT). For example, in the clinical group a number of different disciplines of clinical staff provide telephone advice and the interviews sought to include as many of these clinical disciplines as possible.

Call takers were included because they are the first point of contact for the caller and it is call takers who inform the patient that they will receive a call back from a clinician and that they will not be receiving an ambulance. Therefore, it is relevant to include non-clinical call takers in the interviews explore staff perceptions of service user acceptability at this first stage in the telephone advice process. The rationale for involving clinical staff who were previously involved in providing ambulance telephone advice is that they may have concerns about telephone advice which has led them to step away from the role.

Call Takers also have valuable insight into the telephone advice process, as Call Takers have often taken many thousands of calls, therefore their views on the safety and appropriateness of this process are relevant and important to this research. This view is encapsulated by Sofaer who states that

> *'Qualitative interviews give voice to those who are often unheard, such as health care providers who are far down the hierarchical chain of command' (Sofaer 1999)*

The interviews also sought to include team leader roles in the Emergency Operation Centre (EOC) and staff in managerial positions to obtain managerial and service oversight viewpoints of the clinical telephone advice process and organisational views of safety, appropriateness and perceptions of service user acceptability.

The eligibility criteria for the sample was as follows: employed by EMAS; Involved in the clinical telephone advice process at EMAS (within the previous 2 years); Clinical Advisor, Call taker or has team/managerial/oversight role within the EOC.

Sampling also had a pragmatic element due to the Covid-19 pandemic, as it was unknown whether attempts to recruit staff from a frontline health service during a national lockdown would be successful. Therefore, using the above eligibility criteria and understanding the pragmatic nature of recruitment in a pandemic, this study used a purposive sample, which was based on including staff meeting the eligibility criteria who were willing to take part.

6.3.6. *Recruitment procedure*

To ensure that recruitment met information governance and ethical approvals, recruitment was initiated by EMAS research and development (R&D) department who sent out an email to relevant staff groups that contained information about the study. Study information was also included in a staff newsletter. This recruitment process ensured that the PhD researcher did not receive access to personal information for potential participants, such as email addresses. Therefore, recruitment was a passive process which required potential participants to first contact the researcher to express interest in taking part in the study. To aid recruitment and in recognition that the interviews were to be undertaken in ambulance staff person's own time, participants were offered a £15 voucher for taking part. Using a voucher as a recruitment aid is a well- established recruitment tool and has been successfully used in many previous research studies (O'Cathain et al. 2018). The recruitment process is outlined in the flow chart below (Figure 26 flow chart of recruitment process).

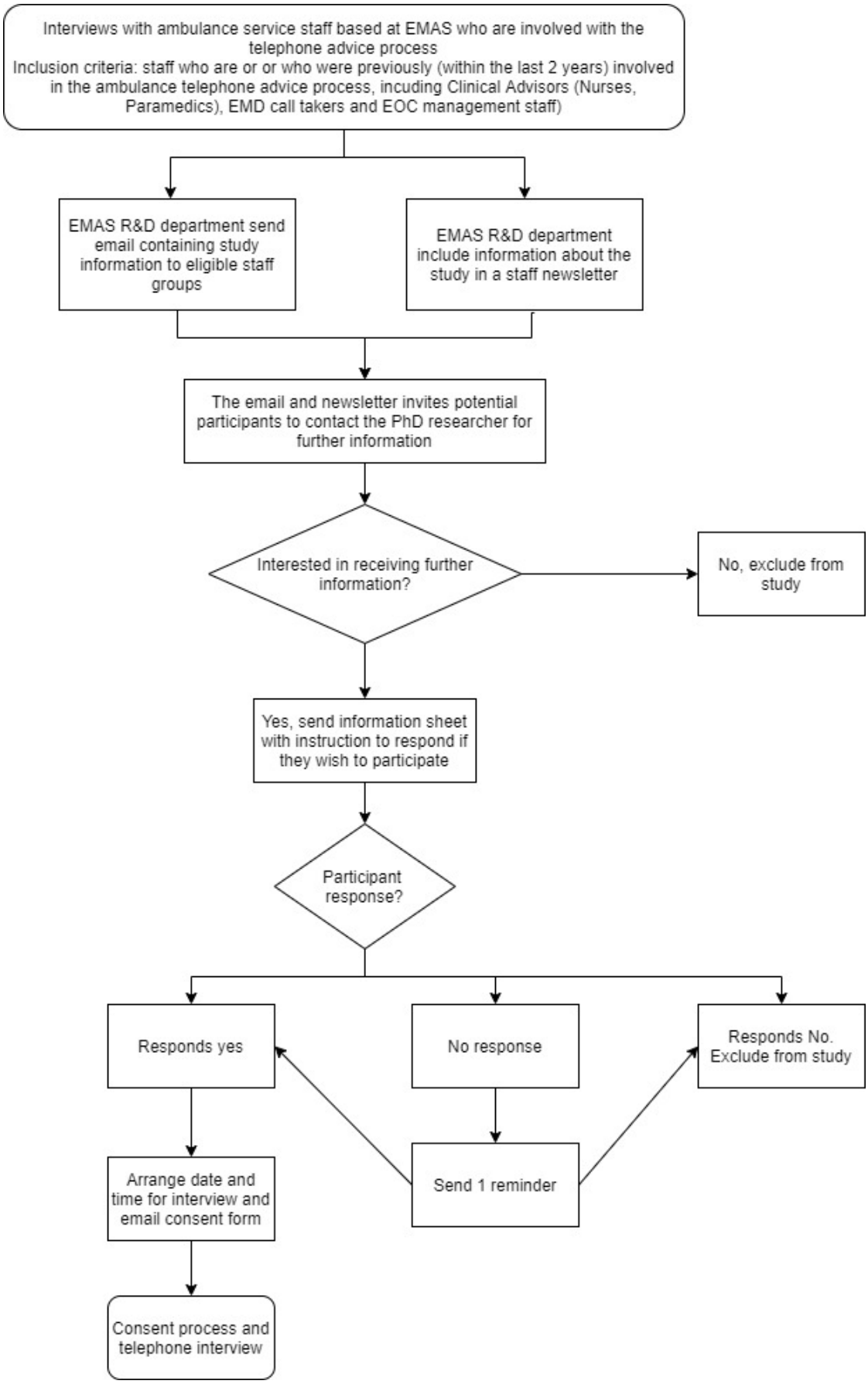
Following the first email to potential interview participants, a more targeted recruitment strategy was used at the two-week reminder email stage. No further emails were sent to non-clinical staff groups as sufficient numbers had responded to the first request. Therefore, only clinical staff were targeted with a reminder email. With the clinical staff group, a snowballing approach was also used to aid the recruitment process (Parker et al 2019). This was helpful because the pool of Clinical Advisors in EMAS

was much smaller than that of Call Takers, meaning there were less staff available for interview. This approach involved interview participants forwarding on the study information to their clinical colleagues. All interviewees were recruited and interviews completed within six weeks of receiving research permissions. The speed and success of the recruitment process was in part related to the R&D department staff, with whom the PhD researcher had worked with on previous occasions for other research projects. This prior relationship was invaluable in obtaining timely local permissions to undertake the research during the Covid-19 pandemic and in a period of winter pressures.

6.3.7. *Consent process*

Obtaining informed consent was a multi-stage process of providing information, with multiple opportunities for the potential participant to withdraw. The first of these was by providing potential participants with a participant information sheet (PIS). A PIS was emailed to potential participants during the ongoing conversation about taking part in the interview. The PIS contained more detailed information about the study and what was involved in taking part. The PIS made clear that participation in the study was voluntary and that participants were free to withdraw from the study at any time, up until the point at which the data had been transcribed, anonymised and exported into NVIVO for analysis (NVivo 2018). At that point it would not be possible to identify individual participants as no names or identifiable information would be attached to the NVIVO transcripts. The PIS also provided information required for General Data Protection Regulation (GDPR) purposes, such as how research data would be stored and other GDPR concerns. If, having received further information about the study, the potential participant wished to take part, I sent them a consent form by email and arranged the date and time of the interview. At the start of the interview, I briefly described the study and gave the participant an opportunity to ask questions. Following this, I read out each item on the consent sheet and the participant gave their consent to each item. Consent was transcribed separately to the rest of the interview, to maintain confidentiality during data analysis and to ensure a record of the consent process was captured. Obtaining consent through virtual means and using electronic methods is becoming more common place during Covid-19, where the consent process occurs without any face-to-face contact (https://www.hra.nhs.uk/covid-19-research/seeking-consent-covid-19-research/).

Figure 26 Flow chart of recruitment and consent process



6.3.8. *Interview process*

All interviews were undertaken remotely due to Covid-19 restrictions. Interviews were intended to be undertaken using a choice of virtual meeting technology (Google meet) or by telephone, depending on what was most convenient and suitable for the interview participant. In practical terms, whilst Google meet was attempted for the first five interviews it was only successfully used on one occasion, due to internet browser and compatibility issues. After the first five interviews I made the decision to undertake only telephone interviews, due to the problematic use of Google meet taking up valuable interview time. Whilst the use of the telephone was less problematic, it was not incident free as sometimes the connection was poor or cut out and this could cause a break in the flow of the interview and was frustrating if this occurred at a point where the discussion was covering key information. Interruptions to the interviews could occur if the interviewee had to answer the door or had family present.

Throughout the interviews I recorded brief notes to document my thoughts at the time of the interview, to make a record of things of note that I might wish to explore further in future interviews, and to note any practical, contextual or technical factors that impacted on the interview process or my mindset during the interview. For example, poor telephone line, presence of a young child during the interview, and these formed the basis of a reflexive process about the interviews. Consideration of my own personal and professional biases and the beliefs and understanding that I brought to the interviews, some of which were held from analysis of previous chapters in this thesis, and some of which were based on my own personal views and experiences as a health service researcher and as a service user, was a useful reflective exercise and this process was enhanced through undertaking the transcription of the interviews myself.

During the interviews I was mindful of following best practice criteria for interview quality (Kvale 1996) and tried to ensure that within the interviews I spoke as little as necessary, that I clarified meaning where it was ambiguous and that I rephrased the interviewees' answers to a form of my own wording to check agreement. Where it became clear that interviewees were using specific organisational terminology or language, I started to use this both to aid the relationship and rapport between myself and the interviewee, so that I was not considered an outsider to their setting, and also to aid the flow of the interview. I also assessed whether the interview questions were resulting in answers that were relevant to the research.

Criteria for judging the best practice of qualitative interviews (Kvale 1996 p.145)

- The extent of spontaneous, rich, specific, and relevant answers from the interviewee.
- The shorter the interviewer's questions and the longer the subjects' answers, the better.
- The degree to which the interviewer follows up and clarifies the meanings of the relevant aspects of the answers.
- The ideal interview is to a large extent interpreted throughout the interview.
- The interviewer attempts to verify his or her interpretations of the subjects' answers in the course of the interview.
- The interview is 'self-communicating' – it is a story contained in itself that hardly requires much extra descriptions and explanations.

6.3.9. *Developing the topic guide*

The PhD focus of safety, appropriateness and acceptability were the main driver in developing the topic guide, but there was also a focus on finding out more about the clinical advice process from a Call Taker, Clinical Advisor and managerial perspective. As this was a sequential study, I was able to

develop the topic guide by drawing on the research question, the findings from the systematic reviews and routine data analysis, the work undertaken to develop the user survey and previous experience of undertaking research with the ambulance service (see Appendix 13 for a copy of the topic guide). Current events were difficult to ignore within this research process and the impact of Covid-19 on the clinical advice process, types of calls and user responses were also explored. The topic guide started with easier to answer questions about the interviewee's role, experience and the clinical advice process and then proceeded to more complex questions relating to their perceptions of service user reactions to advice and the reasons for this, their views of the safety and appropriateness of the clinical advice process and also exploring difficult to handle calls, such as mental health or callers who contact the ambulance service frequently. Prompts were included to encourage in-depth and more detailed responses and exploration. The topic guide was adapted slightly for different types of staff (for example exploration of clinical advice was more limited for non-clinical staff) but the overall structure was the same.

6.3.10. *Data management and data security*

A data management plan was developed prior to the start of the research to ensure that data management met the University's governance standards for information governance and data security. The data management plan states that interviews would be recorded using an encrypted Dictaphone for telephone interviews, or for interviews done using Google meet, the meeting would be recorded using the Google meet record function. Recordings of the interviews were immediately transferred to the University of Sheffield networked storage drive and stored in a secure folder that is only accessible to me using a university username and password, followed by multiple factor authentication. No other university staff (including supervisors) had access to the raw data. Following transcription, the interview transcripts were stored using .doc and NVIVO files. These formats and software enable long-term access to the data.

Each interview was assigned a unique ID, which was also the file name of the audio file and the name of the transcribed word version of the interview. The names of the interviewee were not attached to the recording. To ensure the accuracy and quality of transcriptions, once I had transcribed the interviews I also verified the transcription against the original recording. As a PhD researcher, I was responsible for each data management activity, including data capture, data storage and data analysis.

6.3.11. *Analysis*

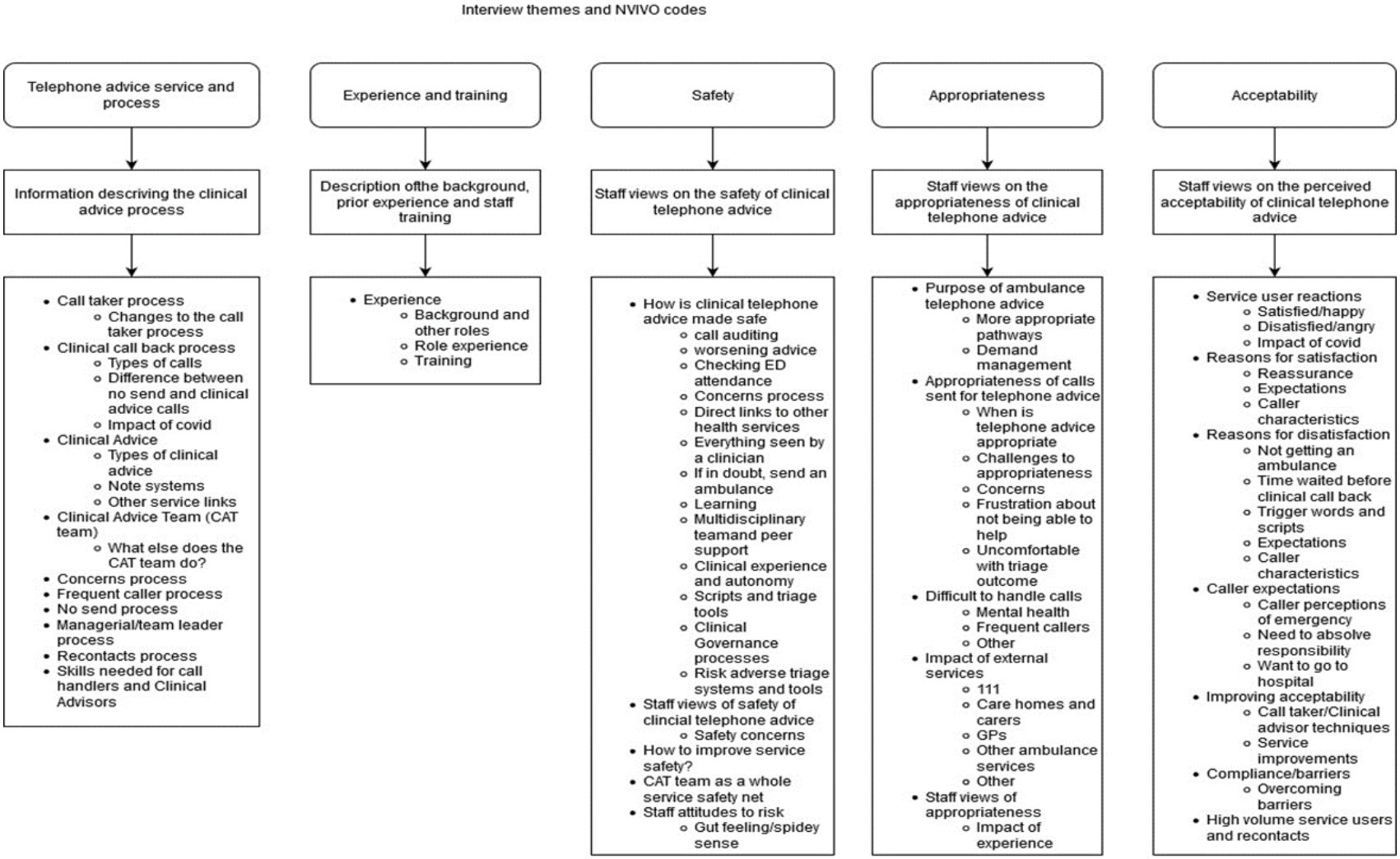
A framework approach was used for the analysis because it uses a thorough and clearly defined approach to qualitative analysis that is well suited to applied health research with specific research questions (Ritchie and Lewis 2003; Gale et al. 2013). The framework approach has five distinct stages to the analysis, which are familiarisation; identifying a thematic framework; indexing; charting; and mapping and interpretation (Ritchie and Lewis 2003). This process was assisted by using NVIVO qualitative data analysis software to organise, code and chart the data (NVivo 2018).

As part of the research process, I undertook all of the interview transcribing and whilst it was a time-consuming process, it served well as a process of familiarisation and reflection, both on interview findings and interview technique, with reflections noting where particular issues could be probed more or where the flow of the interview questions worked well or not. In addition, relistening to transcripts and transcribing them myself allowed an assessment of the quality of the interviews as an ongoing reflective process during the interview phase.

6.3.11.1. Framework analysis process

Due to the specific exploration of the PhD conceptual outcomes of safety, appropriateness and acceptability within the interviews, the analysis was firstly guided by these key interview themes. Following a process of familiarisation, where interviews were transcribed, verified against the original recording, read and re-read, I undertook an initial draft of coding of five transcripts that were reflective of the different staff groups included in the study (clinical and non-clinical, and different types of clinical staff). The results of this initial coding process were discussed through meetings with PhD supervisors and codes were developed and refined. In a parallel process, the same five transcripts were read by a researcher external to the study, using a practice sometimes referred to as peer debriefing (Lincoln and Guba 1985; Nowell et al. 2017). Peer debriefing can be used to increase the trustworthiness and credibility of the coding and the theme generation process and is of particular benefit when coding is undertaken by a single researcher (King 2004). Discussing the codes and the coding framework with an external researcher helped to ensure that the codes reflected the data and not my prior knowledge of the subject area and literature. In developing and refining the coding framework, several iterations of the coding framework were trialled on a few transcripts. Whilst refining the coding framework I re-started the coding process several times, each time being clearer and more consistent about the codes and the application of coding decisions. Once I felt that the codes were right, these were applied to all of the transcripts. See Figure 27: Final coding framework.

Figure 27 Final coding framework



Whilst the overarching themes were based on the study focus of safety, appropriateness and acceptability, the sub-themes of the thematic framework were developed inductively based on reading of the transcripts. An additional contextual theme relating to the clinical advice process was also developed because descriptions of how clinical advice works as a process is important for understanding and interpreting the findings in relation to safety, appropriateness and acceptability. Findings relating to the impact of Covid-19 on the telephone advice process were reported as a separate theme.

Following the coding, interview data was mapped and charted under each of the code headings and the relationship, similarity and interaction between the different codes was considered in order make sense of the data and to develop themes. In qualitative research it is easy to present a simplified analysis, with findings presented as themes when in fact they are descriptive coding categories. Descriptive analysis was undertaken to use the interview findings to map the telephone advice process. However, the main aim of the thematic analysis process was to elevate the data from the descriptive coding categories and into the development of meaningful themes that communicate the main findings of the research. Themes are often more implicit and abstract than a category or a code and thus infer more meaning (Sandelowski 2003). The final thematic framework is presented in the results section.

6.4. Results

6.4.1. *Interview recruitment*

Interviews took place between 24th November and 24th December 2020 and this was during a time of national lockdown in the Covid-19 pandemic. Twenty-four staff responded to the interview request (15 non-clinical staff and 9 clinical staff) and 16 were interviewed (Table 32 Interview participants page 166). Non-clinical staff who were interviewed had a range of roles within the Emergency Operations Centre (EOC), including Call Takers, Senior Call Takers, Team Leader and EOC manager. Many of the Call Takers were also mentors and assisted with the training and support of new Call Takers. Nine clinical staff responded to the interview request information and 8 were interviewed. Clinical staff had a range of backgrounds including nurse, paramedic and mental health nurse. Of the staff that initially responded but were not interviewed, they did not take part in the interviews either because it was not feasible for them to take part (for example, school age children required to home school due to covid-19) or after staff initially emailed to convey their interest they did not respond to follow up emails. Interviews lasted between 40 and 80 minutes, with most interviews lasting approximately an hour.

Table 32 Interview participants

Participant type (Clinical/Non-clinical	Job Role	Job role description	Number interviewed	Method interview (telephone or Google meet)
Non-clinical	Emergency Medical Dispatch Call Taker	Takes the 999 call and undertakes triage and referral. Informs the caller the call will be referred for a clinical call back	6	Telephone – 5 Google Meet – 1
Non-clinical	Senior EMD Call Taker/Team Leader	Acts as a liaison point between the call taker and the CAT team, where the call taker has concerns that they want the CAT team to be aware of. Takes 999 calls at busy times.	1	Telephone
Non-clinical	General Manager (Emergency Operations Centre)	Oversees the strategic direction of the EOC and overall service delivery	1	Telephone
Clinical	Clinical Assessment Team – Nurse	Gives clinical telephone advice to the caller/patient	4	Telephone
Clinical	Clinical Assessment Team – Paramedic	Gives clinical telephone advice to the caller/patient	3	Telephone
Clinical	Clinical Assessment Team – Mental Health	Gives clinical telephone advice to mental health callers/patients	1	Telephone

Due to the numbers of interviewees recruited for different staff groups being low for some groups of staff and that for some roles there are only very few staff that undertake that role across EMAS, for example, EOC General Manager (n =1) or mental health nurse clinical advisors (n = 5), quotes are labelled using clinical or non-clinical groupings rather than the specific job role, so that confidentiality is maintained.

6.4.2. *Overview of themes*

There were five themes. The four themes in the original framework remained in the final themes presented here (safety, appropriateness, acceptability, Telephone advice process and service). The theme related to the process of telephone advice is presented first, followed by the three conceptual themes of safety, appropriateness and acceptability. Findings related to the impact of Covid-19 on the telephone advice service are presented at the end.

6.4.3. *The clinical telephone advice process and service*

Interviewees described the clinical telephone advice scope, process and team and this section describes these findings. It is contextually important to understand the telephone advice process and service in order to correctly interpret and fully understand the findings related to safety, appropriateness and acceptability.

Table 33 Telephone advice process and service sub-themes

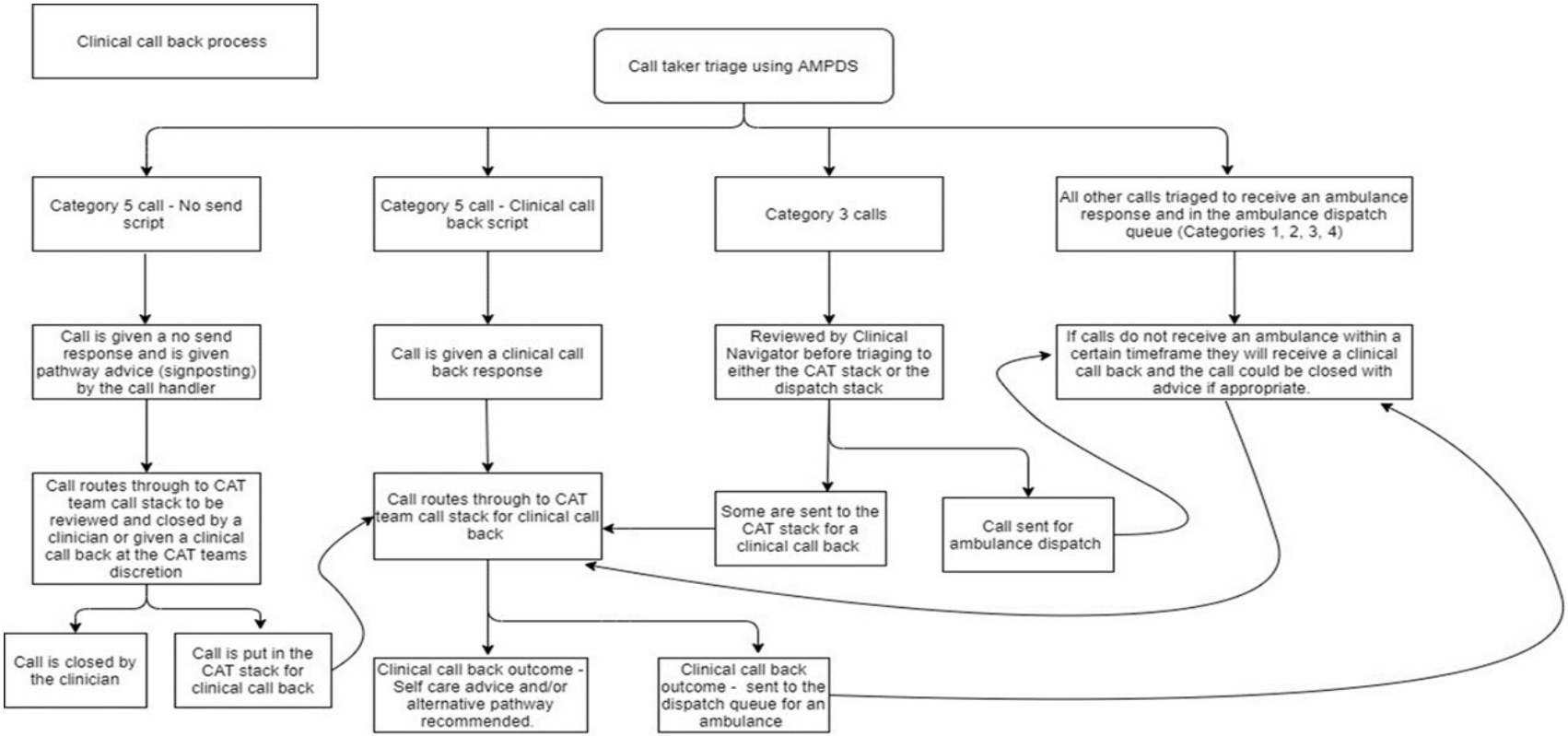
Sub-themes	
Advice process and service	• Telephone advice process mapping
Changing scope of clinical advice	• Staff views of changes in scope and widening role and importance of clinical advice within the ambulance service • Service changes
The Clinical Advice Team (CAT) members	• Description of the different types of staff who give Clinical Advice
Views of different staff groups on the clinical advice process	• Caller taker process and role: little autonomy • CAT process and role: autonomous practitioners
Skills required for Call Takers and Clinical Advisors	• Assessment of the different skills used and whether they relate to the safety, appropriateness or acceptability of telephone advice

The sub-themes that relate to ambulance staff views of the telephone advice process and service are summarised in Table 33. There were 5 descriptive sub-themes that related to the telephone advice process and service. The first of these sub-themes, Advice process and service, was important as through mapping the telephone advice process it was possible to gain a clear understanding of the telephone advice process and service, and from there to understand what the potential issues were relating to safety, appropriateness and perceptions of acceptability. One of the important findings from the interviews was staff perceptions of how the service had developed and evolved over time, and the impact of these service changes on safety, appropriateness and acceptability. This was captured in the second sub-theme, Changing scope of clinical advice. Interviewees described the important of the Clinical Advice Team (CAT), the different types of clinical staff within the team and the benefits that this has for the team and the telephone advice service. This is reported in the third sub-theme, The CAT members. The fourth sub-theme, Views of different staff groups, describes how different staff types perceive telephone advice and the telephone advice process, and this is important due to the range of staff types (clinical and non-clinical) that are involved in the telephone advice process. The final sub-theme, Skills required for Call Takers and Clinical Advisors, reports the skills that interviewees perceived were important when handling telephone advice calls and looks at these from the perspective of safety, appropriateness and acceptability.

6.4.3.1. Advice process and service

Using information from the interviews with ambulance service staff, the clinical call back process has been mapped into a flow chart and this flow chart represents the growth and change to the service in the types of calls that the CAT now deal with (see Figure 1 on the following page). As well as calls which are triaged by AMPDS as requiring a call back from a clinician, there are other calls that may also end up with a call back from a clinician and that may be closed with telephone advice. These are a proportion of category 5 calls that are currently triaged as not receiving any ambulance response (called 'no send'). Whilst these calls do not routinely receive a call back from a clinician, all of these calls are closed by one of the Clinical Advice Team (CAT) as all calls on the stack are looked at by a Clinical Advisor before they are closed. If a Clinical Advisor feel this call warrants input from a clinician, or if the call taker has raised a concern, the Clinical Advisor may call the patient as they would for calls that are triaged to receive a clinical call back. Some higher urgency calls may also receive a clinical call back.

Figure 1 Ambulance telephone advice process



Scripts are standardised call handling scripts that are used to standardise and better manage call response. There are different scripts for different types of response and incident.

6.4.3.2. Changing scope of clinical advice

Interviewees reported that the clinical advice service has evolved over time and the scope of the Clinical Advice Team (CAT) activity is now much broader than when 'hear and treat' was first envisaged and implemented. As well as giving clinical call backs to category 4 and 5 calls, the CAT also provides a 'whole service safety net function', by providing 'welfare calls' to calls that are triaged for an ambulance response and do not receive an ambulance in a specific time frame. They also operate the 'crew line', where ambulance staff on scene can call in for advice, further information about a patient from the linkage with System One GP notes and to give clinical sign off to patients discharged at scene by paramedics who have been qualified less than two years or to Emergency Medicine Technicians (EMTs). Service safety netting is more evident in times of high ambulance activity and when the amount of ambulance resources available is low.

6.4.3.3. Service developments

Currently there is a trial to assess whether some category 3 calls would benefit from a call back from a clinician to ascertain whether an ambulance response is the appropriate response, whether an ambulance response is required more quickly or whether the patient can be directed to other more appropriate pathways. Therefore, at the time of the interviews some of the category 3 calls were also in the stack of calls that are waiting for a clinical call back from a Clinical Advisor.

In addition to an increase in the scope of telephone advice, there have also been key changes which were instigated to improve the delivery of the service. Linkage with System One GP records is a recent change that allows the Clinical Advisor to view the patients GP records and to have access to information such as appointment history, medications and past medical history and this is something that the Clinical Advisors described as useful. It also means that informing the GP of concerns or referrals can be done via the System One notes and does not need to be verbally communicated.

> *"So for low acuity calls, they are then transferred into System One. System One is a patient management computer software function that allows the clinician to not only assess the patient, to receive the patient details, to access the patient's records, their summary care record anyway, and also use a clinical triage tool to determine what's the best outcome and what's the best response that that patient needs" (Interview 16, non-clinical)*

6.4.3.4. The CAT members

Interviewees described the CAT as a multidisciplinary clinical team. They described how the types of clinical staff in the CAT have broadened and increased over time and that this is continuing to develop. Initially, the team at EMAS consisted of paramedics and nurses with experience in prehospital, community or emergency settings, and some had extensive experience in providing clinical telephone advice for other urgent care services e.g. NHS Direct. Challenges in some types of calls, particularly mental health, has seen the addition of mental health specialists to the CAT. Other clinical specialties, such as midwives and GPs have also been added to the team and all staff interviewed here described that this was beneficial in achieving both a safe triage and appropriate clinical advice. Levels of teamwork and cooperation between different team members seemed very positive, with team members reporting seeking and valuing the views of other clinical professions, particularly when dealing with a patient whose health problem was out of their area of expertise.

6.4.3.5. Views of different staff groups on the clinical advice process

6.4.2.6.1 Call taker views: little autonomy

Call takers perceived the telephone advice system as highly automated, with specific scripts for each type of triage outcome and numerous protocols. Scripts and protocols are updated regularly, and call

takers and their managers described how they are expected to keep up to date with all new developments. Call takers perceived that they have little autonomy in their interactions with callers, and stated that this could sometimes lead to frustrations on the part of the caller and sometimes the call taker, e.g. if the caller/call taker perceived that more could be done to help the caller than was stated on the script.

> *But if it's something medical because we're not really giving them advice, unless it's an emergency and then there's loads, but on the less life threatening things, the things that come out lower, so abdominal pain, back pain, things like that, I'm not really telling them anything and they can get very frustrated because they're like 'well we've called you for help' and it's very, very strict as to what I can say, basically nothing, because then it's all on me, if something goes wrong that's, the litigation is on me it's not on the service, which is really hard, it is quite distressing. So, in terms of training, not much, because I think there is a litigation thing because they're not expecting us or paying us enough to be giving personal advice to that patient other than what the system is telling us to say. (Interview 7, non-clinical)*

Call Takers reported that they frequently triage calls to receive telephone advice, and each time a call is triaged to receive telephone advice the Call Taker uses the words on the telephone advice script to impart this information to callers. Call Takers described perceived that the telephone advice script is used for between 25% and 50% of calls. In the interviews, Call Takers all clearly described the criteria that determines whether a call is referred for telephone advice or whether the call receives a 'no send' response.

> *"anything that is category 4 and 5 is shown as green on your screen, where you give either a call back script from a clinician or you give a no send script depending on what the nature of the problem is or what their age group is. So, for example, anybody who's between 5 and 65 and doesn't have diabetes or it's not a sexual assault or they're not still on the floor, then they would get, there is other criteria as well, but they would get an automatic no send." (Interview 10, non-clinical)*

6.4.2.6.2 Clinical Advisor views: autonomous practitioners

When discussing their role, interviewees from the CAT described themselves as autonomous practitioners, in they have more freedom within the call to ask questions outside of a script, to give advice based on their clinical knowledge and to escalate a call to receive a higher response where they feel this is appropriate. A triage assessment tool is available for the CAT members to use during the telephone advice consultation, however interviewees described this as not mandatory. Some of the CAT stated that they prefer to use the triage assessment tool and that they find it helpful, whereas some CAT members state that they would only use the triage assessment tool for calls that are more unusual or that they perceived to be outside of their area of expertise, whilst others prefer not to use it all and feel that it undermines their clinical ability. The difference in approach that Clinical Advisors identified towards the triage assessment tool seemed to be influenced by clinical specialty and former clinical role. Paramedics reported preferring not to use the triage assessment tool as they stated that the questions that it generated were often inappropriate, not relevant to the triage or made the telephone consultation overly long, whereas nurses with no previous experience of prehospital care reported preferring to use the triage assessment tool.

6.4.2.6.3 Skills required for Call Handlers and Clinical Advisors

Call Takers and Clinical Advisors discussed the types of personal and professional skills that are required or that they use for taking calls and giving clinical telephone advice. Whilst there was some

overlap with the skills mentioned by each type of staff, (e.g. visualising the scene) Clinical Advisors mainly referred to a different set of skills that was much more about obtaining the information needed to ensure a safe and appropriate triage and less about customer service skills. Clinical Advisors described using their skills to build up a rapport and a level of trust with the caller, through matching voice tone and language styles, and attempting to use the same kind of camaraderie as if they were seeing the patient face-to-face. Whereas Call Takers identified that a lot of the work they do is about making the decision to refer for telephone advice acceptable to callers, how they deal with challenging calls and the techniques they used to ensure the caller understands what is being said. The different skills mentioned by the Call Takers and Clinical Advisors were identified and mapped against the study focus of safety, appropriateness and acceptability to assess the types of keys skills used and the focus of the calls for the different staff groups. These are shown in Table 34 on the following page. This shows the skills that Call Takers mentioned in the interviews were more geared towards service user acceptability of telephone advice and to some extent safety, whereas the Clinical Advisor calls skills had a wider focus and related to the safety, appropriateness and acceptability of telephone advice. Personal resilience was also mentioned as important by both Call Takers and Clinical Advisors, particularly when dealing with more challenging calls such as mental health calls and the personal resilience needed to deal with these calls and then move directly on to another call.

Table 34 Skills required for call handlers and Clinical Advisors

Skills	Call taker	Clinical Advisor
Safety		
Ability to listen to gut instinct	✓	✓
Listening skills and being able to listen, type and talk at the same time	✓	✓
Visualising the scene	✓	✓
Continual awareness for and identification of red flags		✓
Safety and Appropriateness		
Clinical experience knowledge and skills		✓
Picking up on non-verbal signs and what the caller isn't saying as much as what they are saying		✓
Extracting meaning from what people are saying and putting all the information together		✓
Appropriateness		
Not to prejudge callers or make assumptions based on personal biases	✓	
Acceptability		
Conflict management, de-escalation and diffusion techniques and methods	✓	✓
Customer services skills	✓	✓
Professionalism	✓	
Empathy and sympathy	✓	
Being mindful that this is the caller's personal emergency	✓	
Carefulness and tact around language and choice of words	✓	
Respectfulness and remaining calm when dealing with challenging callers	✓	
Voice tone and to speak to people without patronising them/not to come across as robotic when reading scripts	✓	
Talking slowly so that callers can understand what's being said	✓	
Clearly communicate, not to assume callers know what clinical terms are	✓	
Reassurance	✓	✓
Methods of managing the caller and the caller's expectations		✓
Tailoring communication, language styles, tone of voice to the callers		✓
Distraction techniques		✓
Camaraderie to disperse worry		✓
Other		
Personal resilience	✓	✓
Personal reflection	✓	

6.4.4. *Safety*

The sub-themes developed relating to ambulance staff views of the safety of clinical advice are shown in Table 35

Table 35 Safety sub-themes

Sub-Themes	
A safety net for the ambulance service	
Perceived as a safe thing to do	• Staff have trust in the safety of the telephone advice system and process • Individual safety errors or mistakes are rare
Potential gaps in safety	• Under triage by the AMPDS triage system • Long waits for a clinical call back • Concerns about the Concerns Process
How safety is achieved at system, service and team levels	

6.4.2.7.1 A safety net for the ambulance service

Interviewees (clinical and non-clinical) described how Clinical Advice has a wider role than providing telephone advice to callers, as they perceive telephone advice to act as a 'whole service safety net'. In operating as a whole service safety net, the CAT service and team was perceived by interviewees to be integral to all aspects of ambulance service care, due to the assistance and advice they provide to the ambulance service when the service is stretched or busy, e.g. welfare calls to patients who have been waiting for an ambulance longer than expected or to paramedics on scene via the crew line.

> *"the clinical hub has become the clinical safety net for patients that are waiting for an ambulance as well" (Interview 16, non-clinical)*

6.4.2.7.2 Clinical telephone advice is perceived as a safe thing to do

Most staff in the sample stated that they did not have concerns about the safety of the CAT service and trusted the clinical advice triage system and clinical advice process. Confidence in the system increased with experience of providing the service and interviewees described how individual safety incidents were rare. Where safety issues were identified within the interviews, these tended to be raised by individual interviewees rather than groups of staff, as most interviewees perceived the system was safe. Most of the safety issues that staff talked about were related to system safety and potential weaknesses or gaps in the system that patients could slip through.

6.4.2.7.3 Potential gaps in system safety

Ambulance staff perceived potential gaps in clinical advice safety in the three areas of under-triage by the AMPDS system, long waits for a clinical call back and concerns about the Concerns Process.

6.4.2.7.4 Under-triage by AMPDS

Some Call Takers perceived that some calls were identified as a 'no send' by AMPDS when the Call Takers believed that they should have received clinical advice. This was reported as an infrequent occurrence and was often related to fallibility in the coding process and triage based on the information that the patient had given. Some non-clinical and clinical staff identified that the service as a whole were aware that some types of call could potentially be missed or under triaged by AMPDS e.g. sepsis and that a Concerns Process was in place for Call Takers to highlight sepsis calls that receive a 'no send' outcome for telephone advice.

"You know, and we tend to then, and calls like that, like potential sepsis or meningitis, for some reason our AMPDS system doesn't actually recognise sepsis symptoms for some reason, it doesn't do it, so I know in my head with some of the symptoms they give, like with, maybe, blood pressure or they've got a rash or they're photosensitivity and stuff like that, so I know, and I can manually then write out what we call a raise a concern slip and I write out a slip with the job number and what the description is and what my concern is and I give it straight to the team leader and they will ring it through or go and pass it to the clinicians to look at it" (Interview 2, Non-clinical)

"Yes, so with sepsis, if they mention sepsis or if it's a health care professional call, sometimes health care professionals call in and they say it's sepsis and sometimes the way that the call is processed it might get a category 5, which isn't a response for an ambulance, it's to be assessed to see which priority it needs. So they can let us know 'oooh we've got a sepsis that's come in and it's a category 5' which, as you know, we do calls in order so if it's come through on a category 5 it's not even on the waiting list for an ambulance as of yet. So they will let us know we've got a sepsis and flag that up." (Interview 14, Clinical)

6.4.2.7.5 Long waits for a clinical call back

Clinical Advisors described how they aimed to call patients back within one hour, but at busy times clinical call backs could be two hours or at peak times sometimes four hours later. Some Clinical Advisors reported going into a call for the first time after several hours of the call waiting on the call stack (a list of calls waiting for clinical advice) and experiencing a sense of panic that the call had waited that length of time before receiving a clinical response. Whilst the clinical staff acknowledged that they had the reassurance that the call had already been triaged as a low priority by the AMPDS system, they still perceived that some calls could potentially slip through the net.

"and by the time you've gone into it, it might be really busy, say if it's like two hours, it might even be a one year old choking or something like that, you click in and you get panicked because you think this was literally two hours ago, what's happened since, but if it's got a Cat Five, generally speaking it should be suitable, but as with everything, there's cracks really. They can slip through the net." (Interview 14, Clinical)

6.4.2.7.6 Concerns about the Concerns Process

Recent changes to the Concerns Process meant that Call Takers described being discouraged from raising concerns except for three conditions that are recognised as potentially under-triaged by AMPDS. Due to not being clinically trained, Call Takers found the previous concerns process, where they could raise concerns about any call, reassuring especially where an ambulance is not being sent. However, clinical and managerial staff sometimes perceived that concerns were raised unnecessarily, resulting in increased workload and that this was becoming a concern in itself. The effect of the changes to the concerns process on some Call Takers was described by them as not feeling listened to and being worried that the changes to the Concerns Process raised the chances of more serious cases potentially being missed.

"But yeah, they are kind of discouraging that system [Concerns Process] and moving away from it a little bit and I know that some call takers are frustrated and they are worried that their concerns aren't going to be listened or people are going to slip through the net and maybe not be escalated quickly enough or not be called back quickly enough. Yeah, they are feeling like they're concerned, but I think as it progresses, they'll understand and see that it is

ok, things are being addressed and patients are being looked at and seen to." (Interview 9, Non-clinical)

6.4.4.1. How safety is achieved at system, team and individual staff levels

The safety mechanisms described by interviewees were wide ranging and were categorised as occurring at a system, team and individual level. These are shown in Figure 28.

At a system level ambulance staff described multiple mechanisms in place for ensuring and improving the safety of clinical advice. These include call auditing (where calls are assessed against specific criteria and standards by other ambulance staff who have been trained in the auditing process), learning from internal and external incidents, clinical governance processes, and service level direct links with other services e.g. System One. Staff described the triage system itself as risk adverse and perceived that the use of protocols and scripts ensured consistency of a pre-determined level of response.

At a team level, most interviewees (clinical and non-clinical) perceived that the biggest improvement to the safety of clinical advice was the introduction of mental health nurses to the CAT team. This was due to the complex and sometimes difficult to handle nature of mental health calls.

"I feel it's a lot safer since we had mental health clinicians in control." [Interview 5, Clinical]

Other new roles and addition of other clinical staff to the team, such as the new clinical navigator role and including GPs in the CAT were also identified by Clinical Advisors as having a positive impact on safety. Despite telephone advice being a mainly individual staff/caller interaction, Clinical Advisors reported that they felt part of a strong and collaborative multi-disciplinary clinical team and this is something that they valued and found beneficial in terms of improving the safety of telephone advice. Clinical Advisors described how they sought the input and advice of other Clinical Advisors, particularly when they perceived a call was outside of their own area of clinical expertise, and this was recognised by Clinical Advisors in the sample to enhance the safety of clinical advice.

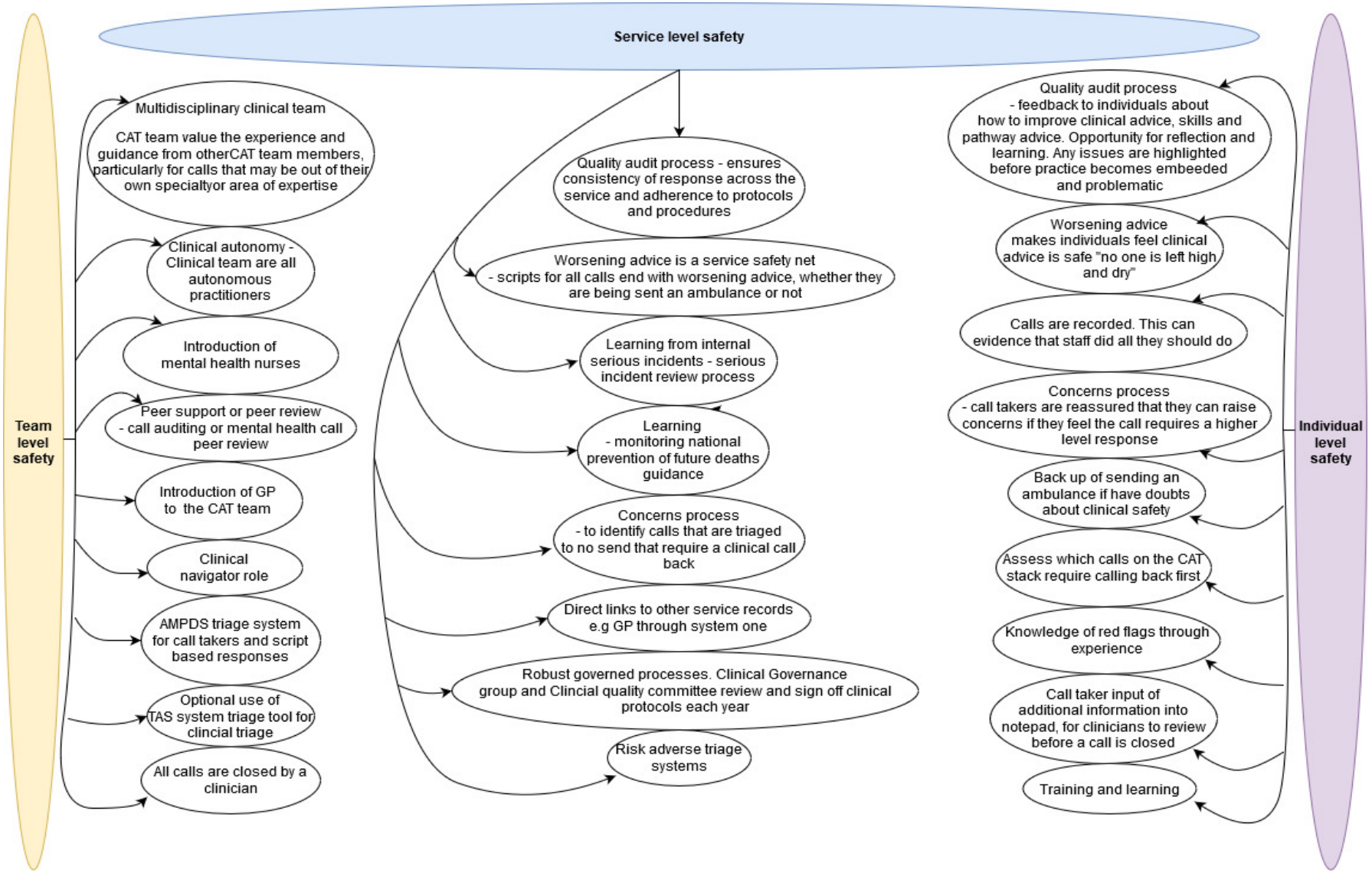
At an individual level, interviewees rarely mentioned safety issues or concerns. One Clinical Advisor discussed one incident in which a colleague had not recognised the seriousness of a health problem and this resulted in the case going to court. Staff commonly discussed closing each call with '*worsening advice'* (where callers are told to call back if the patient's condition worsens) as a safety measure. Nearly all of the Call Takers and Clinical Advisors spoke about an instinctive feeling that they get when they felt something wasn't right with a call. Gut feeling, sometimes called '*spidey sense'* or *'EMD 6th sense'* is something that more experienced Clinical Advisors and Call Takers in the sample described. Clinical Advisors described how they are able to use *'gut feeling'* as part of their clinical assessment and they described that this feeling becomes honed through experience. In the case of Call Takers this is usually done through escalating concerns to their team leader when they believe that a triage outcome is too low or that there are factors that the Clinical Advisors need to be aware of. Due to the changes to the Concerns Process, the use of 'gut feeling' for Call Takers was described by them as more challenging, as Call Takers are only supposed to raise concerns for specific clinical issues. Clinical Advisors reported that *'gut feeling'* that something was not right usually results in the dispatch of an ambulance.

Interviewees perceived that audits of telephone advice calls provided an opportunity for individual staff reflection and learning and most of them found this process beneficial, although some Clinical Advisors perceived that the call auditing process was too heavily focussed on customer service rather than clinical issues. At an individual level, there was variation in practice between Clinical Advisors,

with some individually prioritising which caller to call back next by scanning through the list of calls waiting, and others taking a consecutive approach by calling back in the order the calls are on the stack and stating that they did not *'cherry pick'* which call to call back next. Where calls were called back out of order, this was perceived by Clinical Advisors to be necessary and beneficial for safety reasons.

> *"I saw a diabetic when it was on the stack I saw a diabetic patient was listed low key, it was a middle range call and I thought oh that could be an impending hypoglycaemic, he could go unconscious, so it was twenty down the list and I picked it out and rang it straight away" (Interview 12, clinical)*

Figure 28 Safety mechanisms in place at service, team and individual levels



6.4.5. *Appropriateness*

The sub-themes developed relating to ambulance staff views of the appropriateness of clinical advice are shown in Table 36.

Table 36 Appropriateness sub-themes

Sub-themes	
Perceived to be appropriate generally	• Most calls that are sent for clinical advice are appropriate for clinical advice • A good way of dealing with frequent callers
Key problem is mental health calls	• Call takers and Clinical Advisors find mental health calls challenging • Mental health clinical advisors are a great solution to this
Telephone advice protocols sometimes conflicts with staff desire to help patients	• Call takers can be uncomfortable with triage outcomes or frustrated at not being able to help
Other health services can impact on appropriateness (111; care homes/carers)	

6.4.5.1. *Perceived to be appropriate generally*

Call Takers and Clinical Advisors perceived that telephone advice was appropriate and is necessary both because of the volume of calls that the ambulance service receives and because many calls are low acuity calls that do not require an ambulance to be dispatched. Telephone advice was also seen by Clinical Advisors as a mechanism for ensuring that callers get a response that is appropriate to their clinical need.

6.4.5.2. *A good way of dealing with frequent callers*

Interviewees perceived that telephone advice enabled people who call the ambulance service very frequently, sometimes called frequent callers or high-volume service users, to have their call dealt with in a way which has the least detrimental impact on the ambulance service and its available resources. Interviewees described how people who call the ambulance service very frequently often have their own frequent caller care plan. Clinical Advisors described how the care plan is usually developed in conjunction with the GP, social care, mental health or other community services. Interviewees described how the frequent caller care plan limited the response that subsequent calls from the same person may receive. People who call very frequently were acknowledged by interviewees to be problematic to the ambulance service, due to the persistent contact and the resources that this uses, but many interviewees also spoke about the underlying anxiety or mental health issues that many people who call frequently also have, and discussed their personal empathy for them alongside the benefits of having a frequent caller care plan in place.

> *"We have some frequent callers and we have care plans in place for some of them that maybe use our service inappropriately" (Interview 3, Clinical)*

> *"They literally put the phone down and ring back again, put the phone down and ring back, put the phone down and ring back, put the phone down and ring back. So, it's time consuming. It's sad, you know, it really is sad because they've obviously got issues, but we*

have to appreciate and deal with the calls that come in as fairly as you can and if they've got a care plan then we adhere to the care plan." (Interview 6, Clinical)

6.4.5.3. Key problem is mental health calls

Most interviewees described how challenging mental health calls are to deal with over the telephone. Interviewees reported that there had been an increase in mental health calls during the pandemic and that this could be due to the impact of lockdown on the usual coping mechanisms that people have in place. Call Takers and nurse and paramedic Clinical Advisors highly valued the addition of mental health nurses to the CAT team. This was a recent change, which has come about within the last two years and most interviewees felt this has improved the clinical advice service.

However, there were still challenges related to mental health calls. In the interviews, Call Takers identified that mental health calls are some of the most stressful and upsetting calls that they have to deal with. Where the Call Taker triages a mental health call to receive telephone advice and the patient is the caller and is on their own, the Call Takers explained how they are required to stay on the line with the patient until the Clinical Advisor can take over the call. Sometimes this is after a few minutes, but when the service is busy this could be an hour or more. Call Takers reported feeling underequipped to deal with these calls, in terms of the training they've received and the difficulty of the situation, (callers may be threatening their own life), with many Call Takers stating that they felt scared about what to say to the caller in case they said something that makes the caller react badly or makes the situation worse. Some Call Takers felt there should be more training for dealing with mental health calls or that it is inappropriate that they are asked to stay on the line with mental health patients for extended periods of time or at all.

"We're not equipped for psychiatric calls. We don't get any specific training on how to deal with them" (Interview 1, Non-clinical)

"Well I think like I said, I personally have never thought it's been appropriate for people who have not had any mental health training to be on the phone with people who are suicidal for any length of time, personally, I don't believe that. I'm not saying that won't help people but I'm saying I don't think that's appropriate, so I mean, I've always said that and I mean I've said that out loud to people before and I think it's totally inappropriate that people who've not had any mental health training should be speaking to people for long periods of time who are feeling suicidal. That to me isn't appropriate." (Interview 8, Non-clinical)

Clinical Advisors also perceived that mental health calls could be challenging to deal with, even with the backup of the mental health nurse within the CAT. Whilst mental health nurses will now take the majority of mental health calls, other Clinical Advisors may need to take mental health calls when the mental health nurse is busy, if they're not on shift or if there is a physical health problem to the call as well as a mental health problem.

"I mean from a triage point of view they take longer because they're one of the hardest, ...when you're ringing up and telling me that your mental health's bad, I can't visualise that, I can't sort of, because I don't know what your triggers are, what triggered your mental health issues, you have to very careful what you say with your questioning because you don't want to exacerbate things, you know. (Interview 11, Clinical)

Whilst mental health calls were perceived by Call Takers and Clinical Advisors to be some of the most stressful calls that they have to deal with on a shift, and that they may get several mental health calls during a shift, interviewees described how the mental health nurses spend their full 12 hour shift taking mental health calls, and this could be around 30 to 40 calls per shift. An interview with a

mental health nurse highlighted the importance of personal resilience and the skills needed to deal with these types of calls.

> *"We are a special breed, we are a very special breed we have our own little ways …. And quite a lot of my colleagues I know will say I don't know how you physically can sit for 12 hours and back to back try and talk someone down from trying to harm themselves or be psychotic or be really mentally unwell and not be unwell yourself. Because like they say, we've had two suicidal patients today and it's drove me to the point of where I don't even know what to do anymore, whereas we literally, like I say can take up to sometimes 30 to 40 jobs a day and just constantly speaking to people. And it does take its toll sometimes, it does get to the point where you're exhausted, and you just can't physically talk to anyone anymore because you're just that mentally drained yourself." (Interview 13, clinical)*

The introduction of the mental health nurses to the CAT was also perceived to have an impact on non-conveyance outcomes, with interviewees reporting a reduction in mental health conveyances to ED. In addition, interviewees perceived it to be rare that mental health calls required escalation to the highest acuity response with this new team member in operation.

> *"Quite a lot of our managers have said that since us as a team have come in the conveyance of mental health patients to A&E, the change is huge, it's hardly anything now. So it just shows that little bit of time on the phone and that little but of reassurance and signposting to another service actually does work." (Interview 13, clinical)*

6.4.5.4. Telephone advice protocols sometimes conflicts with staff desire to help

Call Taker interviewees described sometimes being uncomfortable with triage outcomes or frustrated at not being able to help patients. For example, Call Takers sometimes described feeling like they should be able to offer more help to callers, that what they were saying to callers was not helpful or that it was frustrating for callers. Falls was commonly cited as an example of where clinical advice was perceived as inadequate as the patient often required help to be lifted from the fall.

> *"But, some of the calls, you're a bit embarrassed by because some of the ones that do come out as a low category are people that've fallen and I always get a bit like, I feel bad for that sometimes, particularly if it's this weather and they've fallen over outside on the path and they're laid on concrete….. And it could easily be 3 or 4 hours before they get seen to, and you do feel a bit embarrassed and you get people ringing back saying 'they've been on the floor now for an hour and a half and you promised a call back and nobody's rang us back yet' and you do feel a bit like 'oh god, I'm so sorry'. If it was my nan or my mum or something, I would be angry as well." (Interview 2 non-clinical)*

6.4.5.5. Other health services can impact on appropriateness

NHS 111 was described by both Clinical Advisors and Call Takers as a source of frustration to both ambulance staff and callers, due to calls that are perceived to be inappropriately passed from 111 to the ambulance service. Interviewees explained how sometimes these calls may have already received ambulance telephone advice and been advised to contact 111. Some interviewees felt that callers were going around in a continual loop between 111 and the ambulance service, or that some types of calls fell through a gap between the NHS 111 service and the ambulance service.

Care homes, carers and no lift policies were described by some Clinical Advisors as sometimes impacting on the appropriateness of the telephone advice response, because if a care home 'no lift'

policy was in place then the ambulance service would often need to respond with a face-to-face response to a no-injury fall, when Clinical Advisors felt the most appropriate outcome was for the call to be closed with telephone advice and to advise the carers how to get the patient up off the floor safely.

6.4.6. *Acceptability*

The sub-themes developed relating to service provider perceptions of service user acceptability of telephone advice are shown in Table 37.

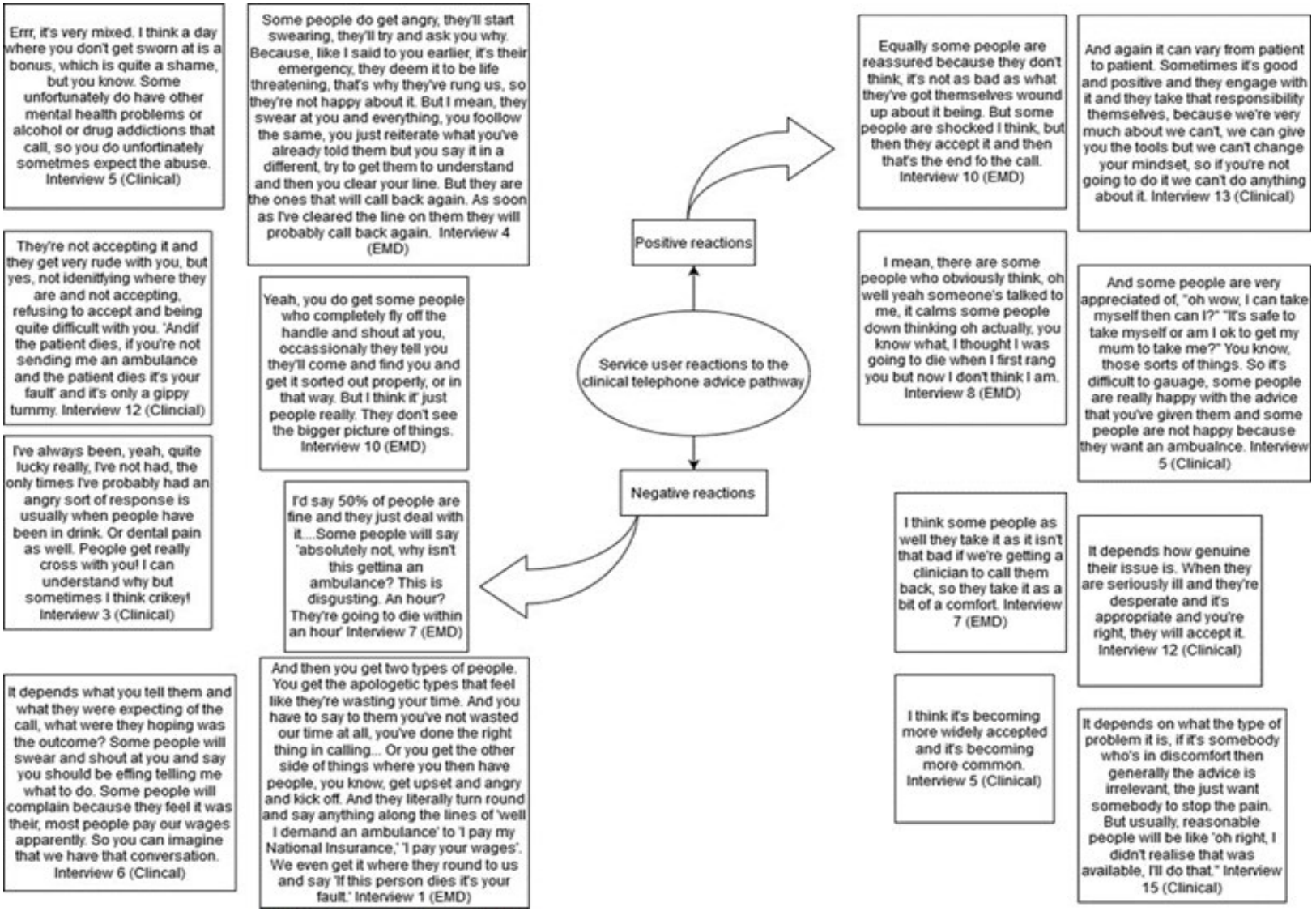
Table 37 Acceptability sub-themes

Sub-themes	
Mixed caller reactions to telephone advice	• Positive and negative reactions to telephone advice
Whether the caller's expectations are met	• Disparity between the caller's expectation of the emergency and the clinical triage outcome • A sense of entitlement • Misconceptions about what the ambulance service can offer/calling for non-clinical reasons • False expectations from other services about receiving an ambulance • Managing caller expectations
Ability to offer reassurance	• Reassurance from being triaged as low urgency/not requiring an ambulance • Reassurance from the clinical consultations • There are certain trigger words and scripts that callers can react negatively to and do not find reassuring
Length of time waited for clinical advice	• Callers sometimes react negatively to the time they are told they will need to wait for the clinician to call back • Callers sometimes react negatively to the clinical advisor about the length of time they have waited for a clinician to call

6.4.6.1. Mixed caller reactions to telephone advice

Examples of the negative and positive reactions to clinical advice that staff described experiencing from callers are highlighted in Figure 29. Most interviewees reported that some callers have a positive reaction to the telephone advice pathway. For example, some callers find it reassuring. All Call Takers reported experiencing some negative reactions from callers. Negative reactions included being shouted at, sworn at, threatened and told it would be their fault if anything happened to the patient. Clinical Advisor interviewees perceived experience of negative reactions from callers was more variable than Call Takers, with some feeling that they experienced very few negative reactions and some that experienced negative reactions more often.

Figure 29 Ambulance staff experiences of caller reactions to clinical advice



6.4.6.2. Whether the caller's expectations are met

Interviewees described that callers who did not want to go to hospital or preferred an alternative pathway were particularly receptive to clinical telephone advice, especially those callers who preferred to care for themselves. Sometimes callers were unaware of the alternative service option that they were advised to seek and were perceived by interviewees to welcome this advice. There was a sense from some interviewees that some callers to the ambulance service called the ambulance service because they did not know what else to do, through being unable to make a decision around the right level of care to seek or that callers wanted someone else to take charge of the situation. These callers were usually perceived as being happy to receive clinical telephone advice.

However, service providers also described that not being sent an ambulance straight away was a source of dissatisfaction for callers who perceived their call as an emergency and this was linked to a negative response to being told they would receive a call back from a clinician, to being given self-care advice or to being signposted to other health services by a clinician. These calls were sometimes described as difficult and challenging to handle by both Call Takers and Clinical Advisors.

> *"sometimes I do, I sometimes say 'well you know we do have to respond to life threatening emergencies first and this isn't immediately life-threatening' and they go 'but it is, but it is, it could be'. You do get that a lot, that's when people start generally kicking off and swearing at you 'you're effing useless you lot'" (Interview 2, Non-clinical)*

The subjectivity around what is an emergency was raised in many interviews, with interviewees expressing that whilst the call may not be a clinical emergency it was always treated as the caller's personal emergency. They explained how different perceptions of what an emergency is can result in a mismatch between caller expectations and the ambulance service response. This was something that some Call Takers and Clinical Advisors described themselves as mindful of when dealing with calls.

6.4.6.3. A sense of entitlement

Service providers described how some callers contacted the ambulance service and not only expected an ambulance, but also felt that they deserved one. Reasons for *'deserving'* an ambulance could relate to callers stating to ambulance staff that they were owed an ambulance due to years of paying taxes. These calls were described by interviewees as difficult to handle as the callers were usually angry that an ambulance would not be sent and difficult to reason with. This could sometimes result in escalating behaviours, where interviewees perceived that callers changed their story or health problem to include red flag symptoms that would result in an ambulance being sent.

> *"But yeah, sometimes you've just got people that think they deserve an ambulance and they say things like 'I've paid taxes all my life, I want an ambulance, I deserve to get an ambulance' Well it doesn't really work that way. We've got people having heart attacks in cardiac arrest, can't breathe, they need ambulances and they can't send them to everybody just because you've hurt your leg or hurt your arm. So yeah, those calls can be quite difficult sometimes." (Interview 9, Non-clinical)*

6.4.6.4. Misconceptions about what the ambulance service can offer

Some interviewees (Call Takers and Clinical Advisors) felt there was a public misconception about the service that the ambulance service offers or the benefits that being taken to ED in an ambulance may confer. The following public misconceptions were described by interviewees: being taken to ED in an ambulance means that you have a shorter wait to be seen in the ED; ambulances are always nearby or that the ambulance will arrive straight away; that ambulance staff can prescribe medication such as antibiotics; and if you call the ambulance service you will always receive an ambulance. These expectations and misconceptions were felt by interviewees to affect service user responses to being told they would receive a call back from a clinician or to receiving clinical telephone advice. A few interviewees said that a small proportion of callers sometimes call for advice, but the general view of interviewees was that callers called the ambulance service because they expected an ambulance to be sent. Interviewees felt that some callers expected an ambulance for non-clinical reasons, and this usually led to a negative reaction when they received clinical advice. For example, where callers wanted transport to hospital, staff perceived they were dissatisfied with the clinical advice pathway.

6.4.6.5. False expectations from other services about receiving an ambulance

Callers that had initially contacted 111 were sometimes passed from 111 to the ambulance service. Interviewees described how these callers were sometimes dissatisfied with the ambulance service response because it did not meet with the expectation given by 111 about the timeframe in which they would receive an ambulance. This led to frustrations for both the caller and the Clinical Advisor, as they described that the 111 and ambulance service triage systems can give different, sometimes incompatible results and that this could result in the caller being misled about the ambulance service response.

> *I think sometimes when, we often get calls passed from the 111 service that haven't had any verbal contact and then we'll ring them back after two hours and say 'well actually it's not a medical emergency, you can deal with it yourself by doing this' they can often be a bit cross with us because they think they're getting an ambulance and they're not. But 111 service have said we're dispatching you an ambulance in the next 20 minutes, and we're not, we're not dispatching an ambulance in the next 20 minutes, they're not anything to do with us. And then we ring them back and tell them they're absolutely not getting an ambulance and then they get a bit cross with us. (Interview 15, Clinical)*

6.4.6.6. Managing caller expectations

Interviewees described how methods to manage callers' expectations were sometimes used by staff at an early stage in the telephone call in an attempt to make clear how the ambulance service would be responding to the call. For example, by explicitly telling the caller that an ambulance is not needed. De-escalation techniques and customer service skills were commonly described by interviewees as being used as part of this process. Clinical Advisors talked about how they always explain their decision process and reasoning in order that the caller understands why they are not being sent an ambulance. This was less evident in the descriptions offered by Call Takers who have less autonomy to veer from a script, but the use of de-escalation techniques or using certain phrases or avoiding certain words or phrases was discussed by most Call Takers in this sample.

"Sometimes all the information that we have to go through, sometimes people don't expect that, I think it's how you go about it, like as a call taker, if you can sort of say at the start of the call that 'none of this is delaying any help, it's just gaining all the information' that can kind of, you can hear that it kind of soothes people. If you kind of don't say anything like that and you go straight into all your questions, they're like 'what is going on? Just get the ambulance here" (Interview 9, Non-clinical)

Managing caller expectations was sometimes perceived to be difficult to achieve by Call Takers, because they are required to adhere to very prescriptive scripts when informing the caller about the triage outcome of the call. Call Takers felt that there are specific words or scripts that callers do not react well to, and that the wording of the script or even the use of specific words within the script is could lead to an increased negative reaction from the caller. In addition, some caller handlers felt limited by the scripts in terms of what they could say to the caller, and that this limited their ability to placate an angry caller.

"because sometimes there's little things that you can say that will set them right off and they'll go mad" (Interview 10, Non-clinical)

6.4.6.7. Ability to offer reassurance

Interviewees described two different aspects to reassurance. Firstly, some callers were described by Call Takers as being reassured from the call being triaged as a low priority. Interviewees described how some callers were comforted by the fact of being triaged to receive telephone advice rather than an ambulance being sent, because this meant that the health problem was not as bad as the caller had feared.

"I think some people as well they take it as it isn't that bad if we're getting a clinician to call them back, so they take it as a bit of a comfort" (Interview 7, Non-clinical)

Providing reassurance to callers was described by Clinical Advisors as an important part of the telephone advice process and callers were perceived to be reassured by talking to a Clinical Advisor.

"Sometimes people need a lot of reassurance." (Interview 6, Clinical)

Some types of calls were identified by Clinical Advisors as potentially requiring more reassurance than others. Calls that are potentially more complex to handle over the telephone, such as mental health calls, calls relating to people who have fallen, callers where the patient is not the caller, elderly callers, people who are highly anxious about their health problem and parents of young children, were described by some Clinical Advisors as requiring more reassurance. For example, mental health calls were sometimes perceived to require a lot of reassurance as part of the de-escalation process.

Callers that required more reassurance were sometimes those calls that Clinical Advisors perceived to require more support from community services. Such as in the case of families with young children or elderly people that may struggle to get a GP appointment. In these cases, the Clinical Advisor will often liaise directly with the GP to ensure that the GP is aware that these patients require more support and the Clinical Advisor will sometimes arrange appointments for these patients with the GP directly.

"So we always tend to get the GP involved in that to let them know that the family have phoned because they are scared or worried about something or anxious and they may just need a bit more support. And it may just be that they need the advice that we've given them, and it's particularly regarding, I think a lot of it is not feeding or not having dirty nappies and things and you know just sort of reassuring them more than anything and making sure they get that follow up support." (Interview 5, Clinical)

6.4.6.8. Length of time waited for clinical advice

Interviewees discussed how negative caller reactions to telephone advice sometimes related to the amount of time that the caller is told they will need to wait for a clinical telephone advice call back or the length of time they actually wait. At busy times the call back may not be until several hours later.

When callers are informed about the length of wait for telephone advice this is perceived by Call Takers as a source of frustration and something that callers react negatively to. Previously, Call Takers used to inform the caller of the expected wait for a clinical call back, but the Call Taker interviewees described how their scripts have recently changed and they no longer inform the caller of the waiting time for telephone advice due to the negative reactions this sometimes prompted in callers. Where the patient was stuck on the floor and, in particular if they were outside, or thought to be in an uncomfortable setting, Call Takers perceived caller reactions to be more negative regarding long waiting times for telephone advice. Long waiting times for telephone advice were also perceived by Call Takers as leading to more recontacts, as callers recontacted to find out when the clinician would be calling.

"I think elderly people get very frustrated, particularly when their partner's fallen over or they've fallen out of bed and they're on the floor and you'll say 'I'm going to get a clinician to give you a call back within the next 60 minutes' and they'll go '60 minutes! 60 minutes! But he's on a wooden floor and it's cold' and stuff like that so …" (Interview 2 Non-clinical)

Clinical Advisors described that when callers have had a long wait for a clinical call back, this can lead to the caller being frustrated or angry with the Clinical Advisor and this can impede the clinical advice consultation.

"It depends how long you keep them waiting. I mean, like I say the cat 5 calls they get told that they're going to get a call back as soon as possible I think they say, you know and we give them a call back and so long as you do it fairly soon and don't leave them waiting for hours I think they are fairly receptive." (Interview 11 Clinical)

6.4.6.9. Impact of Covid 19 on the clinical advice service and process

The sub-themes developed relating to ambulance staff views of the impact of Covid 19 on the telephone advice process and service are shown in Table 38 below. There were three themes that related to the impact of Covid 19.

Table 38 Impact of Covid 19 on telephone advice process and service sub-themes

Sub-themes	
Impact on service demand	• Reduction in calls generally in the first lockdown • Increase in mental health calls throughout the pandemic
Confusion over what the ambulance service could offer people with covid symptoms	
Increase in calls seeking telephone advice	

6.4.4.9.1 Covid impact on service demand

Whilst the media portrayal during the first lockdown was that Covid-19 would increase ambulance demand and ultimately impact on the length of time that service users wait for a clinical call back, interviewees reported that the initial lockdown had the opposite effect and a reduction in overall call volume was noted by clinical and non-clinical staff. This had an impact on the telephone advice service as Clinical Advisors had less need to undertake a service safety netting function by calling patients who had a long wait for an ambulance, due to ambulances delivering national standards in time responses.

> *"When the pandemic first hit in March through to sort of June, it was the quietest time for the ambulance service, contrary to what the press was saying. We were, for lack of a better word, we were dead. And actually, the type of calls we were getting between March and sort of June were genuine medical emergencies..... So, you know as the pandemics gone on, you know, June to now, it did creep back up to normal levels. And now what we are seeing is probably a shift in the type of demand, so we're not getting as many lower level category calls, I'd probably say, you know, your abdominal pain, back pains. I guess people are just kind of persevering. They don't want to go to their doctors. They don't want to go to A&E because they're scared of contracting the coronavirus. So, they don't their contact us, they basically suffer in silence. So, we are seeing a reduction in that kind of capacity." (Interview 1, Non-clinical)*

Interviewees felt that levels of demand returned to normal following the first lockdown and subsequent tier systems and lockdowns were not perceived by interviewees as resulting in a reduction in ambulance calls.

6.4.4.9.2 Increase in mental health calls

Whilst interviewees perceived that the first lockdown had an impact on the number of calls to the ambulance service, there were groups of calls that increased in volume during the pandemic. Mental health calls were identified by clinical and non-clinical staff as a group of calls that has been rising throughout the pandemic.

> *"Mental health kind of plateaued, we didn't see a significant decrease and then as we went into May and June we started to see a real increase in mental health calls, and that's members of the public, patients, who have a mental health condition that are able to manage it and*

sometimes their ability to socially interact is part of their coping mechanism and if you take that away from them, whether it's their family and friends or whether it's a wider social activity it really starts to significantly impact on their ability to manage day to day, so yeah, we've really started to see during covid an increase in mental health activity." (Interview 16, Non-clinical)

6.4.4.9.3 Confusion over what the ambulance service could offer people with covid symptoms

Callers with Covid symptoms or callers who were worried about Covid were described by some Clinical Advisors as wanting an ambulance to be sent as they believed the ambulance service would provide them with a Covid test.

I think a lot of them think that if they think they've got covid they often think that the crew are going to come and give them a test and tell them if they've got it. (Interview 8, Non-clinical)

Some Call Takers perceived that callers who wanted a covid test were less happy with telephone advice, as the caller wanted the reassurance of a negative Covid test.

I've noticed a lot more regular callers, like new regular callers because they're so scared of getting Covid or they've got Covid because they've got one of the many common symptoms and they, they're not happy with happy with advice, they don't particularly want to go to hospital because they're scared of it, they want someone to come and tell them that they haven't got it. (Interview 7, Non-clinical)

6.4.4.9.4 Increase in calls seeking telephone advice

Callers were noted as being more appreciative generally of the ambulance service and ambulance staff when in the initial lockdown period and also more grateful to receive telephone advice. Interviewees perceived that callers were often phoning for reassurance, which could be given by a telephone advice, and that callers did not always want a face-to-face ambulance response or to go to hospital.

"they'll actually tell me that they just want a telephone consultation, they don't want to go to hospital, they don't want to catch anything" (Interview 4, Non-clinical)

I mean we certainly saw during peak covid our hear and treat rate almost doubled, but we also saw at the same time an even higher reduction in our conveyance rate and our feedback that we had operationally was that patients really didn't want to go in they wanted to be assured and often that's a clinician assessment that you're ok to stay at home, but they didn't want to go into hospital because they saw that as increasing their risk, so we haven't got any patient surveys, we haven't done anything like that that we could really hang our hat on, but what we have go is information that would imply that patients in general were looking for reassurance, they were looking for support and they wanted that without having to go to hospital. (Interview 16, non-clinical)

6.5. Discussion

6.4.7. *Summary of findings*

In terms of safety (defined in this thesis as timely and effective care that delivers more benefit than harm), interviewees identified multiple different mechanisms that contributed to the safety of telephone advice, and these occurred at a service, team and individual level. Most interviewees perceived the telephone advice system to be safe and had trust in the telephone advice system. However, staff did identify potential service safety issues relating to under triage of some conditions, long waits for a clinical call back and some concerns from Call Takers about recent changes to the Concern Process. Staff perceived that key developments and improvements to the CAT team have helped make the service safer, such as the introduction of mental health nurses. Individual safety errors were seen by interviewees as rare, and this was partly due to the numerous mechanisms working to ensure safety at multiple different levels

In terms of appropriateness, (defined in this thesis as care that is proportional to the health problem) The interviews identified that telephone advice is mostly seen as appropriate by service providers, as it provides the necessary level of care to treat the patient's health problem or advises patients to seek a more appropriate alternative care pathway. Telephone advice was viewed by interviewees as a good method of handling calls by frequent callers. There was a perception by Call Takers that rather than being inappropriate for callers, one aspect was inappropriate for Call Takers. They did not like non-mental health trained staff to handle mental health calls and both Call Takers and Clinical Advisors identified mental health calls as challenging and potentially upsetting calls for ambulance staff to deal with. The impact of mental health clinicians was therefore viewed as having had a positive impact on the appropriateness of advice and in dealing with mental health calls.

Acceptability was defined as the patient's views of safety and appropriateness of care and their care experience and service providers perceptions of service user acceptability of telephone advice were mixed. Service providers linked user acceptability to expectations around receiving an ambulance, their need for reassurance, and the length of time to receive a clinical call back. Some staff identified that negative service user reactions could lead to ambulance recontacts within a short time of the original call.

6.4.8. *Comparison of findings with other research studies*

Most studies of telephone advice have used retrospective data to assess safety and appropriateness of telephone advice or used service user surveys to explore patient satisfaction in an urgent care setting. There has been very little research undertaken with ambulance service staff to identify their views of the safety, appropriateness of telephone advice or to explore service provider perceptions of service user acceptability of ambulance telephone advice.

6.4.8.1. Safety

A study based in Finland by Venesoja and colleagues explored patient perceptions of safety in EMS services through undertaking interviews with patients (Venesoja et al. 2020). Although the study by Venesoja et al did not focus on telephone advice, it provides insight into patients' views on safety and

identified that professionalism, knowledge and the quality of information given led to increased service user perceptions of safety.

A Swedish study explored nurses' experiences of decision making around not sending an ambulance. This study found that decisions not to send an ambulance required nurses with experience, knowledge and dedication (Backman et al. 2019). Several of the key skills that Clinical Advisors described in this thesis as necessary for the safety of telephone consultations were skills that are linked to knowledge and experience. For example, the ability to listen to gut instinct and the value of clinical experience. Further work by O'Hara and colleagues explored paramedic decision making, transitions of care and the impact on patient safety (O'Hara et al. 2012). Whilst telephone advice was not specifically considered, the findings highlighted the importance of having an appropriately skilled workforce to manage the needs of a diverse population of callers and health problems and to ensure access to alternative more appropriate care pathways to the ED to enhance the safety and appropriateness of paramedic decision making. The work by Reason uses the Swiss Cheese analogy to describe a multi-layered approach to patient safety, and this is applicable here as multiple mechanisms were identified that the ambulance services uses to enhance the safety of telephone advice (Reason J 2000).

6.4.8.2. Appropriateness

A recent study by O'Hara and colleagues used interviews with ambulance staff to explore the variation of operational factors in delivering telephone advice across different English ambulance services (O'Hara et al. 2019). Interviewees in the study identified that telephone advice was thought to be appropriate for managing ambulance service demand, which corresponds with the findings about staff views of appropriateness of telephone advice from this research.

6.4.6.2.1 Mental health calls

Mental health calls were identified as particularly challenging calls in this research and previous research of the NHS Direct service also identified that nurses felt less confident about dealing with mental health calls (Payne et al. 2002). Using a postal survey of nurses, a study by Payne et al identified that nurses had more confidence in dealing with mental health calls if they received some mental health training (Payne et al. 2002). A systematic review by Golding et al explored the psychological health of emergency dispatch operatives and identified there were several stress points for staff, including exposure to traumatic calls, such as mental health calls (Golding 2017). The review identified that stressful calls were linked to negative impacts on staff mental health and highlights the value of workplace interventions to support staff alongside focus on staff emotional resilience and coping skills. A pilot evaluation of the use of mental health nurses in the ambulance service identified there was a perceived need for specialist mental health triage and that there was potential for positive impact from their implementation, around improved patient care, knowledge sharing and referral to more appropriate care options (Irving et al. 2016). There was a perception that the implementation of mental health nurses would lead to improved confidence of the workforce as a whole in handling mental health calls. Potential for mental health nurses to improve the management of frequent callers, who often have mental health problems, was also highlighted as part of this pilot.

6.4.6.2.2 People who call the ambulance service frequently

In terms of people who call the ambulance service frequently, service provider interviewees in this study perceived that telephone advice is a good method of handling these types of calls for the ambulance service. Research by Snooks et al explores how ambulance services meet the needs of frequent callers. People who call frequently may have unmet health needs and or social, psychological or substance misuse issues, as well as other vulnerabilities (Snooks et al. 2019). Therefore, it is important to ensure that these calls are handled appropriately and safely. As part of an overall package of care developed for each specific caller, telephone advice is a key method of ensuring that the call made by a person who calls the ambulance service frequently relates to the frequent caller issue and not a life-threatening condition. Whilst most services used telephone advice as part of their frequent caller response, Snooks et al identified local variation in the initiatives and models of care used by individual ambulance services in relation to frequent callers, which suggests that people who call frequently may have different experiences depending on which ambulance service they contact.

6.4.6.2.3 Acceptability

Research into service user acceptability includes a postal survey of NHS 111 users considered the acceptability of telephone advice for service users (O'Cathain et al. 2013). Most (93%) service users found the advice very helpful or advice quite helpful, with high compliance rates (86% and satisfaction (73% very satisfied, 19% quite satisfied) (O'Cathain 2002). Areas where services users were less satisfied related to the accuracy and appropriateness of the advice that they were given. The study by Turner which assessed the costs and benefits of using NHS Direct nurses to manage low urgency ambulance calls identified that service user acceptability was linked to the appropriateness of the advice and reassurance provided by the nurse advisor. This study also identified that one of the main reasons for service user dissatisfaction related to delays around the timeliness of care. This relates to the findings from interviews with staff in this study, which highlights the perceived value of reassurance and timeliness of response to service users. Research by Togher and colleagues also identifies the value of reassurance to ambulance service users. Interviews with ambulance services users who were not conveyed to hospital (including two interviewees who received telephone advice) identified that service users valued reassurance, a short wait for help and that staff professionalism and communication helped to promote reassurance and confidence in the ambulance service response. Feeling listened to was identified as particularly important for service users who received telephone advice. The two interviews with service users receiving telephone advice only showed a mixed response, with one interviewee describing that a telephone advice response instead of an ambulance response was "exactly what he recommended was the best course of action for me" whereas the other service user interviewee described their experience as "disgusting." The responses to telephone advice described in the study by Togher are indicative of the service provider perceptions of the acceptability of telephone advice to service users identified in this study. In the study by Booker, which considered how service users understand the purpose of ambulance care, Booker identified that where the caller is calling on behalf of someone else, that this creates a 'specific anxiety' (Booker et al 2019). This was one of the groups of callers who some interviewees in this study identified as sometimes requiring more reassurance (other groups were parents of young children, elderly callers, people who call frequently, mental health callers, call relating to falls and highly anxious callers). Identifying typologies of service users that may require more reassurance may

help to improve the telephone advice experience and the acceptability of telephone advice for these groups of service users.

6.4.9. *Strengths and limitations*

6.4.9.1. Strengths

A key strength of this study was to use interviews with multiple types of staff involved in the delivery of ambulance telephone advice to explore safety, appropriateness and provider perceptions of service user acceptability from different staff groups and at different stages in the telephone advice pathway. This enabled a detailed and thorough understanding of the telephone advice pathway and exploration of safety, appropriateness, including identifying how telephone advice is made safe at service, team and individual levels and challenges to appropriateness. There is a dearth of research involving ambulance staff in relation to exploring these issues therefore the findings from this research are important and unique.

As the introduction of mental health nurses to the ambulance service telephone advice service is a relatively new development, there has been very little evaluation and research of their role in the ambulance service, except for a pilot study that did not specifically examine the safety and appropriateness of care delivered by mental health nurses (Irving et al. 2016). Therefore, this is the first time that the safety and appropriateness of the mental health Clinical Advisor role has been explored.

Interviews were undertaken with a wide range of staff interviewed who are involved in delivering the clinical advice service. As this is part of a PhD study this meant that I was responsible for all of the interviews and this gave a consistency to the interviews and the research process. The interviews were in-depth, with many lasting at least one hour meaning that the telephone advice process and focus of safety, appropriateness and perceived acceptability were fully explored, and the use of semi-structured interviews aided this process. Findings were discussed and reviewed with the supervisory team at regular intervals.

6.4.9.2. Limitations

There were four main limitations of this research.

i. Whilst a strength of this research is that I was able to recruit 16 interviews during a period of national lockdown, the sample size is also a limitation as 16 interviews may not be enough to reach data saturation (Baker et al. 2012). During the later interviews I was hearing very similar accounts and experiences from interviewees and therefore saturation was achieved at some level. However, there were some groups of staff where it was not possible to recruit participants or where I recruited few participants. For example, it was not possible to recruit a GP or a midwife. The difficulty in recruiting some of the clinical advice staff groups was due to the small number of staff undertaking this role in the ambulance service. For example, there were a total of 5 mental health nurse clinical advisors at EMAS at the time of the research and even fewer midwifes and GPs. This made recruitment of some clinical groups much harder than recruitment of Call Takers, of which there are many

The approach to sample size taken in this study is in-keeping with the findings of the National Centre for Research Methods Review paper, which sought to use expert voices and early career reflections to identify how many qualitative interviews is enough? and identifies the answer to this question is 'it depends' (Baker et al. 2012). This is because considerations other than data saturation, such as methodological, pragmatic and epistemological considerations are important when determining the sample size for a research study. Whilst data saturation is one factor in determine sample size, Alan Bryman notes this is a methodologically difficult approach to sampling:

> *"Such an approach to sampling is very demanding because it forces the researcher to combine sampling, data collection, and data analysis, rather than treating them as separate stages in a linear process. It also means that the researcher cannot possibly know at the outset how many cases he or she will need to collect data from, which causes problems when trying to formulate a research proposal or plan or when creating a budget. It is probably this pressure on the researcher that results in the common observation that saturation is often claimed when there is little evidence that it has been employed as a criterion for deciding when to stop sampling" (Bryman 2012)*

In the case of this research, the sample was drawn from a relatively homogenous group, as the research was being undertaken at one ambulance service and included staff who were all involved in the delivery of one type of service process to a specific sub-group of service users. Guest and colleagues identified that twelve interviews are satisfactory when undertaking thematic analysis within a homogenous sample and reported that between 88% and 92% of codes are identified after 12 interviews (Guest et al. 2006). The research took place in one ambulance service. Whilst this allows for a deeper analysis and understanding of one ambulance service, this limits the generalisability of the research to other ambulances services, especially those that use different triage methods.

ii. There were practical limitations and challenges associated with undertaking interviews by telephone and through Google meet. Virtual meeting technology represents an opportunity in qualitative interviews for remote interviews to be a more personalised experience with greater rapport and visual cues than is accessible through telephone interviews (Archibald et al. 2019). The choice of virtual meeting platform was restricted to Google meet due to University Information Governance policies and protocols and unfortunately Google meet was not a reliable option for the interviewees in this study. However, this method is one which has clear benefits and where possible will be used in these types of interviews in the future. Whilst telephone interviews provider greater flexibility for the participant and the interviewee, the lack of face-to-face contact may affect the rapport between the interviewer and the interviewee and using telephone interviews can lead to distractions for the interview process. For example, in undertaking interviews at their home, several interviewees had to answer the door during the course of the interview and two interviewees had young children present.

iii. Patient acceptability was based on service provider perceptions of service user acceptability and the reactions that staff observe service users having to telephone advice and not

receiving an ambulance. It is possible that staff have clearer memories of more extreme reactions and that some reports of perceived acceptability are misrepresented.

iv. Due to the change of research plan and the subsequent fast pace at which the research was undertaken, it was not practical to obtain wider PPI input to the development of the interview themes. However, findings of the research were shared and discussed with the Sheffield Emergency Care Forum (SECF).

6.4.9.3. Research quality

Qualitative research has previously been criticised for inconsistent or poor assessment of research quality when compared to more quantitative research methods (Leung 2015). Different methods of assessing the quality of qualitative research have been put forward, including methodological quality checklists (Dixon-Woods et al. 2004) and methods for assessing the quality of the interpretation of findings and results (Lincoln and Guba 2011 p97-128). As well as criteria-based assessments of qualitative research quality, qualitative research can also be assessed in terms of validity, reliability and generalisability or transferability (Leung 2015) but these terms often have different meaning and applications to how they are used quantitative research.

Validity relates to the appropriateness of the research approach, methods, data collection tools and data in answering the research question. For example, the appropriateness of the sampling method or of the data analysis method. To ensure that the validity of the research is transparent within this thesis, each decision to use a specific method, tool or technique was justified and recorded in a methodological log, with the aim of being transparent and honest about the reasoning behind the decision process. Whether the chosen methodological and research processes impact on the study results or findings, for example researcher bias, has been reflected on during the course of the research.

There is some overlap between reliability and validity as both reliability and validity relate to the overall scientific rigour of the research method and the research process. Reliability is primarily concerned with the consistency, transparency and justification of decisions. Particular stages of the qualitative research process are more vulnerable to inconsistency, especially if done as a lone researcher process, for example coding. The process of coding qualitative interview data was done solely by the PhD researcher as there were no funds to support dual coding or involvement of additional coders. The themes of safety, appropriateness and acceptability were generated deductively based on the focus of the PhD, and this was used to shape the coding process and the inductive development of sub-themes. However, an inductive approach to developing the sub-themes was used and this meant that the sub-themes are generated from and relate strongly to the interview data (Boyatzis 1998; Nowell et al. 2017)) and not my preconceived ideas of safety, approropriateness and acceptability. An inductive approach to the development of sub-themes is thought to generate a richer description of the data with findings directly related to what the interviewees felt was important (Braun et al. 2006). To enhance the reliability of the coding process some transcripts were also read by PhD supervisors and also peer reviewed by a researcher external to the PhD, and the

coding framework and its application discussed. This approach was useful as I was able to check the interpretations and meaning that I was identifying from the data and also helped to aid the consistency and transparency of the coding process.

Transferability relates to whether the findings from the research are transferable to other individuals or settings outside the original sample for data collection. This research was undertaken in one ambulance service and this is justified based on it being the same ambulance service where I obtained the data to create the routine dataset. However, there are factors which support and impede the transferability of this research to other settings. For example, the triage software used by different ambulance services. Half of English ambulance services use NHS Pathways as the triage software used by call takers and half of English ambulance service use AMPDS [AMPDS]. There are differences in the triage software which impact on the use and level of clinical telephone advice. For example, with the Pathways System the Call Taker undertakes a more detailed triage and will signpost more calls to other services without the need for a call back from a clinician. This means that the research findings have less transferability to ambulance services which use the NHS Pathways triage system. However, because of AMPDS's international use, there is potential for transferability of findings to international settings.

6.4.9.4. Reflexivity

A potential criticism of qualitative research relates to the collection, coding, analysis and interpretation of data, in that different researchers may approach these in different ways and draw different conclusions. In order to address this, a reflexive account of the researcher's own values and experiences along with identification of the researcher's personal biases is needed so that there is an openness about this information and the possibility of these factors influencing the interpretation of the results. This is particularly important in a research process such as the PhD research process, where the research process is primarily conducted by a single researcher. Therefore, the following section aims to understand how my own beliefs, judgements and previous experience may have influenced the research and the interpretation of the interview data. Creswell identifies three key areas that should be covered in an assessment of reflexivity: the background of the researcher; the potential impact of the researcher's background and characteristics on the research findings; and a consideration of how the results of the study are perceived by the research participants and the readers of the research (Creswell 2016 p.38-46)).

6.4.9.5. Researcher background

My interest in this research area is drawn from my own experiences as a health service researcher. Since 2007 I have specialised in undertaking research in urgent, emergency and prehospital settings, with much of this research taking place in urgent and ambulance settings and reviewing the evidence for or undertaking research related to telephone advice. Prior to this my research focus was on quality of care and patient safety, therefore this PhD study combines my key research interests. Whilst I am an outsider to the research setting of the ambulance, as I am neither clinically trained or employed by the ambulance service, my previous research experience and the findings of my previous research mean that I come to this research with my own views about the potential safety, appropriateness and acceptability of ambulance telephone advice. I have used these views to develop the research questions through knowledge of gaps in the evidence base. Whilst the analysis of the

interviews used a deductive approach for the three themes of safety, appropriateness and acceptability, an inductive approach to the development of the sub-themes was used and these were discussed, revised and tested with other researchers, which included PhD supervisors and a researcher external to the research process.

My knowledge and training in research methodology and qualitative interviews was obtained from undertaking an MSc in Health Services Research and Technology Assessment and an in-depth one-week course in semi-structured interviewing at the National Centre for Social Research, alongside my years of experience as a health services researcher. During my research career I have been involved in several large mixed-method studies with qualitative interview components and complex triangulation and integration sections (O'Cathain et al. 2018; O'Cathain et al. 2019). My personal experience of undertaking qualitative interviews is with patients with chronic conditions (Dean et al. 2007), with urgent care providers (O'Cathain et al. 2009) and as an analyst of qualitative interview data in study involving Medical Examiners and Coronial staff (O'Hara et al. 2021).

6.4.9.6. Impact on the research process and findings

From my previous research about ambulances services and through the early parts of my PhD, I had learnt a lot about telephone advice and I wanted to explore this during the interviews. However, I also wanted to give participants the freedom to talk about what mattered to them. I was aware of this during the interviews and sometimes drew back from the interview topic guide to allow participants to fully have their say. Sometimes this resulted in the interviewee talking more broadly about other types of ambulance response, particularly for the call taker interviews where they regularly handle multiple different types of call and call urgencies. This process was useful in developing the rapport between myself and the interviewee and was also useful contextually and in comparing their views of safety, appropriateness and acceptability of telephone advice with other types of ambulance response. I kept a note book of experiences and reflexive comments during the interview process, and it was during the interviews that I came to understand and know more about the telephone advice process from the perspective of someone involved in delivering telephone advice than as an outsider whose knowledge was primarily based on published literature, and this realisation was a turning point in the analysis.

6.4.9.7. Impact on research participants and wider community

During the interviews I perceived that interviewees, particularly the Call Takers, really valued being asked for their views about the safety, appropriateness and their perceptions of the acceptability of telephone advice. I gained a sense that some interviewees would like to share and input their views within the ambulance service, such as in the development and testing of changes to call scripts and that for some interviewees it was the first time they had been asked for their views of the ambulance service by an external party. Some of the interviews were quite long, in excess of one hour, and particularly in these interviews I perceived that the interview process was cathartic for the interviewee in terms of giving them an opportunity to reflect on their experiences of working in the ambulance service and providing telephone advice. Interviewees often said to me that they had never really thought about these subjects before, or realised how much they did, or how much knowledge they had. Only one interviewee asked whether I was clinically trained. I did not feel this was asked in a negative way as I perceived it was done so the interviewee would know the level of description they

would need to give about a particular issue. Nearly all of the interview participants expressed an interest in finding out more about the results of the study and in reading any publications or reports and seemed to view the research positively. Some interviewees were also interested in finding out other research that I had undertaken in relation to the ambulance service.

Changes in the research plan due to Covid-19 meant that this component of research was been undertaken in a short timeframe. Therefore, there has been little opportunity to discuss findings with participants or to share findings with the wider ambulance and research community and any discussion of the wider community views of the research is speculative. The research could provide ambulance services with a clearer idea of the challenges related to telephone advice, what works well to make telephone advice safe and appropriate and how it could be made safer and more appropriate. These findings and also the staff experiences of dealing with difficult and challenging calls could also be used to help training. I plan to share and discuss the findings with the ambulance service and PPI prior to publishing a paper.

6.4.10. *Conclusion*

The analysis of the interviews identified key insight into the safety, appropriateness and acceptability of telephone advice. Interviews with service providers identified multiple different mechanisms at service, team and individual levels that are used to ensure safety, but that long waits for telephone advice call backs can sometimes affect the timeliness of care. Service provider interviews also identified that telephone advice is mostly seen as appropriate by service providers, as it provides the necessary level of care to treat the patient's health problem or advises patients to seek a more appropriate alternative care pathway. Some Call Takers and Clinical Advisors felt that it is inappropriate for non-mental health trained staff to handle mental health calls and these can be very challenging and upsetting calls for ambulance staff to deal with. Service provider perceptions of user acceptability identified mixed service user reactions to receiving telephone advice and that service user acceptability is based on expectations around receiving an ambulance, the reassurance that service users get from the call being triaged as low urgency and from speaking to a Clinical Advisor and length of time to receive a clinical call back.

7 Chapter 7 Triangulation of key findings from the study

7.1. Summary

This chapter uses an adapted triangulation protocol to bring together and compare the findings from the different components of this mixed methods study. The key findings from each of the methods are compared and contrasted for each of the study concepts of safety, appropriateness and acceptability. The findings are assessed for convergence, complementarity, divergence or silence and summarised using a meta-inference for each of the concepts.

7.2. Background

7.2.1. *What is triangulation?*

Triangulation is an important aspect of mixed methods research. Using a triangulation helps to integrate the findings from different components of research that relate to the same construct or outcome. In this way it leads to what is sometimes referred to as a 'multidimensional understanding' of the research question (Farmer et al. 2006). The aim of triangulation is to explore the findings from different components of research or methods in terms of their convergence, whether the findings are complementary (that is, one set of findings might explain or illuminate another set) or whether there is dissonance between the findings (Erzerberger et al. 1997 p141-154; Lincoln and Guba 1985). If the same or complementary findings are identified through research using different methods, this can increase the credibility, dependability and overall strength of the study findings (Lincoln and Guba) 1985. Where dissonance or disagreement between the findings from different methods is identified, this can lead to further reflection on the possible bias within each of the research methods used to assess whether and how this has impacted on study findings, and it can also lead to more productive outcomes, such as understanding the different perspectives of different stakeholder groups, identifying areas for further research or new research questions and in generating a more "nuanced understanding" (Miles and Huberman 1994).

7.2.2. *Importance of triangulation in this study*

This study uses different methods to explore the safety, appropriateness and acceptability of ambulance telephone advice. These included quantitative, qualitative and systematic review methods. Whilst the findings of each research method are reported in their respective chapters in this thesis, there is an opportunity to develop a better understanding of safety, appropriateness and acceptability through integrating the findings from each of the different research methods and to develop what is sometimes termed as a 'meta-inference' (Tashakkori and Teddie 2010), where 'the whole is greater than the sum of its parts' (O'Cathain et al. 2010)

7.3. Aim

The aim was to integrate findings from the different methods used in this thesis using an adapted triangulation protocol.

7.4. Methods

Different methods of triangulation exist and the use of different methods of triangulation in prehospital research was the subject of a study by Johnson and colleagues (Johnson et al. 2017).

The Triangulation Protocol method is a pragmatic method that involves mapping the key evidence related to each construct or outcome from each method within a matrix and assessing the evidence in terms of convergence, complementarity divergence and silence. This is used to crystalise the different types of information into a meta-inference (Tashakkori and Teddie 2010) and to identify and report the overarching conclusions from the study as a whole.

An adapted version of the Triangulation Protocol was used in this study and this was based on the Triangulation Protocol developed by Farmer (Farmer 2006) and using my own knowledge of how this method has been applied in other ambulance service research (O'Cathain et al. 2010; O'Cathain et al 2019). Although the Triangulation Protocol was originally developed to support the integration of multi-method qualitative studies, this method has also been recommended and adapted within mixed method studies UEC research studies. For example, O'Cathain and colleagues used this approach to triangulate findings from two mixed method studies. The approach used by O'Cathain and colleagues was to create a matrix, whereby all of the findings from the different components of research in one study are displayed in a single table, and the extent to which they converge, complement, explain or diverge is considered and used to inform a meta-inference (O'Cathain et al 2018 O'Cathain et al. 2019).

An adapted Triangulation Protocol method was used to guide this process and the main steps in the process are summarised below (Farmer 2006; O'Cathain et al. 2010). Basing the triangulation method on a recognised process meant that triangulation was systematic and reduced the potential for bias in the triangulation process (Farmer 2006). I further adapted the triangulation protocol method to include a section in the matrix which considered the main limitations or bias within each of the study methods, as an assessment of limitations or bias may impact on the weight given to a particular finding when constructing a meta-inference.

Figure 29: Adapted Triangulation Protocol steps and their application in this thesis (Farmer 2006)

Triangulation protocol step	Related activity	Application in this PhD thesis
Step 1: Sorting	This involves sorting the findings from each method or data source into similar categories or segments that address the research question or specific components in the research question	In this thesis I mapped the findings from each of the different research methods into the categories of safety, appropriateness and acceptability.
Step 2: Convergence coding	In convergence coding the themes from each data source are firstly identified and then compared to assess the level of convergence. The convergence coding is based on the following: convergence, complementarity, divergence and silence.	This was achieved by developing a triangulation matrix and summarising the key findings relating to safety, appropriateness and acceptability and comparing the findings based on the four categories of assessment (agreement, partial agreement, silence and dissonance).
Step 3: Convergence assessment	An assessment of the level of convergence of the findings as a whole. Different researchers may have different views about the level of convergence of the findings and this should be documented.	In this thesis the convergence assessment was a two-stage process, which was firstly undertaken by the PhD researcher and then discussed with PhD supervisors.
Step 4: Completeness assessment	This is a comparison of the scope, source and method of each component. Differences in the methods, scope and sample. These findings are used to enhance the completeness of the whole findings.	In this thesis the completeness assessment was undertaken alongside step 2. Methodological factors and potential bias were included and identified in the triangulation matrix and were included as part of the reflective process of convergence assessment.
Step 5: Researcher comparison	The assessments of convergence and divergence can be undertaken separately by multiple researchers and then brought together to identify the final meta-inference. This process can allow for clarification of finding from different stakeholder viewpoints and to discuss the reasoning behind any potential disagreement.	In this thesis Step 5 was undertaken alongside step 3. It was not possible or practicable for PhD supervisors to conduct an individual assessment of the triangulation of each component, but their knowledge of the results of this thesis, researcher expertise and topic experience made them well placed to contribute to the assessment of

		convergence and the development of meta-inferences.
Step 6: Feedback	This final step involves feeding back the triangulated results to the stakeholders or the research team for their input, in terms of review and clarification.	In this thesis, this was undertaken by providing PhD supervisors with a full draft of the thesis and obtaining their views and feedback. Some of the individual method results were previously fed back to stakeholders.

Within this chapter, 5 different sources of data are assessed for each of the outcomes of safety, appropriateness and acceptability. These are

1. Review of the published literature and policy documents to identify definitions and outcomes related to the safety, appropriateness and acceptability of ambulance telephone advice
2. Systematic review of the published literature to identify the key evidence related to the safety, appropriateness and acceptability of ambulance telephone advice
3. Linkage and analysis of ambulance call and clinical advice routine patient level data (CAD-TAS dataset), to identify call and caller characteristics and clinical advice disposition
4. Linkage and analysis of ambulance call and clinical advice routine patient level data (CAD-TAS dataset) with subsequent event date related to ED, hospital admissions and mortality data (PhOEBE dataset) to identify whether patients had any subsequent health contacts or health outcomes after receiving ambulance telephone advice (using PhOEBE plus dataset)
5. Interviews with ambulance service staff involved in the telephone advice process to explore their views about the safety, appropriateness and acceptability of ambulance telephone advice

Key findings from each of the five study components were recorded in a matrix with rows of safety, appropriateness and acceptability. Within the triangulation matrix an additional row was included to reflect on the key limitations or bias from each of the study methods, as this may impact on the weight given to particular findings or a caveat within the final meta-inference.

7.5. Results

The completed matrix is reported in Figure 31.

7.5.1. *Safety*

Key findings in relation to safety were that it is viewed as an important outcome for the ambulance service but that it is often operationalised and measured in different ways by different studies. Few studies have defined safety in relation to ambulance telephone advice. Safety was defined in this PhD as timely and effective care that delivers more benefit than harm. Research related to the safety of ambulance telephone clinical advice is limited by small sample sizes, and these studies reported few adverse events but may not have been powered to detect adverse events in a low urgency population. This PhD has added to this weak evidence base by showing that hospital admissions rates within three days of a call ranged from 2.6% - 11.2% and deaths were rare. Interviews with staff helped to explain why telephone clinical advice was likely to be a safe thing to do, and the multiple

systems in place that help to make ambulance telephone advice safe at a service, team and individual level. However, there were problems in terms of some system levels issues potentially leaving cracks in the system that a small proportion of patients could fall through.

The meta-inference was telephone advice is likely to be safe, possibly because of the multiple methods used by ambulance services to ensure safety at a service, team and individual level.

7.5.2. *Appropriateness*

Key findings about appropriateness were that it is viewed as an important outcome for ambulance telephone advice services and policy makers, but that it was inconsistently measured. No studies reported a definition of appropriateness in relation to ambulance telephone advice. Appropriateness was defined in this PhD as care that is proportional to the health problem (necessary and sufficient). Previous research about the appropriateness of ambulance telephone advice identified the inconsistent measures and lack of comparability between different studies was problematic for understanding the appropriateness of telephone advice (Blank et al. 2012). This PhD has added to this poorly conceptualised and inconsistent evidence base by defining appropriateness and identifying that telephone advice in EMAS is likely to be appropriate for most patients with low urgency health problems (60% patients had no subsequent health contacts). However, ambulance recontacts ranged between 6.2% - 26.4% therefore in a small proportion of cases telephone advice may not have been sufficient to deal with the patient's health problem. Interviews with staff helped to understand that telephone advice is an appropriate way of handling lower urgency calls that come through to the ambulance service and that some types of more complex calls can be handled well with telephone advice, such as people who call frequently. However, interviewees perceived mental health calls as more challenging to handle with telephone advice, and in some cases, staff found them very upsetting and stressful calls to take. Introducing mental health nurse into the clinical advice system was perceived to increase the appropriateness of telephone advice for mental health calls.

The meta-inference is telephone advice is likely to be is appropriate for most low urgency calls; most calls did not have subsequent events and staff perceived that telephone advice is mostly an appropriate way of handling lower urgency calls, including some complex calls, such as frequent callers. However, mental health calls were perceived as challenging and best handled by specialist mental health clinicians.

7.5.3. *Acceptability*

Key findings about acceptability were that there was little direct evidence about acceptability, with most previous research focussing on components of acceptability, with previous studies focussing on satisfaction and policy documents focussing on the importance of patient experience but without reporting much data. Acceptability was not defined in the published literature and satisfaction, whilst commonly reported, was poorly defined and inconsistently measured. Acceptability was defined in this thesis as: the patient's views on the safety and appropriateness of care and their care experience. This PhD has added to the limited evidence base around acceptability of ambulance telephone advice through defining acceptability and through exploring service provider perceptions of service user acceptability. Whilst the analysis of routine ambulance call and clinical advice data was not intended to identify service user views of acceptability, through analysing the routine data text notes made by Clinical Advisors and Call Takers at the time of the call, it was possible to identify a small number of

callers who did not find telephone advice acceptable and who terminated the call or were angry. Service provider perceptions of service user reactions to telephone advice were mixed. Service providers linked user acceptability to expectations around receiving an ambulance, their need for reassurance, and the length of time to receive a clinical call back. Some staff identified that negative service user reactions could lead to ambulance recontacts within a short time of the original call. Call Takers reported more negative service user reactions and also less scope to reassure callers whereas Clinical Advisors reported having more autonomy when dealing with calls.

The meta-inference is that service providers perceived mixed reactions to telephone advice and linked user acceptability to expectations around receiving an ambulance, the caller's need for reassurance, and the length of time to receive a telephone advice. Some staff identified that negative service user reactions could lead to ambulance recontacts within a short time of the original call and that call takers experience more negative reactions and also had less scope to reassure callers due to scripts.

7.5.4. *Conclusions*

Telephone advice in EMAS is likely to be safe and appropriate as most patients do not have subsequent health events, there are multiple methods used by ambulance services to ensure safety at a service, team and individual level and staff perceived that telephone advice is mostly a safe and appropriate way of handling lower urgency calls. However, mental health calls were perceived as challenging and best handled by specialist mental health clinicians. Service providers perceived mixed service user reactions to telephone advice and linked user acceptability to expectations around receiving an ambulance, the caller's need for reassurance, and the length of time to receive a telephone advice.

Figure 31 Triangulation matrix using adapted Triangulation Protocol

Research method	Review of definitions of safety appropriateness and acceptability in relation to ambulance telephone advice	Systematic review of UEC evidence base about telephone advice, focussing on ambulance service and safety, appropriateness and acceptability	CAD-TAS analysis (routine ambulance call and telephone advice linked dataset	PhoEBE plus dataset Linkage and analysis of routine data to assess to identify what health services patients contact after receiving telephone advice	Qualitative interviews with staff involved in the telephone advice process	**Convergence, complementarity, divergence and silence.**	**Meta-inference**
Safety	No uniform understanding of safety. Few studies define safety and had little relevance to ambulance telephone advice. Safety was defined for this PhD thesis as: timely and effective care that delivers more benefit than harm	In studies of ambulance telephone advice, studies with small sample sizes reported few adverse events. Subsequent hospital admissions rates were 3% - 25.3%. Deaths were not reported as an outcome measure. It was not possible to identify safety due to lack of evidence about deaths following	Not assessed in this dataset	Most patients did not have a subsequent health care event (1485/2521). 192 people had 3 types of health event within 3 days. Deaths were rare within 3 days 0.06% - 0.24. for every 1000 people who are given telephone advice only from the ambulance service, around one person will die within 3 days of the	Interviewees identified multiple different mechanisms that contributed to the safety of telephone advice, and these occurred at a service, team and individual level. Staff felt that clinical advice is usually a safe thing to do and individual safety incidents were rare. Sometimes there	Partial convergence in the findings from the systematic review and the rate of hospital admissions identified in this study. No convergence around death data not reported in other studies. Convergence with PhOEBE plus and the interviews in that safety incidents are rare. The interview data	Telephone advice is likely to be safe, possibly because of the multiple methods used by ambulance services to ensure safety at a service, team and individual level

		telephone advice and variation in hospital admissions.		telephone advice call. Hospital admissions higher, 2.6 – 11.2%. Possible that some patients were undertriaged.	are long waits for a clinical call back. Even with more challenging calls such as mental health, staff described these were rarely raised for a Cat 1 response. Safety issues mainly related to potential gaps in system safety (under triage of some conditions, long waits for clinical advice and the extent to which the caller is reassured.	offered more contextual information about the safety challenges, concerns and methods in place to counter, these and gave more insight into safety overall.	
Appropriateness	Appropriateness was not defined in the literature despite being a widely used term. Appropriateness is defined in this	Different time frames were used to report ED attendance which makes comparisons challenging. There was a wide range of	Only 9.3% patients received clinical advice to seek ED care. Most patients were advised to self-care (21.4%) or to seek in-hours GP	Between 7.6% - 32.2% of patients recontacted the ambulance service. ED attendance rate was between 6.2% - 26.4%. Assessing	Perceived as mostly appropriate by service providers and a good method for handling some	Partial convergence with routine ambulance analysis and interviews. Complex calls were identified in the analysis of routine	Telephone advice is likely to be is appropriate for most low urgency calls because most calls did not have subsequent events

	thesis as: care that is proportional to the health problem (necessary and sufficient).	subsequent ED attendances 20% - 63.4%. Rate of return for an ambulance response was 8% - 69%. Inconclusive evidence around the appropriateness of ED attendances. Issues with data quality make it difficult to conclude appropriateness.	care (27.6). Type of advice given differed by age group. Clinical Advice disposition was comparable with rates identified from Review 2. Frequent callers and mental health calls were mostly referred back to their GP. 26% calls were identified as potentially complex calls which may be difficult to handle over the telephone	compliance with advice was difficult due to missing data. Most ED attendances (>80%) were assessed as appropriate and there was little difference in the appropriateness of attendances of patients that were advised to seek ED care and those that were not.	complex calls e.g. frequent callers. Mental health calls are challenging and potentially upsetting calls to handle over the phone but introducing mental health nurse has increased the appropriateness of TA. Call takers feel it is not appropriate for them to be on the call with mental health patients for extended periods of time.	data as accounting for over ¼ of calls and in the interviews as potentially more challenging. Interviews identified that service improvements are continually being introduced to improve appropriateness of complex calls. Partial convergence with systematic review findings of ED attendance rates. Divergence with the appropriateness of ED attendance as planned attenders similar appropriateness to unplanned but could be due to this study sample. Not	and staff perceived that telephone advice is mostly an appropriate way of handling lower urgency calls, including some complex calls, such as frequent callers. However, mental health calls were perceived as challenging and best handled by specialist mental health clinicians.

						possible to fully assess compliance due to missing data.	
Acceptability	Acceptability was rarely defined or measured. Acceptability was defined in this thesis as: the patient's views on the safety and appropriateness of care and their care experience	Patient satisfaction most commonly measured but poorly defined and inconsistently measured. Paucity of information specifically considering acceptability. Most patients were satisfied with advice but some did not have expectations met and were not reassured. Compliance with advice ranged from 60% - 95%. Limited evidence on which to conclude acceptability and most focused on satisfaction. More	Most patients are calling because they are in pain. Some patients identified in the CAD-TAS data terminated the call or were angry, or who did not want an ambulance.	Over 50% of patients did not comply with advice to attend ED.	Staff described mixed caller reactions to telephone advice and perceived that callers have a negative response to TA when the response does not meet the patient's expectations, they are not reassured or there is a long wait for TA. Staff report that some callers feel that not sending an ambulance is not safe. Acceptability is increased where the patient/caller is reassured and their expectations are	Service providers perceived mixed reactions to telephone advice. Some evidence of poor tolerance and acceptability of telephone advice in the CAD-TAS data and potentially from the low ED compliance rate. Further reports of caller negativity identified from interviews and is related to the caller's perception of the emergency, their expectations around receiving an ambulance. Reassurance was a factor in increased acceptability and	Service providers perceived mixed reactions to telephone advice and linked user acceptability to expectations around receiving an ambulance, the caller's need for reassurance, and the length of time to receive a telephone advice. Some staff identified that negative service user reactions could lead to ambulance recontacts within a short time of the original call and that call takers experience more negative reactions

		evidence in UEC settings that points towards acceptability.			met. Call takers experience more negative reactions and had less scope to reassure callers due to scripts.	clinical advisors had more scope than call handlers to provide reassurance due to clinical autonomy.	and also had less scope to reassure callers due to scripts.
Main limitations of research method		Comparing different studies is difficult due to poorly defined conceptual outcomes, variation in study methods and varied inclusion criteria e.g. some studies only included in-hours calls, Studies used different timepoints for measuring outcomes. Data around compliance is of low quality	Sample relates to a population of users who have other experiences of contacting the ambulance service and therefore may represent patients who are older and sicker than the general population.	Sample relates to a population of users who have other experiences of contacting the ambulance service and therefore may represent patients who are older and sicker than the general population. Therefore event rates are reported as a minimum and maximum range based on a sensitivity analysis. An assessment of compliance with ambulance	Findings are from 16 interviews from one ambulance service.		

				telephone advice to attend ED could not be undertaken on all patients as clinical advice data was missing for ¼ of patients.			

8 Chapter 8 Discussion

8.1. Summary

The aim of this thesis was to explore the safety, appropriateness and acceptability of ambulance telephone advice. A narrative review was firstly undertaken to understand what is meant by safety, appropriateness and acceptability and to develop definitions for use in this thesis. These definitions are used as the basis for reporting the safety, appropriateness and acceptability of ambulance telephone advice, by assessing the findings from the analyses of linked data and the interviews, and the triangulated findings from the study as a whole, against the definitions of safety, appropriateness and acceptability.

A discussion section was reported for each of the different chapters of this thesis. In this chapter, the overarching findings from the study are summarised and the discussion addresses the whole study by placing it in the context of other research, considering its strengths and limitations, considering the impact of the research and identifying implications for policy and future research.

8.2. Main findings

The main findings from this research relate to the study focus of safety, appropriateness and acceptability of ambulance telephone advice.

This study has identified that it is likely that telephone advice is safe, based on the definition of safety as timely and effective care that delivers more benefit than harm and that the level of benefit outweighs any potential level of harm. Most patients did not have a subsequent health event (ED, hospital admission or death). Low rates of potential harms were identified from a sensitivity analysis of routine linked data, which identifies subsequent event rates of between 2.6% – 11.2%. for hospital admissions and 0.06%– 0.24% deaths within 3 days of receiving telephone advice. Interviews with service providers identified multiple different mechanisms at service, team and individual levels that are used to ensure safety, but that long waits for telephone advice call backs can sometimes affect the timeliness of care.

Ambulance telephone advice was mostly identified as likely to be appropriate based on the definition developed for this thesis of telephone advice being proportional to the health needs of calls that are triaged as low urgency and that it provides advice or leads to care that is both necessary and sufficient. Routine linked data analysis identified that 60% of patients had no subsequent health contacts (ED, Hospital admission, death) in the 3 days after receiving telephone advice (n = 1485/2521). However, a sensitivity analysis identified that ambulance recontacts ranged between 7.6% - 32.2% and ED attendances ranged between 6.2% - 26.4%, therefore, in a minority of cases, telephone advice may not always be sufficient to deal with the patient's health problem. Service provider interviews identified that telephone advice is mostly seen as appropriate by service providers, as it provides the necessary level of care to treat the patient's health problem or advises patients to seek a more appropriate alternative care pathway. Interviews with service providers identified that some call takers and clinical advisors feel it is inappropriate for non-mental health trained staff to handle mental health calls and these can be very challenging and upsetting calls for

ambulance staff to deal with. Service providers (Call Takers and Clinical Advisors) perceived mental health calls were best handled by specialist mental health clinicians.

Service providers perceptions of service user acceptability of telephone advice were mixed, in terms of service user views of the appropriateness of telephone advice and service user experiences of the telephone advice care pathway. Service providers linked user acceptability to expectations around receiving an ambulance, the extent to which the caller is reassured and length of time to receive a clinical call back, and some staff identified that negative service user reactions can lead to ambulance recontacts within a short time of the original call. Call handlers reported more negative service user reactions and also less scope to reassure callers whereas Clinical Advisors reported having more autonomy when dealing with calls.

8.2.1. *Results In the context of other research*

Other research has been considered in the discussion sections of the different chapters and the results are compared to the findings from the most relevant other research in this section. An important consideration is that it is 25 years since the recommendation that other methods of managing low urgency ambulance calls should be developed (Chapman 1996), and that most of the UK evidence base is relatively old. The UK existing evidence base related to the feasibility ambulance telephone advice, the evidence on its safety, appropriateness and acceptability is more limited. A key issue is the lack of comparability of findings from different studies, due to the individual approaches that different studies take and the variation in study inclusion criteria and reporting that this causes. For example, using different time measures to measure events, individual studies focus on specific patient groups or exclude key groups of service users, such as OOH. However, there are several key research papers that are important and relevant to consider in relation to the main findings from this study, and these can be split into two key groups of research. Comparison with UK literature is important due to their contextual relevance and because the telephone advice service is directly comparable with this study. The group of Australian studies by Eastwood and colleagues are also highly relevance due the outcomes considered and also because outside of this study, the studies by Eastwood and colleagues was the main research into ambulance telephone advice that uses linked data.

The systematic review of evidence of safety, appropriateness and acceptability identified poor understanding of the health services that patients seek following telephone advice, and of patient outcomes, with much of the data relating to what patient's do next collected from follow up surveys with service users. Consequently, there is a research gap as there are no UK studies that use linked health data to explore the safety and appropriateness of ambulance telephone advice, and little knowledge of the health services that patients contact after receiving telephone advice and subsequent patient outcomes. Without this information it is challenging to assess the safety and appropriateness of telephone advice. Furthermore, acceptability is rarely reported in relation to an ambulance setting and understanding the factors that lead to service user acceptability are important for policy makers, service providers and service users.

8.2.1.1. Early research into ambulance telephone advice

Much of the early research into ambulance telephone advice was UK based, such as the studies by Dale and by Turner (Dale et al. 2003; Turner et al 2006). Both of these studies used a randomised study design and both studies identified higher than expected number of calls returned for an ambulance response (48% and 66.9% respectively). This impacts the analysis of safety, appropriateness and acceptability of calls that are closed with advice as there were fewer of these outcomes in the sample population for these studies, with the study by Turner reporting that the number of calls managed by telephone advice was small (Turner et al. 2006). Since these studies were published, the proportion of calls closed with telephone advice has increased from 3% to an average of 8% all calls across the 11 English ambulance trusts (O'Cathain et al. 2018) and the proportion of calls closed with advice is nationally measured as an AQI. Therefore, the service context at the time of which the studies conducted by Dale and by Turner took place was very different to that in this thesis. The study by Dale concluded that telephone advice may be safe, but that a larger study would be beneficial so as to include rare adverse events. Whilst this thesis research was not powered to detect adverse events, it does examine the safety of telephone advice for a larger group of patients using routine data. Furthermore, routine data systems were not available at the time of the studies by Dale and by Turner, meaning that follow up data about the services patients' accessed after receiving telephone advice was primarily obtained via user surveys and these tended to have a low response rate. Consequently, there is a research gap as there are no UK studies that use linked health data to explore the safety and appropriateness of ambulance telephone advice, and little knowledge of the health services that patients contact after receiving telephone advice and subsequent patient outcomes

8.2.1.2. Comparison of findings with other research

No previous research relating to ambulance telephone advice conceptualised or defined what was meant by safety, appropriateness or acceptability. In terms of safety, it was not possible to fully identify the safety of ambulance telephone advice from previous research as there was not enough evidence from linked data systems about what happens to patients following telephone advice, particularly in a UK setting, and only one study reported deaths and this was only for calls that were returned for an ambulance response (Katayama et al. 2020). There was variation in the rate of subsequent hospital admissions in the eight studies that reported this outcome (Table 9 Hospital admissions after telephone advice page 64), ranging from <0.3% - 25.3%. However, there is significant uncertainty about these findings due to the very different and study specific populations that were included and the varying timeframes at which outcomes were reported. This PhD has added to this weak evidence base by showing that hospital admissions rates within three days of a call ranged from 2.6% - 11.2% and deaths were rare. The data linkage results in the PhOEBE dataset mean that the patients included in this study are likely to be sicker and older than the general population. As the findings from this study are more towards the lower range reported by other studies, this is encouraging in terms of safety.

Comparing ED attendance rates with other studies was particularly challenging. Only four studies reported this information and each used different methods of reporting this information. This resulted in a wide range of subsequent ED attendances 20% - 63.4% (Dale et al. 2004; Vincent et al.

2019; Spangler 2018; Eastwood et al. 2016). This PhD has added to this poorly conceptualised and inconsistent evidence base by defining appropriateness and identifying that telephone advice in EMAS is likely to be appropriate for most patients with low urgency health problems (60% patients had no subsequent health contacts). However, ambulance recontacts ranged between 6.2% - 26.4% therefore in a small proportion of cases telephone advice may not have been sufficient to deal with the patient's health problem. As well as the limitations with the existing evidence base, the rates identified in this study may be different due to the differences in the ways the information is reported, country specific and service specific differences and different triage software.

There is limited evidence from other studies around acceptability in ambulance telephone advice particularly in regard to patient's views on its safety and appropriateness. There is more UEC evidence, which points towards telephone advice being acceptable in UEC settings. However, in both settings evidence was of low quality and mainly focused on satisfaction.

8.2.1.2.1 Understanding service user service choice

Studies which have explored the reasons why patients chose high urgency health care for low urgency health problems also have some relevance here. Understanding the views and decision-making process of service users is important and recent studies have identified that service users chose which service to use based on a wide range of factors that can differ by population sub-group. These include social circumstances such as parental anxiety, the impact of stressful lives on decision making or the need to have a quick resolution to a health problem in order to attend to family and work responsibilities, anxiety around seeking care for someone else, as well as the more widely known reasons such as access to GP services or learnt behaviour from previous health experiences or advice from families (O'Cathain et al. 2019; Booker et al. 2019). A high proportion of calls in this thesis were related to pain, and this may create a specific anxiety for service users. Understanding the factors that drive service users to contact the ambulance service may help to inform the growth of the ambulance telephone advice service and to meet the needs of the population. For example, more mental health nurses in areas where there are high levels of mental health problems.

8.2.2. *Strengths*

There are several strengths to this study. One of the main strengths is that this study reports the first analysis of linked routine patient level data relating to subsequent health events and outcomes following ambulance telephone advice. By linking telephone advice data from English ambulance service users to subsequent ED, hospital admissions and death data, this gave the opportunity to identify unique insights and findings into the safety and appropriateness of ambulance telephone advice. It is important as previously the ambulance service had little or no understanding of what happens to patients who receive telephone advice once their call has been closed with advice. A second strength is one only few studies of ambulance staff views that includes Call Takers and managerial staff and is the only study that includes mental health Clinical Advisors, due to the newness of this role.

A third strength of this research lies in the use of a mixed methods approach. This has enabled a clearer understanding of the safety, appropriateness and acceptability of ambulance telephone advice than if quantitative or qualitative methods were used alone. The sequential approach to the study meant that new knowledge and findings helped to inform and to guide the following research

components (Morse 2003 p190). This meant that findings from the linked data analysis could be used to inform the interviews with staff. However, there was also a reciprocal effect as the interviews with staff provided more understanding and context to the findings from the linked data analysis. The mixed methods approach also allowed the exploration of the safety, appropriateness and acceptability in different ways and from different perspectives. Interviews with staff generated a rich and detailed understanding of all stages of the telephone advice process, of staff perceptions of the different mechanisms that work together to enhance the safety of telephone advice, staff views on appropriateness and their perceptions of service user acceptability. The routine data analysis provided the opportunity to explore the care pathway and outcomes for patients who received telephone advice and to undertake this analysis on a large sample of service users. Therefore, as well as reporting a meta-inference relating to the study as a whole, the individual chapters also contain important, publishable findings.

A fourth strength lies in the use of, a pragmatic approach. The strength of the pragmatic approach is that it is a flexible approach that is based around 'what works,' (Dewey 2008) it is well suited to research in real world clinical settings through developing clinical and policy relevant research questions and can be easily understood by the intended audience of the research due to not being overly theory driven. Due to the changes that were made to the original protocol, with the planned user survey being replaced by interviews with staff, the pragmatic approach was helpful in making these changes and undertaking research that was both achievable, useful and understandable in the real world.

The interview findings show that the telephone advice process and system is still evolving and developing, with the implementation systems that widen the scope of calls referred to Clinical Advisors and through the inclusion of specialist clinical staff in the CAT. Therefore, this study was timely as it generates evidence that is useful to ambulance services as they continue to develop their telephone advice service.

The perspective of ambulance staff who are involved in the telephone advice process was obtained through the interviews with these staff.

8.2.3. *Limitations*

Limitations have been reported in the strengths and limitations sections of their respective chapters. This section reports the key limitations may impact on the overall findings.

8.2.3.1. Primary data about acceptability and the impact of Covid-19

Due to covid-19 related changes to the research protocol, it was not possible to obtain primary data about service users' views about the acceptability of telephone advice. This was both for practical reasons around the running of a patient survey by the study ambulance service during a pandemic and also that it is possible that service users' views of the acceptability of telephone advice may have changed because of the pandemic. Social distancing and worries relating to face-to-face health contacts meant that during the pandemic there was a drop in ED attendances and the pandemic may have caused service users to be more accepting of telephone advice than they were in a non-pandemic situation. Therefore, this would introduce bias into the analysis of service user views of acceptability. Instead, a different approach was used to obtain views of staff involved in the

telephone advice process about the safety, appropriateness and perceived acceptability of ambulance telephone advice. Whilst perceived acceptability does not capture individual service user views it does capture experiences of clinical staff who have often provided advice to thousands to service users.

8.2.3.2. Generalisability

Due to processes outside the control of this PhD study, the linked data used within this study only included one ambulance service. Similarly, the interview data was obtained from the same ambulance service as the linked data to aid the integration of finings. This may limit the generalisability of the study findings, particularly as in England, different ambulance services use different types of triage systems and telephone advice processes. Two different ambulance triage systems are used in England and this study included routine data from an ambulance service that uses the AMPDS triage system. Approximately half of English ambulances use this system. Therefore, the study results may be less applicable to ambulance services that use the NHS Pathways triage system and highlights the importance of understanding the differences in service configuration when looking at safety, appropriateness and acceptability across different services. One of the key differences between the two triage systems is that the NHS Pathways system routes fewer calls through to receive telephone advice from a clinician and closes more calls with advice from a call handler. It would be useful to assess the safety, appropriateness and acceptability of telephone advice in this different system configuration. Even though the findings from the study have some limitations in terms of their generalisability, they are still highly relevant to ambulance service providers and policy makers in England because they affect half the population. They are also of interest to other services that interact with the ambulance service, such as NHS 111 and hospital EDs. The research will also be relevant to other urgent care telephone advice providers due to the similarity of health problems that receive telephone advice from the ambulance service and urgent care health problems. Other countries which have similar ambulance telephone advice systems may be able to assess the similarity with their system when considering the findings and the implications for their own systems.

8.2.3.3. The timing of the different components of research and the evolving nature of telephone advice

The sequential nature of the study meant that the data sample for the linked data and the interviews with ambulance staff took place at different times, meaning that they are not directly comparable. This was further compounded by the difficulties in obtaining the linked data, which caused a delay to the study and further separated the timings of the different study components. Additional difficulties also affected the research timing and the resulting intersect of the sequential nature of the research, the difficulties obtaining the linked data, with the researcher's leave of absence and also Covid-19 means that there was a gap between undertaking the initial systematics reviews, the linked data research and analysis and the interviews with ambulance service staff involved in the telephone advice process of a number of years. It is possible that this has impacted on the results of the study, due to service changes that were implemented in the intervening time period. However, the benefit of undertaking the qualitative component as the last of the sequential studies is that any service changes can be explored and understood and the findings from the linked data interpreted in the context of how the service is now delivered.

The specific challenges associated with linking the different data sources together have been reported in chapters 4 and 6. It is important to note that developing better and more feasible methods of data linkage is still a health research priority, in particular the linkage of prehospital and urgent care with ED records (Swor et al. 2018). Whilst it was possible to update the systematic reviews with newly published findings, it was not possible to update the routine dataset with more recent data, due to the costs and logistical challenges that this brings. A key contextual change in the ambulance service is the linkage with GP data systems and the introduction of mental health nurses. As both are very recent changes, current routinely data from HES is not current enough to examine these changes. Another contextual change that was ongoing as part of a trial at the time of the interviews with staff, was research into expanding the role of the clinical advice team so that some Category 3 calls are triaged by a clinician prior to an ambulance being sent. This results in some calls that are originally triaged as higher urgency receiving telephone advice from a clinical advisor rather than an ambulance response. It would be useful to assess the impact of this on other services with routine linked data. These contextual service changes are important developments in the telephone advice system and service and this growth in service scope and investment in the ambulance telephone advice service demonstrates the continued importance of telephone advice within the ambulance service.

8.2.3.4. Impact of using data multiples sources of health data

Ambulance services have always had a focus on the measurement of time measures and much of their routinely collected data is timestamped to individual minutes and seconds. Other health services do not have the same focus on time as the ambulance service and therefore data can be reported at different time intervals that are relevant to different health services. Hospital admission data obtained from HES reports date of admission but does not report time of admission, whereas ED and ambulance data report time and date. To ensure that the results reported from this analysis are consistent across the different type of health events reported, all outcomes were reported in days rather than calculated using more exact hours. This consistent method of reporting is more easily understood by PPI and service users, but is less precise as it means that all subsequent health and outcome events are calculated and reported in a 24 hour time period and that day zero, the day at which the ambulance telephone advice contact is made, could be between 24 hours and 1 minute, depending on the time of day the telephone advice was given (e.g. 1 minute past midnight or 1 minute before midnight).

8.2.3.5. Undertaking research without a research team

The opportunities provided within a PhD to develop, lead, undertake and analyse the research and write up the findings are excellent for researcher development, but working as a one person team to deliver a multi-component mixed method study is challenging and at times would have benefited from a wider research team. The nature of a PhD means that the research is undertaken by one person, and this brings with it the limitation that the research and analysis could be affected by my personal views, previous experience and skillset. I attempted to offset this limitation through discussing the analysis and findings in detail with my supervisors and through involving and discussing the study with researchers who were external to the project, such as in the coding of the interview transcripts. A strength of this approach is that it can bring greater consistency to primary research, such as the interviews, as all of the interviews were conducted by myself.

8.2.3.6. Achieving saturation within the interviews

Saturation within qualitative interviews is brought about when the inclusion of additional interviews does not bring new findings or insights, and any further interview help to strengthen existing findings rather than add new evidence (Bryman 2012 p700). There was some evidence of saturation in the later interviews, and with the findings from the sub-group of Call Taker staff, with interviewees describing similar views and experiences. However, this was not enough to conclude that saturation was reached across all staff types and this was because there were some types of Clinical Advisor staff that I was unable to interview (GPs, Midwife) or where not many staff took part in the interviews (managerial, mental health).

8.2.4. Implications

8.2.4.1. What is a successful telephone advice call?

A successful telephone advice call was defined as in a recent health strategy document as

> *"A successfully completed call is one where advice has been given with any appropriate action being agreed with the patient and where no further response is required from the ambulance service. Appropriate action may include telephone advice and 'signposting' or referral to any appropriate service such as GP, Out of Hours Service, Urgent Treatment Centre (UTC), Pharmacy, NHS 111, CTA etc" (NHS England, 2018)*

The telephone advice AQI measures 'the proportion of calls closed with telephone advice or managed without transport to A& E where clinically appropriate' and therefore also only takes into account the impact on the ED if the ambulance service refers the call back for an ambulance response after telephone advice. Yet this study identifies that some patients have contacts with other health services after their ambulance contact. A successful ambulance telephone triage could be one which takes a UEC system view as there are other factors that point to whether ambulance telephone advice is a success, such as those related to safety, appropriateness and acceptability explored in this thesis. Therefore, future work could explore what a successfully completed ambulance telephone advice call is from an UEC system perspective.

This study takes a wider view of event rates and considers the wider impact on the UEC system, as well as ambulance recontacts, ED attendances, hospital admissions and deaths are also reported. These subsequent events can be used to report the safety and appropriateness of the telephone advice disposition. Better identification of patients who do not require ED care and can be safely and appropriately referred to alternative care pathways can improve the specificity of ambulance telephone advice. However, in order to routinely identify subsequent events, improvements in the quality of data used for linkage and a simplified and less resource intensive data linkage process are required, as the resource use in the data linkage process means real time data linkage is not feasible for patients whose call is closed with telephone advice. The identification of subsequent events could be further scrutinised to assess whether there are issues with safety and appropriateness of care and advice which can be learnt from. Even though only a small number of deaths were identified in this

study, they may benefit from further review and identification of learning. The use of the Structured Judgement Review method (SJR) (Hutchinson et al 2013) to review the quality of care of patients who died is now being used on a routine basis in ambulance patients as part of the national guidance on learning from deaths (NHS England National Quality Board.2016). However, without linked data it is not possible to know whether patients who received telephone advice have a mortality event unless this occurs within an ambulance setting and therefore mortality review of deaths shortly after telephone advice is not currently possible. More detailed investigation of each case would also be useful to further explore and understand appropriateness. Methods such as the use of expert panels used to review and assess individual cases are both time-consuming, resource intensive and not feasible for assessment of large numbers of cases. Using linked data to identify the cases that would most benefit further from review is a useful strategy in making best use of finite resources.

8.2.4.2. The growth of ambulance telephone advice

Telephone advice plays a key role in ambulance service demand management, as well as ensuring calls with low urgency health problems are handled appropriately. Demand for ambulance care has been consistently high for many years. Telephone advice is a method of demand management that can prevent inappropriate use of ambulance resources by dealing with low urgency calls through clinical telephone advice. Current policy in England is for patients to receive the most appropriate care closer to home, and telephone advice is a mechanism by which ambulance services can achieve this. Where telephone advice is identified as safe, appropriate and acceptable, this gives policy makers and service commissioners the potential for greater flexibility and scope in expanding the telephone advice service to deal with a wider population of service users or clinical conditions. The type of clinical advice given is usually to attend ED, contact OOH or the patient's own GP or to self-care. Very few cases were identified in the care records included in this study where the clinical advice was to seek pharmacy care. Further exploration of this a type of clinical advice may help to decrease the UEC system impact that telephone advice may have on referring patients to other forms of face-to-face care.

8.2.4.3. Face-to-face care and covid-19

There is sometimes a perception of poor access to face-to-face care, particularly GP care. The impact of the Covid-19 pandemic may have resulted in a change to the way in which service users prefer to access healthcare. This could lead to a growth in the use of telephone advice in all health areas and also to potential for other technologies, which may both aid that process and also increase the safety, appropriateness and acceptability of telephone advice. For example, increases in technology and smart phone ownership means that the use of video consultation technology, should be explored.

8.2.5. *Research impact and dissemination*

The findings from the linked data component were published in Prehospital Emergency Care Journal.

- Coster J, O'Cathain A, Jacques R, Crum A, Siriwardena N & Turner J (2019) Outcomes for patients who contact the emergency ambulance service and are not transported to the Emergency Department: a data linkage study. *Prehospital Emergency Care*, 1-27.

This paper led to the use of my PhD findings in NHS England policy, (Planning to safely reduce avoidable conveyance: Ambulance Improvement Programme. NHS England and NHS Improvement, July 2019, p9) which stated that

> *"Questions have been raised regarding the safety of non-conveyance initiatives and calls made for a robust evidence base that demonstrates patient safety. A further paper from Sheffield University: "Outcomes for Patients Who Contact the Emergency Ambulance Service and Are Not Transported to the Emergency Department: A Data Linkage Study" (2018), found that most non-transported patients receiving a "Hear and Treat" intervention from the ambulance service did not have subsequent health events related to their 999 call complaint."*

Further impact of this research was via social media. The paper has had 5566 views, 5 citations and an Altmetric rating of 76 (top 5% of all research outputs). The use of twitter to disseminate findings meant that the research was re-tweeted 132 times and was well-received by paramedics and other ambulance staff. The use of twitter allowed feedback, questions and debate with ambulance service providers and this was a wonderful way of connecting directly with the users of the research and discussing the research with those upon whom it has most impact.

This component of the research was further disseminated to a wide range of national users of ambulance research at the 999 EMS Research Forum:

- Coster J, O'Cathain A, Crum A, Jacques R, Nicholl J, Turner J. PP25 Using a linked health dataset to identify what happens to patients following prehospital care, 2017. Emergency Medicine Journal, 34;10: (Poster presentation, presented at 999 EMS Research Forum, Bristol 2016 by J Coster (Top 5 scoring abstract)
- Coster J, O'Cathain A, Nicholl J. Using linked health data to explore compliance with and appropriateness of ambulance telephone advice. (999 EMS Research Forum, Brighton 2020)

And to an international audience through the following peer reviewed presentations at the EMS 2017 and the European Society for Emergency Medicine (EUSEM) 2019:

- Coster J, Turner J, O'Cathain A, Siriwardena A.N. Safety and appropriateness of non-transport decisions for people who contact the emergency ambulance service. Second European Emergency Medical Services Congress (EMS2017), held in Copenhagen, Denmark on 22-24 May 2017. (Poster and 3 minute oral presentation by J Coster)
- Coster J, Nicholl J, O'Cathain A. Non-urgent calls to the ambulance service: why do people call and what advice are they given? EUSEM 2019, Prague, Czech Republic (Poster and 3 minutes oral presentation by J Coster)

And as part of the Variation in Ambulance Non-conveyance (VAN) study, where I led the data linking chapter which included some of the research from my PhD.

- O'Cathain A, Knowles E, Bishop-Edwards L, Coster J, Crum A, Jacques R, et al. Understanding variation in ambulance service non-conveyance rates: a mixed methods study. Health Serv Deliv Res 2018;6(19)

An early version of the systematic review undertaken for this PhD was reported in review of different models of delivering urgent care, where I led the review undertaken for Chapter 4, Telephone triage and advice services, and this was published as a peer reviewed HS&DR report.

- Turner J, **Coster J,** Chambers D, Cantrell A, Phung V-H, Knowles E, Bradbury D & Goyder E (2015) What evidence is there on the effectiveness of different models of delivering urgent care? A rapid review. *Health Services and Delivery Research*, 3(43)

8.2.5.1. Dissemination to patients and the public

The results were presented at a patient and public involvement (PPI) workshop, and the reporting of event rates was discussed, and some concerns were identified by the PPI attendees. PPI felt that it was more appropriate to present the subsequent event rates as a range than a definitive value and they also found it more useful if results were simplified, such as if they were expressed as the number of deaths per 1000 calls.

8.2.6. Priorities for research

This study has identified that ambulance telephone advice is likely to be safe and appropriate in the system studied. Further research would be useful to identify whether more calls could be handled with telephone advice without compromising safety, appropriateness or acceptability. Some ambulance services have already started this process, with a trial to assess the impact of a new Clinical Navigator role to assess whether Category 3 calls should route straight through to the ambulance dispatch queue or should first receive a call back from a Clinical Advisor (https://www.emas.nhs.uk/news/latest-news/2018-news/clinical-navigators-help-patients-receive-the-right-care-in-the-right-place/). A key future research question is around what evidence is needed in order to support the expansion of the ambulance telephone advice service, and this would include information about costs and cost implications. The definitions of safety, appropriateness and acceptability developed for this thesis can also improve the comparability of future research

From undertaking this research, a number of different opportunities or recommendations for future research have been identified, that build on the focus of safety, appropriateness and acceptability in this thesis and also the new research opportunities from improvements in data systems and linkage with other health data systems.

1. Safety, appropriateness and acceptability: cost effectiveness of safety, appropriateness and acceptability of telephone advice in ambulance services using different types of triage software
2. Safety: Case review of more serious events following ambulance telephone advice, such as deaths or hospital admissions

3. Appropriateness. Impact on calls referred to the ambulance service by 111 from ambulance services where the 111 service is provided by an external provider compared to services where the 111 service is delivered by the ambulance service.
4. Appropriateness: Further research into the benefits of mental health nurses as clinical advisors and how this can be optimised. Developing standards for mental health telephone advice consultations and methods of recording are important, as currently these are separate to the other ambulance telephone advice systems and developing these protocols and standards are in their infancy.
5. Appropriateness: Ensuring that data is collected and recorded in a way that facilitates linkage with other health service data is important for future studies making best use of existing data sources. For example, using the recent linkage between ambulance service and GP data systems to explore GP health contacts following ambulance telephone advice. At the time of the interviews with ambulance staff, links with System One GP data had recently been introduced. Clinical Advisors found it beneficial to access the GP notes about patients when giving advice. Further research could also explore how this information is used and to understand how it can be best used and how key patient information is communicated between the services. In addition, this linkage may mean that GP data is more accessible for linkage with ambulance patient level data and facilitate research into GP health contacts following ambulance telephone advice.
6. Acceptability: Research involving service users and PPI to explore their views on acceptability of telephone advice and the findings from this study related to waiting time for clinical advice, reassurance and expectations.
7. Telephone advice process: What is the optimum configuration of Clinical Advisors in ambulance services? Number and type of different clinical staff.
8. Telephone advice process: inclusion of staff involved in the ambulance telephone advice process to explore possible improvements to the telephone advice process, from a system, team and individual perspective.
9. Telephone advice process: Research into the safety, appropriateness and acceptability of video Clinical Advice consultations compared to telephone consultations and advice

8.2.7. *Conclusions*

Telephone advice in EMAS is likely to be safe and appropriate as most patients do not have subsequent health events, there are multiple methods used by ambulance services to ensure safety at a service, team and individual level and staff perceived that telephone advice is mostly a safe and appropriate way of handling lower urgency calls. However, mental health calls were perceived as challenging and best handled by specialist mental health clinicians. Service providers perceived mixed service user reactions to telephone advice and linked user acceptability to expectations around receiving an ambulance, the caller's need for reassurance, and the length of time to receive a telephone advice.

9 References

AbouZahr C, Boerma T. (2005). Health information systems: the foundations of public health. Bull World Health Organ. Aug;83(8):578-83. Epub 2005 Sep 22. PMID: 16184276.

Adams RJ, Smart P, Sigismund Huff A. Shades of Grey. (2017). Guidelines for working with the grey literature in systematic reviews for management and organisational studies. International Journal of Management Reviews*, Vol. 19, 432–454* DOI: 10.1111/ijmr.12102

Agency for Healthcare Research & Quality. (2002). Agency for healthcare research and quality. Retrieved from: https://archive.ahrq.gov/about/whatis.html

Ahl C. 2006. Making up one's mind: Patient experiences of calling an ambulance. Accident and Emergency Nursing;13, 11-19

Al-Abdullah T, Plint AC, Shaw A, Correll R, Gaboury I, Pitters C*, et al. (2009).* The appropriateness of referrals to a pediatric emergency department via a telephone health line. *CJEM Canadian Journal of Emergency Medical Care;*11:139-48.

Al-Busaidi ZQ. (2008). Qualitative research and its uses in health care. Sultan Qaboos Univ Med J.;8(1):11-9. PMID: 21654952.

Alderson P. (1998). Theories in health care and research: the importance of theories in health care. BMJ;317:1007–10

Ambulance Service Network. (2008). A vision for emergency and urgent care: The role of ambulance services. The NHS Confederation.

Anderson A, Roland M. (2015). Potential for advice from doctors to reduce the number of patients referred to emergency departments by NHS 111 call handlers: Observational study. BMJ Open;5 (11)

Anderson S, Hogskilde PD, Wetterslev J, Bredgaard M, Møller JT, Dahl JB. (2002). Appropriateness of leaving emergency medical service treated hypoglycemic patients at home: a retrospective study. Acta Anaesthesiol Scand;46:464–8. http://dx.doi.org/10.1034/j.1399-6576.2002.460424.x

Andrew E, Nehme Z, Cameron P, Smith K. (2020). Drivers of Increasing Emergency Ambulance Demand, Prehospital Emergency Care; 24:3, 385, DOI: 10.1080/10903127.2019.1635670

Archibald MM, Ambagtsheer RC, Casey MG, Lawless M. (2019). Using Zoom Videoconferencing for Qualitative Data Collection: Perceptions and Experiences of Researchers and Participants. International Journal of Qualitative Methods. doi:10.1177/1609406919874596

Association of Ambulance Chief Executives.(2015). NHS ambulance services – leading the way to care. http://aace.org.uk/wp-content/uploads/2015/10/AACE-Leading-the-way-to-care-FINAL-W.pdf

Atack L, Maher J. (2010). Emergency Medical and Health Providers' perceptions of key issues in prehospital patient safety. Prehospital Emergency Care;14:95–102

Australasian College for Emergency Medicine. (2013). Guidelines on the implementation of the Australasian triage scale in emergency department. West Melbourne: Australasian College for Emergency Medicine, 2013. Contract No: G24.

Backman T, Juuso P, Borg R, Engstrom A. (2019). Ambulance nurses' experiences of deciding if a patient does not require ambulance care. Nursing Open;6:783–789

Baker, Sarah Elsie and Edwards, Rosalind (eds.) (2012) How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research (National Centre for Research Methods Reviews) Southampton, GB. National Centre for Research Methods.

Barber JW, King WD, Monroe KW, Nichols MH. (2000) Evaluation of emergency department referrals by telephone triage. Pediatrics ;105:819–21. http://dx.doi.org/10.1542/peds.105.4.819

Beaulieu R, Humphreys J. (2008) Evaluation of a telephone advice nurse in a nursing faculty managed pediatric community clinic. J Pediatr Health Care ;22:175–81.

Becker J, Dell A, Jenkins L, Sayed R. (2012). Reasons why patients with primary health care problems access a secondary hospital emergency centre. S Afr Med J;102: 800– 1.

Bigham BL. Buick JE; Brooks SC et al. (2012) Patient safety in emergency medical services: a systematic review of the literature. Prehospital Emergency Care;16:1–20

Blank L, Coster J, O'Cathain A, Knowles E, Tosh J, Turner J, et al. The appropriateness of, and compliance with, telephone triage decisions: a systematic review and narrative synthesis. J Adv Nurs 2012;68:2610–21. 10.1111/j.1365-2648.2012.06052.x

Block et al. (2012). Interviewing by Telephone: Specific Considerations, Opportunities, and Challenges Sage journals https://journals.sagepub.com/doi/pdf/10.1177/160940691201100409

Blue Light Programme (2018). -Phase Three New Audience Scoping: 999 Call Handlers Final Report. https://www.mind.org.uk/media-a/4871/blue-light-programme_999-call-handler-scoping-report.pdf

Bogdan GM, Green JL, Swanson D, Gabow P, Dart RC. (2004). Evaluating patient compliance with nurse advice line recommendations and the impact on healthcare costs. Am J Manag Care;10(8):534-42. PMID: 15352529.

Booker MJ, Purdy S, Barnes R, et al. (2019) Ambulance use for 'primary care' problems: an ethnographic study of seeking and providing help in a UK ambulance service. BMJ Open ;9:e033037. doi:10.1136/bmjopen-2019-033037

Booth A, Papaioannou D & Sutton A (2012) Systematic Approaches to a Successful Literature Review. Sage Publications Limited.

Booth A. (2016) Over 85% of included studies in systematic reviews are on MEDLINE, Journal of Clinical Epidemiology. doi: 10.1016/j.jclinepi.2016.04.002.

Boyatzis, R. (1998). Transforming qualitative information: Thematic analysis and code development. Thousand Oaks, CA: Sage.

Braun, V., Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3, 77–101. doi:10.1191/1478088706qp063oa.

Braunschweiger A. Patterson B. (2015). The safety net in protocol 26. The Journal of Emergency Dispatch, 2015. https://iaedjournal.org/safety-net-protocol-26/

Brazier J, Nicholl J & Snooks H (1996) The cost and effectiveness of the London Helicopter Emergency Medical Service.. *J Health Serv Res Policy*, 1(4), 232-237

Bryman, A. (2012) Social Research Methods, fourth edition. Oxford: Oxford University Press

Bunn F, Byrne G, Kendall S. (2009). Telephone consultation and triage: effects on health care use and patient satisfaction (Review). The Cochrane Library, Issue 1.

Bunn F., Byrne E, G. & Kendall, S. (2004). Telephone consultation and triage: effects on health care use and patient satisfaction. Cochrane Database Syst Rev, CD004180.

Bureau of Health Information. (2015). Data Matters: Linking data to unlock information. The use of linked data in healthcare performance assessment. 2015.

Byrne, J. A. (2016). Improving the peer review of narrative literature reviews. Research Integrity and Peer Review, 1(1). doi:10.1186/s41073-016-0019-2

Cain E, Ackroyd-Stolarz S, Alexiadis P, Murray D. (2003). Prehospital hypoglycemia: the safety of not transporting treated patients. Prehosp Emerg Care.7:458–65. doi: 10.1080/312703002193.

Care Quality Commission. (2014). Ambulance survey of 'Hear and Treat' callers 2013/2014. Ambulance survey of 'Hear and Treat' callers 2013/14 | Care Quality Commission (cqc.org.uk)

Care Quality Commission. (2018). Under pressure: safely managing increased demand in emergency departments. https://www.cqc.org.uk/sites/default/files/20180716_underpressure-winterpressures.pdf

Cariello FP. (2003). Computerized telephone nurse triage. An evaluation of service quality and cost. J Ambul Care Manage.26(2):124-37. doi: 10.1097/00004479-200304000-00005. PMID: 12698927.

Carrasqueiro S, Oliveira M, Encarnacao P. (2011). Evaluation of telephone triage and advice services: a systematic review on methods, metrics and results. A. Moen et al. (Eds.) IOS Press. Centre for Reviews and Dissemination. (2009). Systematic Reviews: CRD's Guidance for Undertaking Reviews in Health Care. http://www.york.ac.uk/inst/crd/SysRev/!SSL!/WebHelp/ SysRev3.htm

Chapman JL, Zechel A, Carter YH, Abbott S. (2004) Systematic review of recent innovations in service provision to improve access to primary care. Br J Gen Pract 2004;54:374–81.

Chapman, R. (1996). Review of Ambulance Performance Standards.Final Report of Steering Group. London: NHS Executive

Christen P., Goiser K. (2007) Quality and Complexity Measures for Data Linkage and Deduplication. In: Guillet F.J., Hamilton H.J. (eds) Quality Measures in Data Mining. Studies in Computational Intelligence, vol 43. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-44918-8_6

Clark S, Brand M, Donovan S, Dorning H, Halter M, Porter A. (2019). The pre-hospital emergency department data linkage project: Data linkage across ambulance services and acute trusts: assessing the potential for improving patient care. The Health Foundation.

Clark S, Porter A, Halter M, Damiani M, Dorning H, McTigue M. (2016). Data linkage across ambulance services and acute trusts: Assessing the potential for improving patient care. Emergency Medicine Journal. 33; e12

Clark, S., Damiani, M., Dorning, H., Halter, M. and Porter, A. (2017). Patient-level data linkage across ambulance services and acute trusts: assessing the potential for improving patient care: IJPDS (2017) Issue 1, Vol 1:270 Proceedings of the IPDLN Conference (August 2016), *International Journal of Population Data Science*, 1(1). doi: 10.23889/ijpds.v1i1.290.

Clawson J, Dernocoeur K. (2014). Principles of Emergency Medical Dispatch, Fifth Edition. (Salt Lake City, Priority Press, 2014).

Coleman A. (1997). Where do I stand? Legal implications of telephone triage. Journal of Clinical Nursing. 6(3): 227–31

Cook R, Thakore S, Morrison W, Meikle J. To ED or not to ED: NHS 24 referrals to the emergency department. *Emerg Med J* 2010;27:213-5.

Coster J, Irving AD, Turner JK, Phung VH, Siriwardena AN. (2018).Prioritizing novel and existing ambulance performance measures through expert and lay consensus: a three-stage multimethod consensus study. Health Expect 2018;21:249–60.

Coster JE, Turner JK, Bradbury D, Cantrell A. (2017). Why do people choose emergency and urgent care services? A rapid review utilizing a systematic literature search and narrative synthesis. Acad Emerg Med;24:1137–49. https://doi.org/10.1111/acem.13220

Crane JD, Benjamin JT. (2000). Pediatric residents' telephone triage experience – Do parents really follow telephone advice? Arch Pediatr Adolesc Med 2000;154:71–4.

Creswell J. (2016). 30 Essential skills for the qualitative researcher. London: Sage publications. P 38-46.

Creswell J.W. (2008). Research Design: Qualitative, Quantitative and Mixed Methods Approaches, 2nd edn. London: Sage.

Creswell, J. W. (2014). Research Design: Qualitative, Quantitative and Mixed Methods Approaches (4th ed.). Thousand Oaks, CA: Sage

Creswell, J. W., & Plano Clark, V. (2017). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage Publications.

Creswell, J., & Plano Clark, V. (2007). Designing and Conducting Mixed Methods Research. Thousand Oaks, CA: Sage

Creswell, J., Plano Clark, V., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioural research*. Thousand Oaks: Sage. pp. 209-240

Crilly J, O'Dwyer J, O'Dwyer M, Lind J, Peters J, Tippett V et al. (2011). Linking ambulance, emergency department and hospital admissions data: understanding the emergency journey. MJA. 194:S34-S37.

Crowther L, Williams R. (2009) Nurse interventions in ambulance command-and-control centres. Emerg Nurse;17:22–5

Dale J, Higgins J, Williams S, et al. (2003). Computer assisted assessment and advice for "non-serious" 999 ambulance service callers: the potential impact on ambulance despatch. Emergency Medicine Journal;20:178-183.
Dale J, Williams S, Foster T, Higgins J, Snooks H, Crouch R, et al. (2004). Safety of telephone consultationfor 'non-serious' emergency ambulance service patients. Qual Saf Health Care. 13:363–73. https://doi.org/10.1136/qshc.2003.008003

Dean JE, Hutchinson A, Escoto KH & Lawson R. (2007). Using a multi-method, user centred, prospective hazard analysis to assess care quality and patient safety in a care pathway. BMC Health Services Research, 7.

Dejean D, Giacomini M, Welsford M, Schwartz L, Decicca P. (2016). Inappropriate ambulance use: A qualitative study of paramedics views. Healthcare Policy, 2016;11:3.

Department of Health and Human Services. (2020). Victorian Emergency Minimum Dataset manual 2020 – 2021. 25th Edition, version 10. State of Victoria, Australia.
Department of Health, (2013). Building the evidence base in pre-hospital urgent and emergency care: A review of research evidence and priorities for future research. University of Sheffield Medical Care Research Unit.

Department of Health. (2005). Taking healthcare to the patient.

Department of Health. (2008) Darzi NHS Next Stage Review.

Department of Health. (2009). Tackling demand together: A toolkit for improving urgent and emergency care pathways by understanding increases in 999 demand. 2009.

Department of Health. (2011). Taking healthcare to the patient 2.

Department of Health. (2017) Ambulance quality indicators. *https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/*.

Dewey, J. (2008). How we think. In Boydston, J. (Ed.), The middle works of John Dewey, 1899-1924 (Vol. 11, pp. 105-353). Carbondale: Southern Illinois University Press. (Original work published 1910a)

Dixon-Woods M, Shaw RL, Agarwal S, et al. (2004). The problem of appraising qualitative research BMJ Quality & Safety 2004;13:223-225.

Doctor K. (2013). Evaluation of an after-hours call center: Are pediatric patients appropriately referred to the Emergency Department? *Pediatr Emerg Care*;29 (10):1140.

Donabedian A. (1996). Evaluating the quality of medical care. Milbank Mem Fund Q. ;44: Suppl: 166-206.
Downing A, Wilson R, Cooke M. (2005). Linkage of ambulance service and Accident and Emergency Department data: a study of assault patients in the west midlands region of the UK. Injury, Int. J. Care Injured 36, 738—744

Duncan EAS, Best C, Dougall N, Skar S, Evans J, Corfield AR, Fitzpatrick D, Goldie I, Maxwell M, Snooks H, Stark C, White C & Wojcik W (2019). Epidemiology of emergency ambulance service calls related to mental health problems and self harm: a national record linkage study. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, 27, Art. No.: 34. https://doi.org/10.1186/s13049-019-0611-9

Dunt D, Day SE, Kelaher M, Montalto M.(2006) The impact of standalone call centres and GP cooperatives on access to after hours GP care: a before and after study adjusted for secular trend. Fam Pract;23:453–60

Dunt D, Day SE, Kelaher M, Montalto M.(2006) The impact of standalone call centres and GP cooperatives on access to after hours GP care: a before and after study adjusted for secular trend. Fam Pract;23:453–6

Eastwood et al. (2018) Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 26:8 DOI 10.1186/s13049-018-0475-4

Eastwood K, Morgans A, Smith K, et al. (2016). A novel approach for managing the growing demand for ambulance services by low acuity patients. Australian Health Review,40, 378 – 384.

Eastwood K, Morgans A, Smith K, Stoelwinder J. (2015). Secondary triage in prehospital emergency ambulance services: a systematic review. Emerg Med J 2015;32:486–92. https://doi.org/10.1136/emermed-2013-203120

Eastwood K, Morgans A, Stoelwinder J, Smith K. (2018) Patient and case characteristics associated with no paramedic treatment for low acuity cases referred for emergency ambulance dispatch following a secondary triage: a retrospective cohort study.

Eastwood K, Nambiar D, Dwyer R, et al.(2020) Ambulance dispatch of older patients following primary and secondary telephone triage in metropolitan Melbourne, Australia: a retrospective cohort study. BMJ Open 2020;10:e042351. doi:10.1136/bmjopen-2020-042351

Eastwood K, Smith K, Morgans A, et al. (2017) Appropriateness of cases presenting in the emergency department following ambulance service secondary telephone triage: a retrospective cohort study. BMJ Open;7:e016845. doi: 10.1136/bmjopen-2017-016845

Eastwood K., Smith, K., Morgans, A. & Stoelwinder, J. (2017). Appropriateness of cases presenting in the emergency department following ambulance service secondary telephone triage: a retrospective cohort study. BMJ Open, 7, e016845.

Eastwood, K., Morgans A., Stoelwinder, J. & Smith, K. (2019). The appropriateness of low-acuity cases referred for emergency ambulance dispatch following ambulance service secondary telephone triage: A retrospective cohort study. PLoS One, 14, e0221158.

Ebben R, (2017). A patient-safety and professional perspective on non-conveyance in ambulance care: a systematic review. Scandinavian Journal of Trauma.

Elden OE, Uleberg O, Lysne M, Haugdahl HS. (2020). Community paramedicine-cost-benefit analysis and safety with paramedical emergency services in rural areas: scoping review protocol. BMJ Open. 2020 Sep 25;10(9):e038651. doi: 10.1136/bmjopen-2020-038651. PMID: 32978201; PMCID:

EMAS https://www.emas.nhs.uk/your-service/999/ accessed January 2019

Ernesäter A, Engström M, Holmström I, Winblad U. Incident reporting in nurse-led national telephone triage in Sweden: (2010) the reported errors reveal a pattern that needs to be broken. J Telemed Telecare;16:243–7. H

Erzerberger, C., & Prein, G. (1997). Triangulation: Validity and empirically based hypothesis construction. Quality and Quantity, 31, 141-154.

Farmer. (2006). Developing and implementing a triangulation protocol for qualitative health research. Qual Health Res. Mar;16(3):377-94

Fisher JD, Freeman K, Clarke A, Spurgeon P, Smyth M, Perkins GD, et al. (2015). Patient safety in ambulance services: a scoping review. Health Serv Deliv Res;3(21).

Gale, N.K., Heath, G., Cameron, E. *et al.* (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol* 13, 117 https://doi.org/10.1186/1471-2288-13-117

Gamst-Jensen H, Frishknecht E, Lippert F, Folke F, Egerod I, Huibers L, et al. (2018) Self-rated worry predicts hospitalisation in out-of-hours services telephone triage. BMJ Open.;8 (Supplement 1):A25-A6.

Giacomini, M., (2013). Theory Matters in Qualitative Health Research. In I. Bourgeault, R. Dingwall and R. de Vries, (eds), The SAGE Handbook of Qualitative Methods in Health Research. London: SAGE, pp. 125-156.

Gibson A, Randall D, Tran DT, Byrne M, Lawler A, Havard A, et al. (2018) Emergency Department Attendance after Telephone Triage: A Population-Based Data Linkage Study. Health Services Research.;53(2):1137-62.
Giesen P, Smits M, Huibers L, Grol R, Wensing M. (2011). Quality of after-hours primary care in the Netherlands: a narrative review.Ann Intern Med.155(2):108–13. doi: 10.7326/0003-4819-155-2-201107190-00006.

Golding SE, Horsfield C, Davies A, Egan B, Jones M, Raleigh M, Schofield P, Squires A, Start K, Quinn T, Cropley M. (2017). Exploring the psychological health of emergency dispatch centre operatives: a systematic review and narrative synthesis. PeerJ.17;5:e3735. doi: 10.7717/peerj.3735. PMID: 29062596; PMCID: PMC5649589.

Grant M, Booth A. A (2009). typology of reviews: an analysis of 14 review types and associated methodologies. Health Information and Libraries Journal, 26, page 91 – 108. DOI: 10.1111/j.1471-1842.2009.00848.x

GRAY, D.E.v(2009). Doing Research in the Real World, 2ndedn. London: Sage

Guest, G., Bunce, A., and Johnson, L. (2006). 'How Many Interviews are Enough? An Experiment with Data Saturation and Variability', Field Methods, 18: 59–82

Gustafsson S, Martinsson J, Walivaara B-M, Vikman I, Savenstedt S. (2016). Influence of self-care advice on patient satisfaction and healthcare utilization. Journal of Advanced Nursing. 2016;72(8):1789-99.

Gustafsson S, Martinsson J, Walivaara B-M, Vikman I, Savenstedt S. (2016) Influence of self-care advice on patient satisfaction and healthcare utilization. Journal of Advanced Nursing.;72(8):1789-99.
Hansen EH, Hunskaar S. (2011) Telephone triage by nurses in primary care out-of-hours services in Norway: an evaluation study based on written case scenarios. BMJ Qual Safe.

Harron K, McGrath-Lone L, Mason S, Gilbert R. (2016). Using linked administrative data for monitoring and evaluating the family nurse partnership in England: a scoping report. Family Nurse Partnership National Unit.
http://repository.tavistockandportman.ac.uk/1448/1/FNP%20Report.pdf

Hastings, SN, et al. (2008). *Does lack of social support lead to more ED visits for older adults?* 4, s.l. : The American Journal of Emergency Medicine, 2008, Vol. 26.

Hatch JA. (2002). Doing qualitative research in education settings. Albnay, NY; SUNY Press.

Healthcare Commission. (2008).Not just a matter of time: A review or urgent and emergency care services in England.

Hobbs MST, McCall MG. (1970).Health Statistics and Record Linkage in Australia. Journal of Chronic Diseases.23:375-81

Hodges S, Eitelhuber T, Merchant A, Alan J. (2007). Population Data Centre Profile – The Western Australia Data Linkage Branch. International Journal of Population Data Science (2020) 4:2:13
Hodgins M, Wuest J. Uncovering factors affecting use of the emergency department for less urgent health problems in urban and rural areas. Can J Nurs Reg.39(3):78-102.

Holman C D'Arcy J , Bass John A , Rosman Diana L , Smith Merran B , Semmens James B , Glasson Emma J , Brook Emma L , Trutwein Brooke , Rouse Ian L , Watson Charles R , de Klerk Nicholas H Stanley Fiona J (2008) A decade of data linkage in Western Australia: strategic design, applications and benefits of the WA data linkage system. *Australian Health Review* 32, 766-777.

Huibers L, Keizer E, Giesen P, Grol R, Wensing M. (2012). Nurse telephone triage: good quality associated with appropriate decisions. Fam Pract;29:547–52. 10.1093/fampra/cms005.

Huibers L, Koetsenruijter J, Grol R, Giesen P, Wensing M. (2013) Follow-up after telephone consultations at out-of-hours primary care. J Am Board Fam Med 2013;26:373–9.

Huibers L, Smits M, Renaud V, Giesen P, Wensing M. (2011). Safety of telephone triage in out-of-hours care: a systematic review. Scand J Prim Health Care 2011;29:198–209. 10.3109/02813432.2011.629150.

Hutchinson A, Coster JE, Cooper KL, Pearson M, McIntosh A & Bath PA (2013) A structured judgement method to enhance mortality case note review: development and evaluation. BMJ Qual Saf, 22(12), 1032-1040.

Infinger A, Studnek JR, Hawkins E, Bagwell B, Swanson D. (2013). Implementation of prehospital dispatch protocols that triage low-acuity patients to advice-line nurses. Prehosp Emerg Care 2013;17:481-5.

Irving A, O'Hara R, Johnson M et al. Pilot Evaluation of Utilising Mental Health Nurses in the Management of Ambulance Service Patients with Mental Health Problems. Emergency Medicine Journal, 2016;33:677.

Janssens and Gwinn BMC Medical Research Methodology (2015) 15:84 DOI 10.1186/s12874-015-0077-z

Jensen J.L, Carter J.E., Rose J, Visintini S, Bourdon E, Brown R, McVey J, Travers A.H. (2015). Alternatives to traditional EMS dispatch and transport: a scoping review of reported outcomes. CJEM. 2015;17(5):532–550 DOI 10.1017/cem.2014.59.

Johnson M, O'Hara R, Hirst E, Weyman A, Turner J, Mason S, et al. (2017). Multiple triangulation and collaborative research using qualitative methods to explore decision making in pre-hospital emergency care. BMC Med Res Methodol 2017;17:11.

Johnson, B. and Gray, R. (2010) A history of philosophical and theoretical issues for mixed methods research', in Tashakkori, A., Teddlie, C. (Eds): SAGE Handbook of Mixed Methods in Social and Behavioral Research, 2nd edition, Sage, Thousand Oaks, CA

Katayama Y, Kitamura T, Hirose T et al. (2020) Characteristics and transported by ambulance: a population based study in Osaka Japan. Acute Medicine and Surgery;7:e609.

Kawakami C, Ohshige K, Kubota K, Tochikubo O. (2007). Influence of socioeconomic factors onmedically unnecessary ambulance calls. BMC Health Serv Res;7:120.

Kelly M, Egbunike JN, Kinnersley P, Hood K, Owen-Jones E, Button LA, Shaw C, Porter A, Snooks H, Bowden S, Edwards A. (2010). Delays in response and triage times reduce patient satisfaction and enablement after using out-of-hours services. Fam Pract.27(6):652-63. doi: 10.1093/fampra/cmq057.

Kempe A, Dempsey C, Hegarty T, Frei N, Chandramouli V, Poole SR. (2000). Reducing after-hours referrals by an after-hours call center with second-level physician triage. Pediatrics;106:226–30

Khangura S, Konnyu K, Cushman R, Grimshaw J, Moher D. (2012). Evidence summaries: the evolution of a rapid review approach. Syst Rev;1:10.

King, N. (2004). Using templates in the thematic analysis of text. In Cassell, C., Symon, G. (Eds.), Essential guide to qualitative methods in organizational research (pp. 257–270). London, UK: Sage.

Kinnersley P, Egbunike JN, Kelly M, Hood K, Owen-Jones E, Button LA, et al. (2010) The need to improve the interface between in-hours and out-of-hours GP care, and between out-of-hours care and self-care. Fam Pract 2010;27:664–72

Kirkland SW, Soleimani A, Rowe BH, et al. (2018). A systematic review examining the impact of redirecting low-acuity patients seeking emergency department care: is the juice worth the squeeze? Emergency Medicine Journal Published Online First. doi: 10.1136/emermed-2017-207045

Krumperman K, Weiss S, Fullerton L. (2015). Two types of prehospital systems interventions that triage low acuity patients to alternative sites of care. Southern Medical Journal & Volume 108, Number 7, July 2015.

Kuczawski M, Stone T & Mason S (2019) CUREd: Creating a research database to improve urgent and emergency care system research. *EUSEM Abstracts*. Prague, 12 October 2019 - 16 October 2019.

Kvale, S. (1996). Interviews: An introduction to qualitative research interviewing. Thousand Oaks, CA: Sage.

Lake et al. (2017). The quality, safety and governance of telephone triage and advice services – an overview of evidence from systematic reviews BMC Health Services Research (2017) 17:614 DOI 10.1186/s12913-017-2564

Lambert R, Fordham R, Large S, Gaffney B. (2013) A cost-minimisation study of 1,001 NHS Direct users. BMC Health Serv Res ;13:300

Larkin GL, Claasen CA, Pelletier AJ, Camargo CA. (2006). National study of ambulance transports to United States emergency departments: Importance of mental health problems. Prehospital Disaster Medicine, 2006;21:2:p82-90.

LaVela SL, Gering J, Schectman G, Weaver FM. (2012) Optimizing primary care telephone access and patient satisfaction. Eval Health Prof 2012;35:77–86.

Leclerc BS, Dunnigan L, Cote H, Zunzunegui MV, Hagan L, Morin D. (2003). Callers' ability to understand advice received from a telephone health-line service: comparison of self-reported and registered data. *Health Serv Res*;38:697-710

Leibowitz R, Day S, Dunt D. (2003) A systematic review of the effect of different models of after-hours primary medical care services on clinical outcome, medical workload, and patient and GP satisfaction. Fam Pract;20:311–7

Lemma S. (2020) Improving quality and use of routine health information system data in low- and middle-income countries: A scoping review. https://doi.org/10.1371/journal.pone.0239683
Leung L. (2015). Validity, reliability, and generalizability in qualitative research. Journal of family medicine and primary care, 4(3), 324–327. https://doi.org/10.4103/2249-4863.161306

Leventhal H, Brissette I, Leventhal E. (2003). The Common-sense Model of Self-regulation of Health and Illness. In Cameron L, Leventhal H, editors. The Self-regulation of Health and Illness Behaviour. London: Routledge; 2003. pp. 42–65

Lincoln Y, Lynham S, Guba E. (2011) Chapter 6. Paradigmatic Controversies, Contradictions and Emerging Confluences Revisited, in Denzin H, Lincoln Y: The SAGE Handbook of Qualitative Research Sage, Thousand Oaks, CA.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Beverly Hills, CA: Sage

Lord Carter of Coles, NHS England. (2018) Operational productivity and performance in English NHS Ambulance Trusts. 2018. Report for NHS England. (Accessed September 2020 https://www.england.nhs.uk/publication/lord-carters-review-into-unwarranted-variation-in-nhs-ambulance-trusts/)

Lyons, R.A., Jones, K.H., John, G. *et al.* (2009). The SAIL databank: linking multiple health and social care datasets. *BMC Med Inform Decis Mak* 9, 3. https://doi.org/10.1186/1472-6947-9-3

Mackenhaeur J, Valentin J, mikkelsen S et al. (2021). Emergency Services response levels and subsequent emergency contacts among patients with a hisotry of mental illness in Denmark: a nationwide study. European Journal of Emergency Medicine, XXX:000–000

Mark AL, Shepherd ID. (2003) How has NHS Direct changed primary care provision? J Telemed Telecare;9(Suppl. 1):S57–9

Martinsson J, Gustafsson S. (2018) Modeling the effects of telephone nursing on healthcare utilization. International Journal of Medical Informatics;113:98-105.

Martinsson J, Gustafsson S. (2018). Modeling the effects of telephone nursing on healthcare utilization. International Journal of Medical Informatics. 2018;113:98-105.

Maxwell RJ. (1984). Rospectus in NHS management: quality assessments in health" British Medical Journal. 288:148–72.

McAteer A, Hannaford PC, Heaney D, Ritchie LD, Elliott AM. (2016) Investigating the public's use of Scotland's primary care telephone advice service (NHS 24): a population-based cross-sectional study. British Journal of General Practice.;66(646):E337-E46.

McKenzie R, Dunt D, Yates A. (2016). Patient intention and self-reported compliance in relation to emergency department attendance after using an after hours GP helpline. Emergency Medicine Australasia. 2016;28(5):538-43.

McKinstry B, Hammersley V, Burton C, Pinnock H, Elton R, Dowell J, et al. (2010) The quality, safety and content of telephone and face-to-face consultations: a comparative study. Qual Saf Health Care 2010;19:298–303. http://dx.doi.org/10.1136/qshc.2008.027763

Meer A, Gwerder T, Duembgen L, Zumbrunnen N, Zimmermann H. (2012) Is computer-assisted telephone triage safe? A prospective surveillance study in walk-in patients with non-life-threatening medical conditions. Emergency Medicine Journal;29(2):124-8.

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis (2nd ed.). Thousand Oaks, CA: Sage

Monaghan R, Clifford C, McDonald P. (2003) Seeking advice from NHS direct on common childhood complaints: does it matter who answers the phone? J Adv Nurs ;42:209–16.

Morimura N, Sruga T, Sakamoto T et. Al. (2009). The impact of an emergency telephone consultation service on the use of ambulances in Tokyo. Emergency medicine Journal. first published as 10.1136/emj.2009.073494

Morse, 2003, pg. 190). Morse. J., 2003. Chapter 7: Principles of Mixed Methods and Multimethod Research Design. In: A. Tashakkori and C. Teddlie (eds), Handbook of mixed methods in social& behavioural research. London: Sage, pp. 189-208

Munro J, Clancy M, Knowles E, Sampson F, Nicholl J. (2003). Evaluation of NHS Direct: impact and appropriateness. 2003 Medical Care Research Unit (MCRU), University of Sheffield

Munro J, Nicholl J, O'Cathain A, Knowles E. (2000). Evaluation of NHSDirect first wave sites. [Second interim report to the Departmentof Health.] Sheffield: Medical Care Research Unit, University of Sheffield, 2000

Munro J, Nicholl J, O'Cathain A. (2001) Evaluation of NHS Direct first wave sites: Final report of the phase 1 research.
https://www.researchgate.net/publication/246112002_Evaluation_of_NHS_Direct_first_wave_sites_Final_report_of_the_phase_1_research

National Audit Office. (2017). NHS Ambulance Services.

Navratil-Strawn JL, Ozminkowski RJ, Hartley SK. (2014) An economic analysis of a nurse-led telephone triage service. J Telemed Telecare ;20:330–8.

Ng J, Fatovich D, Turner V, Wurmel J, Skevington S, Phillips M. (2011). Does contact with healthdirect lead to appropriate use of the emergency department and ambulance services? A prospective, observational study comparing healthdirect, general practitioner and self-referred patients. *EMA - Emergency Medicine Australasia*;23:28-9
NHS Digital (2017)
https://digital.nhs.uk/article/500#Make%20better%20use%20of%20health%20and%20care%20information (Accessed 25/7/2107)

NHS Digital (2020). https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics/the-processing-cycle-and-hes-data-quality#hes-data-quality-notes

NHS Digital, (2013) Ambulance services England https://digital.nhs.uk/data-and-information/publications/statistical/ambulance-services/ambulance-services-england-2012-13

NHS England (2014). NHS Five year forward. https://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf

NHS England (2017 b) NHS England. High quality care for all, now and for future generations: transforming urgent and emergency care services in England. The evidence base from the urgent and emergency care review. http://www.england.nhs.uk/wp-content/uploads/2013/review. (Access Date: March 2017)

NHS England (2017) https://www.england.nhs.uk/wp-content/uploads/2017/07/new-ambulance-standards-easy-read.pdf

NHS England (2018) https://www.england.nhs.uk/wp-content/uploads/2018/10/ambulance-response-programme-review.pdf

NHS England Ambulance Quality Indicator Data Set (Accessed September 2020 https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/)
https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/ambulance-quality-indicators-data-2020-21/

NHS England National Quality Board. National Guidance on Learning from Deaths. 2016. Available from: https://www.england.nhs.uk/wp-content/uploads/2017/03/nqb-national-guidance-learning-from-deaths.pdf

NHS England, (2015). Transforming urgent and emergency care services in England: Urgent and emergency care review.

NHS England, (2018). Service Specification: Urgent and Emergency Ambulance Services.

NHS England. (2013) Transforming urgent and emergency care services in England: Urgent and emergency care review End of Phase 1 Report,

Nicholl J, Coleman P, Jenkins J, Knowles E, O'Cathain A, Turner J. (2011) The Emergency and Urgent Care System. Final report to the Department of Health and Social Care. Sheffield: University of Sheffield, Medical Care Research Unit.

Njeru JW, Damodaran S, North F, Jacobson DJ, Wilson PM, St Sauver JL, et al. (2017) Telephone triage utilization among patients with limited English proficiency. BMC Health Services Research.;17(1):706.

Noble H, Smith J. (2018). Reviewing the literature: choosing a review design. Evidence-Based Nursing 2018;21:39-41.

Novick G. Is there a bias against telephone interviews in qualitative research? (2008). Res Nurs Health. 2008;31(4):391-398. doi:10.1002/nur.20259

Nowell LS, Norris JM, White DE, Moules NJ. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. International Journal of Qualitative Methods. December 2017. doi:10.1177/1609406917733847

NVIVO. (2018). NVivo qualitative data analysis software; QSR International Pty Ltd. Version 12.

O'Cathain A, Goode J, Luff D, Strangleman T, Hanlon G, Greatbatch D. (2005) Does NHS Direct empower patients? Soc Sci Med;61:1761–71.

O'Cathain A, Knowles E, Bishop-Edwards L, Coster J, Crum A, Jacques R, et al. (2018). Understanding variation in ambulance service non-conveyance rates: a mixed methods study. Health Serv Deliv Res;6(19)

O'Cathain A, Knowles E, Bishop-Edwards L, et al. Understanding variation in ambulance service non-conveyance rates: a mixed methods study. Southampton (UK): NIHR Journals Library; 2018 May. (Health Services and Delivery Research, No. 6.19.)

O'Cathain A, Knowles E, Long J, Connell J, Bishop-Edwards L, Simpson R, Coster J et al. Drivers of 'clinically unnecessary' use of emergency and urgent care: the DEUCE mixed-methods study. Southampton (UK). IHR Journals Library; 2020 Mar. (Health Services and Delivery Research, No. 8.15.)

O'Cathain A, Knowles E, Turner J, Nicholl J. (2014). Acceptability of NHS 111 the telephone service for urgent health care: cross sectional postal survey of users' views. Fam Pract 2014;31:193–200. 10.1093/fampra/cmt078

O'Cathain A, Turner J, Withers A, Nicholl JP. (1999). Views of people who call 999 to request an ambulance. *Pre-hospital Immediate Care* 1999;3: 131-135.

O'Cathain A, Webber E, Nicholl J, Munro J, Knowles E. (2003) NHS Direct: consistency of triage

O'Cathain A. (2009) Reporting results. In: Mixed Methods Research for Nursing and the Health Sciences. Andrew S, Halcomb E (eds).In: Mixed Methods Research for Nursing and the Health Sciences. London: Blackwell Publishing; 2009. p 135-158.

O'Cathain, A., (2010). Murphy, E. and Nicholl, J. (2010). Three techniques for integrating qualitative and quantitative methods in health services research. British Medical Journal, 341 p. c4587.

O'Cathain A, Connell J, Long J & Coster J (2020) 'Clinically unnecessary' use of emergency and urgent care: A realist review of patients' decision making. Health Expectations, 23(1), 19-40.

O'Cathain A, Coster J, Salisbury C, Pearson T, Maheswaran R & Nicholl J (2009) Do walk-in centres for commuters work? A mixed methods evaluation. BRIT J GEN PRACT, 59(569), 934-939.

O'Cathain A, Turner J & Nicholl JP (2002) The acceptability of an emergency medical dispatch system to people who call 999 to request an ambulance. Emerg Med J, 19(2), 160-163. RIS download Bibtex download

O'Connell JM, Johnson DA, Stallmeyer J, Cokingtin D. (2001). A satisfaction and return-on-investment study of a nurse triage service. Am J Manag Care 2001;7:159–69

O'Hara R, Coster J & Goodacre S (2021) Qualitative exploration of the Medical Examiner role in identifying problems with the quality of patient care. BMJ Open, 11(2).

O'Hara R, O'Keeffe C, Mason S, et al (2019). Quality and safety of care provided by emergency care practitioners Emergency Medicine Journal 2012;29:327-332.

O'Hara RA, Bishop-Edwards L, Knowles E & O'Cathain A (2019) Variation in the delivery of telephone advice by Emergency Medical Services: a qualitative study in three services. *BMJ Quality and Safety*, 28(7), 556-563.

O'Meara P. (2005). A generic performance framework for ambulance services: An Australian health services perspective. Journal of Emergency Primary Health Care (JEPHC), Vol. 3, Issue 3.

Oderkirk J, Ronchi E, Klazinga N. (2013). International comparisons of health system performance among OECD countries: opportunities and data privacy protection challenges. Health Policy. 2013;112:9-18

outcomes. Emerg Med J;20:289–92. http://dx.doi.org/10.1136/emj.20.3.289.

Ovretveit. J. (1998). Evaluating health interventions, Open University Press: Buckingham, 321.

Paez A. (2017). Grey literature: An important resource in systematic reviews. J Evid Based Med. doi: 10.1111/jebm.12265. Epub ahead of print. PMID: 29266844.

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. (2020) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. Administration and policy in mental health, 42(5), 533–544. https://doi.org/10.1007/s10488-013-0528-y

Palma E, Antonaci D, Coli A, Cicolini. (2014). Analysis of emergency medical service triage and dispatch errors by registered nurses in Italy. J Emerg Nurs 2014;40:476-83

Pap R, Lockwood C, Stephenson M, Simpson P. (2018). Indicators to measure prehospital care quality: a scoping review. JBI Database System Rev Implement Rep. 2018 Nov;16(11):2192-2223. doi: 10.

Parker, C., Scott, S., & Geddes, A. (2019). Snowball Sampling. In P. Atkinson, S. Delamont, A. Cernat, J.W. Sakshaug, & R.A. Williams (Eds.), SAGE Research Methods Foundations. https://www.doi.org/10.4135/9781526421036831710

Pasma C. (2020). A statistical report on paramedic services in Ontario. Canadian Union of Public Employees. (Accessed September 2020 https://cupe.ca/under-pressure-statistical-report-paramedic-services-ontario

Patterson PD, Lave JR, Weaver MD, Guyette FX, Arnold RM, Martin-Gill C, Rittenberger JC, Krackhardt D, Mosesso VN, Roth RN, Wadas RJ, Yealy DM. (2014). A comparative assessment of adverse event classification in the out-of-hospital setting. Prehosp Emerg Care. 18(4):495-504. doi: 10.3109/10903127.2014.916022. Epub 2014 May 30. PMID: 24878451; PMCID: PMC4410777.

Patton, M. Q. (2015). Qualitative research & evaluation methods: Integrating theory and practice (4th ed.). SAGE

Pawson R, Greenhalgh T, Harvey G, Walshe K. (2005). Realist review--a new method of systematic review designed for complex policy interventions. J Health Serv Res Policy. 2005 Jul;10 Suppl 1:21-34. doi: 10.1258/1355819054308530. PMID: 16053581.

Payne F, Harvey K, Jessopp L, Plummer S, Tylee A, Gournay K. (2002). Knowledge, confidence and attitudes towards mental health of nurses working in NHS Direct and the effects of training. J Adv Nurs. 2002 Dec;40(5):549-59. doi: 10.1046/j.1365-2648.2002.02413.x. PMID: 12437604.

Peculo-Carrasco J-A et al. (2020). Feeling safe or unsafe in prehospital emergency care: A qualitative study of the experiences of patients, carers and healthcare professionals. Journal of Clinical Nursing. 9; 4720 – 4732.

Penson R, Coleman P, Mason S, Nicholl J. (2012). Why do patients with minor or moderate conditions that could be managed in other settings attend the emergency department? *Emerg Med J*. 29: 487– 91.

Pernas MP; Novo SD; Otero MB, Lopez GP, Santos LS, Vazquez JAI, (2016). Efficacy if nurse consultants in a health emergency coordination center. Emergencias. 28:179-181

Piccirillo JF, Tierney RM, Costas I, Grove L, Spitznagel EL Jr. (2004). Prognostic importance of comorbidity in a hospital-based cancer registry. JAMA. 26;291(20):2441-7. doi: 10.1001/jama.291.20.2441. PMID: 15161894.

Pickering A, Mason S, Turner J, Bradley P, Irving S. (2009). Emergency Services Review: A Comparative Review of International Ambulance Service Best Practice. London: Office for Strategic Health Authorities; 2009.

Pons PT, Haukoos JS, Bludworth W, Cribley T, Pons KA, Markovchick VJ. (2005). Paramedic response time: does it affect patient survival? Acad Emerg Med. 2005; 12: 594- 600.

Pope C, van Royen P, Baker R, (2002). Qualitative methods in research on healthcare quality. Qual Saf Health Car3; 11: 148-152)

Pope C, Ziebland S, Mays N. 2000. Qualitative research in health care. Analysing qualitative data. BMJ, 320, 114-6.

Popper K. (1959). The logic of scientific discovery. London: Hutchinson.

Porter A, Badshah A, Black S, Fitzpatrick D, Harris-Mayes R, Islam S, et al. (2020). Electronic health records in ambulances: the ERA multiple-methods study. Health Serv Deliv Res. ;8(10).

Public Health Research Data Forum. (2015). Enabling Data Linkage to Maximise the Value of Public Health Research Data.

Purc-Stephenson RJ, Thrasher C. (2012). Patient compliance with telephone triage recommendations: a meta-analytic review. Patient Educ Couns; 87(2):135-42

Rahmqvist M, Ernesater A, Holmstrom I. (2011). Triage and patient satisfaction among callers in Swedish computer-supported telephone advice nursing. Journal of Telemedicine and Telecare. 2011;17(7):397-402.
Raleigh VS, Foot C. (2010). Getting the measure of quality; Opportunities and challenges The King's Fund 2010

Read S, Wild S, Lewis S. (2013). Applying missing data methods to routine data: a prospective, population-based register of people with diabetes. *Trials*.14(Suppl 1):P113. Published 2013 Nov 29. doi:10.1186/1745-6215-14-S1-P113

Reason J. Human error: models and management. BMJ. 2000;320(7237):768–70. https://doi.org/10.1136/bmj.320.7237.768.

Richards DA, Godfrey L, Tawfik J, Ryan M, Meakins J, Dutton E, et al. (2004) NHS Direct versus general practice-based triage for same day appointments in primary care: cluster randomised controlled trial. BMJ 2004;329:774–7.

Ritchie J, Lewis J.(2003) Qualitative research practice: a guide for social science students and researchers. London: Sage.

Rossman GB, Wilson BL. (1985). Number and words: Combining quantitative and qualitative methods in a single large-scale evaluation study. Eval Rev 9(5):627–643

Sakurai A, Morimura N, Takeda M, Miura K, Kiyotake N, Ishihara T, et al. (2014) A retrospective quality assessment of the 7119 call triage system in Tokyo – telephone triage for non-ambulance cases.J Telemed Telecare;20:233–8.

Saldana J. (2016). The coding manual for qualitative researchers. 3rd edition. Sage Publications.

Sandelowski M, Barroso J. (2003). Classifying the findings in qualitative studies. Qualitative Health Research. 13(7): 905-23. http://dx.doi.org/10.1177/1049732303253488

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research Methods for Business Students*. England: Pearson Education Limited.

Scholl I, Zill JM, Ha¨rter M, Dirmaier J (2014) An Integrative Model of Patient-Centeredness – A Systematic Review and Concept Analysis. PLoS ONE 9(9): e107828. doi:10.1371/journal.pone.0107828

Shaw J Connelly D, Zecevic A. (2010) PhD Pages 510-518 | Accepted 28 Jan 2010, Published online: 22 Jul 2010.

Shepard, K., (2019). Exploring the perceptions of patient safety in the NHS Ambulance Services. For Inquisitive Minds [online]. Available from: https://anchor.fm/fim/episodes/10-Exploring-the-perceptions-of-patient-safety-in-the-NHS-ambulance-services-e3vt2j [Accessed 2 September 2019]

Smith EM. (2005). Telephone interviewing in healthcare research: A summary of the evidence. Nurse Researcher. 2005;12(3):32–41.

Smith Wr, Culley L, Plorde M, Murray JA, Hearne T, Goldberg P, Eisenberg M. (2001) Emergency medical services telephone referral program: An alternative approach to nonurgent 911 calls. Vol. 5, No. 2 , Pages 174-180 (doi:10.1080/10903120190940092)

Snape D, Spencer L. (2008). The Foundations of qualitative Research. In J. Ritchie and J. Lewis (eds), Qualitative research practice: a guide for social science students and researchers, 2nd Edition. London: Sage, pp. 1-23.

Snooks H, Anthony R, Chatters R, et al. (2012) Support and assessment for fall emergency referrals (SAFER 2) research protocol: cluster randomised trial of the clinical and cost effectiveness of new protocols for emergency ambulance paramedics to assess and refer to appropriate community-based care. BMJ Open;2:e002169. doi: 10.1136/bmjopen-2012-002169

Snooks H, Peconi J, Munro J, Cheung WY, Rance J, Williams A. (2009) An evaluation of the appropriateness of advice and healthcare contacts made following calls to NHS Direct Wales. BMC Health Serv Res.;9:178. 10.1186/1472-6963-9-178.

Snooks H, Wrigley H, George S, Thomas E, Smith H, Glasper A. (1998). Appropriateness of use of emergency ambulances. J Accid Emerg Med 15:212-218.

Snooks H.A., Khanom A., Cole R, Edwards A, Edwards B.M, Evans B.A. Foster T, Fothergill RT et al. What are emergency ambulance services doing to meet the needs of people who call frequently? A national survey of current practice in the United Kingdom. BMC Emerg Med, 19, 82.

Snooks, H., Peconi, J., Munro, J. et al. (2009). An evaluation of the appropriateness of advice and healthcare contacts made following calls to NHS Direct Wales. BMC Health Serv Res 9, 178 (2009). https://doi.org/10.1186/1472-6963-9-178

Sofaer S, Firminger K. (2005). Patient perceptions of the quality of health services. Annu. Rev. Public Health 2005. 26:513–59

SOFAER, S. (1999). Qualitative methods: what are they and why use them? Health Serv Res, 34, 1101-18.

SOFAER, S. (2002). Qualitative research methods. Int J Qual Health Care, 14, 329-36.

Spaite, D et al. (2001). Emergency Medical Services Outcomes Project (EMSOP) II: Developing the foundation and conceptual models for out-of-hospital outcomes research. Annals of emergency medicine. 37. 657-63. 10.1067/mem.2001.115215. 11124/JBISRIR-2017-003742. PMID: 30439748.

Spangler D. (2018). An Evaluation of nurse triage at the Emergency Medical Disaptch centers in two Swedish counties. Uppsala Universitet, 2018.

Stacey D, Noorani H Z, Fisher A, Robinson D, Joyce J, Pong R W. (2003) Telephone triage services: systematic review and a survey of Canadian call centre programs. Ottawa, ON, Canada: Canadian Coordinating Office for Health Technology Assessment (CCOHTA). Technology Report; 43. Available from: http://www.cadth.ca/index.php/en/hta/reports-publications

Strauss, A. (1987). Frontmatter. In *Qualitative Analysis for Social Scientists* (pp. I-Vi). Cambridge: Cambridge University Press.

Strom M, Marklund B, Hildingh C.(2009) Callers' perceptions of receiving advice via a medical care help line. *Scand J Caring Sci*;23:682-90.

Studnek J, Thestrup L, Blackwell T, Bagwell B. (2012). Utilization of prehospital dispatch protocols to idenify low acuity patients. Prehospital Emergency Care; 16; 204 – 209.

Swor R, Qu L, Putman K, Sawyer KN, Domeier R, Fowler J, Fales W. (2018) Challenges of using probabilistic linkage methodology to characterize post-cardiac arrest Care in Michigan, Prehospital Emergency Care.;22(2):208–213. doi: 10.1080/10903127.2017.1362086

Tara Nutley & HeidiW. Reynolds (2013) Improving the use of health data for health system strengthening, Global Health Action, 6:1, DOI: 10.3402/gha.v6i0.20001

Tashakkori, A., & Teddlie, C. (2003 and 2010) (Eds.). Handbook of mixed methods in social and behavioural research. London: Sage Publications.

Temple B, Young A. (2014). Approaches to Social Research: The Case of Deaf Studies Print publication date: Print ISBN-13: 9780199929535 Published to Oxford Scholarship Online: March 2015 DOI: 10.1093/acprof:osobl/9780199929535.001.0001

Thabane, L., Mbuagbaw, L., Zhang, S. et al. (2013) A tutorial on sensitivity analyses in clinical trials: the what, why, when and how. BMC Med Res Methodol 13, 92 https://doi.org/10.1186/1471-2288-13-92

The Joanna Briggs Institute (2014) Reviewers' Manual Methodology for JBI Umbrella Reviews. https://nursing.lsuhsc.edu/JBI/docs/ReviewersManuals/Umbrella%20Reviews.pdf

The Scottish Government. (2017), Initial Results of the Scottish Out-Of-Hospital-Cardiac Arrest Data Linkage Project, 2017 https://www.gov.scot/publications/initial-results-scottish-out-hospital-cardiac-arrest-data-linkage-project/pages/1/

Thilsted SL, Egerod I, Lippert FK, Gamst-Jensen H. (2018) Relation between illness representation and self-reported degree-of-worry in patients calling out-of-hours services: a mixed-methods study in Copenhagen, Denmark. Bmj Open. 2018;8(9).

Timans, R., Wouters, P. & Heilbron, J. (2019) Mixed methods research: what it is and what it could be. *Theor Soc* 48, 193–216. https://doi.org/10.1007/s11186-019-09345-5

Togher, F.J., O'Cathain, A., Phung, V.-H., Turner, J. and Siriwardena, A.N. (2015), Reassurance as a key outcome valued by emergency ambulance service users: a qualitative interview study. Health Expect, 18: 2951-2961. https://doi.org/10.1111/hex.12279

Toloo GS, FitzGerald GJ, Aitken PJ, Ting JY, McKenzie K, Rego J, (2013). Enraght-Moony E. Ambulance use is associated with higher self-rated illness seriousness: user attitudes and perceptions. Acad Emerg Med 2013;20:576–83. https://doi.org/10.1111/acem.12149Larking 2006

Tong A, Sainsbury P, Craig J. (2007) Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349-357.

Tran, D.T., Gibson, A., Randall, D. *et al.* (2017) Compliance with telephone triage advice among adults aged 45 years and older: an Australian data linkage study. *BMC Health Serv Res* 17, 512 (2017). https://doi.org/10.1186/s12913-017-2458-y
Tricco AC, Antony J, Zarin W, et al. (2015). A scoping review of rapid review methods. BMC Med 2015;13:224.

Turnbull J, Prichard J, Pope C, Brook S, Rowsell A. (2017) Risk work in NHS 111: The everyday work of managing risk in telephone assessment using a computer decision support system. Health, Risk & Society.;19(3-4):189-208.

Turner J, Coster J, Chambers D, et al. (2015) What evidence is there on the effectiveness of different models of delivering urgent care? A rapid review. Southampton (UK): NIHR Journals Library; 2015 Nov. (Health Services and Delivery Research, No. 3.43.) Chapter 4, Telephone triage and advice services. Available from: https://www.ncbi.nlm.nih.gov/books/NBK327604/
Turner J, Jacques R, Crum A, Coster J, Stone T, Nicholl J. (2019). Ambulance Response Programme: Evaluation of Phase 1 and Phase 2. Final Report to NHS England (Accessed September 2020 (https://www.england.nhs.uk/wp-content/uploads/2017/07/ARPReport_Final.pdf)

Turner J, Preston L, Booth A, O'Keeffe C, Campbell F, Jesurasa A, Cooper K, Goyder E. (2014). What evidence is there for a relationship between organisational features and patient outcomes in congenital heart disease services? A rapid review. Southampton (UK): NIHR Journals Library; 2014 Nov. PMID: 25642567.

Turner J, Siriwardena AN, Coster J, Jacques R, Irving A, Crum A, Gorrod HB, Nicholl J, Phung VH, Togher F, Wilson R, O'Cathain A, Booth A, Bradbury D, Goodacre S, Spaight A, Shewan J, Pilbery R, Fall D, Marsh M, Broadway-Parkinson A, Lyons R, Snooks H, Campbell M. (2019) Developing new ways of measuring the quality and impact of ambulance service care: the PhOEBE mixed-methods research programme. Southampton (UK): NIHR Journals Library; 2019 Apr. PMID: 31034193.

Turner j, Snooks H, Youren A et al. (2006) The costs and benefits of managing some low-priority 999 ambulance calls by NHS Direct nurse advisors. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO).

Urgent and Emergency Review Team (Keogh Review). (2013). (Transforming urgent and emergency care services in England: Urgent and emergency care review: End of Phase 1 Report.

2013. NHS England. https://www.nhs.uk/NHSEngland/keogh-review/Documents/UECR.Ph1Report.FV.pdf accessed 25th May 2019)

Vecellio E, Raban MZ, Westbrook JI. (2012)Secondary ambulance triage service models and outcomes: A review of the evidence. Australian Institute of Health Innovation, University of New South Wales. Sydney.

Venesoja A, Castrén M, Tella S, et al. (2020). Patients' perceptions of safety in emergency medical services: an interview study. BMJ Open.;10:e037488. doi:10.1136/ bmjopen-2020-037488

Vincent A, Jomard N, Haesbaert J et al. (2019). Referral pathway of patients aged over 75 years and older after a telephone triage by the French emergency medical communication centre (SAMU) *Archives of Gerontology and Geriatrics 84 (2019) 103893*

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. (2007) The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Lancet.;370(9596):1453-1457. PMID: 18064739 (https://www.equator-network.org/reporting-guidelines/strobe/)

Waffenschmidt et al. (2019) BMC Medical Research Methodology 19:132 https://doi.org/10.1186/s12874-019-0782-0

Wahlberg AC, Bjorkman A. (2018) Expert in nursing care but sometimes disrespectedTelenurses' reflections on their work environment and nursing care. Journal of Clinical Nursing;27(21-22):4203-11.

Welsh Ambulance Services NHS Trust, (2007). Time to make a difference: Transforming ambulance services in Wales.

Wheeler S, Greenburg M, Majlmeister L, Wolfe N. (2015) Safety of Clinical and Non-Clinical Decision Makers in Telephone Triage: a narrative review. Journal of Telemedicine and Telecare Vol 21 (6 (305 – 322).

10 Appendix

10.10. Appendix 1: Review 1 data extractions

Review 1: Conceptual review data extraction; definitions and attributes of safety, appropriateness and acceptability

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
Definitions search	Peculo-Carrasco J-A et al. (2020). Feeling safe or unsafe in prehospital emergency care: A qualitative study of the experiences of patients, carers and healthcare professionals. Journal of Clinical Nursing. 9; 4720 – 4732.	Qualitative. Focus groups with patients, carers and prehospital staff	Spain. Prehospital and emergency care. Does not specifically consider telephone advice	"To determine the feelings of safety among patients taken to hospital after requesting urgent care, based on their experiences and those of their carers and prehospital emergency care professionals"	Neither the patients or carers group nor the healthcare professionals group provided a clear definition of what it means to feel safe.	Appropriateness not included in this paper	For service users, feelings of safety were enhanced through perceptions of calmness, trust and protection. Key factors were information and communication, person centre care, professional competency, accessibility, response times and equipment and healthcare. Healthcare professionals perceived that patients felt safer in their own home.

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
							"Patients taken to hospital after requesting prehospital emergency care feel safe or very safe. Patients do not necessarily feel safe if everything is done correctly. It is essential to recognise safety as both a psychological and physical perception"
Definitions search	Patterson PD, Lave JR, Weaver MD, Guyette FX, Arnold RM, Martin-Gill C, Rittenberger JC, Krackhardt D, Mosesso VN, Roth RN, Wadas RJ, Yealy DM. (2014). A comparative assessment of adverse event classification in the out-of-hospital setting. Prehosp Emerg Care. 18(4):495-504. doi: 10.3109/10903127.2014.916022. Epub 2014 May 30. PMID: 24878451; PMCID: PMC4410777.	Modified Delphi with Medical Directors to develop consensus definition. Retrospective case note review and physician agreement	US. EMS. Does not specifically consider telephone advice	"To develop a method to define and rate the severity of adverse events (AEs) in emergency medical" services (EMS) safety research.	Defined an adverse event in EMS care as "An adverse event in EMS is a harmful or potentially harmful event occurring during the continuum of EMS care that is potentially preventable and thus independent of the progression of the patient's condition."	Appropriateness not included in this paper	Acceptability not included in this paper

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
Definitions search	Pap R, Lockwood C, Stephenson M, Simpson P. (2018). Indicators to measure prehospital care quality: a scoping review. JBI Database System Rev Implement Rep. 2018 Nov;16(11):2192-2223. doi: 10.	Scoping review of ambulance prehospital quality of care	Australia. Prehospital. Does not specifically consider telephone advice	"To locate, examine and describe the literature on indicators used to measure prehospital care quality"	"Whilst there is paucity in research aiming to specifically define prehospital care quality, the attributes of generic healthcare quality definitions appear to be accepted and applicable to the prehospital context." "The most commonly addressed prehospital care quality attributes were Appropriateness (n ¼ 250, 47.5%), Clinical effectiveness (n ¼ 174, 33.1%) and Accessibility (n ¼ 124, 23.6%)." "The findings suggest that timely access to appropriate, safe and effective care, which is responsive to patients' needs and efficient and equitable to populations are the key quality attributes in the prehospital context."		
Definitions search	O'Meara P. (2005). A generic performance framework for ambulance services: An Australian health services perspective. Journal of Emergency Primary Health Care (JEPHC), Vol. 3, Issue 3.	Developing a performance framework for measuring ambulance service performance	Australia. Prehospital. Does not specifically consider telephone advice.	"To explore existing and potential performance frameworks for Australian ambulance services"	Potential risks of an intervention or the environment are avoided or minimized. Key components of safety **Structure**: Monitoring system **Process:** safety procedures; quality of care **Outcomes;** Accreditation; complications	Care/service provided is relevant to client/patient needs and based on established standards Key components of appropriateness **Structure**: Staff configuration; staff level; evidence base **Process:** Research activities; time at scene **Outcomes;** New knowledge; adverse events	Care/service provided meets expectations of client, community, providers and paying organizations. Key components of acceptability **Structure**: Public participation; ethical standards **Process:** Respect for patient autonomy; accountability **Outcomes;** Satisfaction; complaints

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
Definitions search	Elden OE, Uleberg O, Lysne M, Haugdahl HS. (2020). Community paramedicine-cost-benefit analysis and safety with paramedical emergency services in rural areas: scoping review protocol. BMJ Open. 2020 Sep 25;10(9):e038651. doi: 10.1136/bmjopen-2020-038651. PMID: 32978201; PMCID:	Scoping review	Norway. Community paramedic safety. Does not specifically consider telephone advice	"To examine the current knowledge and possibly identify gaps in the research/knowledge base for cost–benefit analysis and safety concerning community paramedicine in rural areas using a scoping review methodology."	Uses IOM definition of safety – Patients should be safe from injury caused by the care system. Reducing risk and ensuring safety require greater attention to systems that help prevent and mitigate errors.[IOM]	Appropriateness not included in this paper	Acceptability not included in this paper
Definitions search	Atack L, Maher J. (2010). Emergency Medical and Health Providers' perceptions of key issues in prehospital patient safety. Prehospital Emergency Care;14:95–102	Qualitative study. Interviews	Canada. Prehospital. Does not specifically consider telephone advice	To identify emergency medical and health providers perceptions of key issues in prehospital safety	Uses the Royal College of Physicians and Surgeons, Canada definition of safety "Patient safety is defined as "the reduction and mitigation of unsafe acts within the health-care system, as well as through the use of best practices shown to lead to optimal patient outcomes"	Appropriateness not included in this paper	Acceptability not included in this paper

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					Identifies two key safety issues within EMS 1) clinical decision making and 2) EMS's focus and relationship with health care.		
Definitions review	Bigham BL. Buick JE; Brooks SC et al. (2012) Patient safety in emergency medical services: a systematic review of the literature. Prehospital Emergency Care;16:1–20	Systematic review	EMS. Does not specifically consider telephone advice	"To identify the threats to patient safety unique to the EMS environment and interventions that mitigate those threats"	Seven themes/ components of safety in EMS were identified from the literature "adverse events and medication errors (22 articles), clinical judgment (13), communication (6), ground vehicle safety (9), aircraft safety (6), interfacility transport (16), and intubation (16)."	Appropriateness not included in this paper	Acceptability not included in this paper
Definitions search	National Audit Office. (2017). NHS Ambulance Services.	National Audit Office report			Ambulance trusts collect information on clinical effectiveness, patient safety and patient experience by looking at the number of	Appropriateness not included in this paper	Ambulance trusts collect information on clinical effectiveness, patient safety and patient experience by looking at the number of serious

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					serious incidents, complaints, concerns and compliments.		incidents, complaints, concerns and compliments.
Grey literature	SHEPARD, K., (2019). Exploring the perceptions of patient safety in the NHS Ambulance Services. For Inquisitive Minds [online]. Available from: https://anchor.fm/fim/episodes/10-Exploring-the-perceptions-of-patient-safety-in-the-NHS-ambulance-services-e3vt2j [Accessed 2 September 2019]	Qualitative exploratory study.	UK. Ambulance service. Does not specifically consider telephone advice	Staff perceptions of patient safety in three ambulance service trusts.	Uses IOM definition "prevention of harm to patients"	Appropriateness not included in this paper	Acceptability not included in this paper
Definitions search	Eastwood K, Smith K, Morgans A, et al. (2018) Appropriateness of cases presenting in the emergency department following ambulance service secondary telephone triage: a retrospective cohort study. BMJ Open 2017;7:e016845. doi: 10.1136/bmjopen-2017-016845	Retrospective cohort analysis of ED presentations following telephone advice	Australia. Ambulance and ED. Specifically considers telephone advice	"To investigate the appropriateness of cases presenting to the emergency department (ED) following ambulance-based secondary telephone triage."	Safety not included in this paper	"Appropriateness was measured using an ED suitability definition and hospital admission rates." "ED suitability was based on a modified version of the 'potentially avoidable GP-type presentation' measure used by the Australian Government for ED presentations that are considered avoidable had an	Acceptability not included in this paper

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						appropriate community-based service been accessed."	
Definitions search	Ahl C. 2006. Making up one's mind: Patient experiences of calling an ambulance. Accident and Emergency Nursing 13, 11-19	Qualitative interviews with service users.	Sweden. Prehospital. Does not specifically consider telephone advice	"To analyse and describe patients' experiences related to the decision to call an ambulance and the wait for it to arrive."	Safety not included in this paper	Appropriateness not included in this paper	To experience a sense of safety and trust "The informants reported that the personnel at the emergency call centre and the caregivers in the ambulance can strengthen patients' feeling of safety and trust, partly because the patients know that someone is coming and because they can speak to them on the phone before the ambulance arrives."
Policy search	Department of Health (2011)b Taking healthcare to the patient 2: A review of 6 years progress and recommendations for the future.	Policy document	Ambulance	A review of 6 years progress and recommendations for the future.	"Clinical safety nets for patients left at home e.g. referral to more	"in the majority of cases this is aimed at preventing an unnecessary ambulance	Patients should have "Complete confidence in the ambulance crews skills"

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					appropriate local services"	response and therefore avoids inappropriate attendance at hospital by providing advice to the caller or using established referral pathways to other healthcare services." Emphasis on clinically appropriate care. Avoid unnecessary admissions to hospital when appropriate.	
Policy search	Department of Health, 2005. Taking healthcare to the patient: Transforming NHS Ambulance Services.	Policy document	Ambulance	Transforming NHS Ambulance Services	"The triage system used by ambulance services to prioritise calls is very good at safely identifying which patients must get a quick response. This is what it is designed to do. But it acts like a net with small holes. In capturing the vast majority of the patients who need a very quick response, is also	"Using the most clinically appropriate staff" "Systems should be designed to deliver the most appropriate care first time" "treat patients more appropriately in the out-of-hospital setting" "Staff delivering clinical telephone advice should	"Need to improve quality of care for example, pain management and communication with patients." "Patients will receive improved care and experience from consistently getting the right response, first time, in time."

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					sweeps up many patients who do not have an emergency need“ “Clearly there is a need to over-prioritise in order to provide a safe response and manage risk” “Safe advice, assessments, diagnosis, treatment and/or care closer to home or over the phone” “Many 999 patients are still taken to hospital when they could safely receive advice, assessment, diagnosis, treatment and/or care closer to home or over the phone”	advise patients on care appropriate to their need”	Ambulance services should “Provide high quality patient centred care”
Policy search	Ambulance Service Network (2008). A vision for emergency and urgent care: The role of the ambulance service. The NHS Confederation.	Policy document	Ambulance	The role of ambulance services in emergency and urgent care.	Treating patients safely and effectively.	“appropriately trained and skilled ambulance service staff working in multi-disciplinary teams	“World-class outcomes and experiences for all patients.” “Patient outcomes and experiences should be

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						across a variety of settings" "We need to ensure patients get the most appropriate and cost-effective care whenever possible." Patients should "receive the most appropriate response for their need – whether this is an ambulance or rapid response vehicle, a referral to an urgent care service, or self-care advice." "The role of the ambulance service is to deal with all of these callers in the most clinically appropriate and cost-effective way" "The challenge now is for the whole health and social care system to work together to develop the most	adopted as a measure of success." "Providing care in the local community or at home, so patients don't have to go into hospital unnecessarily, will often deliver the best outcomes and experiences for patients" "A patient's outcome or experience is not solely improved by getting to them quickly; ambulance service staff must also provide appropriate and effective treatment when they get there to make a difference"

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						appropriate care pathways so all patients get the right care in the right place at the right time." Consistent and appropriate triage of 999 calls. "Most appropriate response for need"	
Policy search	Healthcare Commission. (2008).Not just a matter of time: A review or urgent and emergency care services in England.	Policy document	UEC	A review of urgent and emergency care services in England.	Describes safe care as "appropriate advice for the safe handling of situation" "Opportunities to safely treat more people at home or using telephone advice" "Effective sharing of data should also help to improve the safety of patients, by saving time and cutting down on the chance of errors occurring."	Care "delivered by competent and professional staff" "Achieve the delivery of patient care in the most appropriate and convenient setting." "Patients treated by the most appropriate service" "People were referred to other services inappropriately. For example, they were told to call an alternative telephone number	Patients want "effective resolution of their problems through the provision of appropriate care or treatment and reassurance, delivered by competent and professional staff" "Services should evolve to reflect patients' choices." "'whole system' measures of outcomes and patients' experiences, from initial

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					Quality of care measures • Results of clinical audits • Patient safety incidents • Unplanned repeat attendances within a short timescale (for example, one week) Outcomes • Patients treated at home/dealt with by telephone advice • Emergency attendances and admissions • Patients' views • Mortality/survival rates (adjusted to take account of differences in risk and case mix)	that went to an answering machine or referred to a service which referred them back to the first service." "Even where a fast response is not necessary from a clinical point of view, a timely and appropriate response is important to build the patient's confidence in services and minimise the concern that waiting can cause" "the challenge now is to develop measures which look along pathways and across services, such as measures of how efficiently patients are handed over between services, the proportion of patients treated by the most appropriate service and 'whole	contact to resolution of their problem." Where a patients health problem is not dealt with by the first service they contact and they are transferred or referred between service "patients told us that they were left feeling confused, that their care was poorly organised or that services were 'passing the buck'" "Negative experiences of care can not only lead to frustration and anxiety, but can leave them upset – particularly where they do not feel that they have been treated with dignity and respect – and anxious about using

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						system' times from initial contact to resolution"	services in the future" "patients want "effective resolution of their problems through the provision of appropriate care or treatment, with: • Reassurance and prompt attention •Effective and timely care • Integrated services – not to be passed from one service to another •Their GP to be kept informed"
Policy search	Welsh Ambulance Services NHS Trust, (2007). Time to make a difference: Transforming ambulance services in Wales.	Policy document	Ambulance. Wales.	A modernisation plan for ambulance services and NHS Direct Wales	"Review the training needed by call takers to ensure consistency of approach and improve the safety and specificity of call categorisation' 'measure the specificity and safety of call categorisation C'	"effectiveness' means something else: helping them to identify their real needs and giving them access to advice, information or appropriate care." "appropriate first response from the emergency service."	Taking into account "views of patients, their carers, relatives and the public into account in the design, planning delivery, review and improvement of services"

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						"provide quality assured clinical treatment and care appropriate to need, and based on evidence"	
Policy search	NHS England, 2013. Transforming urgent and emergency care services in England: Urgent and emergency care review End of Phase 1 Report,	Policy document	UEC. England.	Review of UEC service organisation	"safely manage many more people at scene." "create a comprehensive system of care across a network that will deliver good outcomes for all patients in a safe and effective way"	"get patients to the best and most appropriate services" "delivery of patient care in the most appropriate and convenient setting"	"For those people with urgent care needs we should provide a highly responsive service that delivers care as close to home as possible, minimising disruption and inconvenience for patients and their families." "Building a responsive network of services across the system to better meet the needs of patients"
Policy search	NHS England, 2015. Transforming urgent and emergency care services in England: Urgent and emergency care review.	Policy document	UEC. England.	Review of UEC service organisation	"Safe and efficient patient care requires effective, timely and appropriate transfer of key information that follows the patient	GP "Nurses triage through telephone consultation. This results in a clinical decision, identifying the most	Patient satisfaction with the care they received. Increase in the confidence to self-manage chronic

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					through the healthcare system." "patients can be managed close to home where it is safe and appropriate to do so."	appropriate intervention for the individual" "identifying the most appropriate care pathway for that patient." "Avoiding unnecessary and inappropriate delays to the appropriate care; Avoiding duplication of assessment and additional steps in the urgent care pathway that add no value to the patient;	condition exacerbations.
Policy search	NHS England, (2018). Service Specification: Urgent and Emergency Ambulance Services.	Strategy document	Urgent and emergency ambulance services	Implementation and service delivery specification building on UEC review 2013 and 2015.	"providing remote advice for responding staff to enable patients to be managed safely either in, or close to their home environment, wherever possible." "Developing common protocols and models of support for paramedics on scene to	"appropriately assess patient needs and provide the most appropriate response in a timely way. This response may not be an emergency ambulance" "Hear and Treat / Refer: Incidents with no face to face response. Calls will be managed via the Clinical Support Desk	"Ensuring people have a positive experience of care"

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					safely reduce avoidable conveyance." "Treating and caring for people in safe environment and protecting them from avoidable harm" "combined challenges of the safe management of high acuity patients, who make up a minority of activity, whilst also addressing the needs of the larger volume of mid and low acuity patients, against the backdrop of a finite funding position,"	resulting in no resource (vehicle) arriving at the scene. Hear and Treat / Refer service is to be available and staffed with appropriately qualified staff 24 hours per day. A successfully completed call is one where advice has been given with any appropriate action being agreed with the patient and where no further response is required from the ambulance service. Appropriate action may include telephone advice and 'signposting' or referral to any appropriate service such as GP, Out of Hours Service, Urgent Treatment Centre (UTC), Pharmacy, NHS 111, CTA etc. "	

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
Policy search	NHS England (2014). NHS Five year forward. https://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf	Policy document	NHS	To set out a clear direction for the NHS – showing why change is needed and what it will look like	"The definition of quality in health care, enshrined in law, includes three key aspects: patient safety, clinical effectiveness and patient experience. A high quality health service exhibits all three."	"Helping patients get the right care, at the right time, in the right place, making more appropriate use of primary care, community mental health teams, ambulance services and community pharmacies, as well as the 379 urgent care centres throughout the country."	"The definition of quality in health care, enshrined in law, includes three key aspects: patient safety, clinical effectiveness and patient experience. A high quality health service exhibits all three."
Systematic review identified from review 2	Department of Health, (2013). Building the evidence base in pre-hospital urgent and emergency care: A review of research evidence and priorities for future research. University of Sheffield Medical Care Research Unit for the	Systematic review			No definition of safety reported by the authors Safety assessed by clinical review and measured using adverse incidents and morbidity (Shaefer 2002) Safety was measured using the mis-triage rate and number of	No definitions of appropriateness reported. Studies included in the review measured/reported appropriateness in the following ways: •Appropriate response •Appropriate application of protocols	No definition of acceptability reported. Studies included in the review measured/reported acceptability in the following ways: •Acceptability of transportation/referral to other (non-ED) services

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					adverse incidents in an RCT to assessing low urgency ambulance calls with telephone advice from NHS Direct. (Turner 2006) Safety was measured using the proportion of subsequent hospital admissions, deaths and admissions to intensive care in a study evaluating non-transport protocols for EMS patients (Haines 2006) Safety was measured using risk of under triage in a study about call prioritisation (Nicholl 1996) One of the studies included in the review measured safety as as admissions within 14 days of treat and refer protocol for non-	•Appropriately triaged to care in a setting other than ED •Inappropriate transportations •Patient treated in most appropriate place •Most appropriate care •Care at home with appropriate referral •Appropriateness of assignment of low acuity dispatch codes •Clinically appropriate response	•Acceptability of waiting times for services or services responses •Patient preferences •Patient satisfaction •Caller perceptions of urgency

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					serious 999 calls (Snooks).		
Systematic review identified from review 2	Fisher JD, Freeman K, Clarke A, Spurgeon P, Smyth M, Perkins GD, et al. (2015). Patient safety in ambulance services: a scoping review. Health Serv Deliv Res;3(21).	Systematic review			No definitions reported. See findings from Turner review as uses the same papers	No definitions reported. •Under triage •Referred to the most appropriate service •Managed by most appropriate health care professionals for the health care need •Appropriately managing resources	No definitions reported. •Acceptable alternatives to transport to ED •Acceptability of alternative prehospital protocols e.g treat and refer •Acceptability of telephone advice •Patient satisfaction •Patient experience
Systematic review identified from review 2	Huibers L, Smits M, Renaud V, Giesen P, Wensing M. (2011). Safety of telephone triage in out-of-hours care: a systematic review. Scand J Prim Health Care 2011;29:198–209. 10.3109/02813432.2011.629150.	Systematic review			Huibers defined unsafe performance as triage which could harm patients because of under-triage, under-estimation of urgency, or under-referral. These triage outcomes could lead to delay in treatment and thus pose risks to patients. Whereas safe performance was	No definition of appropriateness is reported, but the definition used to measure safety also includes some aspects of appropriateness (under-referral/ underestimation). Studies included in the review measured/reported	Not reported in this review

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					defined as triage resulting in an appropriate outcome (i.e. no under triage, under estimation of over referral. Studies included in the review measured safety in the following ways: •Appropriateness of decisions, referrals and outcomes •Inappropriate advice •Appropriateness of triage •Correctly or accurately identified urgent and non-urgent responses •Triage accuracy •Under triage •Adequate advice •Correct advice •Mortality •Unplanned hospitalisations •ED attendance after non-urgent disposition	appropriateness in the following ways: •Appropriateness of decisions, referrals and outcomes •Inappropriate advice •Appropriateness of triage/triage resulting in an appropriate outcome •Correctly or accurately identified urgent and non-urgent responses •Triage accuracy •Under triage •Adequate/appropriate advice •Correct advice •Unplanned hospitalisations •ED attendance after non-urgent disposition	

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					•Errors		
Systematic review identified from review 2	Ebben R, (2017). A patient-safety and professional perspective on non-conveyance in ambulance care: a systematic review. Scandinavian Journal of Trauma.	Systematic review			No definitions reported. Included studies measured patient safety in the following ways: •Unplanned/repeated ED attendance •Unplanned/repeated EMS access •Unplanned/repeated GP attendance •Walk-in-centre attendance •Mortality (measured between 24hrs and 30 days) •Hospital admissions (measured between 24hrs and 14 days) Recurrence of symptoms (measured between 48hrs and 6 months)	No definitions reported. Non-conveyance was defined as "an ambulance deployment as appropriate, where the patient after examination and/or treatment on-scene does not require conveyance with medical personnel and equipment to the healthcare facility". Included studies measured/reported appropriateness in the following ways: •Appropriate conveyance or referral decisions •Appropriate triage or treatment decisions •Unplanned/repeated ED attendance •Unplanned/repeated EMS access	Not reported in this review

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						•Unplanned/repeated GP attendance •Walk-in-centre attendance •Hospital admissions (measured between 24hrs and 14 days) •Recurrence of symptoms (measured between 48hrs and 6 months)	
Systematic review identified from review 2	Blank L, Coster J, O'Cathain A, Knowles E, Tosh J, Turner J, et al. The appropriateness of, and compliance with, telephone triage decisions: a systematic review and narrative synthesis. J Adv Nurs 2012;68:2610–21. 10.1111/j.1365-2648.2012.06052.x	Systematic review			Not reported in this review	The authors state that "Although the concept of appropriateness is frequently used in health care, there is no agreement on a standardized operational definition or uniform understanding". The authors suggest "suggest that a definition of appropriateness incorporating both accuracy and adequacy of triage	No definitions reported. •Patient satisfaction •Patient compliance with telephone advice

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						decision should be encouraged". The study included papers which looked at either the most appropriate or accurate referral and adequate care.	
Systematic review identified from review 2	Eastwood K, Morgans A, Smith K, Stoelwinder J. (2015). Secondary triage in prehospital emergency ambulance services: a systematic review. Emerg Med J 2015;32:486–92. https://doi.org/10.1136/emermed-2013-203120	Systematic review			No definitions reported. •Adverse events •Deaths •under triage patient outcomes following telephone advice	No definitions reported. •Under triage •Referred to the most appropriate service •Managed by most appropriate health care professionals for the health care need •Appropriately managing resources	No definitions reported. •Patient satisfaction with telephone advice •Patient expectations
Systematic review identified from review 2	Wheeler S, Greenburg M, Majlmeister L, Wolfe N. (2015) Safety of Clinical and Non-Clinical Decision Makers in Telephone Triage: a narrative review. Journal of Telemedicine and Telecare Vol 21 (6 (305 – 322).	Systematic review			Defined safety as appropriate referrals (AR) – (right time, right place with the right person). •appropriate referral rate	No definition of appropriateness is reported, but the definition used to measure safety also includes some aspects of appropriateness (appropriate referral).	Not reported in this review

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
					•safety of decisions by different staff types	•Appropriate referral rate	
Systematic review identified from review 2	Bunn F., Byrne E, G. & Kendall, S. (2004). Telephone consultation and triage: effects on health care use and patient satisfaction. Cochrane Database Syst Rev, CD004180.	Systematic review			Not reported in this review	Not reported in this review	No definition of acceptability reported. •proportion of patients that were satisfied with the telephone advice they received and the telephone consultation •proportion of patients that would be happy to receive the service again.
Systematic review identified from review 2	Lake et al. (2017). The quality, safety and governance of telephone triage and advice services – an overview of evidence from systematic reviews BMC Health Services Research (2017) 17:614 DOI 10.1186/s12913-017-2564	Systematic review			No definitions reported. •Adverse events •Errors •Hospitalisation rates	No definitions of appropriateness. Included studies considered evidence about the appropriateness of telephone advice in two ways "either the number of calls which could be managed with telephone advice alone or the appropriateness of the advice given."	No definitions reported. •Patient satisfaction •Expectations not met and impact on satisfaction •Telephone advice represents a barrier to traditional forms of care •Compliance rates

Review source	Study details	Study design	Setting	Study overview/aim	Safety definition/outcome measures/attributes	Appropriateness definition/outcome measures/attributes	Acceptability definition/outcome measures/attributes
						•Inappropriate or avoidable attendances •Appropriate advice •Rate of accuracy •Adequacy of triage •Ability of drs and nurse to handle enquiries over the phone	
Systematic review identified from review 2	Kirkland SW, Soleimani A, Rowe BH, et al. (2018). A systematic review examining the impact of redirecting low-acuity patients seeking emergency department care: is the juice worth the squeeze? Emergency Medicine Journal Published Online First. doi: 10.1136/emermed-2017-207045	Systematic review			Not reported in this review	No definition of appropriateness. •Referral to the most appropriate healthcare practitioner	No definitions reported. •Proportion of patients accepting alternatives to ambulance response •Refusal of non-ambulance response
Systematic review identified from review 2	Carrasqueiro S, Oliveira M, Encarnacao P. (2011). Evaluation of telephone triage and advice services: a systematic review on methods, metrics and results. A. Moen et al. (Eds.) IOS Press.	Systematic review			No definitions reported. •Adverse events •Deaths •ED admissions •Delayed care	No definition of appropriateness. •Appropriate levels of care •Advice appropriateness	No definitions reported. •Patient satisfaction

10.11. Appendix 2: Attributes/measures of safety, appropriateness and acceptability in prehospital care identified from searches

Attributes/ measures of safety	Definitions search	Policy documents	Systematic reviews
Accreditation	✓		
Appropriate advice for safe handling of situation		✓	✓
Benchmarking		✓	
Clinical claims		✓	✓
Clinical decision-making, safe decisions	✓		✓
Clinical safety-net		✓	
Complaints/concerns	✓	✓	
Complications	✓		
Data sharing to improve safety		✓	
Delayed care			✓
ED attendance		✓	✓
Hospital admissions		✓	✓
Monitoring safety/monitoring systems	✓	✓	
Mortality, survival rates, case mix adjusted mortality, preventing people from dying prematurely	✓	✓	✓
Number of patient safety incidents/adverse events/medication errors	✓	✓	✓
Number of patients who do not complete their care (telephone advice – hang up)		✓	
Patients treated at home/dealt with by telephone		✓	
Prevention and mitigation of harm/errors	✓	✓	✓
Quality of care	✓		
Results of clinical audit		✓	
Risk	✓	✓	✓
Safe and effective care/clinical effectiveness	✓	✓	
Safe management in or close to home		✓	
Safe non-conveyance		✓	
Safe over-triage		✓	

Safe reductions in avoidable conveyance		✓	
Safe service		✓	
Safe treatment		✓	
Safe triage/mis-triage/under triage		✓	✓
Triage accuracy			✓
Unplanned/repeat EMS attendances in a short timescale e.g 1 week		✓	✓

Appropriateness

Attributes/ measures of appropriateness	Definitions search	Policy documents	Systematic reviews
Adequacy of triage			✓
Adverse events	✓		
Appropriate action agreed with patient (sign posting/referral)		✓	✓
Appropriate assessment of patient's needs		✓	✓
Appropriate clinical response first and every time		✓	
Appropriate clinical response that is cost-effective		✓	
Appropriate direction/referral to other health services, inc. community-based services or local services		✓	✓
Appropriate evidence base	✓		
Appropriate management of resources			✓
Appropriate triage	✓	✓	✓
Appropriate use of ambulance service by the public		✓	
Appropriately qualified staff/configuration of staff	✓	✓	
Appropriateness measured by the proportion of patients treated by the most appropriate service		✓	✓
Avoidable attendances at ED or avoidable ambulance responses/ED suitability	✓		✓
Care appropriate to need		✓	✓
Care that is necessary		✓	
Clinical quality indicator "Proportion of calls closed with telephone advice or managed without transport to A and E (where clinically appropriate)		✓	
Clinically appropriate and effective/ most effective and appropriateness level of care		✓	✓
Effectiveness of clinical advice is giving access to advice, information or appropriate care		✓	
Ensuring services are available to meet patient's needs, rather than labelling inappropriate		✓	
Inappropriate referrals		✓	✓
Managed by most appropriate health care staff for clinical need			✓
No further response from ambulance service = successful and appropriate		✓	
Rate of triage accuracy			✓
Response and care appropriate to need		✓	✓
Treatment in appropriate location/health care setting/service for clinical need		✓	✓
Under triage			✓

Acceptability

Attributes/ measures associated with acceptability	Definitions search	Policy documents	Systematic reviews

Acceptability of a non-ambulance alternative			✓
Acceptability of a non-ED health service referral			✓
Acceptability of not being sent an ambulance or being conveyed to ED			✓
Accessibility of care	✓		
Ambulance Clinical Quality Indicators		✓	
Appropriate care		✓	✓
Care explained /good communication		✓	
Complaints	✓	✓	
Compliments		✓	
Confidence in health care staff and services		✓	
Effective care		✓	
Expectations	✓		✓
Good patient outcomes		✓	
Happy to use/receive the service again			✓
Happy with advice received			✓
Improved paramedic training to improve patient experience		✓	
Measure success by identifying progress in improving patient experience and outcomes		✓	
Necessity of advised healthcare			✓
Patient centred care	✓	✓	✓
Patient experience/improvements in patient experience/ Patient experience with care pathways	✓	✓	✓
Patient preferences and patient choices		✓	✓
Patient safety	✓		
Patient satisfaction	✓	✓	✓
Prompt attention		✓	
Reassurance		✓	✓
Relevance of questions asked			✓
Service experience		✓	✓
Timeliness of service and response times	✓	✓	✓
Trust, calmness and protection	✓		

Whole system measures of outcomes and patient experience		✓	

10.12. Appendix 3: Examples of safety, appropriateness and acceptability

Conceptual outcome	Definition	Example
Safety	Safe care is timely and effective care that does not cause harm	Safe care is that which is timely, is effective in treating the patient's health problem and does not cause undue harm to the patient. Some treatments or responses may be effective, but may not be as effective or cause harm if they are not timely.
Appropriate	Appropriate care that is proportional to the health problem	The right amount of care to safely treat the patient's health problem. Sending a helicopter ambulance to a patient with a low urgency ambulance health problem may safely treat the patient's health problem, but it is excessive and inappropriate in relation to the patient's health care need. Similarly, where a patient with a high urgency health problem is triaged to receive telephone advice, this is insufficient care and therefore inappropriate
Acceptability	Acceptable care is care that the patient views as safe and appropriate and where the patient has a good experience of care.	It is possible that a patient may not view telephone advice as acceptable, if they expect or feel they need an ambulance. A patient may also feel the telephone advice they were given was not acceptable, if they feel this did not address or resolve their health care problem effectively or was not practicable for them.
Inappropriate but safe	Too much care or a higher level of care than was required to treat the health problem. However, the care was safe.	For instance, if an emergency ambulance is sent to a patient who has injured their toe or can't sleep.

Inappropriate but acceptable	Too much care or a higher level of care than was required to treat the health problem. However, this was acceptable to the patient.	As per the example above, but the patient felt that being sent an ambulance for a toe injury was the right level of care for their health problem and resolved their health problem effectively.
Unacceptable but safe	Care that is safe but the patient feels the care is not acceptable e.g. not practicable or their expectations were not met.	For example, if the patient expected to be taken to the ED but was treated at home and they did not think this was acceptable.
Unacceptable but appropriate	Care that is proportional to the health problem but the patient does not feel it is acceptable	As per the example above.
Unsafe, inappropriate and unacceptable	Care that is ineffective, delayed or causes harm, is insufficient and unacceptable to the patient	Care that falls short on all three of the conceptual outcomes.

10.13. Appendix 4: Review 2 Searches

UEC search

MEDLINE (via Ovid SP)

Search strategy

1. Ambulances/
2. “ambulance*”.ab,ti.
3. exp Emergency Medical Services/
4. (pre-hospital or pre hospital or prehospital).ab,ti.
5. Emergency Service, Hospital/
6. “emergency department*”.ab,ti.
7. “emergency service*”.ab,ti.
8. “accident and emergency”.ab,ti.
9. (urgent adj3 care).ab,ti.
10. After-Hours Care/
11. ‘out of hours care’.ab,ti.
12. after hours care.ab,ti.
13. ‘out of hours medical care’.ab,ti.
14. ‘after hours medical care’.ab,ti.
15. ‘out of hours service$’.ab,ti.
16. after hours service$.ab,ti.
17. ‘out of hours medical’.ab,ti.
18. ‘out of hours clinic$’.ab,ti.
19. after hours medical.ab,ti.
20. after hours clinic$.ab,ti.
21. or/1-20
22. “Delivery of Health Care”/
23. (classification or economics or legislation jurisprudence or manpower or organization administration or standards or statistics numerical data or supply distribution or trends or utilization).fs.
24. (service adj1 (deliver$ or reform$ or reorganis$ or reorganiz$ or restructur$ or chang$ or innovat$)).ab,ti.
25. 22 or 23 or 24
26. 21 and 25
27. limit 26 to (english language and yr=“1995 -Current”)
28. (efficien$ or effectiv$).ab,ti.
29. (reduc$ or shorten$ or cut$).ab,ti.
30. (demand or ‘waiting time$’).ab,ti.
31. 29 and 30
32. right care.ab,ti.
33. appropriate care.ab,ti.
34. right place.ab,ti.
35. right time.ab,ti.
36. Patient Satisfaction/
37. Patient Readmission/

38. readmi$.ab,ti.
39. reattend$.ab,ti.
40. re-attend$.ab,ti.
41. re-admi$.ab,ti.
42. revisit.ab,ti.
43. re-visit.ab,ti.
44. Crowding/
45. crowd$.ab,ti.
46. reduc$.ab,ti.
47. 44 or 45
48. 46 and 47
49. Health Services Accessibility/
50. 28 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 48 or 49
51. 26 and 50
52. limit 51 to (english language and yr="1995 -Current")
53. Comment/
54. Letter/
55. Editorial/
56. (comment or letter or editorial).pt.
57. 53 or 54 or 55 or 56
58. 52 not 57

#	Searches	Results
1	*Telephone/ or *Hotlines/	6753
2	limit 1 to yr="2015 -Current"	861
3	(triage or consultation).mp.	131161
4	"nhs 111".mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	49
5	3 or 4	131194
6	1 and 5	1135
7	telephone triage.mp.	459
8	call centre triage.mp.	1
9	advanced nursing.mp.	1017
10	appropriate*.mp.	543909
11	exp Patient Safety/	16763
12	"Quality of Health Care"/	69407
13	quality framework.mp.	154
14	inappropriate.mp.	58664
15	Safety/	38571
16	satisf*.mp.	367938

17	consistency.mp.	75687
18	consequence.mp.	148633
19	(adherence or compliance).mp.	267369
20	decision-making.mp. or Decision-making/	190749
21	Decision Support Systems, Clinical/	7203
22	Needs Assessment/	28476
23	experience.mp.	611921
24	Patient Satisfaction/	77055
25	7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24	2186732
26	6 and 25	535
27	exp "Systematic Review"/	106977
28	"review literature as topic"/ or systematic reviews as topic/	9609
29	"Review Literature as Topic"/	7399
30	literature review.mp.	81194
31	27 or 28 or 29 or 30	188737
	26 and 31	
32		15

10.14. Appendix 5: Studies excluded from data extraction

Appendix x Group of studies included in multiple systematic reviews

Author Year	**Stacey, 2003**	**Leibowitz, 2003**	**Chapman, 2004**	**Bunn, 2005**	**Huibers, 2011**	**Purc-Stephenson, 2012**	**Blank, 2012**	**Eastwood 2015**	**Wheeler 2015**	**Kirkland 2018**	**Total**
Munro, 2000			✓								**1**
Moore, 2002						✓	✓				**2**
Lattimer, 1998	✓	✓	✓	✓							**4**
Gallagher, 1998			✓								**1**
Christensen, 1998		✓									**1**
Dale, 1997						✓	✓				**2**
Jackson, 1997					✓						**1**
Giesen, 2007					✓		✓				**2**
Killip, 2007					✓						**1**
Marklund, 2007						✓	✓		✓		**3**
Stewart, 2006					✓		✓				**2**
Kempe, 2006					✓	✓	✓		✓		**4**
St George, 2005					✓						**1**
Bogdan, 2004						✓	✓				**2**
Richards, 2004							✓				**1**

Sprivulis, 2004					✓		✓				**2**
Kempe, 2003					✓		✓		✓		**3**
Foster, 2003							✓				**1**
Belman, 2002							✓				**1**
O'Connell, 2002						✓	✓				**2**
Jiwa, 2002			✓	✓							**2**
Kempe, 2001						✓	✓				**2**
Frisbee, 2001						✓	✓				**2**
Derkx, 2008					✓						**1**
Hirsh, 2007					✓		✓		✓		**3**
Labarère, 2003					✓		✓				**2**
Dale, 2004					✓		✓	✓		✓	4
Lee, 2003 and Lee, 2002	✓					✓	✓		✓		**4**
McKinstry, 2002	✓		✓	✓							**3**
De Coster, 2010						✓	✓				**2**
Giesen, 2007							✓		✓		**2**
Thompson, 1999	✓										**1**
Krumperman 2014										✓	1

a. The Carrasquiero *et al.* review has been excluded from this table as no reference list of included studies is available. b. The Lake et al. review has been excluded from this table as this review focussed only on systematic reviews

10.15. Appendix 6: Review 2 data extractions

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
1	Amb 1	Spangler D. (2018). An Evaluation of nurse triage at the Emergency Medical Disaptch centers in two Swedish counties. Uppsala Universitet, 2018.	Retrospective analysis of linked data Sample = 1094	Emergency medical dispatch service	Nurse	To systematically assess the safety and appropriateness of triage decisions made by EMD nurses among the cohort of patients determined to not require an ambulance or transport by any other means to an ED	Proportion of callers attending ED within 72 hours Proportion admitted to hospital within 72 hours	20% of patients who were referred to ED by the EMD nurse attended ED within 72 hours and 57% received specialist care and 37% were admitted. Most ED visits were related to the EMD call. Elderly patients were less likely to be referred to other care pathways and on ED attendance were more likely to be admitted and received ED specialist care. Frequent callers were more likely

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								to be referred to alternative care pathways and had increased odds of a ED attendance. Calls closed by the EMD nurse with self-care were more less likely to result in ED visit.
2	Amb 2	Eastwood K, Smith K, Morgans A, et al. (2017) Appropriateness of cases presenting in the emergency department following ambulance service secondary telephone triage: a retrospective cohort study. BMJ Open;7:e016845. doi: 10.1136/bmjopen-2017-016845	Retrospective cohort analysis Sample = 44.523	Ambulance service	Paramedic or nurse	To investigate the appropriateness of cases presenting to the ED following telephone advice from the ambulance service	Appropriateness (measured using an ED suitability definition) of planned versus unplanned ED presentations	Planned ED attendance were more likely to be appropriate than unplanned (0r 1.62 95% CI 1.5 – 1.7 p<0.001) and were more likely to be admitted to hospital than unplanned attendances (or 1.5 95% CI 1.4 – 1.6 P<0.001). Approximately 15% of cases referred to

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								alternative care pathways presented in the ED and 9.5% of unplanned ED attendances were assessed as appropriate attendances and 6.5% were admitted to hospital.
3	Amb 3	Eastwood et al. (2018) Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 26:8 DOI 10.1186/s13049-018-0475-4	Retrospective cohort analysis Sample = 8,510/19,041	Ambulance service	Paramedic or nurse	To identify patient characteristics and triage outcomes associated with 'no paramedic treatment' for cases which received telephone advice from the ambulance service	Characteristics of patients receiving no paramedic treatment	8510/19041 (44.7) of cases were not treated after being sent an ambulance following secondary triage. The following call and caller characteristics were associated with no paramedic treatment: age; time of day; pain; triage guideline

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								group; and comorbidities. Age 0 – 4 and psychiatric health problems were less likely to be treated by paramedics and increased pain was associated with increased rate of paramedic treatment.
4	Amb 4	Crowther L, Williams R. (2009) Nurse interventions in ambulance command-and-control centres. Emerg Nurse;17:22–5	Retrospective	Ambulance service	Nurse		Final disposition	Introduction of nurse assessment of symptoms for low urgency ambulance callers has reduced the number of inappropriate ambulance call outs.
5	Amb 5	Pernas MP; Novo SD; Otero MB, Lopez GP, Santos LS, Vazquez JAI, (2016). Efficacy if nurse consultants in a health emergency coordination center. Emergencias. 28:179-181	Retrospective, observational, descriptive study Sample = 34,549	Emergency Centre	Nurse consultant	To describe nurse consultants' work at the Health	Appropriateness of decisions Proportion of calls resolved without	Nurses resolved 92% of calls over the telephone without sending an ambulance or

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
						Emergency Coordination Center in terms of their ability to resolve problems and the appropriateness of their decisions.	requiring an ambulance Proportion of calls resolved without subsequent recontacts or complications	referring the patient elsewhere. 97% of calls did not call again within 24 hours or have any complications.
6	Amb 6	Morimura N, Sruga T, Sakamoto T et. Al. (2009). The impact of an emergency telephone consultation service on the use of ambulances in Tokyo. Emergency medicine Journal. first published as 10.1136/emj.2009.073494	Before-and-after study using routine data. Compares ambulance use and cost before and after introduction of telephone line	24/7 nurse-run telephone advice line. Ambulance service callers.	Nurse-run telephone advice line	To assess if the introducing a telephone advice centre led to a reduction in ambulance use in non-urgent cases and a decrease in ambulance dispatch costs	Number of ambulance uses; emergency hospitalisation rate; cost	Compared with the previous year, the number of ambulance uses per 1 million people decreased (46,846 vs. 44,689; $p < 0.0001$). The emergency hospitalisation rate of ambulance cases increased significantly because of the decreased

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								proportion of non-urgent cases (36.5%, vs. 37.8%; p<0.0001). The total cost related to despatching ambulances was reduced by approximately £4,520,000
7	Amb 7	Krumperman K, Weiss S, Fullerton L. (2015). Two types of prehospital systems interventions that triage low acuity patients to alternative sites of care. Southern Medical Journal & Volume 108, Number 7, July 2015.	Retrospective comparative study comparing face-to-face responses with telephone triage and referral, for low acuity patients Sample = System a (treat on scene) 374/1512 System b (telephone advice) 216/631	Ambulance Low acuity ambulance calls	Nurse	To retrospectively compare alternatives for navigating low-acuity patients in two emergency medical services systems.	Compliance with advice/disposition Satisfaction	Satisfaction rates were high (> 93%) but equivalent in the both systems. Callers in the on scene paramedic response group were less likely to follow instructions than those in the telephone advice group (OR = 0.31, 95%CI = 0.14,0.69)

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
8	Amb 8	Vincent A, Jomard N, Haesbaert J et al. (2019). Referral pathway of patients aged over 75 years and older after a telephone triage by the French emergency medical communication centre (SAMU) Archives of Gerontology and Geriatrics 84 (2019) 103893	Retrospective observational study	Emergency medical communication centre	Non-clinical call taker, physician or GP	To identify what happens to elderly people patients after contact with the EMCC to determine appropriateness of EMCC triage for older patients	EMCC disposition. Proportion referred to ED. Proportion discharged from the ED and proportion admitted to hospital.	62% of elderly callers were referred to the ED after calling the EMCC and 56% were admitted to hospital from the ED. Falls was the main reason for admission. Nearly half of patients were discharged from the ED after referral. More appropriate assessment could improve triage appropriateness and reduce ED referrals.
9	Amb 9	Eastwood K, Morgans A, Smith K, et al. (2016). A novel approach for managing the growing demand for ambulance services by low acuity patients. Australian Health Review,40, 378 – 384.	Descriptive epidemiological study Sample = 107,148/123,458 ambulance calls	Ambulance Low acuity calls.	Nurse or paramedic	To describe a model of secondary telephone triage in the ambulance setting and to	Final disposition: proportion returned to emergency dispatch, proportion referred to a non-	68% of patients were referred to the ED by the secondary triage, but only 27.6% were by emergency

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
			sent for telephone advice			report what advice was given to patients	emergency ambulance dispatch, proportion advised to attend ED, proportion referred to other service providers and proportion given self-care advice	ambulance, with the rest travelling by non-emergency ambulance or making own way. The other 32% of cases were referred to alternative service providers or given self care advice.
10	Amb 10	Studnek J, Thestrup L, Blackwell T, Bagwell B. (2012). Utilization of prehospital dispatch protocols to idenify low acuity patients. Prehospital Emergency Care; 16; 204 – 209.	Retrospective two phase study. Sample = 1863 patients in phase 1; 1078 patients in phase 2, 530 of which underwent secondary triage by nurse advisor	EMS Low acuity callers	Nurse	To describe the experience of a US emergency service agency utilising a dispatch algorithm to identify low-acuity	Disposition; factors associated with hospital admission; proportion requiring subsequent hospital admission. Frequency of admission for those identified as	In phase 2 49% of eligible patients completed secondary triage by an advice line. Of these, 71% required immediate care and delayed care was appropriate for 29%. Those classified as

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
						patients and determine whether secondary telephone triage by a nurse was associated with subsequent hospital admission	appropriate for delayed care.	requiring immediate care were more likely to be admitted to hospital than those classified as appropriate for delayed care (29% vs 16% p<0.01). One patient classified for delayed care required an ICU admission. From the 1st phase (no telephone nurse) 25% of patients classified as requiring delayed care were admitted to hospital. In the 2nd phase a subset of patients were identified as requiring delayed care and these had a significantly

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								lower frequency of hospital admission.
11	Amb 11	Turner j, Snooks H, Youren A et al. (2006) The costs and benefits of managing some low-priority 999 ambulance calls by NHS Direct nurse advisors. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO).	RCT; observational study; postal questionnaire Sample = RCT: 1766 intervention; 2158 control Observational study: 2276; questionnaire; 340 intervention; 261 control	Ambulance service and NHS Direct. Low priority 999 callers Compares telephone advice versus standard care	Nurse	To assess the costs and benefits of transferring some low-priority 999 calls to NHS Direct nurse advisors for further assessment and advice	return rates of passed calls back to ambulance service; transports to hospital; ambulance service satisfaction and acceptability of new service; safety; reliability of call transfer; cost	The return rate back to the ambulance service was 66.9% (range 36.1–75.5%). Of returned calls 25% were returned for a 999 response and the remainder for transport or other non-clinical reasons. Callers were generally satisfied with the service
12	Amb 12	Infinger A, Studnek JR, Hawkins E, Bagwell B, Swanson D. (2013). Implementation of prehospital dispatch protocols that triage low-acuity patients to advice-line nurses. Prehosp Emerg Care 2013;17:481-5.	Retrospective review of 1 years EMS data; follow up telephone survey. Sample = 329 patients, 204 of	Ambulance service (single municiple EMS service. Low acuity callers.	Nurse	To assess the impact of implementing a telephone advice based protocol and to assess whether	Number of calls eligible for nurse advice; patient needs met and acceptability	329 (20%) patients were transferred to an advice-line nurse and 204 (12%) received no ambulance response. 118 of

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
			which did not receive an ambulance response			patients felt their health needs were met		the patients who were not transported by ambulance (58%), completed telephone follow-up, 88% reported the nontransport option met their health-care needs. 92% of responders would accept the transfer again.
13	Amb 13	Smith Wr, Culley L, Plorde M, Murray JA, Hearne T, Goldberg P, Eisenberg M. (2001) Emergency medical services telephone referral program: An alternative approach to nonurgent 911 calls. Vol. 5, No. 2 , Pages 174-180 (doi:10.1080/10903120190940092)	2 phase prospective study using routine data and telephone patient follow up. Sample = Phase 1: 38 callers transferred Phase 2: 133 callers transferred	Ambulance service consulting nurse line. Nonurgent 911 callers	Nurse	To examine the effects of transferring non-urgent 911 calls to a telephone consulting nurse.	Number of callers eligible for nurse advice; adverse outcomes; nurse recommended disposition; patient satisfaction; number of BLS responses	There were no adverse outcomes detected. Patients were satisfied with the outcome in 96% of the cases. Transferring 911 calls to a nurse line resulted in fewer BLS responses

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
14	Amb 14	Dale J, Williams S, Foster T, Higgins J, Snooks H, Crouch R, et al. (2004). Safety of telephone consultationfor 'non-serious' emergency ambulance service patients. Qual Saf Health Care. 13:363–73. https://doi.org/10.1136/qshc.2003.008003	Pragmatic RCT data, subsequent care routine clinical records infromation and clinical expert review. Sample = 330/635 intervention patients	Ambulance service. Non-serious (Category C) callers	Nurse and paramedic	To re-analyse trial data to assess the safety of the assessment and advice provided in light of health care needs identified in the days following the 999 call	Safety of triage decisions	Nearly all of the panel agreed with the nurse or paramedics triage decision. There were 8 patients where the panel did not agree and only two were rated as requiring an ambulance within 14 minutes. However, these were likely to have been dispatched an ambulance as the call transcript revealed data entry errors.
15	Amb 15	Dale J, Higgins J, Williams S, et al. (2003). Computer assisted assessment and advice for "non-serious" 999 ambulance service callers: the potential impact on ambulance despatch. Emergency Medicine Journal;20:178-183.	Pragmatic controlled trial. Compares Nurse telephone advice versus standard response	Ambulance service. Non-serious (Category C) callers	Nurse or paramedic	To investigate the potential impact of providing telephone advice for low urgency	Proportion of patients triaged as not requiring an ambulance; proportion that did not attend ED; differences	Nurses were more likely than paramedics to triage calls as not requiring an ambulance OR 1.28 (95% CI 1.12

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
			Sample = 635 intervention calls and 611 controls			ambulance service callers	between nurse and paramedic call handlers. Proportion triaged as not requiring an ambulance admitted to a hospital bed.	to 1.47). Of the 330 (52%) triaged as not requiring an emergency ambulance, 119 (37%) did not attend ED, whereas 55 (18%) of those triaged by a nurse/ paramedic as requiring an ambulance did not attend ED (odds ratio 2.62; 95% CI 1.78 to 3.85). 9% triaged as not requiring an emergency ambulance were admitted to a hospital bed.
16	Amb 16	Eastwood K, Morgans A, Smith K, Stoelwinder J. (2015). Secondary triage in prehospital emergency ambulance services: a systematic review. Emerg Med J 2015;32:486–92.	Systematic review	Ambulance service. Calls to ambulance service triaged as low priority		SR of structure, safety and success of ES secondary	Structure, safety and success of secondary triage systems.	Most papers looked at the safety and accuracy of telephone advice when identifying

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		https://doi.org/10.1136/emermed-2013-203120		Six articles and one report identified between 1981- Nov 2012		telephone triage		low urgency patients. Two studies looked at patient satisfaction. There were few adverse events. Half of the patients were advised they did not need an ambulance. 31% of patients were advised to self-care, with the remaining patients being recommended care other than the ambulance service. Patients were satisfied on follow up.
17	Amb 17	Palma E, Antonaci D, Coli A, Cicolini. (2014). Analysis of emergency medical service triage and dispatch errors by	Retrospective qualitative analysis of EMS telephone calls.	EMS	Nurse	To analyse factors associated with	Caller characteristics Factors associated with undertriage	Characteristics associated with green-black calls; Older patient

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		registered nurses in Italy. J Emerg Nurs 2014;40:476-83	Compares Green black calls compared to other calls			registered nurse under-triage of EMS calls subsequently found to be associated with deaths (green-black code cases).		(>80+); Callers calling on behalf of patients, rather than patients themselves; Callers reported non-life threatening symptoms; Nurse operators did not always ask about vital signs as required by the MPDS protocol; Phone conversations were shorter (54.26 seconds vs 65 seconds).
18	Amb 18	Kirkland SW, Soleimani A, Rowe BH, et al. (2018). A systematic review examining the impact of redirecting low-acuity patients seeking emergency department care: is the juice worth the squeeze? Emergency Medicine Journal Published Online First. doi: 10.1136/emermed-2017-207045	Narrative review	EMS 19 papers published between 2002 – 2012	Telephone triage by clinical and non-clinical (emergency medical dispatchers	To examine telephone triage safety by clinical and non-clinical decision makers.	Appropriate referrals (measured by professional role and referral rates)	Appropriate referral (AR) rates: Nurses (91%), physicians' (82%). Clerical staff had no system or perform

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
					(EMD) and clerical) staff			telephone triage by standard definitions. Nurses felt to be the most cost-effective professional who can safely perform the task. Nurse decision-making safety could be enhanced by improving system quality (clinical training, practice and call centre standards). Non-clinicians are not safe decision makers, even when adhering to expert software. Physicians used only one system (documentation) and this was not

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								done consistently.
19	Amb 19	Katayama Y, Kitamura T, Hirose T et al. (2020) Characteristics and transported by ambulance: a population based study in Osaka Japan. Acute Medicine and Surgery;7:e609.	Retrospective analysis of routine data	Ambulance	Nurse	To describe the patients who are conveyed to hospital by ambulance after receiving telephone advice	Deaths Patient disposition Proportion conveyed to hospital after telephone advice	4999/105,763 (4.7%) patients were conveyed to hospital after receiving telephone advice. Telephone triage nurses judged 4,240 (98.8%) patients to be highly urgent but most (70%)were discharged home from the ED. 8 (0.2%) died
20	Amb 20	Eastwood K, Nambiar D, Dwyer R, et al.(2020) Ambulance dispatch of older patients following primary and secondary telephone triage in metropolitan Melbourne, Australia: a retrospective cohort study. BMJ Open 2020;10:e042351. doi:10.1136/ bmjopen-2020-042351	Retrospective cohort study	Ambulance	Nurse or paramedic	To explore the appropriateness of ambulance dispatch following secondary triage for older patients	ED conveyance rates Characteristics	Increasing age was associated with fewer treatments and increased conveyance. Older patients who received an ambulanc e following secondary triage

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								were half as likely to be treated by paramedics.
21	Amb 21	EASTWOOD, K., MORGANS, A., STOELWINDER, J. & SMITH, K. (2019). The appropriateness of low-acuity cases referred for emergency ambulance dispatch following ambulance service secondary telephone triage: A retrospective cohort study. PLoS One, 14, e0221158.	Retrospective cohort study	Ambulance	Nurse or paramedic	To assess the appropriateness of cases where an ambulance was sent following secondary triage	Proportion and characteristics of cases sent an ambulance following secondary triage	This group of calls has higher conveyance rates than cases where ambulances are sent after primary triage (82.2% versus 71.1% suggesting secondary triage increases the appropriateness of response.
22	Amb 22	O'Hara RA, Bishop-Edwards L, Knowles E & O'Cathain A (2019) Variation in the delivery of telephone advice by Emergency Medical Services: a qualitative study in three services. BMJ Quality and Safety, 28(7), 556-563. View this article in WRRO	Qualitative multi-method study	Ambulance	Nurse/paramedic	To explore the operational factors that influence the provision of telephone advice	Staff views of telephone advice Identification of calls for low priority responses	Clinical telephone advice was viewed as an appropriate method for managing demand and ensuring that patients receive more appropriate care. There was variation

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								between services in the service view of the primary role of telephone advice with some services viewing demand management as the primary function and others related to risk management of telephone advice and therefore adopted a more cautious and risk adverse approach towards telephone advice delivery, which often resulted in the sending of an ambulance.
23	Amb 23	Eastwood K, Morgans A, Stoelwinder J, Smith K. (2018) Patient and case characteristics associated with no	Retrospective cohort study	Ambulance	Nurse/Paramedic	To identify characteristics of calls	Patient characteristics	Age, time of day, pain, triage guideline group

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		paramedic treatment for low acuity cases referred for emergency ambulance dispatch following a secondary triage: a retrospective cohort study.				which do not require treatment by a paramedic, following ambulance dispatch after secondary triage.	Suitability for alternative pathways	and comorbidities were associated with no paramedic treatment. Age 0 -4 and psychiatric patients were significantly less likely to be treated by paramedics.
24	Amb 24	Mackenhaeur J, Valentin J, mikkelsen S et al. (2021). Emergency Services response levels and subsequent emergency contacts among patients with a hisotry of mental illness in Denmark: a nationawide study. European Journal of Emergency Medicine, XXX:000–000	Nationwide cohort study of patients with and without a history of mental illness	EMS	Non-clinical call takers. Decision not to send an ambulance required GP sign off.	To compare the level of Emergency Medical Services (EMS) response and subsequent contacts emergency between patients with and without a history of mental illness	Recontacts; Unplanned hospital contact within 7 days	Patients with a history of mental health problems were more likely to receive telephone advice RRs 1.61 (1.53–1.70), 1.30 (1.24–1.37), and 1.08 (1.04–1.13) and those who received telephone advice were more likely to recontact within 24 hours adjusted risk ratio

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								(RR) 2.11 (1.88–2.40), 1.96 (1.20–2.21), and 1.38 (1.20–1.60). However, they were less or equally likely to subsequently attend hospital within 7 days adjusted RRs 1.05 (0.99–1.12), 1.04 (0.99–1.10), and 0.90 (0.85–0.94), respectively
25	UE 55	Gamst-Jensen 2018 Denmark	Simultaneous mixed methods: exploration of Potentially Under-Triaged Calls (PUTC) with descriptive statistics and thematic analysis of subset (n=31	OOH; Non-lifethreatening calls	Nurse or physician	To describe under-triage and identify communication patterns contributing to under-triage	PUTC; distribution of PUTC; themes of PUTC	327 (0.04%) of all calls PUTC. PUTC= digestive (24%); circulatory (19%; respiratory (15%); others (42%). PUTC resulted from inadequate communication and non-normative symptom description.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
26	UEC 1	Lake et al. (2017). The quality, safety and governance of telephone triage and advice services – an overview of evidence from systematic reviews BMC Health Services Research (2017) 17:614 DOI 10.1186/s12913-017-2564	Literature review	Primary and urgent care Ten SR from 2003–2013 included. TTAS		The systematic review focused on key governance, quality and safety findings related to telephone-based triage and advice services	TTAS performance reported across 9 indicators: access, cost, appropriateness, compliance, patient satisfaction, safety, health service utilisation, physician workload, clinical outcomes	Identified 9 quality, safety and governance dimensions from the available evidence: access, appropriateness, patient compliance, patient satisfaction, cost, safety, health service utilisation, clinical workload and clinical outcomes. Patient satisfaction with TTAS was generally high and there is some consistency of evidence of the ability of TTAS to reduce clinical workload. This review

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								considered two reviews that looked at safety and concluded TTAS is safe but less so for high risk patients, five reviews which looked at appropriateness, but appropriateness was defined in different ways, such as adequacy of triage or accuracy of advice. Acceptability of TTAS was not specifically reported in the reviews.
27	UEC 10	Doctor K. (2013). Evaluation of an after-hours call center: Are pediatric patients appropriately referred to the Emergency Department? Pediatr Emerg Care;29 (10):1140.	Retrospective observational study.	OOH urgent; Paediatric;	Nurse	To identify non-essential after hours referrals made by	Call and caller characteristics associated with non-essential	73/220 patients (33%) were classified non-essential and 67% as essential.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
						telephone nurses	referral/over triage	Nonessential referrals were significantly younger (p <0.05), had lower triage scores (p=0.026) and shorter ED stays (p<0.0001). The algorithms for 'Fever - 3 months or Older' (12.3%), 'Vomiting Without Diarrhoea (8.2%) 'Trauma - Head' (8.2%), 'Headache' (6.8%) and 'Sore Throat' (5.5%) were determined most likely to result in a non-essential referral
28	UEC 11	Ernesäter A, Engström M, Holmström I, Winblad U. Incident reporting in nurse-led national	Retrospective study of incident reports	In and OOH Urgent	Nurse	To conduct a retrospective study of incident	Number of errors/incidents. Category of incident.	The 426 incident reports included 452 errors. Of the analysed incident

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		telephone triage in Sweden: the reported errors reveal a pattern that needs to be broken. J Telemed Telecare 2010;16:243–7. h				reports from the national, nurse-led telephone triage system in Sweden		reports, 41% concerned accessibility problems, 25% incorrect assessment, 15% routines/ guidelines, 13% technical problems, 6% information and communication. The most frequent outgoing incident reports (i.e. sent from SHD to other health-care providers) concerned accessibility problems and the most frequently incoming reports (i.e. sent to SHD from other health-care providers)

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								concerned incorrect assessment.
29	UEC 12	Barber JW, King WD, Monroe KW, Nichols MH. (2000) Evaluation of emergency department referrals by telephone triage. Pediatrics 2000;105:819–21. http://dx.doi.org/10.1542/peds.105.4.819	Blinded Delphi review of medical appropriateness. Compares telephone referral advice and other source referrals with Physician view	Paediatric. Hospital	Nurse telephone advice	To examine the appropriateness of referrals to a paediatric ED by the Paediatric Health Information Line (PHIL), a hospital-based telephone service versus other referrals	Appropriateness of referral to ED	The telephone group had an appropriateness rate of 80.2%, compared with 60.5% for the control group (chi (2) = 14.6369; odds ratio = 2.65; 95% confidence interval [1.5759,4.5008]). For the period studied, PHIL referrals to the ED had a 33% higher rate of appropriateness than controls.
30	UEC 13	McKinstry B, Hammersley V, Burton C, Pinnock H, Elton R, Dowell J, et al. (2010) The quality, safety and content of telephone and face-to-face consultations: a comparative study. Qual Saf Health Care	Retrospective analysis of audio recordings: Compares telephone and face to face	Primary care/Urgent.	Doctor	To investigate whether there are differences in quality and safety of	Quality and safety of telephone versus face-to-face consultations	Telephone consultations were shorter (4.6 vs 9.7 min, p<0.001), presented fewer

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		2010;19:298–303. http://dx.doi.org/10.1136/qshc.2008.027763				family doctors' telephone and face to-face consultations		problems (1.2 vs 1.8, p<0.001) and had less data gathering, counselling/advice, rapport building (all p<0.001) than face-to-face consultations. Telephone consultations were less likely to include enough information to exclude serious illness. Patient involvement and satisfaction were similar for both groups.
31	UEC 14	O'Cathain A, Nicholl J, Sampson F, Walters S, McDonnell A, Munro J. Do different types of nurses give different triage decisions in NHS Direct? A mixed methods study. J Health Serv Res Policy 2004;9:226–33. http://dx.doi.org	Mixed methods including semi-structured interviews with 24 nurses and a multilevel analysis of 60794 calls	In and OOH urgent; NHS D	Nurse; Compares different types of nurses	To determine whether nurses with different clinical backgrounds make	Proportion of calls triaged to self-care. Impact of nurse experience on triage decisions	The proportion of calls triaged to self-care was 40% varying by individual nurse from a 10th centile of 22% to

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
			triaged by 296 nurses.			different triage decisions in NHS Direct		a 90th centile of 60%, (adjusted for age, sex, time of the call). Variability was partly explained by length of clinical experience and type of software used: nurses with >20 years clinical experience were more likely to triage callers to self-care than those with < ten years experience (42% versus 36%, respectively; OR = 1.41, 95% CI 1.13, 1.78). Proportions triaged to selfcare differed by type of clinical decision support

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								software used: 31%, 37% and 44%.
32	UEC 15	Hogenbirk JC, Pong RW. An audit of the appropriateness of teletriage nursing advice. Telemed J E Health 2004;10:53–60. http://dx.doi.org/10.1089/1530562047736 44580	Retrospective analysis of call transcripts: Compares views on appropriateness by different staff (Nurse, Nurse Practitioner, GP)	In and OOH urgent	Nurse	To assess the appropriateness of advice given by teletriage nurses	Audit of appropriateness of advice	In 56% of the 73 calls, all three auditors judged the nurse's advice as "appropriate." In 92% of the 73 calls, at least two of the three auditors judged the teletriage nurse's advice as "appropriate." All calls were rated as "appropriate" by at least one auditor. If not "appropriate," then auditors were three times more likely to rate the advice as "overly-cautious" rather than "insufficient."

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
33	UEC 16	O'Connell JM, Johnson DA, Stallmeyer J, Cokingtin D. (2001). A satisfaction and return-on-investment study of a nurse triage service. Am J Manag Care 2001;7:159–69	Before and after cost analysis. Compares pre and post service introduction	In and OOH Urgent	Nurse	To assess patient satisfaction and a health plan's return on investment associated with a telephone-based triage service	Satisfaction; utilisation of additional services.	More than 90% of users were satisfied, and utilization of hospital ED and physician office services decreased significantly after service implementation. Reductions in health plan expenditures exceeded the costs of service provision. The plan's estimated return for every dollar invested in the nurse triage service was approx. $1.70.
35	UEC 18	Grant C, Nicholas R, Moore L, Salisbury C. An observational study comparing quality of care in	Observational study using standardised patients. Compares	In and OOH primary and urgent	Nurse/Face to face and telephone	To compare the quality of clinical care in Walk-in centres with	Quality of care	Walk-in centres had a significantly greater mean score for all scenarios

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		walk-in centres with general practice and NHS Direct using standardised patients. BMJ 2002;324:1556	settings: walk-in centres, GPs, and NHS Direct.			that provided in general practice and by NHS Direct.		combined than general practices (difference between groups 8.2, 95% CI 1.7 to 14.6) and NHS Direct (10.8, 5.5 to 16.1). In contrast to general practices, Walk-in centres and NHS Direct referred a higher proportion of patients (26% and 82%, respectively)
36	UEC 19	Carrasqueiro S, Oliveira M, Encarnacao P. (2011). Evaluation of telephone triage and advice services: a systematic review on methods, metrics and results. A. Moen et al. (Eds.) IOS Press.	Secondary analysis of routine data. Compares staff types	In and OOH urgent care. Children	Nurse	To determine if there are differences in call length and outcomes of children presenting by telephone when triaged by different	Triage appropriateness and nurse characteristics	Mean call length of the Registered Sick Children's Nurses was significantly shorter than Registered Nurses (P < 0001). Except for referrals for routine

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
						types of nurses		appointment with a GP, both types of nurse referred to other triage outcomes groups with equal frequency.
37	UEC 2	Carrasqueiro S, Oliveira M, Encarnacao P. (2011). Evaluation of telephone triage and advice services: a systematic review on methods, metrics and results. A. Moen et al. (Eds.) IOS Press.	Systematic review	In and OOH, primary and urgent care		To review telephone triage and advice service evaluation studies and compare results	Appropriateness of advice; compliance; access to care; adverse events; death; patient satisfaction	55 papers included. Key findings for each outcome: Studies were unable to demonstrate high rates of advice appropriateness; Patient compliance varied by type of advice and is higher when measured by self-report data; Access to care is not always improved; Medical workload is usually reduced

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								(but may be only delayed.); Few reported adverse events with death; No studies on long-term clinical outcomes; Most report high patient satisfaction; Most suggest there is a net cost benefit but some disagree; No study evaluated all relevant benefits and costs or perspectives.
38	UEC 20	Crane JD, Benjamin JT. (2000). Pediatric residents' telephone triage experience – Do parents really follow telephone advice? Arch Pediatr Adolesc Med 2000;154:71–4.	Prospective observational study. Compares recorded advice versus parental actions	OOH primary and urgent care	Paediatric residents	To determine parents' compliance to after-hours telephone advice given by paediatric residents	Compliance with different types of advice	83.6% of 493 caregivers followed the telephone advice. Of the 270 callers only given telephone advice, 90.4% followed the advice, 15

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								(5.6%) went to the ED, and 11 (4.1%) made an appointment for the next day. When a visit to the ED was recommended, 93.5% complied.
39	UEC 21	Kempe A, Dempsey C, Hegarty T, Frei N, Chandramouli V, Poole SR. (2000). Reducing after-hours referrals by an after-hours call center with second-level physician triage. Pediatrics;106:226–30	Prospective observational study.	OOH; Urgent; Paediatric; Hospital	Nurse referral versus physician view	To evaluate the appropriateness of urgent after hours referrals and parental compliance	Compliance; judgement of appropriateness of patient referrals; hospital admissions	Of the referred patients, 339 (82.9%) complied with the recommendation for AHR. 90.7% of patient referrals was judged appropriate. Of evaluated patients, 37.0% had a diagnostic test, and in 43.5% of cases, the evaluating physician thought a therapeutic intervention was necessary that

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								night. 6.6% were admitted to the hospital.
40	UEC 22	Dunt D, Day SE, Kelaher M, Montalto M.(2006) The impact of standalone call centres and GP cooperatives on access to after hours GP care: a before and after study adjusted for secular trend. Fam Pract;23:453–60.	Pre-trial and post-trial telephone surveys of two separate random samples.	OOH; urgent	Compares Standalone call centre versus GP cooperative	To study the impact of two standalone call centres and one GP cooperative in improving consumer access to services	Acceptability; access; reduction in unmet need	Consumer acceptability and affordability increased in residents in the area served by the GP cooperative. Access, however measured, did not improve in either of the standalone call centre areas. Reduction in unmet need approached but did not achieve statistical significance in most but not all trial areas.
41	UEC 23	Strom M, Marklund B, Hildingh C.(2009) Callers' perceptions of receiving advice via	Qualitative method with a	Urgent care helpline	Nurse	To describe patients' perceptions	Patients views of telephone service;	The patients perceived the help line as:

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		a medical care help line. Scand J Caring Sci;23:682-90.	phenomnograpic approach			of receiving advice via a medical care help line	satisfaction; factors associated with satisfaction; factors associated with increased compliance and acceptance	Professional, reliable and easily accessible; self-care is promoted through personal advice; a kind of 'back up'; satisfactory when the nurse is calm, friendly, confirming and shows respect; compliance and acceptance are enhanced when patients feel involved in the decision-making process; is easily accessible; perceived as simple and time saving.
42	UEC 24	Kinnersley P, Egbunike JN, Kelly M, Hood K, Owen-Jones E, Button LA, et al. (2010) The need to improve the interface between in-hours and out-of-hours GP care, and	Cross survey using the validated Out-of-Hours questionnaire.	OOH; GP; A&E; NHSD	Multiple	To identify strengths and weaknesses of OOH service	Factors associated with good and poor care	Across providers and types of care, consistent strengths were the 'manner of

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		between out-of-hours care and self-care. Fam Pract 2010;27:664–72	Compares across service providers			provision in Wales.		treatment by call operator' and the 'explanation of the next step by call operator'. Consistent weaknesses were the 'speed of call back by the clinician', the 'information provided by the GP',
43	UEC 25	LaVela SL, Gering J, Schectman G, Weaver FM. (2012) Optimizing primary care telephone access and patient satisfaction. Eval Health Prof 2012;35:77–86.	National cohort study (18 clinics)	In hours primary care	Staff type unknown	To understand patients' experiences regarding telephone encounters for medically based purposes.	Satisfaction; factors associated with satisfaction	Calling for an urgent medical issue was associated with dissatisfaction. Odds of call satisfaction were greater when patients thought staff was friendly (10x), call answer was timely (5x), and needed medical

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								information was provided (7x).
44	UEC 26	Richards DA, Godfrey L, Tawfik J, Ryan M, Meakins J, Dutton E, et al. (2004) NHS Direct versus general practice based triage for same day appointments in primary care: cluster randomised controlled trial. BMJ 2004;329:774–7.	Cluster RCT. Compares NHS Direct versus GP practice based nurse triage for same day appointments	In hours primary and urgent care	Nurse	To assess the effects on consultation workload and costs of off-site triage by NHS Direct for patients requesting same day appointments	Calls resolved by telephone advice	NHS Direct group patients' calls were less likely to be resolved by a nurse and more likely to have a GP appointment. NHS Direct calls took longer (mean 7.62 minutes longer) and costs were £2.88 more (£0.88 to £4.87) per patient triaged (difference between groups in proportions of patients at each final point contact after triage).
45	UEC 27	Kempe A, Dempsey C, Hegarty T, Frei N, Chandramouli V, Poole SR. (2000) Reducing after-hours referrals by an after-hours call	Prospective evaluation Compares nurse	OOH emergency	Nurse	To examine the effect of second level	Accuracy of nurse triage	From 955 eligible calls, 22% were initially given an

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		center with second-level physician triage. Pediatrics;106:226–30	versus Doctor assessment of urgency	and urgent care		physician triage on the rate of after-hours referrals (AHR)		urgent disposition by Call Centre nurses. Physician questionnaires were completed for 97%. Of patients triaged for AHR, 49% were given an AHR, 17% a next day office referral, and 34% home care and advice.
46	UEC 28	Cariello FP. (2003). Computerized telephone nurse triage. An evaluation of service quality and cost. J Ambul Care Manage.26(2):124-37. doi: 10.1097/00004479-200304000-00005. PMID: 12698927.	Cost evaluative. Compares cost of original intentions with actions after the call	In and OOH emergency and urgent care	Nurse	This study evaluates service quality and cost of a nationally recognised nurse telephone help-line	Caller rated service quality; impact on intended service use	Most callers rated the level of service quality very highly. The overall rating of service quality, measured by the total score on the SERVQUAL instrument was a mean of 6.42/7. The action taken by the caller after

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								the call resulted in cost savings (38.6% reduction in cost).
47	UEC 29	O'Cathain A, Webber E, Nicholl J, Munro J, Knowles E. (2003) NHS Direct: consistency of triage outcomes. Emerg Med J;20:289–92. http://dx.doi.org/10.1136/emj.20.3.289	Scenario based comparisons Compares agreement between nurses	In and OOH emergency and urgent care; NHSD	Nurse	To examine the consistency of triage outcomes by NHS Direct nurses		Overall agreement between the nurses using the four systems was "fair" rather than "moderate" or "good" (κ=0.375, 95% CI: 0.34 to 0.41). E.G, the proportion of calls triaged to accident and emergency departments varied from 22% (26 of 119) to 44% (53 of 119).
48	UEC 3	Stacey D, Noorani H Z, Fisher A, Robinson D, Joyce J, Pong R W. (2003) Telephone triage services: systematic review and a survey of Canadian call centre programs. Ottawa, ON, Canada: Canadian Coordinating Office for Health Technology	Systematic review	In and OOH primary and urgent care; Nurse and Doctor led services	Compares across services and Dr vs Nurse	To evaluate the effects of teletriage services on health service use, caller	Adverse outcomes; subsequent hospitalisations, ED visits, death.	10 comparative studies met the inclusion criteria. Various delivery models were compared.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		Assessment (CCOHTA). Technology Report; 43. Available from: http://www.cadth.ca/index.php/en/hta/reports-publications				safety, satisfaction and health-related quality of life	Proportion of calls resolved by telephone advice; caller satisfaction	Despite differences in interventions, the studies indicated that teletriage decreased immediate GP visits without increasing adverse outcomes (subsequent hospitalizations, ED visits or deaths). Half of the calls were fully managed by the teletriage service. Caller satisfaction ranged from 55%-90% for RN call centre programs and was 70% for MD teletriage. The effect of teletriage on immediate ED

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								visits, subsequent contact with practitioners and health-related quality of life was less clear.
49	UEC 30	Leclerc BS, Dunnigan L, Cote H, Zunzunegui MV, Hagan L, Morin D. (2003). Callers' ability to understand advice received from a telephone health-line service: comparison of selfreported and registered data. Health Serv Res;38:697-710	Secondary data analysis Compares user recollection of advice versus recorded advice	In and OOH emergency and urgent care	Nurse	To examine the telephone advice-line users' perception of the advice to recorded advice.		Many callers appear to interpret advice to seek additional health care differently than intended. Advice to consult was recorded by the nurse in 42 percent of cases, whereas 39 percent of callers stated they had received one. Overall disagreement between the two sources is 27 percent.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
50	UEC 31	Mark AL, Shepherd ID. (2003) How has NHS Direct changed primary care provision? J Telemed Telecare;9(Suppl. 1):S57–9	Mixed method evaluation Compares call data before and after introduction of NHSD	In and OOH emergency and urgent care; NHSD	Nurse	To study the impact of introducing a telephone health-line	Use of other services; calls closed with telephone advice	Use of primary care centres declined following the arrival of NHS Direct; home visits initially increased then decreased; out-of-hours doctor advice and accident and emergency attendances showed a progressive increase; and information calls increased during the study period.
51	UEC 32	O'Cathain A, Goode J, Luff D, Strangleman T, Hanlon G, Greatbatch D. (2005)Does NHS Direct empower patients? Soc Sci Med;61:1761–71.	Qualitative interview study	In and OOH emergency and urgent care; NHSD	Nurse	To determine whether NHS Direct facilitates patient empowerment (helping people to be	Patient empowerment	NHS Direct facilitates patient empowerment by: Enabling patients to self-care and access health advice/ services; Service

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
						in control of their health, health interactions)		provides patients with time, respect, listening, support, and information; Alternative contact point for people seeking to avoid being labelled 'time wasters'; Legitimises help-seeking actions
52	UEC 33	Lambert R, Fordham R, Large S, Gaffney B. (2013) A cost-minimisation study of 1,001 NHS Direct users. BMC Health Serv Res ;13:300.	Cost minimisation study. Compares NHS Direct advice vs patient-stated first alternative had NHS D not been available	In and OOH emergency and urgent care; NHSD	Nurse	To determine financial and quality of life impact of patients calling the NHS Direct	Quality of life. Impact on other services	An average per patient saving of £19.55 (36%) compared with patient-stated first alternatives, representing an annual cost saving of £97,756,013. Self-classified 'urgent' cases made significantly greater health gains than those

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								who said they were 'non-urgent' (urgent by 21.5 points; non-urgent by 16.1 points).
53	UEC 34	Beaulieu R, Humphreys J. (2008) Evaluation of a telephone advice nurse in a nursing faculty managed pediatric community clinic. J Pediatr Health Care ;22:175–81.	Before and after study using a survey. Compares data 12 months prior and after 1 year service	Primary care; Paediatric	Nurse	To examine the effect of a telephone advice nurse on parent/ caregiver satisfaction and access to care.	Patient satisfaction and access to care	Post-implementation group said nurse-parent/caregiver shared decision-making was important, (100% vs 75%) ($p<0.05$). No difference in satisfaction levels or views on the helpfulness of the nurse.
54	UEC 35	Ng JY, Fatovich DM, Turner VF, Wurmel JA, Skevington SA, Phillips MR. Appropriateness of healthdirect referrals to the emergency department compared with self-referrals and GP referrals. Med J Aust 2012;197:498–502	Prospective observational study using chart review. Compares health direct referred versus self- referred patients and GP referred	In and OOH emergency and urgent care; Health Direct	Nurse	To assess the appropriateness of Health Direct ED referrals	Appropriateness of referrals; Hospital admission; hospital care	No differences in appropriateness between Health Direct (72.9%) and self-referred (73.8%) patients ($p = 0.72$). GP-referred patients were significantly

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								more appropriate (89.7%) than other groups ($p < 0.01$). Health Direct nurses used ambulance services appropriately in 97% of cases. Health Direct patients were often unwell; 25.7% required hospital admission, 37.9% required assessment by specialist inpatient teams, and 67.5% required laboratory or radiological testing in the ED.
55	UEC 36	Al-Abdullah T, Plint AC, Shaw A, Correll R, Gaboury I, Pitters C, et al. (2009). The appropriateness of referrals to a pediatric emergency department via a telephone	Prospective observational study Compares appropriateness	In and OOH urgent care; ED; self-referred	Nurse telephone line; GP	To determine the appropriateness of patients	Appropriateness of referrals. Subsequent care	More physician referred patients were rated appropriate than

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		health line. CJEM Canadian Journal of Emergency Medical Care;11:139-48.	of different provider referrals			referred by a telephone health service to a paediatric ED compared to self and Physician referred patients	of referred patients	health-line (80% v56%, p <0.001) or self/ parent-referred (63%, p=0.002) (appropriateness assessed by the examining ED physician). Physician referred patients were significantly more likely to have investigations/ treatment, be admitted to hospital, longer lengths of stay. Using explicit criteria that gives equal weight to symptoms, diagnosis and parental concerns found no significant differences in

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								visit appropriateness.
56	UEC 37	Snooks H, Peconi J, Munro J, Cheung WY, Rance J, Williams A. (2009) An evaluation of the appropriateness of advice and healthcare contacts made following calls to NHS Direct Wales. BMC Health Serv Res.;9:178. 10.1186/1472-6963-9-178	Multi-method (postal questionnaire/expert review). Compares necessary vs un-necessary/sufficient vs in-sufficient advice	In and OOH emergency and urgent care; NHSDW	Nurse	To describe the appropriateness of advice and healthcare contacts made following calls	Caller rated appropriateness of advice; clinician rated appropriateness; Unecessary advice; insufficent advice	Over 80% of callers rated advice as appropriate. The clinical panel rated over 80% of callers as having taken necessary and sufficient actions following their calls. From two caller groups the clinical panel identified un-necessary advice was given to 17.1% and 11% of patients and insufficient advice was given to 1.4% and 3.3%
57	UEC 38	Cook R, Thakore S, Morrison W, Meikle J. To ED or not to ED: NHS 24 referrals to the emergency department. Emerg Med J 2010;27:213-5.	Expert review. Compares appropriateness of NHS 24 ED referrals reviewed	In and OOH emergency and urgent care; NHS 24	Nurse	To compare different specialty doctors views on the	Agreement with ED disposition. Suitability for primary	Agreement with ED disposal was 59.2% for ED doctors and 47% for GPs. ED

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
			by GPs and ED doctors			appropriate-ness of NHS 24 referrals to ED	care/appropriateness	doctors thought 20.8% of cases should have been referred to primary care, GPs, 35.7%. Results show GPs and ED consultants believe many NHS 24 ED referrals should be handled in primary care.
58	UEC 39	Hansen EH, Hunskaar S. (2011) Telephone triage by nurses in primary care out-of-hours services in Norway: an evaluation study based on written case scenarios. BMJ Qual Safe.	Assessment of medical scenarios Compare with national guidelines	OOH Nurse telephone helpline	Nurse	To evaluate decisions about urgency made by nurses in out-of-hours services in Norway.		Among the acute, urgent and non-urgent scenarios, 82%, 74% and 81% were correctly classified according to national guidelines.
59	UEC 40	Huibers L, Keizer E, Giesen P, Grol R, Wensing M. (2012). Nurse telephone triage: good quality associated with	Secondary analysis of telephone consultations by	OOH Nurse telephone helpline	Nurse	To explore the impact of quality of consultation	Appropriateness of decisions consultation quality.	90% of 6739 callers were non-urgent. Most decisions were

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		appropriate decisions. Fam Pract;29:547–52. 10.1093/fampra/cms005.	nurses at 29 centres. Compares quality of consultation vs appropriateness of decisions			and estimated urgency on the appropriateness of decisions.	Relationship between urgency and consultation quality	appropriate (91% urgency, 96% follow-up advice, 95% timing). Higher quality consultation was related to more appropriate estimates of urgency [OR= 1.8; 95% CI: 1.7–1.95], follow-up advice (OR = 2.7; 95% CI: 2.4–3.0) timing (OR=2.4; 95% CI: 2.2–2.6). High urgency was associated with suboptimal consultation quality.
60	UEC 41	Huibers L, Koetsenruijter J, Grol R, Giesen P, Wensing M. (2013)Follow-up after telephone consultations at out-of-hours primary care. J Am Board Fam Med 2013;26:373–9.	Coss-sectional study of patients using a validated question-naire. Compares age groups/experience	OOH Nurse telephone helpline	Nurse	To identify if patient/age experience of telephone consultations were associated	Proportion of patients with a follow up contact. Relationship between positive nurse telephone experience and	Half of patients had a follow up contact. More probability of follow-up contacts in patients age >65

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
						with follow-up contact	probability of follow up contact	(OR 2.39), for cooperatives with high levels of telephone consultations (OR, 1.02). Decreased probability for patients who had positive nurse telephone experiences (OR,0.68).
61	UEC 42	Sakurai A, Morimura N, Takeda M, Miura K, Kiyotake N, Ishihara T, et al. (2014) A retrospective quality assessment of the 7119 call triage system in Tokyo – telephone triage for non-ambulance cases. J Telemed Telecare;20:233–8.	Retrospective quality assessment. Compares telephone consultation advice with medical records	24 hours Nurse telephone helpline	Nurse	To investigate the 7119 process by reviewing the outcome of triage in order to identify system problems	Refusal of telephone triage advice	Problems identified with the telephone triage system were - refusal of telephone triage recommendations (20% refusal from peer review of 56 cases) - problems with staff education

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								problems with the protocol itself
62	UEC 43	Navratil-Strawn JL, Ozminkowski RJ, Hartley SK. (2014) An economic analysis of a nurse-led telephone triage service. J Telemed Telecare ;20:330–8.	Economic analysis. Compares compliance vs non-compliance cost	24 hour Nurse telephone helpline	Nurse	To identify whether compliance with nurse advice was associated with lower expenditure	Compliance with advice	Overall, 57% of callers were compliant with nurse recommendations. The average expenditures were $328 lower among compliant callers.
63	UEC 45	Gibson A, Randall D, Tran DT, Byrne M, Lawler A, Havard A, et al. (2018) Emergency Department Attendance after Telephone Triage: A Population-Based Data Linkage Study. Health Services Research.;53(2):1137-62.	Data linkage observational cohort study Sample = 1.04 million calls between 2009 and 2012	Australian telephone triage service	GP or nurse telephone triage using decision support tool 24 hrs/7 days a week	Investigate compliance with disposition for ED and acuity of post call ED attenders.	Compliance with ED disposition advice; ED presentations within 24 hours of a call. Caller characteristics; disposition advice; medical condition.	66.5% callers compliant with ED dispositions; 6.2 % low-urgency dispositions self - referred to ED in 24hrs. Low rates of over-referral to ED suggested. Other factor affecting self-referral to ED after call: live in remote area or

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								made many previous calls in last 6 months
64	UEC 46	Dunt D, Day SE, Kelaher M, Montalto M.(2006) The impact of standalone call centres and GP cooperatives on access to after hours GP care: a before and after study adjusted for secular trend. Fam Pract;23:453–6	Time series analysis	After Hours Primary Medical Care Trials (AHPMCTs) centres. All primary care OOH service users	Nurse or GP	To determine if telephone triage reduced emergency GP after hours service utilization	Emergency GP OOH service use (GP first call-out)	Both systems identified reduced GP emergency OOH use. Standalone system identified significant reductions in total monthly OOH utilisation rate in three out of four services. Embedded system identified significant reductions in monthly OOH utilisation deputising centre, but no change in local triage centre.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
65	UEC 47	Gustafsson S, Martinsson J, Walivaara B-M, Vikman I, Savenstedt S. (2016) Influence of self-care advice on patient satisfaction and healthcare utilization. Journal of Advanced Nursing.;72(8):1789-99.	Cross-sectional study using a postal questionnaire Sample = 500 randomly selected callers to SHD (total 1500) in March 2014	Health care direct	Nurse	Explore influence of nurse-led self-care advice on health-care utilisation and patients' satisfaction (compared with medical care advice)	Self-reported caller satisfaction; intended actions before consultation; disposition advice; actual disposition	Young callers and watchful waiting significantly less satisfied with call. Reassurance influences satisfaction most. Self-care advice reduced healthcare utilisation in 66.1% of self-reported cases. Self-care disposition rather than GP referral negatively influences patient satisfaction.
66	UEC 48	McKenzie R, Dunt D, Yates A. (2016). Patient intention and self-reported compliance in relation to emergency department attendance after using an after hours GP helpline. Emergency Medicine Australasia. 2016;28(5):538-43.	Descriptive study using routinely collected data Sample = 2783 Australian telephone triage/ advice line callers between 2011–12	OOH nurse triage and telephone advice line or OOH PC helpline	GP	To determine ED attendance and compliance with OOH telephone triage advice	ED attendance post call. Disposition compliance	Overall: small reduction (3.6%) in ED attendance compared to callers' original intentions. Pre- call intention: ED

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								(29.7%); self-care (20.3%); primary care (27%); unsure (19.1%). Post call actions: ED (30%); self-care (26%); primary care (44%). 22% of callers who intended to go to the ED did not follow GP's advice.
67	UEC 49	Martinsson J, Gustafsson S. (2018) Modeling the effects of telephone nursing on healthcare utilization. International Journal of Medical Informatics;113:98-105.	Ordinal regression model development based on a questionnaire. Sample = 225/500	Nurse telephone triage with decision support tool. (NHS direct model 24 hr)	Nurse	Regression model to estimate effects of telephone triage on patient behaviour; healthcare utilization; and potential cost savings.	Patient behaviour; Health-care utilization effects; Potential cost savings. Factors affecting compliance. Association between compliance and level of care advised	Bayesian ordinal regression model that predicts 76.4% of patients' healthcare utilization after using telephone triage service. Model suggests telephone triage: constricts healthcare utilization;

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								potential to save costs. Compliance dependent on: level of care advised; advice agreement with patient's prior intention; care option availability, influenced by patients' perceptions of risk (compliance 7x higher if highest level of care is advised).
68	UEC 5	Huibers L, Smits M, Renaud V, Giesen P, Wensing M. (2011). Safety of telephone triage in out-of-hours care: a systematic review. Scand J Prim Health Care 2011;29:198–209. 10.3109/02813432.2011.629150.	Systematic review	OOH primary and urgent/ patients with a first request for help	Compares levels of urgency and real and simulated patient studies	To assess the research evidence on safety of telephone triage in out-of-hours primary care.	Triage safety by urgency of call; Adverse events. Mortality, hospitalisations, attendance at ED, medical errors.	13 observational studies showed that on average triage was safe in 97% (95% CI 96.5 – 97.4%) of all patients contacting out-of-hours care and in 89% (95% CI 86.7

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								– 90.2%) of patients with high urgency. 10 studies that used high-risk simulated patients showed that on average 46% (95% CI 42.7 – 49.8%) were safe.
69	UEC 50	Njeru JW, Damodaran S, North F, Jacobson DJ, Wilson PM, St Sauver JL, et al. (2017) Telephone triage utilization among patients with limited English proficiency. BMC Health Services Research.;17(1):706.	Retrospective cohort study	Primary care. Computer-aided, nurse-led telephone triage service	Nurse	Determine characteristics of Limited English proficiency (LEP) callers and compare to age matched English Proficient (EP) cohort.	Call and caller characteristics; Advised and actual actions post call. Disagreement with advice; likelihood of following advice	LEP and EP cohort 587 patients each. No significant difference between call volumes. Call length mins: LEP 13.9 vs EP 12.2 (P = 0.0002); Surrogate caller: LEP 34.6% vs 6.0% (P < 0.0001). Higher acuity care recommendations LEP 49.4% vs EP

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								39.0%; (P < 0.0004). Disagreement with advice: LEP 30.1% vs EP 20.9%; (P = 0.0004). Less likely to follow advice LEP 60.9% vs EP 69.4%; P = 0.0029)
70	UEC 51	Anderson A, Roland M. (2015). Potential for advice from doctors to reduce the number of patients referred to emergency departments by NHS 111 call handlers: Observational study. BMJ Open;5 (11)	Observational study	24 hr NHS 111 call centre, ED dispositions. GPs placed in 111 call centres to review OOH calls to review calls with ED disposition	Nurse	What effect does using GPs to review 111 call handlers' advice to attend ED have on the number of ED referrals?	% calls where the GP would give an alternative disposition; referral appropriateness	73% of 1474 OOH ED referrals reviewed by GPs would have been given an alternative disposition 5.2% to MIU; 40% to OOH GPs clinic; 27.8% self-care. Potential cost saving to EDs of £52,528 vs GP employment

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								costs of £41,416. Impact could be limited as only 6% of A&E attendances are result of 111 advice.
71	UEC 52	Huibers L, Keizer E, Giesen P, Grol R, Wensing M. (2012). Nurse telephone triage: good quality associated with appropriate decisions. Fam Pract;29:547–52. 10.1093/fampra/cms005.	Prospective observational study	OOH	GP	To describe telephone contacts triaged to face to-face contacts. Contact details from self-reported questionnaire from GP call handler. GPs assessing face to face dispositions described efficiency and nature of triage decisions.	Triage appropriateness; over triage	Face-to-face dispositions: 12% could have been telephone consults; 84% were relevant; 4-5% not relevant for GP OOH service. Irrelevant dispositions associated with: >24 hour problems; contacts on weekday nights; contacts <2 hours before own GP opened. Relevant dispositions

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								associated with: number of shifts per year of the triage GP; patient age; medical severity. Telephone consult dispositions (60% calls) associated factors: younger pts; more short-term; fewer potentially severe problems. Face-to-face dispositions (40% calls) associated factors: >40 years; 12–24 hrs persisting problem.
72	UEC 53	Thilsted SL, Egerod I, Lippert FK, Gamst-Jensen H. (2018) Relation between illness representation and self-reported degree-of-worry in patients calling out-of-hours services: a mixed-methods study in	Convergent parallel mixed methods design. Convenience Sample of callers age ≥15 years	OOH	nurses/physicians	To examine relationship between patients' illness	Qualitative DOW themes. Quantitative scale of DOW.	180 calls analysed. Low DOW themes: strong illness identity; illness duration <

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		Copenhagen, Denmark. Bmj Open. 2018;8(9).	from three consecutive days in 2016, to a Dutch OOH telephone triage service			representations and self-reported DOW		24hrs; clear cause and solution. High DOW: medium illness identity, illness duration of >24 hrs; high illness consequence
73	UEC 54	Gamst-Jensen H, Frishknecht E, Lippert F, Folke F, Egerod I, Huibers L, et al. (2018) Self-rated worry predicts hospitalisation in out-of-hours services telephone triage. BMJ Open.;8 (Supplement 1):A25-A6.	Mixed-methods: descriptive statistics and thematic analysis	OOH	Nurse or physician	Explored DOW (1-10 scale) and associated factors and themes.	DOW thematic content; DOW for each call; association of DOW and caller variables; effect of DOW on disposition;	94.4% participants rated DOW (median =3). High DOW associate with female sex (95% CI = 1.13 to 3.45). Symptom duration >24hrs (95% CI = 1.13 to 3.45) increases odds ratio of receiving face to face disposition. Exploring caller's DOW helps involvement in decision making and info sharing.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
74	UEC 56	Meer A, Gwerder T, Duembgen L, Zumbrunnen N, Zimmermann H. (2012) Is computer-assisted telephone triage safe? A prospective surveillance study in walk-in patients with non-life-threatening medical conditions. Emergency Medicine Journal;29(2):124-8.	Prospective observational study. Sample = 208 adults with non-life threatening issues attending Swiss hospital ED 8am-8pm	ED	Nurse triage with GP support if needed	Investigation of computer-assisted telephone triage decision safety.	Evaluation of safety of telephone triage advice.	Computer-assisted nurse telephone triage undertaken by competent specialists found to be safe method of potential clinical risk
75	UEC 57	Turnbull J, Prichard J, Pope C, Brook S, Rowsell A. (2017) Risk work in NHS 111: The everyday work of managing risk in telephone assessment using a computer decision support system. Health, Risk & Society.;19(3-4):189-208.	Ethnographic study	NHS 111	Non-clinical call handlers	Description and explanation of how risk work is configured across NHS 111.	Management of risk themes	Substantial part of frontline staff's everyday practice, experience and interaction concerned the management of risk. Technologies have redistributed risk (whilst appearing to reduce or even remove risk).
76	UEC 58	Wahlberg AC, Bjorkman A. (2018) Expert in nursing care but sometimes disrespectedTelenurses' reflections on	Qualitative content analysis	OOH	Nurse	To describe telenurses' views of work	Themes regarding telehealth nurses	Work was cognitively demanding.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		their work environment and nursing care. Journal of Clinical Nursing;27(21-22):4203-11.				environment and impact on care.	working environments.	Caller appreciation and feeling able to provide qualified nursing care made work worthwhile.
77	UEC 59	McAteer A, Hannaford PC, Heaney D, Ritchie LD, Elliott AM. (2016) Investigating the public's use of Scotland's primary care telephone advice service (NHS 24): a population-based cross-sectional study. British Journal of General Practice.;66(646):E337-E46.	Population-based cross-sectional mixed methods	NHS 24 (nurse telephone advice and triage service)	Nurse	Explore public's beliefs, use and understanding of service	Reasons for not using service; Reason for use; factors associated with service use; satisfaction	49.5% (n = 589) never used service. Reasons for non-use: lack of need (79.4%); prefer face-to-face (23.5%); unaware of phone number (15.8%). Reason for use: problem occurred OOH 87.5%; too ill to leave home 16.5%; unsure who else to contact 8.9%. Presenting symptoms: new 69.0%; ongoing 28.5%; general

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								advice required 2.5%. Post call action: 38.6% contacted health professional (GP 58.9%; 23.3% ED or 999, and 11.4% local OOH service). >80% of users satisfied or very satisfied. NHS 24 viewed as: an out OOH GP alternative; not appropriate for minor symptoms; deemed valuable for avoiding resource waste. Service use encouraged by: OOH availability and convenience.
78	UEC 6	Leibowitz R, Day S, Dunt D.(2003) A systematic review of the effect of different models of after-hours	Systematic review	OOH primary and urgent;	Compares different services and	To determine what evidence	Patient satisfaction and dissatisfaction.	Results indicate the introduction of a telephone

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		primary medical care services on clinical outcome, medical workload, and patient and GP satisfaction. Fam Pract;20:311–7		Nurses and Physicians	service provisions	exists about the effect of different models of out-of-hours primary medical care service on outcome.		triage and advice service for after-hours primary medical care may reduce immediate medical workload. Studies consistently showed patient dissatisfaction with telephone consultations. There was very little evidence about the advantages of one service model compared with another in relation to clinical outcome.
79	UEC 60	Kelly M, Egbunike JN, Kinnersley P, Hood K, Owen-Jones E, Button LA, Shaw C, Porter A, Snooks H, Bowden S, Edwards A. (2010). Delays in response and triage times reduce patient satisfaction and enablement after using out-of-hours services. Fam	Cross-sectional study using survey data	OOH	GP	Identify predictors of user satisfaction and enablement	Patient self-reported: service use; professional consulted; service experience; consultation	26% response rate (855/3250). Treatment centre v telephone consultations: Treatment centre

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		Pract.27(6):652-63. doi: 10.1093/fampra/cmq057.				across unscheduled care in Wales.	Satisfaction	consults significantly associated with reduced satisfaction (OR): 0.58, P = 0.03] and reduced enablement. Statistically significant reduced satisfaction associated with: call answering delays; triage call back; shorter consultations. Satisfaction of home visit disposition v telephone advice not significantly different (P = 0.48).
80	UEC 61	Rahmqvist M, Ernesater A, Holmstrom I. (2011). Triage and patient satisfaction among callers in Swedish computer-supported telephone advice nursing.	Before and after study using postal questionnaire data linked to	OOH	Nurse	Investigation of telenursing satisfaction and	Caller satisfaction; Caller behaviour;	If caller and the nurse disagree about recommendation

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		Journal of Telemedicine and Telecare. 2011;17(7):397-402.	healthcare utilisation data			disposition of callers given less urgent disposition than expected.	Nurse classification of emergency.	s, consequence can be dissatisfied caller and more unnecessary health care visits.
81	UEC 7	Bunn F., Byrne E, G. & Kendall, S. (2004). Telephone consultation and triage: effects on health care use and patient satisfaction. Cochrane Database Syst Rev, CD004180.	Systematic Review	In and OOH; Primary and Urgent; GP/Nurse	Compares staff types and different services	To assess the effects of telephone consultation on safety, service usage and patient satisfaction and to compare by different staff types.		9 studies included. Not all studies reported on each outcome. 3/5 studies reported decrease in GP visits but 2/5 studies reported an increase in follow up/ return face to face GP appointments There was no increase in ED visits (6/7 studies), except for one study about a nurse led telephone line.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
82	UEC 8	Purc-Stephenson RJ, Thrasher C. (2012). Patient compliance with telephone triage recommendations: a meta-analytic review. Patient Educ Couns; 87(2):135-42	Meta-analytic Review.	In and OOH; Primary and Urgent; Nurse		To investigate if patients comply with triage advice from tele-nurses and to identify factors that may influence compliance	Compares Compliance rates by type of advice (attend ED; office care (GP); self-care	13 studies were included. The overall compliance rate was 62%. Compliance by type of advice was: use emergency services 63.08%; office care/GP 44.14%; self-care 78.92% ES vs OC OR: 2.68, 95% CI 1.77 – 4.04; SC vs OC OR 3.30 (95% CI 2.18 – 4.99). Main reasons for non-compliance were recall problems, symptom change and accessibility to services. Non-compliant patients used a

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								lower intensity of care than advised.
83	UEC 9	Blank L, Coster J, O'Cathain A, Knowles E, Tosh J, Turner J, et al. The appropriateness of, and compliance with, telephone triage decisions: a systematic review and narrative synthesis. J Adv Nurs 2012;68:2610–21. 10.1111/j.1365-2648.2012.06052.x	Systematic review and narrative synthesis using rapid evidence synthesis methods.	In and OOH; Primary and Urgent;	Nurse (49/52 papers). Compares different services	To report on a synthesis of evidence of the appropriateness of and compliance with telephone triage advice	Appropriateness or accuracy of referral or adequate care. Compliance	Triage decisions rated as appropriate varied between 44–98% and compliance ranged from 56–98%. Variation could not be explained by type of service or method of assessing appropriateness. Triage decisions to contact primary care may have lower compliance than decisions to contact emergency services or self-care. Inconsistent definitions of

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								appropriateness may explain some variation. We suggest that a definition of appropriateness incorporating both accuracy and adequacy of triage decision should be encouraged.
84	UEC 4	Chapman JL, Zechel A, Carter YH, Abbott S. (2004) Systematic review of recent innovations in service provision to improve access to primary care. Br J Gen Pract 2004;54:374–81.	Systematic review	In and OOH Primary and urgent care; Nurse/GP	Compares across services and GP vs Nurse	To review the evidence of 7 recent innovations in service provision to improve access or equity in access to primary care		GP led telephone services (5 studies) Decrease in demand for same day appointments but may increase subsequent contacts; Patients view service as appropriate Nurse led telephone services (4 studies)

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								Nurses manage most OOH calls safely and effectively, with no increase in GP contact within 3 days; No difference between GP/ nurse triage for 7 day mortality, hospital admissions, or A&E attendances. NHS Direct (1 study) Easily accessible service, well used and high quality; high caller satisfaction rates; no less safe than other service; concern over delays in getting through/quality of self-care advice; may halt

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								increasing demand on OOH Telephone consultations (GP or nurse) can safely substitute face-to-face consultations, but it is not clear if this reduces face-to-face consultations over time.
85	UEC 44	Tran, D.T., Gibson, A., Randall, D. et al. (2017) Compliance with telephone triage advice among adults aged 45 years and older: an Australian data linkage study. BMC Health Serv Res 17, 512 (2017). https://doi.org/10.1186/s12913-017-2458-y	`	Australian telephone triage service callers aged ≥45 yrs	Nurse	To assess extent disposition compliance in callers aged ≥45 yrs and how socio-demographic; lifestyle; health characteristics and call features affect this.	Call disposition; Disposition compliance. Caller characteristics: Age; sex; time of call; caller patient relationship; pre-call caller original intent; triage protocol used.	% complied with advice: ED 68.6%; Dr consult 64.6%; Self-care 77.5%. Self-referral to ED against advice = 7.0% of calls. Characteristics: disadvantaged areas; OOH calls; calls made by another person; caller intention 'to attend ED'.

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
								Reduced ED compliance: rural/ remote locations; high/very high psychological distress levels. Reduced See Dr compliance: rural /remote areas; taking five+ medications. Reduced self-care compliance: ≥65 years Self-referrals to ED: Callers concerned with bleeding, cardiac, gastrointestinal, head and facial injury symptoms and given self-care advice.
86		O'Cathain O'Cathain A, Knowles E, Turner J, Nicholl J. Acceptability of NHS 111 the telephone service for urgent health care: cross sectional postal survey of users'	Cross sectional postal survey of service users	Urgent in and OOH	Non-clinical	To explore service user acceptability of the NHS	Satisfaction; Helpfulness; Acceptability	

	Ref ID	Author; Year; Country;	Study design	Population and setting	Type of call handler	Study purpose/aim	Main outcomes	Main findings
		views. Fam Pract 2014;31:193–200. 10.1093				111 urgent care telephone line.		

10.16. Appendix 7: Service user survey

Patient Survey version 10 3/10/18

Study number										

Your views about telephone advice from the ambulance service

In the last few weeks you sought help from the 999 ambulance service.

This questionnaire asks you about your experience of the 999 service on this occasion.

Your answers will be used in a research project to find out what people think about telephone advice from the ambulance service. Your help in completing this questionnaire is appreciated.

Please complete all the questions as best you can.

If you are a carer or parent and called about someone else, such as the person you care for or your child, please complete the questionnaire on their behalf. If you called on behalf of someone else you may wish to answer the questions with the help of that person.

Your name and address do not appear on this booklet and at no time will you be identified. The information you give will only be used by the researcher at the University of Sheffield.

Once you have completed this questionnaire please return it in the envelope provided, which does not need a stamp.

Thank you.

Centre for Urgent and Emergency Care Research (CURE),
School of Health and Related Research (ScHARR), University of Sheffield

SECTION A: The 999 telephone call

Q.1 Before calling the ambulance service, did you or the person who called the ambulance contact any other health services for this health problem? *Please tick one*

- Yes
- No
- Don't know/can't remember

Q.2 Who did you make the call for? *Please tick one*

- I made it for myself → go to Q4
- I made it for someone else → go to Q3

Q.3 If you made the call for someone else, did you know them? *Please tick one*

- Yes
- No

Q.4 After you spoke to the call handler, what happened? *Please tick one*

- I was sent an ambulance → go to Q.28
- I'm not sure → go to Q.5
- I was given clinical advice over the telephone by a nurse/paramedic → go to Q.5

SECTION B: The telephone advice

Important information: telephone advice and assessment

Some calls are sent to a telephone advisor (usually a nurse or a paramedic) so that you can receive advice or a health assessment over the telephone. We call the nurses or paramedics who give telephone advice Clinical Advisors in this questionnaire.

Q.5 Who were you put in touch with or told to contact? *Please tick all that apply*

- To go to an accident and emergency department
- To see my GP
- To go to a walk in centre or urgent care centre
- To call back if the health problem gets worse
- To visit a pharmacist
- To see someone else, please say who
- To contact GP out-of-hours or 111
- To contact someone else at my general practice e.g. nurse
- I was told how to look after the problem myself
- I don't know/can't remember
- Other, please say

Q.6 Did the Clinical Advisor clearly say when you should seek help? *Please tick one*

If more than one type of advice was given, please answer this for the most urgent advice you were given.

- Immediately (e.g. within few hours)
- The same day
- I was not told when to seek help
- The following day
- In the next few days
- Don't know or can't remember

Q.7 Did you follow the advice given? *Please tick one*

- Yes completely → go to Q.9
- Yes to some extent → go to Q.8
- No → go to Q.8
- I'm not sure → go to Q.8

Q.8 If you didn't follow the advice completely, please explain why not *Please tick all that apply*

- I did not agree with the advice
- I wasn't sure what had been advised
- I was unable to act on the advice
- Other, please say
- I preferred to do something else
- I did not understand the advice
- The advice wasn't practical for me

SECTION C: After the call

Q.9 Did you need to call the ambulance service again for the same problem? *Please tick one*

- Yes → go to Q.10
- No → go to Q.12

Q10. If yes, how many days after the first call was the next call to the ambulance service?

[ ] Days

Q.11 In total, how many times did you call the ambulance service for the same health problem?

[ ] Times

Q.12 Which health services did you or the person you called for contact in the 10 days after your call? *Please tick all that apply and write the number of days after the call that you contacted each service (either for yourself or on behalf of the person you called for)*

Health service	Tick if contacted this service	Number of days after the call
Accident and emergency	•	
Your GP	•	
Someone else at your general practice	•	
Out of hours GP or 111	•	

Minor injuries Unit/ Walk in Centre or Urgent Care Centre	•	
Community health service e.g. district nurse	•	
Social services	•	
Other, please say who (e.g. midwife, pharmacy)	•	
Don't know or not sure	•	
No other services	•	

SECTION D: Going to A&E?

Q.13 Did you or the person you called for go to A&E? *Please tick one*

- Yes → go to Q.14
- No → go to Q.17

Q.14 Did you or the person you called for have any investigations, tests or treatment whilst at A&E? *Please tick one*

- Yes
- I received guidance and advice only
- No
- Not sure/ Don't know

Q.15 Were you or the person you called the ambulance for admitted to hospital? P*lease tick one*

- Yes → go to Q.16
- No → go to Q.17

Q.16 If yes, how many days after the ambulance call did the admission occur?

☐ Days

SECTION E: Your views about the telephone advice from the ambulance service

Q.17 What did you expect to happen when you called the ambulance service? *Please tick one*

- I strongly expected an ambulance to be sent
- No expectation
- I'm not sure/don't know
- I had a general expectation that an ambulance would be sent
- I did not expect an ambulance

Q.18 Did you agree with the decision not to send an ambulance? *Please tick one*

- Yes, completely
- No
- Yes, to some extent
- I'm not sure/don't know

Q.19 Were you happy with the length of time it took to speak with a clinical advisor? *Please tick one*

- Yes
- No
- Not sure

Q.20 Did the call help to resolve your healthcare problem? *Please tick one*

- Yes
- To some extent
- No
- Not sure

Q.21 How was the problem you called about, 7 days after the call? *Please tick one*

- Completely better
- Improved
- The same
- Worse
- I can't remember
- Not sure/Don't know

Q.22 Did you think the advice was helpful? *Please tick one*

- Very helpful → go to Q.23
- Quite helpful → go to Q.23
- I don't know → go to Q.24
- Not very helpful → go to Q.24
- Not helpful at all → go to Q.24

Q.23 If you found the advice VERY HELPFUL or QUITE HELPFUL, please say why? *Please tick all that apply*

- I felt reassured and worried less
- It helped me to contact the right service
- I learned how to deal with the problem myself
- I learned how to prevent the problem
- Other, please say
- It helped me realise that I did not need to contact any services
- I was given clear advice about when and where to get more help
- The advice worked well in practice

Q.24 If you found the advice NOT VERY HELPFUL or NOT HELPFUL AT ALL, please say why? *Please tick all that apply*

- I didn't feel reassured or worry less
- I didn't learn how to deal with the problem
- I didn't learn how to prevent the problem
- Not sure
- It stopped me contacting a service
- It didn't help me contact the right service
- The advice was not practical for me
- Other, please say

Q.25 Would you be willing to accept telephone advice again for a similar health problem?

- Yes
- No
- Not sure

Q.26 Overall, were you satisfied with the service? *Please tick one*

- Yes totally
- Yes to some extent
- No
- Not sure

Q.27 Please write any other comments that you have about this service here

SECTION F: Some questions about the person who the call was made for	
Q.28 How old are you?	
Q.29 Are you	
• Male	• Female
Q.30 How well can you speak English?	
• Very well	• Not well
• Well	• Not at all
Q.31 Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? (This includes problems related to old age)	
• Yes, limited a lot	• Yes, limited a little
• No	
Q.32 Does your household own or rent their accommodation? (this is a standard question used in other surveys)	
• Owns outright	• Owns with a mortgage/ loan
• Lives rent free	• Rents
• Other	• I don't know

Thank you for completing this questionnaire

Please return using the envelope. It doesn't need a stamp. For queries about this questionnaire, please contact Jo Coster on: Telephone: 0114 2220854 Email: j.e.coster@sheffield.ac.uk

10.17. Appendix 8: Mapping changes to the coding framework

Code	Final code name	Previous code names included	Previous code
1	Fever or unwell	Fever, high temperature Unwell	1.6 Other
2	Cardiac symptoms or chest pain	Chest pain Irregular heart beat Palpitations; High pulse/fast hear rate; Pins and needles	1.24 Other
3	Falls	Falls	1.2
4	Constipation or bowel problem	Constipation Rectal bleed; Stoma problem; Rectal prolapse	1.4 Other
5	Urinary/bladder problem	UTI Catheter issue Prolapsed bladder; Urinating blood; Incontinence	1.7 1.15 Other
6	Accident or injury, including assault	Accident or injury Assault	1.3 1.23
7	Non-health reason	Wants transport No health symptoms Wants advice Wants help to lift partner; Lost phone charger; Wants a health check; Stuck at home	1.11 1.12 Coded elsewhere* Other
8	Mental health, alcohol or social support	Alcohol or drug problem/support Confusion Anxiety, depression, panic, mental health Suicidal OD (intentional) Self-harm	Coded elsewhere* 1.22 1.26 1.27 1.28 1.13
9	Diarrhoea, vomiting or nausea	Diarrhoea, vomiting or nausea	1.5
10	Health problems suitable for community or pharmacy care or advice	Nosebleed Medication issue Personal or social support Mobility issues Wound dressings/ wound site problems Additional other reasons	1.14 1.21 1.9 1.19 Other Other
14	Difficulty in breathing, including chest infection	Chest/lung infection DIB/SOB Pneumonia	1.16 1.8 Other
11	Chronic condition	Diabetes Arthritis Fybromyalgia	Coded elsewhere* Coded elsewhere* Other
12	Other	Includes the following:	1.17

		Vision problems; Swelling; Pregnancy/termination/miscarriage; Post-surgery issues; Passed from 111; Insomnia; Bites or stings; Allergies; Hair loss; Absconded patients; Dental issues; Vertigo; Tiredness/insomnia	
13	Unconscious/fainting and fits	Unconscious; Fainting Seizure/fit Feels dizzy	Other Coded elsewhere* 1.18
15	Pain	Pain injury Pain non-injury	1.1a 1.1b

*coded elsewhere means that this was previously coded under a different coding category

10.18. Appendix 9: Health care reasons for call and caller characteristics table

Reason for call by call and caller characteristics	N (%)	In hours	OOH	Male	Female	0-2	3-10	11-20	21-40	41-60	61-80	81-90	>90
Fever or unwell	111 (4.4)	28 (3.1)	83 (3.6)	48 (4.8)	58 (4.0)	9 (15.5)	6 (20.7)	2 (2.2)	15 (3.6)	14 (2.2)	40 (5.2)	20 (4.9)	4 (3.9)
Cardiac symptoms or chest pain	75 (3.0)	24 (2.6)	51 (2.2)	31 (3.1)	53 (3.6)	0 (0.0)	1 (3.4)	9 (10.0)	21 (5.0)	23 (3.6)	16 (2.1)	6 (1.5)	1 (1.0)
Falls	123 (4.9)	43 (4.7)	80 (3.5)	38 (3.8)	85 (5.8)	1 (1.7)	1 (3.4)	1 (1.1)	13 (3.1)	21 (3.3)	39 (5.1)	31 (7.6)	9 (13.7)
Constipation or bowel problems	99 (3.9)	19 (2.1)	80 (3.5)	35 (3.5)	64 (4.4)	3 (5.2)	0 (0.0)	1 (1.1)	7 (1.7)	(26 (4.1)	41 (5.4)	13 (3.2)	4 (3.9)
Urinary/bladder problems	132 (5.2)	30 (3.3)	102 (4.4)	72 (7.2)	60 (4.1)	0 (0.0)	0 (0.0)	1 (1.1)	14 (3.3)	15 (2.4)	50 (6.5)	37 (9.1)	14 (13.7)
Accident or injury, including assault	109 (4.3)	31 (3.4)	78 (3.4)	50 (5.0)	59 (4.0)	2 (3.4)	1 (3.4)	7 (7.8)	23 (9.3)	31 (4.9)	18 (2.4)	4 (1.0)	5 (4.9)
Non-health reason	27 (1.1)	8 (0.1)	19 (0.1)	16 (1.6)	11 (0.7)	0 (0.0)	1 (3.4)	0 (0.0)	5 (1.2)	7 (1.1)	11 (1.4)	2 (0.5)	0 (0.0)
Mental health, alcohol, drugs or social support	213 (8.4)	53 (5.8)	160 (7.0)	87 (8.7)	126 (8.6)	2 (3.4)	0 (0.0)	11 (12.2)	56 (13.3)	73 (11.5)	49 (6.4)	15 (3.7)	5 (4.9)
Diarrhoea, vomiting or nausea	288 (11.4)	85 (9.3)	203 (8.8)	111 (11.1)	177 (12.1)	6 (10.3)	5 (17.2)	8 (8.9)	57 (13.5)	60 (9.4)	89 (11.6)	54 (13.3)	9 (8.8)
Minor health problems	230 (9.1)	62 (6.8)	168 (7.3)	100 (10.0)	130 (8.9)	8 (13.8)	3 (10.7)	7 (7.8)	26 (6.2)	48 (7.5)	60 (7.9)	63 (15.5)	14 (13.7)
Chronic condition	31 (1.2)	11 (1.2)	20 (0.1)	11 (1.1)	20 (1.4)	0 (0.0)	0 (0.0)	1 (1.1)	3 (0.7)	8 (1.3)	13 (1.6)	7 (1.7)	0 (0.0)
Other	314 (12.5)	87 (9.6)	231 (10.0)	124 (12.4)	196 (13.4)	14 (24.1)	3 (10.3)	11 (12.2)	64 (15.2)	74 (11.6)	100 (13.1)	42 (10.3)	11 (10.8)

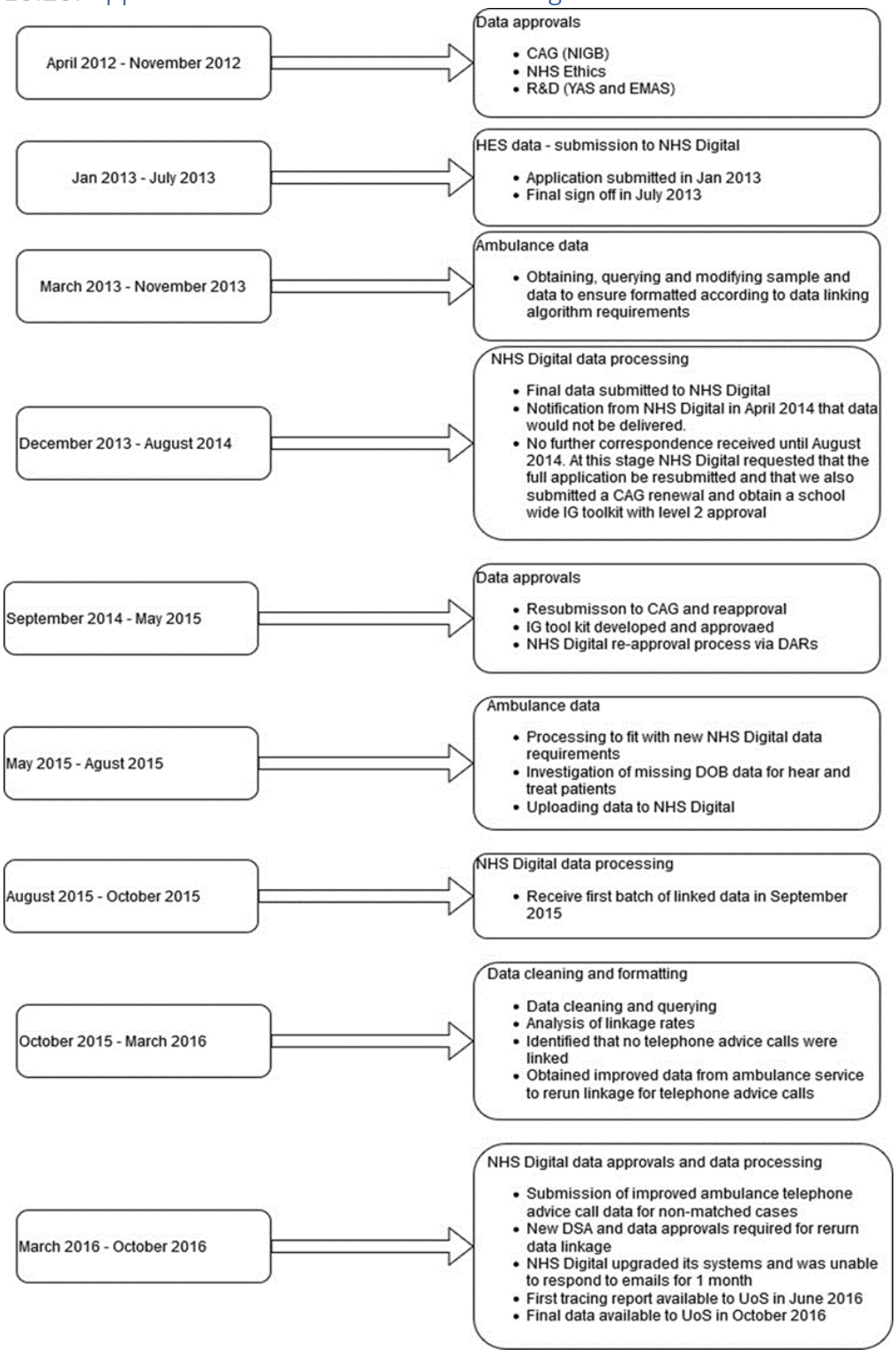
Unconscious, fainting or fits	139 (5.5)	47 (5.2)	92 (4.0)	51 (5.1)	88 (6.0)	4 (6.9)	1 (3.4)	4 (4.4)	25 (5.9)	38 (6.0)	27 (3.5)	31 (7.6)	8 (7.8)
Difficulty in breathing, including chest infection	216 (8.6)	46 (5.1)	170 (7.4)	107 (10.7)	109 (7.4)	9 (15.5)	2 (6.9)	8 (8.9)	28 (6.7)	61 (9.6)	64 (8.4)	40 (9.9)	6 (5.9)
Pain	992 (39.3)	300 (33.0)	692 (30.0)	358 (35.8)	634 (43.2)	5 (8.6)	8 (27.6)	39 (43.3)	178 (42.3)	276 (43.3)	322 (42.1)	132 (32.5)	30 (29.4)
Missing	120	36 (4.0)	84 (3.6)	57 (5.7)	63 (4.3)	1	4	1	22 (5.2)	16 (2.5)	47 (6.2)	19 (4.7)	6 (5.9)
Total (number of reasons)	3225	874	2229	1239	1870	63	31	107	551	775	938	365	125
Total (people in the sample)	2521	720	1801	996	1467	57	29	90	421	637	764	406	102

10.19. Appendix 10: reason for call crosstabulations

	Age groups										Sex				Time of call			
Reason for call	0-16		17-40		41-60		61-80		>80		Female		Male		In hours		OOH	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Fever or unwell	15	13.8	17	3.7	14	2.3	40	5.6	24	5.0	58	4.0	53	5.5	28	4.1	83	4.8
Cardiac symptoms or chest pain	2	1.8	28	6.1	23	3.7	18	2.5	4	0.8	53	3.7	22	2.3	24	3.5	51	3.0
Falls	2	1.8	14	3.1	21	3.4	39	5.4	45	9.3	84	5.8	39	4.1	43	6.3	80	4.7
Constipation or bowel problems	4	3.7	7	1.5	26	4.2	41	5.7	20	4.1	64	4.4	35	3.7	19	2.8	80	4.7
Urinary or bladder problems	0	0.0	16	3.5	15	2.4	50	7.0	51	10.6	60	4.2	72	7.5	30	4.4	102	5.9
Accident or injury, inc assault	5	4.6	43	9.4	31	5.0	18	2.5	9	1.9	59	4.1	50	5.2	31	4.5	78	4.5
Non-health reason	1	0.9	5	1.1	7	1.1	11	1.5	2	0.4	11	0.8	16	1.7	8	1.2	19	1.1
Mental health, alcohol, drugs or social support	8	7.3	61	13.3	73	11.8	49	6.8	20	4.1	126	8.7	87	9.1	53	7.7	160	9.3
Diarrhoea, vomiting or nausea	12	11.0	64	13.3	60	9.7	89	12.4	63	13.0	177	12.3	111	11.6	85	12.4	203	11.8
Minor health problems	12	11.0	32	7.0	48	7.7	60	8.4	77	15.9	130	9.0	100	10.4	62	9.1	168	9.8
Chronic condition	0	0.0	4	0.9	8	1.3	12	1.7	7	1.4	20	1.4	11	1.1	11	1.6	20	1.2
Other	21	19.3	71	15.5	74	11.9	100	13.9	53	11.0	196	13.6	124	13.0	89	13.0	231	13.5
Unconscious, fainting or fits	8	7.3	26	5.7	38	6.1	27	3.8	39	8.1	88	6.1	51	5.3	47	6.9	92	5.4
Difficulty in breathing inc chest infection	14	12.8	31	6.8	61	9.8	64	8.9	46	9.5	109	7.5	107	11.2	46	6.7	170	9.9
Pain	22	20.2	208	45.3	276	44.4	322	44.9	162	33.5	634	43.9	358	37.4	300	43.9	692	40.3
Total	109		459		621		717		483		1444		957		684		1717	

** the Pearson chi-square test for significance cannot be calculated using a multiple response variable*

10.20. Appendix 11: Timescales of data linkage



10.21. Appendix 13 Interview topic guide

Topic guide: Ambulance service views on the safety, appropriateness and acceptability of telephone advice for patients triaged as having low urgency health problems; a qualitative interview study

Thank you for agreeing to take part in this interview. The interview should take approximately 1 hour to complete.

[Review consent and willingness to take part in the interview]

Do you have any questions before we begin?

Can you confirm that you are happy for the interview to be recorded?

1. Can you describe how the telephone advice system works and your involvement in it?

Probe
• How long have you been in the role? • What type of staff provide telephone advice?

2. Can you describe the types of calls and health problems that receive telephone advice?

Probe
• Most commonly received types of calls • Are there any calls that don't receive telephone advice that you think should receive it? • Are there any calls that do receive telephone advice that you think shouldn't receive it? • Has this changed due to the pandemic? If so how has it changed?

3. What are the different types of clinical advice that you give to patients?

Probe
• What type of advice is most commonly given? • How do patients react to the advice that you give? – do you think they find the advice helpful or unhelpful? • Do you think patients follow the advice? • What about referral to pharmacy, is this something that you regularly do? How do you see referral to pharmacy developing in the future?

4. Can you think of examples where telephone advice works well in practice?

Probe
• Why/how does it work well? • Particular patient groups • Proportion of calls that you think telephone advice works well for • Is telephone advice working well in the Covid-19 pandemic? Why

5. Can you think of examples where telephone advice works less well in practice?

Probe
• Why doesn't it work well? • Particular patient groups • What about difficult to handle calls? Difficult to handle calls – are any of the calls more complex or complex, such as people with mental health problems, people who have been drinking, dissatisfied callers • Proportion of calls that you think telephone advice works less well for • Safety • Appropriateness

6. Can you tell me what happens when patients recontact the ambulance service after receiving telephone advice?

Probe
• Do you know what proportion of callers recontact? • Are these usually frequent callers • Do you have protocols for dealing with frequent callers?

7. How do patients respond to receiving telephone advice?

Probe
• Is it what they were expecting? • What factors suggest to you that patients are happy/unhappy to receive telephone advice and not be sent an ambulance? • Do patients usually seem happy to receive telephone advice? In what way? • Are there some groups or types of patients that seem more or less happy to receive telephone advice? • Do patient's think the advice is appropriate? What types of things make advice inappropriate for patients e.g. distance to travel, no transport, difficulty seeing GP etc • Are they sometimes unhappy? In what way? • Have patients' views changed due to the pandemic? If so how was it before? • Do you think there are any ways of making ambulance telephone advice more acceptable to patients?

8. Do you have any concerns about telephone advice, particularly in terms of the safety and the appropriateness of the advice?

Probe
• How do they make it safe? • What factors affect the appropriateness of telephone advice? • What happens if telephone advice is inappropriate? Are concerns different pre – covid and during covid • What do you think the best way is of measuring the safety/appropriateness of ambulance telephone advice?

   ○

9. What could be done to improve ambulance telephone advice?

Probe

- Could it be made more safe?
- Could the appropriateness of the advice be improved?
- Is there anything that you think could improve patient experience and patient views on the acceptability of telephone advice?

10.22. Appendix 14: Assessing the potential to increase the number of pharmacy referrals made by ambulance telephone advice services: a pilot case study using linked health data from one ambulance service

Background

The NHS five-year forward view report describes how in order to meet rising demand for health services, it is necessary for different models of care delivery to be developed and for the appropriate workforce configuration to be identified. NHS policy is that patients should 'get the right care, at the right time, in the right place, making more appropriate use of primary care, community mental health teams, ambulance services and community pharmacies.'

Appropriateness has been defined in this PhD thesis as care that is proportional to the health problem. Pharmacists are a potentially under-utilised health resource, who may be able to appropriately deal with low urgency health problems and provide health and self-care advice, thereby reducing demand for other, already over-stretched, services such as EDs, GPs and OOH urgent care. In 2019 it was confirmed that clinical pharmacists would take on an expanded role in primary care, through working alongside GP surgery and primary care networks. A fundamental aim of this is to provide better support to the elderly and care homes in medication management and reduce the proportion of medicine related hospital admissions in the elderly (currently 10%). This is in response to the CQC report, which identified that "more than half a million people aged 65 and over are admitted as an emergency with 'avoidable' conditions that potentially could have been managed, treated or prevented in the community"

There has been some small-scale research into the introduction of Pharmacists into ED settings, with research finding that pharmacists were able to manage low urgency and minor cases. In addition, pharmacists are now being incorporated into the NHS 111 provision of urgent care with the aim of reducing demand for other UEC and GP services. The potential benefits that have been identified of referring patients to pharmacists rather than GPs or UEC services through the NHS 111 system is a better capability of the UEC system to meet patient's healthcare needs, improved access to medicines and OOH medication advice to better enable self-care and self-management and wider benefits to the EUC system around more appropriate patient pathways and Pharmacist role enhancement.

A recent study is looking at the potential to refer patients who call 111 with very low urgency symptoms to a pharmacist instead of a General Practice or other health service. The aim is to reduce the number of referrals to GP services, which may help to reduce demand for GP appointments. It is estimated that up to 6% of all GP consultations could be safely referred to a pharmacist instead of a GP and this has the potential to free up 20,000,000 GP appointments per year across England and Wales.

With the addition of other new roles, such as Physician Associates and Advanced Care Practitioners, it is clear that the EUC system is undergoing a system wide workforce re-configuration. There are many different workforce arrangements and potential for pharmacists to be better involved with and provide support to the EUC system, particularly in those areas of the system which deal with

lower urgency and minor health problems. One such area is ambulance telephone advice, where patients typically have low urgency health problems. It is possible that some of these low urgency patients who contact the ambulance service have symptoms that can be appropriately managed by pharmacy referral. There is an opportunity to undertake a pilot investigation of the potential for pharmacy referral, using the linked dataset that was created for this PhD thesis.

Therefore, the aim of this chapter is to assess the potential for increasing the number of pharmacy referrals for patients who receive ambulance telephone advice.

In chapter 4 of this thesis, I identified and coded the reasons why these low urgency patients call the ambulance. For example, 3.3% of calls to the ambulance service were about constipation and 11.1% were for symptoms related to diarrhoea. In addition, other symptoms listed in Box 1 were captured within the other category, which amounted to 16% of calls. Whilst the number of these calls were small and included symptoms such as bites or stings and sleep difficulties, they all represent opportunities to steer patients towards the most appropriate health service for their health care need. The ambulance telephone advice service already directs some patients to their pharmacist. However, in the data analysis in Chapter 4 of this thesis, I identified that only 6 patients were referred to a pharmacist. Some of the health reasons for call identified in chapter 4 of this thesis match the symptoms identified as suitable for pharmacy care and reported by DHSC.

Methodology

This study uses routine data and thematic coding to identify whether patients who contact the ambulance and receive clinical advice over the telephone are calling with health problems that could be appropriately dealt with by a pharmacist. These methods are used because this sub-study is building on research done in previous chapters of this thesis and in doing so is making better use of routine data to explore new research ideas. After identifying a sub-group of pharmacy appropriate patients, these patients are then tracked through the EUC system using linked data, to identify what they did after the call and to further assess the suitability for pharmacy referral.

A study to assess the appropriateness of 111 patients for pharmacy referral has reported a list of symptoms that are associated with appropriate pharmacy referral and this list of symptoms has been published by the Department of Health and Social Care, see Box 1 below.

Box 1: List of symptoms identified as suitable for pharmacy referral

Acne
Spots and pimples
Ankle or foot pain or swelling
Athlete’s foot
Bites or stings
Insect or spider blisters
Constipation
Diarrhoea
Ear discharge or ear wax

Sticky or watery eyelid problem
Hair loss
Headache
Hearing problems or block ear
Mouth ulcers
Nasal congestion
Shoulder pain
Skin rash
Sleep difficulties
Sore throat
Tiredness
Toe pain or swelling
Wrist, hand or finger pain or swelling

Using the list of symptoms identified in Box 1 above, the routine ambulance CAD data relating to 'what's the problem' and the ambulance 'clinical telephone advice' data was recoded to assess whether the patient's health complaint corresponded with the pre-identified list of pharmacy appropriate health complaints. Data from both of the ambulance data sources was used as sometimes information about clinical symptoms was provided in only one data source. Where calls did not contain enough clinical information to verify whether the patient had a particular symptom, or no information was provided, the data was coded as missing for this analysis.

The coding was undertaken on all 2521 cases. The coding was undertaken by a single researcher as this work is part of a PhD thesis. To enhance the reliability of the coding, the researcher undertook the coding process twice in order to verify that the coding was accurate and consistent. Coding was undertaken manually and individually for each of the 2521 cases and involved an assessment of the health symptoms contained in the ambulance data against the symptom list in Box 2. Data was coded as follows: yes the call was appropriate for pharmacy referral; no the call was not appropriate for pharmacy referral; insufficient information or missing. A conservative approach to the coding was used, and if patients described any other symptoms that were not in the list of symptoms in Box 1 above, these calls were coded as not appropriate for pharmacy referral. Data was coded in excel and then transferred to SPSS for further descriptive analysis.

The analysis identifies how many patients could potentially be referred to pharmacy based on the matching of the reported health complaint with the symptoms identified in Box 1. It also explores the call and caller characteristics, what the advice to those patients was from the ambulance service, and what happened to those patients following the ambulance call in terms of ambulance recontacts, ED attendances, hospital admissions and deaths. Results are reported quantitatively, using tables and graphs.

Results

Insufficient or missing data meant that it was not possible to include 84 calls in the coding, meaning that the total number of calls used for this analysis is 2437. A total of 156 (6.4%) calls were identified as potentially appropriate for pharmacy referral, see table 1.

Table 1: Potential for pharmacy referral

Could this call have been referred to pharmacy	N (%)
Yes	156 (6.4)
No	2281 (93.6)
Total	2437 (96.7)
Insufficient data to code/missing data	84 (3.3)

The reason for call, as identified through the thematic coding reason for call categories, for the 156 calls identified as potentially appropriate for pharmacy referral is shown in Table 2. This uses a symptom-based approach to coding rather than a condition or diagnosis-based approach. This is because there is not enough information contained in the routine databases to identify a condition or to diagnose a condition.

The total number of symptoms in table 2 is higher than the total number of calls potentially appropriate for pharmacy referral, and this is because some patients called the ambulance service and described more than one symptom.

Table 2: Reason for call for calls identified as potentially appropriate for pharmacy referral

Reason for call	N (%)
Constipation or bowel problems	38
Accident or injury, including assault	10
Mental health, alcohol, drugs or social support	1
Diarrhoea, vomiting or nausea	22
Minor health problems	7
Other	39
Pain	52
Total	171

Some reasons for call do not initially look as if they match the list of symptoms described in Box 1. For example, Accident injury or assault and pain. However, many of the calls where the patient had diarrhoea also described some abdominal pain, and patients who called because of bites or stings and headaches often also described pain. Calls included in the accident injury or assault category mainly related to injuries to ankles, wrists, toes or fingers which resulted in pain and or swelling. Therefore, it was relevant to code these as potentially appropriate for pharmacy referral. Examples of calls coded as potentially appropriate for pharmacy referral are shown in Box 2.

Box 2: Example data from calls coded as potentially appropriate for pharmacy referral

- Spoke to pt [patient] ongoing rash x 3 weeks told has eczema. advised to call 111 service.
- Pt [patient] unable to open bowels for past day, has taken one dose of fibrogel, advised take regular and also take paracetamol, call back advice given triage
- Some diarrhoea with nausea, no vomiting, no other symptoms, pt [patient] has, improved since original call, caller happy, to monitor and call OOH or 999 if any, further concerns,
- Pts [patients] headache gone advised analgesia any problems call back,
- Ankle pain, no injury
- Patient has constipation advised to call oohs
- Ongoing problems with bowels pt [patient] feels needs to pass bowel motion but can't, nill nausea, nill vomiting. pt [patient] happy to contact gp, worsening instructions given

Data relating to the clinical advice given by the ambulance service was missing for 20 of the 156 calls identified as potentially appropriate for pharmacy referral. Table 3 shows the disposition given by the ambulance clinical advisor for the remaining 136 calls identified as potentially appropriate for pharmacy referral. Of the 156 calls identified as potentially appropriate for pharmacy referral, only 1 was advised to seek pharmacy care by the ambulance clinical advisor and this was for an insomnia related health problem. 62% of the 156 calls identified as potentially appropriate for pharmacy referral were advised to seek other types of emergency and urgent care, with 7.4% advised to seek ED care.

Table 3: Ambulance disposition of calls identified as potentially appropriate for pharmacy referral

Ambulance disposition	Number (%)
Make own way to ED	10 (7.4)
Out of hours GP	19 (14.0)
Refer to GP	47 (34.5)
Refer to 111	6 (4.4%)
Refer to District nurse or other community care	1 (0.7)
Pharmacy	1 (0.7)
Self-care advice (including worsening advice)	23 (16.9)
Nurse agreed plan	6 (4.4)
Patient refuses, ends call or is abusive	4 (2.9)
Symptoms resolved since call	6 (4.4)
Other	13
Total	136 (100)

Most calls were potentially appropriate for pharmacy referral were OOH calls relating to female in patients in older age groups. Calls were predominantly made on Saturdays, Sundays and Mondays.

Table 4: Caller characteristics for calls coded as potentially appropriate for pharmacy referral

Caller characteristics	**Number (%)**
Age	

0 - 16	10 (6.4)
17 - 40	21 (13.5)
41 - 60	40 (25.6)
61 - 80	59 (37.8)
>80	26 (16.7)
Sex	
Male	68 (43.6)
Female	88 (56.4)
In and out of hours	
In hours	34 (21.8)
Out of hours	122 (78.2)
Day of call	
Sunday	28 (17.9)
Monday	29 (18.6)
Tuesday	21 (13.5)
Wednesday	18 (11.5)
Thursday	18 (11.50
Friday	16 (10.3)
Saturday	26 (16.7)
IMD Deprivation quintiles	
1 (most deprived)	58 (37.2)
2	25 (16.0)
3	18 (11.5)
4	47 (30.1)
5 (least deprived)	8 (8.0)

Using the linked data, it was possible to identify what happened to patients whose call was coded as potentially appropriate for pharmacy referral. Table 5 shows the numbers of these patients who recontacted the ambulance service, attended ED, were admitted to hospital or who died within either 3 or 7 days of the ambulance contact. A high proportion of calls resulted in a recontact with the ambulance service and over a quarter of calls attended the ED within 3 days. No patients died, but just over 1 in 10 patients were admitted to hospital.

	With 3 days of the ambulance call	Within 7 days of the ambulance call
Recontacted the ambulance service	61 (39.1)	67 (42.9)
Attended ED	40 (25.6)	44 (28.2)
Admitted to hospital	18 (11.5)	19 (12.2)
Died	0 (0.0)	0 (0.0)
Total	119	130

Discussion

Main findings

Whilst it is possible to code the ambulance data to assess whether calls were potentially suitable for pharmacy referral using retrospective routine patient level data, many of these patients had subsequent health care contacts with emergency care or hospital services shortly after the ambulance call. These recontacts have not been assessed for appropriateness, so it may be that some of the ambulance service recontacts and the ED attendances were in fact inappropriate, in that their health problem could be dealt with by a lower urgency level service. However, it is unlikely that the admissions to hospital fall into this category. Many of the calls coded as potentially appropriate for pharmacy referral were made by older callers and it is likely that these patients have more complex health problems than it is possible to identify from the routinely recorded telephone advice data. Therefore, whilst on paper it is possible to identify potentially appropriate calls, in practice these calls may not be suitable for pharmacy referral, based on the number of hospital admissions for these patients. Pharmacy referral could be an option for handling frequent calls and also for those patients who live rurally and do not have access to as many health services locally as people who live in urban areas. Further exploration of the appropriateness of pharmacy referral could be undertaken using more detailed case review and acceptability to patients could be explored using qualitative research, such as interviews.

Implications and future research

This research applies a condition list from NHS 111 callers to an ambulance population to assess whether they are appropriate for pharmacy referral. Work to investigate whether there are other types of ambulance calls (other health complaints) that could be included on this list for an ambulance population is required.

The patients included in this analysis are a population of patients who receive ambulance telephone advice, who have other experiences of contacting the ambulance service. This is due to the data linking methodology. However, these patients are likely to represent the sicker and more complex component of ambulance telephone advice calls, due to their other experiences. Using this methodology to assess pharmacy referral appropriateness in a wider ambulance population is would be beneficial, however the feasibility of using such an approach has been demonstrated here. In addition, other viewpoints, such as those of service users and service provider views are important.