

**School of Health and Related Research**

**Senior doctor triage and emergency department performance: A mixed methods study**

**A thesis submitted in partial fulfillment of the degree of PhD**

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**Abstract**

**Aim:** Emergency department (ED) crowding has led many EDs to implement interventions such as senior doctor’s involvement in the initial assessment of emergency patients or senior doctor triage (SDT). The aim of this study was to quantify and evaluate the SDT process in English EDs and supplement this with descriptions of various aspects of the SDT process.

**Methods:** For the first phase of this mixed methods study, a national cross-sectional survey, and a retrospective secondary data analysis were used. This was followed by the qualitative component of the study; the semi-structured interviews. The survey was aimed at emergency consultants of all Type I EDs in England to identify those which implemented a form of SDT and then, the secondary routine ED performance data analysis study proceeded to test the theoretical assumption that EDs with SDT achieved superior ED performance using the relevant statistical tests. Subsequently, the qualitative study recruited a convenience sample of emergency health care professionals and ED managerial staff. Template analysis was followed in the qualitative study.

**Results**: Responses were received for 119 out of the 171 surveyed EDs with 69.6% response rate. In about two-fifths of EDs (42.8%, 51/119), a form of SDT was utilized for either ambulance arrivals or walk-in patients or both. The most commonly used model was senior doctor and registered nurse triage. The retrospective routine ED data analysis study compared the ED performance of the two groups (with and without SDT) using routinely collected ED quality indicators for a one year period. It revealed that there was no statistically significant difference in ED performance across the two groups, but hospitals with SDT received a significantly higher number of patient attendances per year. In the interviews, participants identified that crowded EDs revert to a form of SDT at peak times when patient volume increases, and that this model was mainly used as a safety mechanism to recognise and treat the ‘sick’ patients in these circumstances. Participants had various understandings of the SDT process. The positive and negative aspects, barriers and facilitators to the application of the SDT process were described.

**Conclusion:** SDT was a relatively popular practice in EDs across England but it did not impact ED performance indicators. This could partly be explained by the notion that SDT was implemented as part of a ‘crisis management and patient safety’ strategy in these hospitals, as was evidenced in the interviews. Future research should attempt to measure the impact of SDT on patient outcomes such as patient mortality and near-miss events, in addition, to its impact on ED targets. A process evaluation study that takes into account the local contextual factors is warranted.

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**Publications**

The impact of senior doctor assessment at triage on emergency department performance measures: systematic review and meta-analysis of comparative studies.[**Abdulwahid MA**](http://www.ncbi.nlm.nih.gov/pubmed/?term=Abdulwahid%20MA%5BAuthor%5D&cauthor=true&cauthor_uid=26183598)**,** [Booth A](http://www.ncbi.nlm.nih.gov/pubmed/?term=Booth%20A%5BAuthor%5D&cauthor=true&cauthor_uid=26183598),[Kuczawski M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Kuczawski%20M%5BAuthor%5D&cauthor=true&cauthor_uid=26183598),[Mason SM](http://www.ncbi.nlm.nih.gov/pubmed/?term=Mason%20SM%5BAuthor%5D&cauthor=true&cauthor_uid=26183598).[Emerg Med J.](http://www.ncbi.nlm.nih.gov/pubmed/26183598) 2015 Jul 16 <http://emj.bmj.com/content/early/2015/07/16/emermed-2014-204388.long>

Senior doctor triage (SDT), the front door solution for emergency department crowding or is it really? A qualitative study of clinicians’ views on senior doctors’ involvement in triage and early assessment of emergency patients. [**Abdulwahid MA**](http://www.ncbi.nlm.nih.gov/pubmed/?term=Abdulwahid%20MA%5BAuthor%5D&cauthor=true&cauthor_uid=26183598),Turner J,[Mason SM](http://www.ncbi.nlm.nih.gov/pubmed/?term=Mason%20SM%5BAuthor%5D&cauthor=true&cauthor_uid=26183598). Emerg Med J. In press.

Understanding better how emergency doctors work. Analysis of distribution of time and activities of emergency doctors; systematic review and critical appraisal of time and motion studies. <http://emj.bmj.com/content/33/7/447.full> [**Abdulwahid MA**](http://www.ncbi.nlm.nih.gov/pubmed/?term=Abdulwahid%20MA%5BAuthor%5D&cauthor=true&cauthor_uid=26183598)**,** [Booth A](http://www.ncbi.nlm.nih.gov/pubmed/?term=Booth%20A%5BAuthor%5D&cauthor=true&cauthor_uid=26183598),Turner J ,[Mason SM](http://www.ncbi.nlm.nih.gov/pubmed/?term=Mason%20SM%5BAuthor%5D&cauthor=true&cauthor_uid=26183598). [Emerg Med J.](http://www.ncbi.nlm.nih.gov/pubmed/26183598) In press.

**Impact**

The paper -The impact of senior doctor assessment at triage on emergency department performance measures: systematic review and meta-analysis of comparative studies- was chosen as the one of the highlight of this issue of the Emergency Medical Journal. July 2016 <http://emj.bmj.com/content/33/7/447.full>

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**Conferences**

Poster. Understanding better how emergency doctors work. Analysis of distribution of time and activities of emergency doctors; systematic review and critical appraisal of time and motion studies. Annual Scientific

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Poster.Where did the day go? Understanding better how emergency doctors work. Analysis of distribution of time and activities of emergency doctors; systematic review and critical appraisal of time and motion studies. September 2014. The Society of Acute medicine conference.

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**List of abbreviations**

BA Before and After study

CDU Clinical Decision Unit

DOH Department of Health

DVT Deep Venous Thrombosis

ED Emergency Department

EM Emergency Medicine

EPHPP Effective Public Health Practice Project Tool

IQR Interquartile Range

ICMED International Crowding Measure in the Emergency Department

LOS Length of Stay

LWBS Left Without Being Seen

LWTC Left Without Treatment Completed

NHS National Health Service

NHST National Health Service Trust

RAT Rapid Assessment and Treatment

RCEM Royal College of Emergency Medicine

RCT Randomized Controlled Trial

RR Relative Ratio

RTM Regression To the Mean

SDT Senior Doctor Triage

ScHARR School of Health and Related Research

START Supplemented triage and rapid treatment - The name given to the intervention - doctor screening in triage – in a few American studies

STAMP Suggested Time And Motion Procedures Checklist

SWAT Senior Work Up And Assessment Model

WMD Weighted Mean Difference

TA Template Analysis

TMS Time and Motion Study

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**Chapter One Background**

### General introduction and outline of thesis

Senior doctor triage is a poorly defined and evaluated process. Generally, it takes the advantage of the advanced senior doctor decision-making skills in formulating early management and disposition decisions that could enhance patient flow in the emergency department. It has been applied in a number of emergency departments (EDs) worldwide as a measure to combat ED crowding, enhance the patient experience and the quality of care received in the ED.

There is some evidence from the United States and Australia on the benefits and risks of involving a senior doctor in triage (SDT). The SDT model has also been applied in several emergency departments (EDs) across England as well. In these EDs, various forms of senior doctors’ involvement in triage improved both ‘time to assessment’ and ‘time to treatment’ ED quality indicators. However, this was documented in the form of a series of 3 case-studies with no clear methodology of data collection and analysis (1). It is regrettable that there is no recent good quality evidence on the extent to which senior doctor triage is applied in English EDs, and whether this process translates to improved ED quality indicators and better patient flow. There is also a lack of understanding of the various structures and purposes of this process.

This PhD study aims to use a mixed methods approach which benefits from both quantitative and qualitative research methods to enhance our understanding of senior doctor triage process and evaluate the use and effectiveness of this process. The research findings would be beneficial for emergency senior clinicians as well as leaders and policy makers in emergency medicine.

The first chapter aims to describe the current problems facing EDs worldwide and outline the proposed solutions to these problems including senior doctor triage. Standard triage practice in the United Kingdom is described. In addition, the current role of senior doctors in the ED and the potential development of senior doctor triage in the context of the National Health Service (NHS) are outlined. The presently used ED performance measures in the UK are discussed. The chapter then concludes with the research questions of this PhD study.

The second chapter presents two systematic literature reviews. The first systematic review evaluates the previous research on the impact of senior doctors’ involvement in triage, supplemented with a meta-analysis of the findings of included studies where appropriate. The second review, on the other hand, aims to characterise the current role and tasks of senior doctors in the ED. It is difficult to assess the senior doctor triage process without the full understanding and background knowledge of the role and activities of senior doctors in the emergency department.

The third chapter elaborates further on the research questions; presents the aim and objectives of the study as well as the study design and method of investigation (online survey of ED triage practices, secondary routine ED performance data analysis, semi-structured interviews with ED staff) and validation of the research methods undertaken.

The fourth chapter presents the results of this mixed methods study. It is divided into three sections. The first meta-theme ‘senior doctor triage, towards an evidence-based practice’, presents findings from the survey, secondary routine ED data analysis study and the interviews. The second section ‘Towards a clearer understanding of senior doctor triage’ draws data from the qualitative interviews only. The third meta-theme presents ‘The barriers and enablers of senior doctor triage as identified by ED health care professionals’ and draws data from both the survey and the interviews.

The fifth chapter, then, discusses the key findings of this mixed methods study and elaborate on the strength and limitations of using a mixed methods approach. It then discusses the study implications on research, policy, and practice.

### Emergency department crowding

‘Crowding ‘ the descriptive term or ‘ Overcrowding,’ the term commonly in use, was defined by the Australian College of Emergency Medicine as the situation when the number of patients waiting to be seen, assessed and treated, exceeds the ED staff and/or physical capacity (2). The American College of Emergency Physicians defines crowding as the situation where the demand for ED services exceeds the available resources for patient care in the ED, hospital or both. A definition described as one closer to disaster medicine (3). On the other hand, the Royal College of Emergency Medicine (RCEM) in the UK adopts a scale based definition of crowding where a crowded ED is described as one where ambulances cannot offload, there is a long waiting time to see a doctor, high rates of ‘leaving without being seen’ codes, and a wait of more than two hours for an in-patient bed for ED patients where their admission was deemed necessary. The RCEM discourages the use of the term overcrowding since ‘any degree of crowding’ is harmful to the emergency patients (4).

Emergency department crowding is becoming a serious public health crisis in the U.K. and worldwide (2). Over 130.4 million ED visits occurred in 2013 in the USA (5). In the UK, recently published data showed that the overall number of attendances has increased significantly since 2003/2004 from 14 million to 22.9 million in 2015/2016, an increase of around 40% (6). In Italy, there has been a remarkable increase in demand for ED services over the past 12-15 years where several interventions have been proposed (7). A report titled ‘international perspectives on ED crowding’ documented increased ED crowding across 16 countries, including the United Kingdom, Germany, France, India and Saudi Arabia (8).

A sizeable evidence suggests strong associations between ED crowding and adverse outcomes such as long waiting times, decreased patient satisfaction, medical errors and higher mortality rates.

In a comprehensive systematic review that included 93 studies (mostly retrospective studies), four general consequences of ED crowding were identified, including adverse outcomes, reduced quality of care, impaired access in terms of ambulance diversion and patient elopement, as well as provider losses financially (9).

A review by Carter et al that focused on the relationship between ED crowding and patient outcomes assessed 11 observational studies. This review concluded that ED crowding is a major safety concern associated with poor patient outcomes in terms of higher mortality rates and percentage of patients who left without being seen (10).

A more recent literature review of 35 studies described the effects of ED crowding on patient outcomes and confirmed previous findings. The review strongly suggests that ED crowding is associated with the potential for delays in treatment interventions, increased medical errors and higher mortality. The authors then recommended that policies that target ED crowding must be developed to enhance patient outcomes (11).

ED crowding creates obvious logistical and operational problems which result in undesirable consequences for patients as well as staff. The six determinants of quality of care (safety, patient- centeredness, efficiency, timeliness, effectiveness, and equity) as described by the Institute of Medicine in the USA can be compromised when patients experience long waiting times to see a physician, leave without being seen, are not transferred to an in-patient ward after a decision to admit to the hospital and remain in the ED, or when ambulances are diverted away from the hospital nearest to the patient (due to ED crowding and lack of bed capacity ((12). Carlson K, the President of the Emergency Nursing Association noted that since mean wait times from entering the ED until being seen by a provider have increased by 25% in the period 2003-2009, arguably perhaps, the most dangerous place in the ED is the waiting room (13).

Another review of ED crowding by Boyle et al concluded that the evidence is clear of the harmful effects and consequences of ED crowding, and therefore, future research is required to evaluate interventions and guide evidence-based policies that target ED crowding (14).

In other words, the consequences of ED crowding and its harmful effects have been explored extensively by emergency medicine and health service scientists. What remains to be explored, however, are the solutions and proposed interventions to mitigate this problem. This research focuses on one intervention: senior doctors’ involvement in the early assessment and treatment of emergency patients in the ED for several important reasons outlined later in this chapter.

### Causes of ED crowding

Crowding is a multifactorial and complex problem. Worldwide, the increase in ED crowding can be attributed to several reasons.

Firstly, the increase in ED demand, population growth and ageing population, accompanied by ED staff shortages, are amongst the possible reasons for ED crowding. The change in population demographics, the increase in elderly population and improved life expectancy of chronic illnesses has led to a rise in demand for ED services and workload of ED staff (9,15,16).

Secondly, non-urgent and inappropriate ED attendances were cited in the literature as one of the reasons behind crowded EDs although the evidence is mixed. One of the described reasons for increased non-urgent ED visits, according to a recent review of evidence, is that people chose EDs over other healthcare settings because of the comprehensive and continuous care provided 24/7 (17). It appears that patients came to the conclusion that being evaluated in an emergency department with its facilities is superior to evaluation in a doctor’s office (18,19). Secondly, the lack of effective and timely alternative outpatient care systems was often blamed as a cause of ED crowding in a number of countries (20–22). Although recent evidence suggests that improved access to primary care services and integrated primary and emergency care i.e. GP co-location, is not accompanied by a decrease of ED attendances.

One of the other causes of ED crowding is ED staff time spent assessing patients. The development and accessibility of various therapeutic and diagnostic procedures have increased the time ED staff spend on the ‘assessment’ of patients (23). Recent evidence has shown a trend of increased use in diagnostic investigations and advanced imaging techniques by ED doctors. In the US in particular, there have been dramatic increases in the use of CT scans in EDs (24).

In England, ambulance handover and flow issues have been identified as a reason for the delay in EDs, which directly relates to the workforce at the ‘ front door,’ as well as the hospital internal capacity (25).

In addition, studies seem to highlight the important role of ‘exogenous factors’ i.e. inadequate hospital capacity and access block. This phenomenon, also known as “boarding” in the USA, refers to the delay of admission of patients from the ED where hospital bed capacity is used to its limits (26,27). This results in crowding, ambulance diversion, and patients being cared for in the corridors and hallways in a less than optimal environment.

However, a study by Pitts et al that evaluated national trends of ED occupancy in American EDs found that although boarding continues to contribute to ED crowding, it has not changed or worsened over the study period of 7 years (21). A rapid review of exit block by Mason et al showed that evidence is mixed with regard to whether or not exit block is worsening. Evidence from one ED in Ireland and EDs in Australia suggests that exit block has worsened. Yet, analysis of a representative sample of EDs from the States showed that the total length of stay has actually decreased over time (26).

To enhance the understanding of ED crowding, in 2003, Asplin and colleagues created a conceptual model which was widely accepted by EM clinicians, policy makers and administrators (29). Asplin et al suggested that this model can assist researchers in finding potential solutions to the problem of ED crowding. This model partitions the ED into three areas ‘input-throughput-output’ and highlights the possible reasons for ED crowding in each area. The input section refers to the events that take place before patients arrive in the department i.e. the demand for ED services. The throughput component implies the patient flow processes in the ED and the efficiency of the ED system in terms of staff resource and ED design. Lastly, the output section refers to factors that influence patients’ disposition after they receive their ED-based care such as access block. See Figure 1

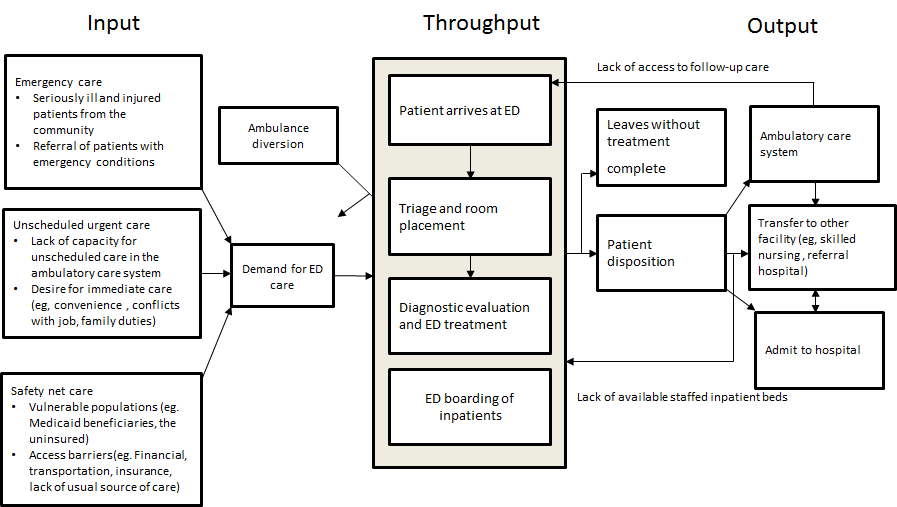


Figure 1 The conceptual model of ED crowding by Asplin et al

In 2014, this conceptual model was updated and expanded by American researchers who added other causative factors to each section. For example, pre-hospital care and ambulance diversion were added to the input section. Defensive medicine and elderly population were added to the throughput component. Finally, the output section included other new factors such as access block or ‘boarding’ and regionalisation of secondary care (30).

### Potential solutions to emergency department crowding

Several literature reviews have been published in an attempt towards the provision of an evidence-based solution to the problem of ED crowding (31–33). The Royal College of Emergency Medicine in the UK and the American College of Emergency Physicians published documents detailing high impact solutions for ED crowding (34,35).

One review by Morris et al succinctly summarised the interventions aimed at reducing ED crowding in a ‘conceptual synthesis’ format where they divided their key solutions according to the input, throughput and output components (36).

Unfortunately, it is rather difficult to control demand for ED services i.e. input. In a systematic review, primary care services or ‘input’ solutions were shown to have a negligible effect on ED attendances (37). On the other hand, output solutions require multi-level collaboration and use of resources that are often out of the hands of ED clinicians and administrators. For this reason, many EDs have focused their efforts on throughput-based solutions. Throughput-based solutions focus on managing ED staff and space better and cutting any wasteful steps in order to enhance patient flow and reduce ED crowding. Many throughput solutions have been documented by Morris et al. These include the provision of GPs and specialised clinicians in the ED or the creation of additional ED space in the form of observation units for patients awaiting test results. Other solutions were documented, such as the creation of new jobs e.g. the use of scribes for documentation on behalf of physicians in the USA, or the addition of new responsibilities for the existing jobs like the use of nurse practitioners to perform doctors’ duties in several developed countries (36). Finally, Morris et al referred to triage-related interventions, such as the elimination of triage when beds are available, or bringing clinicians to the triage area to perform the early assessment and start medical management of patients (36).

While most of these interventions seem to mitigate ED crowding, all are under-researched and there is no robust evidence base for health care leaders to draw from in order to establish these models. Therefore, there remains a substantial unmet need for better control of ED crowding. One of the solutions that has been implemented in leading EDs in the developed world is senior doctor assessment in triage; the subject of this PhD project.

Senior doctor triage is an increasingly promoted practice. The Royal College Of Emergency Medicine and the House of Commons Health Committee in the UK suggested rapid senior assessment of patients as part of their recommendations to reduce ED crowding (4,25,38). The American College of Emergency Physicians included ‘provider in triage’ in the documents outlining high impact solutions for ED crowding (35).

In fact, there seems to be a growing interest in, and use of, senior early decision making at the ED. According to a published UK report, 82% of the 56 participating trusts reported the availability of senior clinicians to perform early assessments at their EDs (39). A recent survey of triage practices in the Yorkshire and Humber region found that around one-third of the hospitals in the region operate some form of SDT (40). A UK report examined the organisational factors that influence waiting times, suggesting that lead clinicians who adopted a proactive and participative style, positively influenced waiting time for ED patients (41). It suggests that the early senior decision making positively impacts patient outcomes and ED crowding. In addition, the involvement of senior clinicians early in the patient journey might positively influence the staff behaviour as well as its potential benefits to the patients.

However, a preliminary search of the literature has shown that there is little high-quality evidence to support the implementation of SDT, especially from a UK perspective. There are also no mixed-methods studies that address the need for the inclusion of the clinicians’ views and experiences of this model and take advantage of both quantitative and qualitative methods. This is in order to explore the effect of various practices of senior doctor triage on ED quality of care while taking into account the ED clinicians’ perspective of applying this model in their EDs.

Therefore, the evaluation of senior doctor triage is important for several reasons. Firstly, exploring and understanding the clinicians’ opinions of senior doctor triage and reasons behind its implementation can help to reveal the underlying logic of the emergency department activities and can help ED clinicians to re-evaluate their strategies and measure the impact of SDT. Second, a fundamental decision confronting all emergency care policy makers, ED managers, and clinical leaders concerns whether or not to encourage or adopt the conduct of an intervention such as senior doctor triage. Knowledge of the influence, consequences, perceived positive and negative aspects of senior doctor triage can serve as an input to that decision. Third, researchers have often studied a form of senior doctor triage in one or two emergency departments but their findings may have been implicitly over-generalised to all organisations. This study benefits from comparing the presence of various models of SDT in a large number of EDs across England.

### Current triage practice

Triage is a tool that is used to initiate a preliminary clinical assessment for all patients presenting to the ED with the purpose of prioritising those who are in need of immediate care (42). The word ‘triage’ is the noun format of the French verb ‘trier’ which means to select or to sort. In the ED setting, triage is used as a verb which refers to quickly screen ED attendances and assess the urgency of their condition (42).

Triage was first used back in the late 1700s, where military surgeons used to examine wounded soldiers during the Napoleonic war in order to decide which soldiers would need evacuation versus those for whom prompt treatment could render them fit enough to return to the line (43). The involvement of doctors in the early assessment of patients is not new. Before the 1980’s, doctors were the first point of contact for patients attending the ED. However, ED crowding and increasing patient volume necessitated the introduction of nurse triage to prioritise patients’ care in the ED according to the urgency with which they required medical treatment (44,45). Due to ED crowding and centralization of care, most EDs have routinely been using triage systems in order to help the staff with limited ED space to cope with the radical increases in ED visits (46).

Since then, triage has been performed by nursing staff with the help of different triage scoring tools used across EDs around the world. Nurse triage involves the patient first being registered by a clerk, then waiting to be called by the triage nurse. Hence, the patient initially waits for the nurse and then waits for the doctor. The traditional process of nurse triage has been criticised recently as being out-dated and in need of change (42). Of note, a study found triage errors and varying levels of competencies of traditional triage nurse (47). Another study highlighted the increased complexity of the triage process with the increased use of intense triage tools and computers (48). Furthermore, there have been some concerns regarding the safety and accuracy of nurse triage. One US study revealed that nurses had an accuracy rate of 54% in triaging patients with symptoms suggestive of acute myocardial infarction in a cohort of 286 patients (49).

More recently, there has been a move back towards involving doctors in triage in the form of senior doctor triage (SDT) or rapid assessment and treatment models (RAT). A literature review of ED staff profiles advocates the use of more experienced staff in the ED (50). Due to the role of triage in eliminating bottlenecks in ED throughput, EM leaders and policy makers are attempting to restructure and redesign their triage models.

Variations of this model are used by various EDs worldwide and a number of quantitative research studies have been conducted examining the use of this model as will be detailed in the second chapter (51).

### Overview of current senior doctors’ role in the emergency department, and the possible development of senior doctor triage in the context of the National Health Service.

In the UK, the term emergency medicine (EM) consultant is usually used to refer to the most senior emergency physician. An EM consultant is a physician who completed their postgraduate clinical training in Emergency Medicine. The EM consultant workforce can also include locum consultants, associate specialists and senior registrars working on the consultant rota (52).

Unfortunately, the UK compares unfavourably with other developed countries in the numbers of trained EM consultants. In Australia, EDs that receive an average of 60,000-80,000 patients a year are staffed by 14 consultants who primarily deliver care. In the USA, on the other hand, all patients could be seen by a consultant or an ‘ attending’ physician prior to discharge (53).

The role of EM consultants in the UK involves the provision of hands-on clinical care, teaching, leadership, and management. The RCEM states that it is hard to define exactly what EM consultants do due to the multi-faceted nature of their role. EM consultant duties are not formulated in a rigid format. A qualitative study conducted in the UK described the problem-solving role of emergency physicians in charge and identified nine problem-solving mechanisms used by in charge ED physicians which included guiding, frontloading and deflecting (54).

A review that describes in detail the activities of senior emergency doctors, and how EM senior doctors spend their time in the ED, is presented later. A recent survey of EM consultant workforce in the UK revealed that the majority of EM consultants are regularly working in excess of their planned programme activities. In point of fact, more than half of the surveyed sample reported they exceeded their contracted hours by 20% or more (52). Evidence from the US reveals that EM physicians have the highest levels of stress and professional ‘burn out’ in comparison to other medical specialties (55,56). In fact, emergency medicine has always been regarded a high-stress specialty due to the heavy responsibility and the need to make important clinical decisions based on limited information (55). A recent qualitative study of EM consultants in Wales explored the reasons behind the difficulties in retention of senior doctors. This study identified work pressures impacting patient care as the root cause of consultants leaving EM (57). There are continuous efforts by the RCEM to advocate for the increase in its consultant workforce and protection of their work-life balance (52,53).

Due to the aforementioned information, it is postulated that the optimal SDT model should only be applied to maximise the current role of EM physicians where there are sufficient resources and, taking into account the consultants’ views and preferences.

### Currently used emergency department performance measures

The evaluation of the different models of senior doctor triage needs evidence-based quality indicators.

In the last decade, there have been global efforts, especially in the industrialised world that focused on measuring ED performance and crowding through the introduction of different quality indicators and targets. These ED performance measures tried to evaluate the effectiveness and efficiency of patient care in the ED through indicators like ED waiting times and unplanned re-attendances.

Most of these ED performance measures are time-based but there are no cross-country standardised measures that are followed by EDs worldwide. A relatively recent study derived an International Crowding Measure in the ED (ICMED) via a formal consensus process. It included an eight-point measure of ED crowding (58). These encompassed both input, throughput and output measures. Yet, the authors recommended validating this measure with further research before its widespread use.

The ICMED contains several measures that are already being used by the Department of Health (DOH) in the UK. An understanding of the current quality indicators as determined by the DOH is central to the evaluation of different models of SDT in hospitals in England. The following section lists the measures used by DOH to serve as a point of reference for the empirical study of SDT.

1. **Ambulatory care**

This indicator marks the number of ambulatory-care-sensitive cases that can be managed in the community i.e. avoidable admissions. Currently, it is being used to measure the number of admissions in relation to two medical conditions (cellulitis and deep venous thrombosis). This measure is essential since hospital admissions can be distressing to both patients and their families (59). It is also associated with greater risk of morbidity and mortality as well as its expensive costs to the health care system. The Quality Watch report documents an increase in overall ambulatory-care-sensitive cases admission of around 50% over the last 12 years (2001-2013). Only half of this increase can be explained by ageing and population growth (60).

1. **Unplanned re-attendance**

This outcome describes the rate of ED service users who re-attend to the ED within 7 days of their previous visit. There is evidence nationally and internationally that this measure is an important clinical indicator of ED quality of care. It indirectly reflects if the clear information has been communicated to patients by ED staff. In addition, it can help to reduce misdiagnoses and suboptimal treatment through regular audits of this category of patients. Finally, it can indicate the number of patients who visit the ED with mental health problems and related substance abuse. The DOH recommends that the rate of unplanned re-attendances should be ideally between 1-5%. A review of very low re-attendance rate <1% is recommended since it might actually reflect risk adverse behaviour and a corresponding increase in admission rate (61). The latest benchmarking report published by RCEM states an overall average of 4.23% of unscheduled re-attendances across 114 EDs in England (62).

1. **Total time spent in the emergency department and the Four-hour target**

This measure recognises the importance of the total time patients spend in the ED from arrival to either being admitted, discharged or sent to Clinical Decision Unit (CDU) (61). The DOH recommends that 95% of patients should spend no more than a maximum of four hours in the ED and that no single patient should wait more than 6 hours. This quality indicator was first implemented in 2004. Over the next 10 years, this target has gained strong media and political attention yet there is still a controversy regarding its evidence-base. Some ED staff reported expediting care for patients who are about to breach the target over others (63). Overall, it is thought that measuring the total length of stay of patients in the ED is an essential indicator of patient flow, appropriate ED staffing, structure and facilities (61,64). The last quarterly report of the year 2014 revealed only 92.6% of patients seen within the 4-hour target, which is the lowest quarterly performance since the introduction of the target in 2004 (65). Recently, the NHS England stated that 2016-2017 figures for the four-hour target are not directly comparable to previous years for several reasons (66).

1. **Left without being seen**

Left without being seen describes the patients who leave the ED before proper clinical assessment and evaluations take place. This includes patients leaving after being registered with ED reception and those who leave after initial triage assessment (61).

A literature review published on patients who leave without being seen revealed that this is an international problem and it is directly associated with long waiting times (67). Interestingly though, there were not enough data to suggest increased risk of adverse events in this group of patients (67). One recently published Australian study of a large cohort of around 64,000 patients suggested increased 72-hour re-attendance of those who leave without being seen (68).

This indicator is one of the essential indicators adopted by DOH which recommends that a rate of more than 5% of patients leaving the ED without appropriate assessment should warrant a detailed review of ED staffing and processes (61). The overall average of LWBS was reported to be around 2.5% in 2011 across the majority of EDs in England (62).

1. **Time to initial assessment**

This measure records the time from arrival in the ED to initial assessment by staff for ambulance arrivals. This indicator is useful in the identification of those patients who require immediate care. It also enhances the patient journey in the ED via developing pathways for early investigation and treatment (61). The DOH recommended that time to initial assessment for patients arriving by ambulance should not be more than a maximum of 15 minutes. This was actually only realised in around 74 % of patients according to the latest published RCEM survey ‘Drive for Quality’. Accordingly, the House of Commons Health Committee called for the formation of Rapid Assessment Team (RAT) – senior early assessment - and the avoidance of the traditional triage process with its typical ascending hierarchy for ambulance patients (25). Several hospitals are fined with a considerable amount of money every year for missing the ambulance handover target.

1. **Time to treatment**

This measure refers to the time from patient arrival to the ED to the time the patient is seen by a ‘decision-making clinician’ (69). That is to say, a clinician who has the authority to discharge the patient, for example, an experienced doctor, or an emergency nurse practitioner. Typically the time to treatment should not take longer than 60 minutes in 95% of ED patients. This indicator is essential since many ED presentations are time-sensitive. This indicator also enhances the management of patients with time-critical conditions. Furthermore, it enhances patient flow through encouraging physicians to see patients even if there is still time to the maximum 4-hour length of stay in the E.D. The RCEM, however, warned against employing a ‘hello clinician’ who submits to the criteria of a decision maker but has no additional patient value. It also advised against employing junior physicians with not enough experience early in the patient journey only to meet the expected target (61). Only around half of ED visitors across England are seen by a decision-making clinician within the recommended 60-minute target (62).

**Other quality indicators**

**Service Experience and Consultant-sign off**

Service experience refers to both staff and patient experience in the ED. DOH advised that local policies should be implemented to collect data in this regard and narrative reports should be produced regionally. Consultant-sign off, on the other hand, indicates that all patients who fall in the following high-risk categories i.e. non-traumatic chest pain, febrile illness in less than 1-year-old children, unplanned re-attendance within 72 hours; should be reviewed by a consultant or senior EM doctor before discharge. Only half of EDs reported the use of service experience as a quality indicator and just a third of EDs used consultant-sign off according to the recently published RCEM survey which could be due to a shortage of staff and resources (62).

In theory, SDT can have a positive influence on each of the above-mentioned quality indicators since the early senior assessment of ED patients can reduce duplication and accelerate the path of ED patients through the system.

### The purpose statement and research questions

The purpose statement behind the literature reviews and the empirical study are outlined here.

The purpose of the literature reviews was to provide a systematic and critical review of comparative studies on senior doctor triage, and summarise the available literature that describes the current duties of senior emergency doctors and how much time senior doctors spend on direct patient care in the emergency department, what we can learn about their current duties in terms of if they can spend more time in direct contact with the patients performing the role of senior doctor triage, and whether that is actually beneficial, which was explored in the empirical study.

The intent of the two-phase sequential mixed methods study is to describe and evaluate the involvement of senior emergency physicians in early assessment of patients at the front door or senior doctor triage in various shapes or forms. The first phase, a survey, and quantitative secondary data analysis is used to identify triage practices in English EDs and explore the relationship between the involvement of senior doctors in triage and emergency department performance measures in English EDs. In the second phase, qualitative interviews with a sample of ED clinicians are used to explore aspects of senior doctor triage in more detail. The reason for combining both quantitative and qualitative data is converging both quantitative (broad numeric trends) and qualitative (detailed views) data in order to answer the research questions.

This study aims to answer the following research questions

1. What is the current evidence regarding the senior doctor’s involvement in early assessment of patients, and how much trust could be put in the available evidence?
2. What is the current evidence that describes the senior doctor's duties in the emergency department, and how much time the senior doctors spend on direct face-to-face contact with the patient, and what is the quality of this evidence?
3. What is the extent to which senior doctor triage is used, and what is the typology of the various SDT models used in EDs across England?
4. How do NHS trusts with senior doctor triage compare on key performance metrics such as time to triage for ambulance arrivals and the number of patients waiting for more than four hours, with their counterparts with no senior doctor triage?

A) What are ED staff views and perceptions on senior doctor triage?

A1). What are the positive and negative aspects of this model?

B) What were the reasons behind the establishment of senior doctor triage?

B1) What are the reasons behind its application in some emergency departments, explanations behind its suspension in other emergency departments?

B2) What are the challenges that face EDs which implement/implemented senior doctor triage and suggested methods to improve this process?

# Chapter Two

# Literature reviews

### Introduction

A literature review is defined succinctly by Fink as a *systematic, explicit, and reproducible method for identifying, evaluating, and synthesising the existing body of completed and recorded work produced by scholars, researchers, and practitioners* *(70)*. The use of ‘Systematic’ in the definition implies that all types of literature reviews have to follow a systematic approach. The term ‘systematic literature review’ on the other hand, combines the strengths of a critical review with an exhaustive search process to produce the ‘best available’ evidence. It provides a summary of studies with a pre-defined question and eligibility criteria using scientifically defensible and reproducible methods to reduce bias, and if appropriate, a meta-analysis to decrease the role of chance (71,72).

Conducting a literature review is very important for a number of reasons. A good systematic review can provide us with the most dependable answer to a particular question. It evaluates the strength of the available evidence and critically appraises the quality of the included studies. Therefore, it can indicate how much confidence practitioners, policy makers and service users can have in the results, thereby, it can offer a valuable tool in decision making with regard to a particular intervention.

Additionally, a systematic review can also help us to compare the results of various included studies, to examine the consistency of their findings and identify disagreements across multiple studies. Evaluation of these differences across the studies can allow us to understand whether these differences are due to methods, settings, bias or simply chance. A review, as a result, can point out the circumstances under which a particular intervention can work best, or be most effective. A good search synthesis can shed light on how well an intervention or a policy works in particular subgroups of users and include consideration of the cost implications of the evaluated intervention to assist in the decision-making process of whether or not to adopt this particular intervention and whether it is value for money (71).

Two systematic reviews are presented in this chapter. This first systematic review aims to summarise and critically appraise the available evidence on senior doctor triage, identify research gaps and produce recommendations that can guide the methods of the empirical study.

During the proposal writing for this project, there was a lack of understanding of the role and activities of senior emergency doctors in the emergency department, how they spend their time in the department, how much free time do they have. Therefore, the second systematic review aims to provide an up-to-date understanding of the activities and duties of senior emergency doctors. Although it could be argued that a ‘simpler’ approach such as a traditional literature review could provide sufficient information regarding the senior doctors’ role, considering that this systematic review would not significantly change the methods or results of the empirical study. However, a systematic approach was followed to help produce publishable and high-quality work which could be disseminated to ED practitioners, health system developers, and policy makers, which could be a sufficient end itself.

## The impact of senior doctor triage on emergency department performance measures; Systematic review and meta-analysis of comparative studies.

### Background

There has been an increasing amount of evidence coming to light recently on the benefits and risks of various models of senior doctor triage. Previously, Rowe et al. reviewed evidence on doctor triage in a broad context which included junior, middle grade or senior doctors (73). In some of their included studies, the intervention was by either a doctor or a nurse practitioner, or a physician assistant (74,75). Furthermore, they depended heavily on abstract-only studies. In comparison, this current review adopts a tight focus looking specifically at the role of the ‘senior’ doctor in early assessment at triage. In addition, this review considers whether the doctor in triage was additionally recruited or a mere reallocation of existing staff. Another two reviews have succinctly summarised the numerous throughput interventions aimed at improving flow through the ED such as nurse-requested x-ray, and rapid assessment zones (73,76).

The key objective of this systematic review is to synthesise all the comparative studies available in the literature which explore the impact of senior doctor triage versus the standard single nurse triage on ED performance measures. This should allow EM clinicians to draw conclusions in respect to applying this intervention to their own practice.

### Methods

**Protocol and registration**

Methods of the analysis and inclusion criteria were specified in advance and documented in a protocol (77).

**Search strategy**

An extensive search of the following electronic databases was undertaken to identify relevant studies: MEDLINE, EMBASE, CINAHL, EPOC, Cochrane Library, Web of Science and Clinicaltrial.gov. This was accompanied by searching citation indices and secondary references. Literature for inclusion in the review was restricted to the last twenty years (1994-2014) in order to keep the information as relevant as possible; otherwise, it was felt that relevance to current practice could not be validated. Please see Appendix 1 Search Strategy.

**Eligibility criteria**

Articles were included in the systematic review if they fulfilled the following eligibility criteria: 1) comparative in design (randomised and non-randomised controlled trials, before and after studies, interrupted time-series and cohort studies with controls); 2) published peer-reviewed studies;

3) conducted in adult or mixed age group EDs; 4) evaluated senior doctor triage working either individually or as a part of a team of other healthcare professionals, and 5) explicitly mentioned at least one of the key ED performance measures (78).

Articles were excluded if they were: 1) non-comparative descriptive studies;2) abstract-only studies;3) published in language other than English; 4) investigated specific patient illnesses;5) the intervention (senior doctor) was allocated to other duties in the ED, for example, seeing ‘clerked’ patients, administrative work or teaching and supervision;6) interventions that employed primary care physicians or general physicians in triage; 7) evaluated ‘see and treat’ or ‘fast track’ schemes.

**Outcomes**

The outcomes were length of stay in minutes (total time spent in the ED), Waiting time in minutes (time to initial assessment by a clinician), proportion of patients who left without being seen or without treatment complete, mortality rate, re-attendance rate, patient satisfaction and costs associated with senior doctor triage. Since there was a lack of consensus on ED outcomes measures across different countries, the chosen outcomes represent the outcomes that were the most commonly used in EDs and the ones recommended by the Royal College of Emergency Medicine in the UK.

**Screening and Data Extraction**

Clearly irrelevant studies and duplicate publications were removed via screening through the titles. Once a shortlist of potentially relevant literature was obtained from the initial search, the studies were selected according to the predetermined inclusion and exclusion criteria. This was achieved through reading the abstracts, or full text if necessary. Authors were contacted to retrieve the qualification of the physician if not clearly stated. With regard to data extraction, a specifically designed and piloted form was used. Data extracted for continuous outcomes (Length of stay LOS and Waiting Time WT) include: mean, standard deviation (SD) and sample size for each group. SD was sometimes calculated from confidence interval (CI) or p-value. For the purpose of the review, where only medians and interquartile range (IQR) were reported, medians were accepted as means and SD was estimated using this formula ‘*SD = IQR/1.35’* *(79).*

**Risk of Bias**

Each included study was evaluated for the risk of bias. The Effective Public Health Practice Project (EPHPP) quality assessment tool was used to appraise the included studies (80). This tool was appropriate since it accounts for the different study designs of included studies.

The EPHPP tool examined each study against six dimensions namely: selection bias, study design, confounders, blinding, data collection methods, withdrawals, and drop-outs. Finally, the quality of each article was graded as strong, moderate or weak according to the individual ratings attributed to each dimension.

**Data Analysis**

A narrative synthesis was completed. A table of the findings was produced to summarise the population, design, intervention, and comparator of each study. Heterogeneity between studies was assessed using the *I*2 statistic. Homogeneous studies were statistically summarised and meta-analysed. The meta-analyses were performed by computing risk ratios (RR) and weighted means difference (WMD) with 95% Confidence Intervals (CIs) using a random-effects model, as it provides a more conservative estimate of the effect size. If meta-analysis was not feasible due to high heterogeneity (I2 > 90%), weighted means or risk ratios were calculated for all studies for a given outcome to provide a non–meta-analytic comparison for each result. This was carried out via Review manager programme (RevMan5.2).

Subgroup analyses according to study design, intervention type (senior-led team versus senior doctor and nurse triage) and population type (medium acuity patients) were conducted if feasible.

Sensitivity analysis according to study design and methodological quality was planned.

**Assessment of publication bias**

The symmetry of funnel plots was used to assess for publication bias.

### Results

**Literature search**

The initial search identified 4506 abstracts, which were evaluated for relevance. 55 studies were considered as potentially relevant and evaluated in full text. In addition, 2 studies were found through citation search and secondary references. Ultimately, 25 studies were selected. The final selection process was based on predetermined eligibility criteria. Visual inspection of the funnel plot suggested the presence of publication bias. See Figure 2 for PRISMA chart Appendix 2

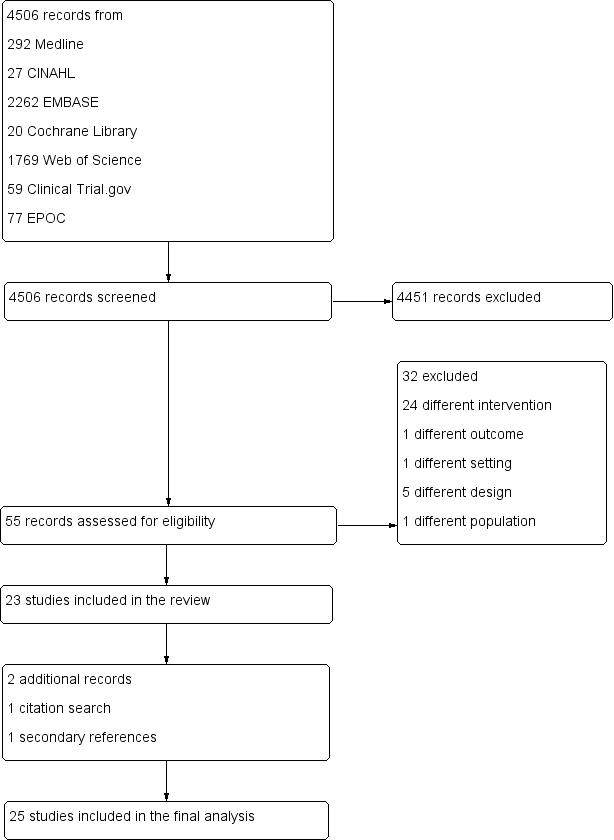


Figure 2 PRISMA Chart

**Description of the studies**

All 25 included studies were comparative in design, 16 observational before and after (BA) studies (81–96), 3 cohort studies (97–99), 4 randomised controlled trials (RCTs) (100–103) and 2 clinical controlled trials (CCTs) (104,105).

Two studies evaluated senior doctor-only triage where the senior doctor alone was responsible for assessing patients and initiating treatment (84,96). In another group of 6 studies including 2 RCTs, the presence of combined senior doctor and nurse triage was examined (82,88,94,100,101,104). In the final group of 17 studies, the intervention was senior doctor-led team triage where the senior doctor was accompanied by a team of other health professionals such as nurses and technicians. In 5 of these studies, the team included junior doctors in addition to nurses or technicians (90,97,98,102,103). See Table 1. The number of studies that required additional resources to operate SDT was twelve (84–87,91,92,96,97,100,101,103–105). In contrast, thirteen studies simply reassigned the senior doctor from their usual duties (81–83,88–90,93–95,98,99,102). Interestingly, all the studies that did not require additional staff except one (83) reported improvements in ED performance measures, whilst two studies using the resource-additive model reported no significant changes in ED performance outcomes associated with SDT (96,103).

The population of the ED users appeared comparable across the included studies. Fourteen studies documented the age, gender and mode of arrival to ED. In 12 of these studies, patients were middle-aged with neither gender being predominant.

**Quality assessment**

Using the EPHPP global rating decision tool, four studies were assessed as being of strong quality, nine of moderate quality and twelve of weak quality. None of the studies was double-blinded. Although typically patients were not aware of the introduced change in the ED, the intervention could not be blinded to ED staff. However, two studies stated that they blinded the data analysts to the study objectives (100,103). See Table 2 Effective Public health practice project (EPHPP) quality assessment tool rating for individual studies.

Table 1 Characteristics of the included studies: a review of the impact of senior doctor triage on emergency department performance.

| **Study & country of origin** | **Annual visits rate** | **Intervention** | **Resource-additive or neutral model\*** | **Study population** | **Study period** | | **Study design** |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Asha 2013** **(97)**  **Australia** | 65,000 | **Senior-led team triage**  Senior Assessment and Streaming (SAS); team of ED consultant, *intern,* and nurse | Resource- additive  Model | 18962 | 3 months | Prospective cohort study | | |
| **Baumann 2006** **(99)**  **USA** | 52,000 | **Senior-led team triage**  **T**eam **T**riage and **T**reatment (T3). Attending emergency physician, an emergency nurse, and technician | Resource-neutral  Model | 243  medium acuity patients | 1 week | Prospective cohort | | |
| **Burstrom 2012** **(98)**  **Sweden** | 52,000 -64,000 | **Senior-led team triage**  Consultant led team of *junior doctor* and nurse versus traditional single nurse triage model | Resource-neutral  Model | 91023 | 1 year | Retrospective cohort | | |
| **Cheng 2013** **(100)**  **Canada** | 45,000 | **Senior doctor and nurse triage**  Consultant academic emergency physician and nurse supplementary triage assessment team. | Resource –additive  Model | 17034 | ~ 7 months | RCT | | |
| **Choi 2006** **(81)**  **Hong Kong** | ~146,000 | **Senior-led team triage**  **T**riage **R**apid **I**nitial **A**ssessment by **D**octor (TRIAD)  Team of senior ED attending physician, nurse, health care assistant | Resource-neutral  Model | 2665 | 2 weeks | BA | | |
| **Crane 2012** **(96)**  **USA** | 95,000 | **Single senior doctor triage**  Faculty physician | Resource- additive  Model | NR | ~ 3 months | BA | | |
| **Davis 2014** **(103)**  **Australia** | 70,000 | **Senior-led-team triage**  A team comprising an emergency medicine consultant, a *junior medical officer,* and an ED nurse. Senior workup assessment and treatment team (SWAT) | Resource –additive  Model | 1737 | 36 days | RCT | | |
| **Grant 1999** **(82)**  **Australia** | NR | **Senior doctor and nurse triage**  Rapid assessment team RAT ( staff specialist or training registrar and registered nurse) | Resource- neutral  Model | 9778 | 6 months | BA | | |
| **French 2014** **(83)**  **Jamaica** | NR | **Senior doctor and nurse triage**  Team consisting of a consultant emergency medicine physician and two nurses  Versus three nurses only | Resource-neutral  Model | 257 | 4 days | BA | | |
| **Han 2010** **(84)**  **USA** | 50,000 | **Single senior doctor triage**  Board certified Emergency physician | Resource –additive  Model | 17285 | ~ 5 months | BA | | |
| **Holroyd 2007** **(101)**  **Canada** | 55,000 | **Senior doctor and nurse triage**  Team of certified emergency physician with one year’s experience and nurse | Resource –additive  Model | 5718 | 6 weeks | RCT | | |
| **Imperato**  **2012** **(86)**  **USA** | 36,000 | **Senior-led team triage**  A team of attending physician, nurse, and technician. | Resource –additive  Model | 18109 | 6 months | BA | | |
| **Imperato**  **2013** **(85)**  **USA** | 36,000 | **Senior-led team triage**  PIT (physician in triage) Board certified emergency physician, registered nurse, and technician | Resource –additive  Model | 966 | 6 months | BA | | |
| **Partovi**  **2001****(105)**  **USA** | 52, 000 | **Senior-led team triage**  Faculty physician,2 nurses and emergency medical technician | Resource –additive  Model | 1734 | 16 days | CCT | | |
| **Patel 2005** **(87)**  **USA** | 39000 | **Senior-led team triage**  Team assignment system  Teams of 1 board certified emergency physician, 2 nurses, and usually 1 technician | Resource –additive  Model | 78017 | 2 years | BA | | |
| **Richardson**  **2004** **(88)**  **Australia** | 36,000 | **Senior doctor and nurse triage**  MDT (Multi-disciplinary team )  comprising a senior registrar/consultant and triage nurse | Resource- neutral  Model | 4148 | 6 months | BA | | |
| **Rogg 2013** **(89)**  **USA** | 90,000 | **Senior-led team triage**  **S**upplemented **T**riage **A**nd **R**apid **T**reatment (START)  Team of senior attending emergency physicians and nurses versus nurse triage | Resource- neutral  Model | 180870  medium acuity patients | 4 years | BA | | |
| **Shetty 2012** **(90)**  **USA** | 56,000 | **Senior-led team triage**  Senior Streaming Assessment Further Evaluation after Triage (SAFE-T) zone (senior doctor, nursing, and ***junior medical staff***) | Resource- neutral model | 23253 | 77 days | BA | | |
| **Soremekun &Biddinger 2012** **(91)**  **USA** | 90,000 | **Senior-led team triage**  **S**upplemented **T**riage **A**nd **R**apid **T**reatment  (START) A team of senior attending emergency physicians and nurses versus nurse triage. | Resource- additive  Model | 76858  medium acuity patients | 2 years | BA | | |
| **Soremekun & Capp2012** **(92)**  **USA** | 90,000 | **Senior-led team triage**  **S**upplemented **T**riage **A**nd **R**apid **T**reatment  (START) A team of senior attending emergency physicians and nurses versus nurse triage. | Resource-additive model | 20318  medium acuity patients | 2 years | BA | | |
| **Soremekun 2014** **(93)**  **USA** | 68,000 | **Senior doctor and nurse triage**  Attending physician and two registered nurses. | Resource-neutral model | 91903  medium acuity patients | 2 years | BA | | |
| **Subash 2004** **(102)**  **UK** | 50,000 | **Senior-led team triage**  A team of designated consultant, a middle grade, 2 SHOs, a triage nurse. | Resource-neutral model | 1028 | 8 days | RCT | | |
| **Terris 2004** **(104)**  **UK** | 108,000 | **Senior doctor and nurse triage**  The IMPACT team; team composed of emergency medicine consultant and a senior ED nurse | Resource-additive model | 378 | 3 months | CCT | | |
| **Travers 2006** **(94)**  **Singapore** | NR | **Senior doctor and nurse triage**  **S**enior **E**mergency **P**hysician and **N**urse **T**riage (SEDNT)  A team of senior attending physician and nurses versus nurse-triage. | Resource-neutral model | 792 | 2 months | BA | | |
| **White 201**2 (95)  **USA** | 85,000 | **Senior-led team triage**  Supplemented Triage And Rapid Treatment  (START)  Team of senior attending emergency physicians and nurses versus nurse triage | Resource-neutral  Model | 27156  medium acuity patients | 6 months | BA | | |

RCT, randomised controlled trial; CCT, clinical controlled trial; NR, Not reported; BA, before and after study; ED, emergency department.

\*Resource -additive model indicates that additional staff were recruited to operate the intervention while a resource-neutral model refers to the relocation of a senior doctor from the main ED to perform an early assessment at the triage site.

Table 2 Effective Public health practice project (EPHPP) quality assessment tool rating for individual studies

W weak, M medium, S strong

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***1st*** ***Author*** | ***Study title*** | ***Selection***  ***Bias*** | ***Study***  ***Design*** | ***Confounders*** | ***Blinding*** | ***Data collection***  ***methods*** | ***Withdrawals***  ***and dropouts*** | ***Global rating*** |
| Asha 2013 (97) | Improvement in emergency department length of stay using an early senior medical assessment and streaming model of care: A cohort study | M | M | S | M | S | S | ***M*** |
| Baumann 2006 (99) | Team Triage: Addressing Challenges to Emergency Department Flow | W | M | S | W | M | S | ***W*** |
| Burstrom 2012 (98) | Physician-led team triage based on lean principles may be superior for efficiency and quality? A comparison of three emergency departments  with different triage models | M | W | S | M | S | S | ***M*** |
| Cheng 2013 (100) | Implementing wait-time reductions under Ontario government benchmarks (Pay-for-Results): a Cluster Randomized Trial of the Effect of a Physician-Nurse Supplementary Triage Assistance team (MDRNSTAT) on emergency department  patient wait times | M | S | S | M | S | S | ***S*** |
| Choi 2006 (81) | Triage rapid initial assessment by doctor (TRIAD) improves waiting time and processing time of the emergency department | M | M | W | M | M | W | ***W*** |
| Crane 2012 (96) | A Lack of Effect on Patient Satisfaction Scores in One Large Urban Emergency Department | W | M | W | M | S | W | ***W*** |
| Davis 2014 (103) | Senior work-up assessment and treatment team in an emergency department: A randomised control trial | M | S | S | M | S | S | ***S*** |
| French 2014 (83) | Doctor at triage – Effect on waiting time and patient satisfaction in a Jamaican hospital | W | W | M | M | S | M | ***W*** |
| Grant 1999 (82) | Rapid assessment team reduces waiting time | W | M | W | W | M | M | ***W*** |
| Han 2010 (84) | The effect of physician triage on emergency department length of stay | M | M | S | M | S | W | ***M*** |
| Holroyd 2007 (101) | Impact of a Triage Liaison Physician on Emergency Department Overcrowding and Throughput: A Randomized Controlled Trial | S | S | S | M | S | M | ***S*** |
| Imperato 2012 (86) | Physician in triage improves emergency department patient throughput | M | M | W | M | M | S | ***M*** |
| Imperato 2013 (85) | Improving patient satisfaction by adding a physician in triage | W | M | W | M | S | W | ***W*** |
| Partovi 2001 (105) | Faculty Triage Shortens Emergency Department Length of Stay | M | S | W | M | S | M | ***M*** |
| Patel 2005 (106) | Team assignment system: expediting emergency department care | M | M | W | W | W | W | ***W*** |
| Richardson 2004 (88) | Multidisciplinary assessment at triage: A new way forward | W | M | W | M | S | W | ***W*** |
| Rogg 2013 (89) | A Long-term Analysis of Physician Triage Screening in the Emergency Department | M | M | S | M | M | M | ***S*** |
| Shetty 2012 (90) | Senior Streaming Assessment Further  Evaluation after Triage zone: A novel model of  care encompassing various emergency department throughput measures | M | M | M | W | S | W | ***W*** |
| Soremekun a2012 (91) | Operational and financial impact of physician screening in the ED | M | M | S | W | M | M | ***M*** |
| Soremekun b2012 (92) | Impact of physician screening in the ED on patient flow | M | M | M | W | S | M | ***M*** |
| Soremekun 2014(93) | The Effect of an Emergency Department Dedicated Midtrack Area on Patient Flow | M | M | S | W | S | M | ***M*** |
| Subash 2004 (102) | Team triage improves emergency department efficiency | M | S | W | W | S | W | ***W*** |
| Terris 2004 (104) | Making an IMPACT on emergency department flow: improving patient processing assisted by consultant at triage | M | S | W | W | W | S | ***W*** |
| Travers 2006 (94) | Avoiding prolonged waiting time during busy periods in the emergency department: is there a role for the senior emergency physician in triage? | M | M | W | W | W | W | ***W*** |
| White 2012 (95) | Supplemented triage and rapid treatment (START)improves performance measures in the emergency department | M | M | M | W | S | M | ***M*** |

**Outcomes**

See Table 3

1. Length of stay

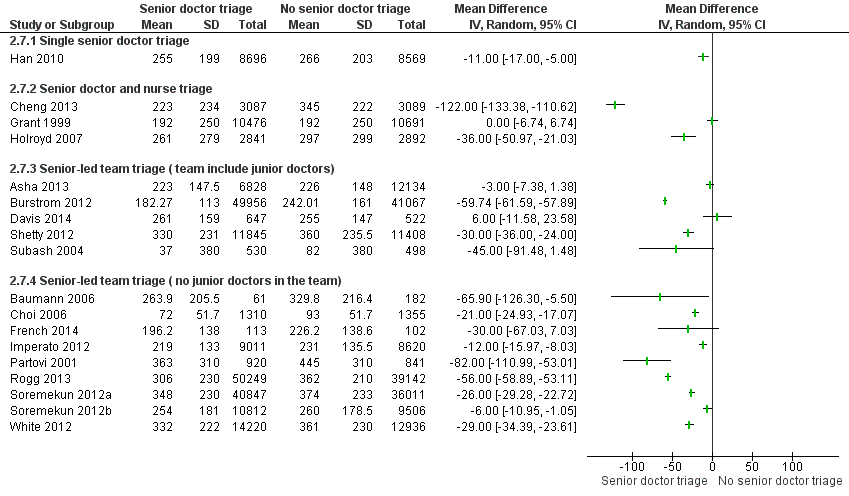
Nineteen studies reported on the length of stay (LOS) including four RCTs. Two Canadian RCTs revealed a significant reduction in LOS with senior doctor triage (100,101). This was not the case in the remaining two RCTs (102,103) including a recent study by Davis et al in Australia where senior work-up assessment and treatment (SWAT) model was associated with a 6 minute increase in LOS (103). High heterogeneity did not allow pooled estimates to be provided. All the other non-RCT design studies except three (82,83,97) were associated with a significant reduction in LOS with a median decrease of 26 minutes ( IQR -6 to -56).

Subgroup analysis according to patient acuity was conducted. A pooled result from two homogeneous RCTs (100,101) reported a significant reduction in ED LOS for medium acuity patients with senior doctor led triage (WMD -26.26 95% CI -38.50 to -14.01). The effect of senior doctor triage on medium acuity patients in non-RCT studies was similar with a median decrease of 29 minutes (IQR -6 to -56).

In spite of carrying out a subgroup analysis in accordance with the intervention type (single senior doctor, a senior doctor and a nurse, senior-doctor-led team), the very heterogeneous nature of the studies I2=99 could not be justified. The median decrease in LOS for senior-led team triage (with or without junior doctor involvement) was also 29.5 minutes (IQR -12 to -56). SeeFigure 3

Sensitivity analysis was not possible owing to the high heterogeneity of the studies.

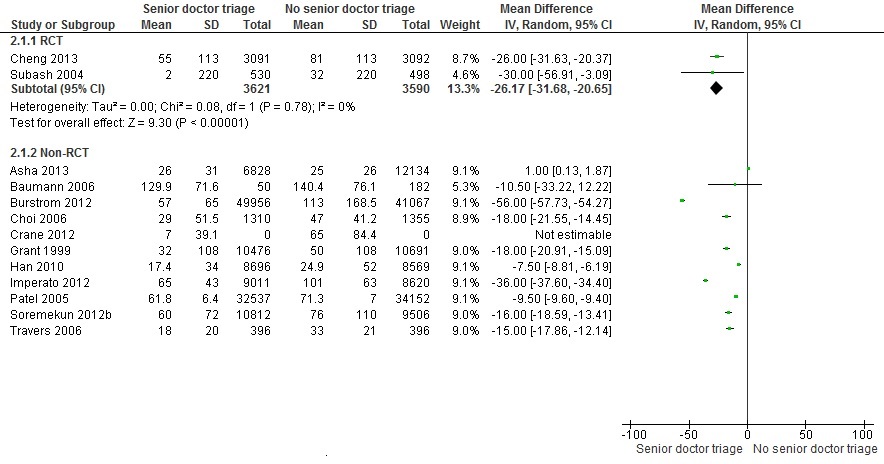
Figure 3 Impact of senior doctor triage on length of stay (min) stratified by intervention type



1. Waiting time

Thirteen studies reported outcome data on waiting time to see a doctor. Two RCTs revealed a significant reduction in waiting time in association with senior doctor triage (WMD -26 min, 95%CI -31.68,-20.65). All non-RCT studies except two (97,99) showed a significant reduction in this indicator with a median reduction of -15 minutes [IQR – 7.5 to -18]. See Figure 4.

Figure 4 Impact of senior doctor triage on waiting time (min)

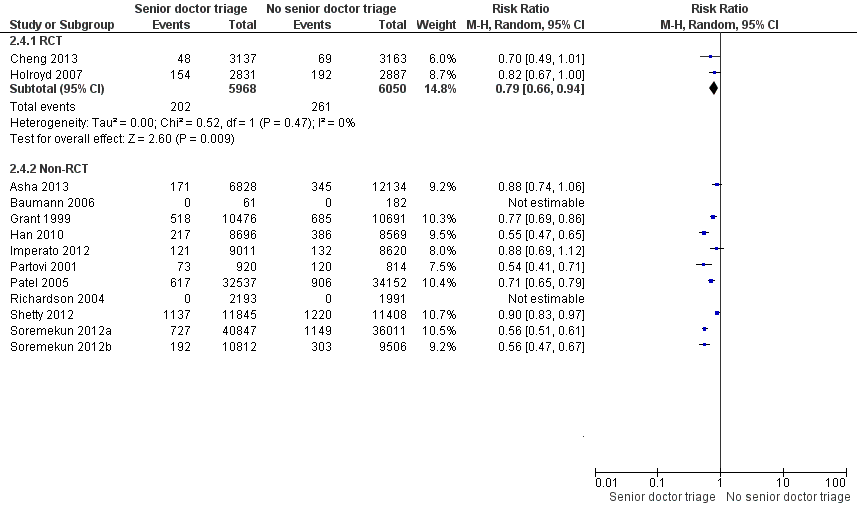


1. Left without being seen

Fourteen studies reported on patients who left the ED before being seen by a doctor (LWBS). Pooled results from two RCTs reported an improvement in LWBS (RR = 0.79, 95% CI 0.66 to 0.94).

All the remaining non-RCTs showed a reduction in LWBS rates. However, in four studies, this reduction was not statistically significant (86,97,99,105). Pooled results from two homogenous studies (I2=0) evaluating senior-led team triage on medium acuity patients showed a significant reduction in LWBS rates (RR=0.56, 95% CI 0.51 to 0.61) (91,92). Missing data did not allow the calculation of weighted risk ratios for three studies (88,93,99). See **Figure** 5.

**Figure** 5 **Impact of senior doctor triage on number of patients who left without being seen \***



\*Note in a study by Soremekum 2014 (93), LWBS rates significantly decreased from 7.3% to 4.0%. But it was not included in the figure as mean and SD were not reported.

1. Left without treatment complete

Four studies reported on patients leaving without completing their treatment (LWTC) (89,95,98,101).

In one RCT, the number of patients who left without completing their treatment/assessment did not decrease significantly with a risk ratio of 0.65 (95% CI 0.25 to 1.67) (101). On the other hand, three non-RCT studies showed a significant reduction in LWTC rates (89,95,98).

1. Adverse events (Mortality and re-attendances)

Two studies reported on the impact of senior doctor triage on mortality rates of patients visiting the ED. One RCT showed that senior doctor and nurse triage was associated with a non-significant reduction in mortality rate (0.16 to 0.06%, p=0.4) (100). An observational study by Burstorm et al showed that there was a statistically significant reduction in mortality (p<0.001)(98).

Patient re-attendance was measured in three non-RCT studies (81,98,104). Burstorm et al showed a significant improvement in unplanned re-attendance associated with senior-led team triage (P<0.001).

The other two non-RCT studies followed up a sample of patients presented in the intervention period only. First, Terris documented no adverse events or need for unscheduled care while Choi reported one case with a minor complication (81,104).

1. Patient satisfaction

Patient satisfaction was reported in six studies (85,94,96,102,104,106) using different survey tools.

Three non-RCT studies compared patient satisfaction in intervention and control periods (83,85,96). Two of these studies revealed no change in patient satisfaction (83,96). In contrast, a study by Imperato et al showed a significant improvement in patient satisfaction with senior doctor triage (RR =0.16, 95% CI 0.04 to 0.28)(85). Alternatively, three studies evaluated patient satisfaction on intervention days only (94,104,106) and found it to be high.

1. Costs associated with senior doctor triage

The cost associated with senior doctor triage was not commonly reported. This outcome was examined in one American study over a one-year period (91). The study found that there was an overall positive financial impact of having a START team led by a senior doctor (the START team was responsible for screening and treating medium acuity patients) with net value of £ 16.6 million and 13 months period to break even from the initial investment (91)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Primary and secondary outcome measures | Total | Asha 2013 | Baumann 2006 | Burstrom 2012 | Cheng 2013 | Choi 2006 | Crane 2012 | Davis 2014 | Grant 1999 | French 2014 | Han 2010 | Holroyd 2007 | Imperato 2012 | Imperato 2013 | Partovi 2001 | Patel 2005 | Richarsdson 2004 | Rogg 2013 | Shetty 2012 | Soremekun a 2012 | Soremekun b 2012 | Soremekun 2014 | Subash 2004 | Terris 2004 | Travers 2006 | White 2012 |
| LOS, min | 19 | X | X | X | X | X |  | X | X | X | X | X | X |  | X |  |  | X | X | X | X | X | X |  |  | X |
| Waiting time, min | 13 | X | X | X | X | X | X |  | X |  | X |  | X |  |  | X |  |  |  |  | X |  | X |  | X |  |
| LWBS,%[[1]](#footnote-1) | 14 | X | X |  | X |  |  |  | X |  | X | X | X |  | X | X | X |  | X | X | X | X |  |  |  |  |
| LWTC,% | 4 |  |  | X |  |  |  |  |  |  |  | X |  |  |  |  |  | X |  |  |  |  |  |  |  | X |
| Patient satisfaction | 6 |  |  |  |  |  | X |  |  | X |  |  |  | X |  | X |  |  |  |  |  |  |  | X | X |  |
| Mortality,% | 2 |  |  | X | X |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Re-attendance,% | 3 |  |  | X |  | X |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |  |

Table 3 Summary of reported outcomes of included studies

LOS, length of stay; LWBS, left without being seen; LWTC, left without treatment complete

### Discussion

The majority of the included studies concluded that dedicating a senior doctor to triage reduced the waiting time for patients to see a doctor, decreased the length of stay, and lowered the proportion of patients who leave without being seen as well as the proportion of patients who leave without completing their treatment. Nevertheless, the impact of this model on patient satisfaction was not consistent across the studies.

The review findings confirm those presented by Rowe et al (73). However, Rowe et al. evaluated physician liaison triage i.e. the physician, of any grade, assisted in triage, and was not necessarily always present to perform an early assessment (74,75). In addition, they drew nearly half of their included evidence from abstract-only studies (73).

It is important to differentiate senior doctor triage from the fast track or see and treat models. Fast tracking often targets patients with a specific illness such as chest pain for rapid life-saving intervention. Several studies included in the review have a separate fast track unit running in their ED.

This review demonstrates that senior doctor triage positively impacted the total LOS across the majority of the studies reporting this outcome. After performing subgroup analysis, a pooled result from two strong quality RCTs (100,101) revealed around half an hour reduction in LOS associated with senior doctor triage of medium acuity patients. A good quality before and after study, that considered history threats and a potential Hawthorne effect, showed a sustainable reduction in LOS over a three-year period after the introduction of senior doctor led team triage (89). Although a well-conducted study by Davis et al stated no significant difference in LOS with senior doctor triage, in a subgroup of discharged patients there was a significant reduction in LOS associated with the Senior Work-up Assessment and Treatment (SWAT) model (103). This reduction in ED LOS may be justified by shorter waiting times as the senior doctor is involved early in the patient journey.

After carrying out subgroup analysis according to intervention types, senior-led team triage model appeared to have a similar impact on LOS which was reduced by a median of around half an hour. However, only a few studies evaluated the other two models of SDT i.e. senior doctor and nurse triage, and single senior doctor triage. The last two models appeared to have various implications on LOS from no effect at all to a reduction of up to 122 minutes. Previous studies have shown that different factors can be responsible for variation in LOS, including daily admissions, discharges, and timing of presentations (107).

One of the key findings of the review is that the involvement of a senior doctor at triage can result in shorter waiting times. Pooled results from two RCTs showed that waiting time was reduced by around half an hour (100). Interestingly, waiting time was reduced by around a quarter of an hour across the majority of the non-RCT studies reporting this outcome. Although the majority of the studies reporting this outcome examined potential sources of bias, the fact that most of these studies were retrospective, single centre studies should not be overlooked. Subgroup analysis was conducted in an attempt to group homogeneous studies together. However, this was only occasionally successful. There are several advantages related to significant time savings early in the ED process as this can translate into enhanced patient flow, improved patient satisfaction, and reduction of the proportion of patients who leave without being seen (68).

Another key observation in the review is that the majority of the studies reported that fewer patients left the ED without being seen by a physician (LWBS). Such an effect can be related to the presence of a senior physician in triage. One can reason that reduced numbers of departures unseen by a physician from the ED are a direct effect of immediate assessment and handling of patients more rapidly. To put this finding into perspective, one previous study showed a reduction in the proportion of patients who LWBS is an important factor of quality for both physicians and patients, resulting in better patient satisfaction and, equally, better adherence to treatment in the ED (108). However, these results must always be interpreted with caution because these small changes in LWBS rates can be a natural phenomenon in a before and after study i.e. the risk of regression to the mean (RTM) bias must be taken into account (109).

In terms of patient satisfaction, which is an important outcome measure in modern health care (110), only a few studies reported on this outcome. Reports on patient satisfaction showed contradictory findings across studies. While the two most recently published studies showed no change in patient satisfaction after the introduction of senior doctor triage (83,96), some older evidence of weak quality suggests improved patient satisfaction is related to senior doctor triage model (85).

It could be argued that the impact of SDT is attributable to the addition of a new resource - the senior physician to the ED - rather than the real value of SDT intervention. In order to address this argument, we classified the intervention in the included studies into a resource-additive versus a resource-neutral model. The majority of studies that simply relocated staff from main ED to the new role led to significant improvements in most of their measured outcomes. This contrasts with a recent study evaluating a different intervention - a physician assistant at triage – in which throughput benefits were lost in a resource-neutral model versus a resource-additive model (111). Two studies adopting the resource-neutral model questioned the sustainability of SDT in its current form and appealed for extra funding and resources if SDT was to be established (81,82).

Lastly, it is worth noting that the majority of the studies did not address the costs or safety profile of senior doctor triage as well as the impact of SDT in terms of mortality or unplanned re-attendances. Studies often overlooked reporting on these rather essential outcomes.

**Strengths and limitations**

This review has certain strong points. It employed a comprehensive approach to assess the risk of bias in the included studies. This allowed the reviewer to detect any internal or external validity threats in the included studies. Furthermore, this review contained a brief resource analysis which can help the reader to interpret the findings in relation to their own practice. Finally, since only a few systematic reviews focused on innovations in ED operations (73,112), this review is thought to be valuable for emergency medicine clinicians as well as policy makers, as it provides them with a summary of the current literature on senior doctor triage.

The review has a number of limitations that must be acknowledged. Firstly, the main limitation is that the patient population and outcome definitions are not standardised across the studies. One could argue that an overall consistent effect across the majority of the studies, notwithstanding the heterogeneous nature of those studies, should allow more global conclusions to be drawn. Moreover, subgroup analysis was performed in an attempt to allow more meaningful comparisons to be made. Secondly, most of the available evidence included in this review was either quasi-experimental or observational studies. This has implications for the internal validity and the applicability of any conclusions made. Finally, publication and language biases might account for some of the observed effect.

**Implications for research and practice**

The logical next step for future research would be to confirm the review findings to determine the optimal model of senior doctor triage that can provide safe, sustainable and cost-effective gains. Work is also required to develop an international ED outcome measurement tool and to use this tool as a basis for collaborative research and comparative evaluation.

**Conclusion**

It is becoming increasingly clear that senior initial assessment at triage can present valuable benefits in terms of improving patient throughput and ED performance. Nevertheless, the confidence intervals are wide and variability must be taken into account. Future research should investigate and economically evaluate the benefits and sustainability of different models of senior initial assessment at triage.

**Understanding better how emergency doctors work. Analysis of distribution of time and activities of emergency doctors; systematic review and critical appraisal of time and motion studies**

**Background**

Senior emergency doctors are the supervising providers and the most expensive human resource in the emergency setting. They undertake 3-7 years of medical training after their medical degree to become certified providers in emergency medicine (113–115). They have essential roles including administrative work, diagnosis and management of complex cases, supervision and teaching and liaison with police, ambulance, and patients’ relatives. A number of leading organisations in the UK, USA, and Australia have formulated guidelines on specialist emergency doctors’ workloads, which suggested that senior emergency doctors’ duties should include direct clinical care and supervisory requirements as well as administrative duties (53,116,117). Emergency doctors spend time on face-to-face contact with patients, gathering information, developing a relationship and maintaining their knowledge base. However, there has been a little study of the senior doctors’ time as a resource. With the increased emphasis of health care managers and policy makers on value and efficiency of healthcare systems, quality time spent with the patients is an increasingly valuable resource. There is evidence that associates time spent on direct patient care with better patient and staff satisfaction (118,119)**.**

Currently, there are a number of reports in the literature that evaluate the proportion of time spent on individual tasks performed by emergency doctors during their shifts. Time and motion studies allow quantifying how senior emergency doctors spend their working time at the ED. This can provide insights into improving working conditions and enhancing productivity and may also assist in the implementation and evaluation of new strategies and management policies (120).

Understanding the tasks of senior doctors in the emergency departmenthas important implications for hospitals, health systems, and patients. Lack of understanding of senior doctors’ activities and tasks can result in negative consequences on patient safety and human resource allocation and planning. The aim of this systematic review is to determine how senior emergency doctors spend their time in the ED and what tasks occupy the highest percentage of their time, and secondly, how much of their time is spent on multi-tasking and what is the number of tasks completed per hour?. The secondary objective of the review was to create a standardised classification of activities which are performed in the ED by senior doctors, in order to assist researchers in this field who may use this list of activities for collaborative research and comparable findings.

### Methods

The search strategy was adapted from a systematic review by Tipping et al that looked at time and motion studies of internal medicine physicians (121). The updated search strategy focused on three key terms: (time and motion studies) AND (emergency department OR emergency services) AND (physicians OR doctors). It did not include keywords from the desired outcomes as this limited the number of resultant studies.

The literature search was carried out in November 2016 and was restricted to the period 1998-2016 in order to take into account the introduction of the 1998 European Working Time Directive which restricted the maximum working hours of doctors to 48 hours per week in the UK and Europe. Both MeSH terminology and free-text words were used (See Appendix 3 ). Relevant studies were retrieved from the following databases: Cochrane Library, MEDLINE, EMBASE, Web of Science and SCOPUS. Reference lists and citations of the retrieved studies were scrutinised for additional studies.

**Study registration and protocol**

The review protocol is available at the international prospective register of systematic reviews PROSPERO registration number 42014014496 (122).

**Eligibility criteria**

Studies were included if they fulfilled the following inclusion criteria; observational time and motion or work-sampling studies. Studies were included whether the data was self-reported or collected via an observer; undertaken in adult or mixed population EDs, both teaching and non-teaching hospital EDs in urban or rural settings were included, described the activities of emergency medicine (EM) senior doctors where a senior emergency doctor was defined as a consultant or an attending physician with EM speciality qualification, or a senior registrar who works on the consultant rota; published as full-text peer-reviewed papers in the English language.

Studies were excluded if they were time and motion studies of emergency senior doctors during the hand-over period only, or if studies observed a sample of junior emergency doctors only or a sample of both senior doctors and nurses where the results were not reported separately, and finally if they were conference proceedings or abstract-only studies.

**Study selection and data abstraction**

Titles were screened for relevance. Abstracts or full-text papers, if necessary, were evaluated against the inclusion and exclusion criteria. Suggested Time And Motion Procedures (STAMP) checklist was used to extract the relevant information including information relevant to the review outcomes. The modified data extraction form STAMP outlines a set of 29 data information elements organised into eight main areas (See Appendix 4 STAMP Data extraction sheet used in the review of emergency doctors’ activities). The reported working time on different activities was converted to percentages when possible to provide a comparable picture across the studies included in the review..

**Quality assessment**

There is no formal quality assessment tool for observational time and motion studies, a quality assessment tool was designed based on criteria that are relevant to observational studies in general which include Hawthorne effect, seasonal variability, observer bias and ethical grounds (109). Consideration was also given to whether the authors had taken any actions to improve the validity and reliability of the individual study results, for example, if any measures were taken to reduce the identified biases in a particular study.

**Data analysis**

A narrative synthesis approach was used. Summary tables were produced to illustrate the findings of the review in terms of the included studies’ characteristics and outcomes.

5851 Records

529 Web of Science

131 Embase

4379 Medline

763 Scopus

49 Cochrane library

162 Excluded records after second title screening

243 Included records after initial sifting of titles (20 Web of science, 8 Embase,

173 Medline, 42 Scopus)

81 Included records after second title screening

28 Duplicates removed

39 Excluded records after abstract or full-text screening

(21 Different outcomes

11 Different subjects

2 Different design or settings

4 Abstract or commentary or review

1 Same study reported as part of a larger study)

14 Included in the review

15 studies included in the final analysis

1 Additional study from

citation search and secondary

references search

**Figure** 6 **PRISMA chart**

**Results**

**Search results**

After verification of the abstracts and full-text against the inclusion criteria, a total of 14 studies were included. 39 were excluded from the review (See Appendix 5 List of excluded studies: Review of time and motion studies). Following citation and secondary references search, an additional study was included**.** Finally, the review included 15 studies as shown in PRISMA Chart **Figure 6.**

**Description of the included studies**

All fifteen studies except one were observational time and motion studies which used an external observer. One was a self-reported diary (123). See **Table** 4**.**

All studies were conducted in developed country healthcare settings. The largest study sampled 169 participants from 11 EDs in Canada (124). In contrast, the remaining ten studies were small single-site studies. The number of senior doctors observed ranged from 5 to 169 (IQR 8-23, median 10). The number of hours of observation of senior emergency doctors ranged widely across the included studies (IQR 58-308.23 hours) with a median of 130 hours.

All the studies reported the amount of time ED clinicians spent on various clinical and non-clinical tasks but the main focus for each study varied. Although seven studies aimed to characterise the work activities of emergency clinicians (123,125–130). The remainder of the studies adopted different aims. These included: the rate of interruptions (131–133), workload (134), time spent on patients of different triage categories (124), and finally, the impact of newly introduced interventions in the ED on physician work activities (135–137).

**Table** 4 **Description of the included studies**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study and country of origin** | **Setting** | **Study design** | **Number of observers** | **Observer assignment** | **Provider type** | **Study duration** | **Hours of observations** | **Classification of tasks** |
| **Anderson 2009,**  **Canada** | 11 EDs, mixed | TMS and workload analysis | 3 | NR | 169 Emergency doctors | Sporadically over 1 year | 4736 hours | 13 categories |
| **Asaro 2004,**  **USA** | Academic ED | TMS | NR | NR | ED clinicians including 7 emergency doctors | NR | 36 hours | 3 categories and 25 subcategories |
| **Benda 2016,**  **USA** | Academic ED | Pre-post observational TMS | 2 | NR | ED clinicians including 9 emergency doctors | Sporadically over the course of a year | 84 hours | 5 categories |
| **Brown 2000,**  **UK** | 9 EDs, academic and non-academic | Self-reported diary | NA | NA | 9 Emergency doctors | 1 month | 170 hour per consultant | 6 categories |
| **Chisholm 2001,**  **USA** | 5 EDs, non-academic | TMS | 1 | NA | 22 Emergency doctors | 2 months | 66 hours | 9 categories |
| **Chisholm 2010,**  **USA** | 4 EDs, academic and non-academic | TMS | 2 | NR | 85 Emergency doctors | 2 months | 406 hours | 3 main categories |
| **France 2005,**  **USA** | Academic ED | Pre-post TMS | 1 | NA | ED clinicians including 10 emergency doctors | 9 months | 50 hours | 13 categories |
| **Friedman 2005,**  **Canada** | Academic ED | TMS | 1 | NA | 11 Emergency doctors | NR | 96 hours | 13 categories |
| **Hollingsworth 1998, USA** | Academic ED | TMS | 1 | NA | ED clinicians including 10 emergency doctors | 1 month | NR | 3 main categories and 26 subcategories |
| **Innes 2005,**  **Canada** | Academic ED | TMS | NR | NR | 20 Emergency doctors | 1.5 months | NR | 12 categories |
| **Kee 2012,**  **Australia** | Non- academic ED | TMS | 1 | NA | 17 Emergency doctors | < 1 month | 130 hours | 7 main categories and 38 subcategories |
| **Mache 2012,**  **Germany** | 3 EDs, type not reported | TMS | 1 | NA | 25 Emergency doctors | 5 months | 821 hours | 12 categories |
| **Perry 2013,**  **USA** | Academic ED | TMS | 1 | NA | ED clinicians including 3 emergency doctors | <1 month | 20 hours | 7 main categories and 33 subcategories |
| **Walter 2017,**  **Australia** | Academic ED | Observational workflow study | 2 | NR | ED clinicians including 10 emergency doctors | 4 months | 121.7 hours | 6 categories |
| **Westbrook 2010,**  **Australia** | Academic ED | TMS | 1 | NA | 5 Emergency doctors | 6 months | 210.45 hours | 10 main categories and 16 subcategories |

NA, Not applicable; NR, not reported; ED, emergency department; academic ED, affiliated with a teaching hospital; TMS, time and motion study

**Quality assessment of included studies**

See **Table** 5**.**

There were ten single-site versus five multiple-site studies. Eight studies observed senior emergency doctors during day-night shifts, weekdays and weekends. Observer bias was accounted for in two studies through the employment of two observers recording data simultaneously and then the measurement of inter-observer agreement. Inter-rater reliability was high in these studies (125,131). Data collection methods varied. Eight studies used a computer-based data collection tool. The use of handheld computers presents more accurate findings and can also account for overlapping and multitasking (136). One study asked senior doctors to report their activities using a work-based diary (123). All studies except two (123,135) reported Hawthorne effect i.e. the subjects’ awareness that their actions are observed can result in alteration of their behaviours and attitudes (138). These studies undertook some measures to minimise its influence such as keeping the observer at a distance from the senior doctor. Seasonal variability was considered in six studies and reported as a limitation (124,126–128,130,137) but it can be argued that all studies suffered from Hawthorn and seasonal variability biases.

There was a lack of a standard categorisation of emergency doctors’ tasks in the ED. Six studies acknowledged previous similar work, where their categories were adapted from previous studies and were modified to fit the specific aims of their studies (125,130–133,137). In another four studies, the task classification was developed in consultation with expert ED staff (124,128,129,136) while five studies did not report information with regard to the development of their task classification (123,127,134,135,137).Finally, ethical approval was reportedly granted in all studies except one (135).

**Table** 5 **Quality assessment of the included studies**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study author and year | Single site versus multiple -site study | Day-night shifts, weekdays-weekends included | Observer bias considered | Data collection tool | Seasonal variability considered | Hawthorn bias considered | Acknowledgement of previous task classification schemes | Development and validation of new task classification | Ethical approval  granted |
| Anderson 2009 | M | Y | Y | Handheld personal digital assistant | Y | Y | N | Y | Y |
| Asaro 2004 | S | NR | Y | PALM Data collection tool specifically designed for the study | N | N | NR | NR | NR |
| Benda 2016 | S | NR | Y | Paper-based form and a stop-watch | Y | Y | Y | Y | Y |
| Brown 2000 | M | Y | NA | Self-reported diary | N | N | N | N | Y |
| Chisholm 2001 | M | Y | Y | NR | N | Y | Y | Y | Y |
| Chisholm 2010 | M | Y | Y | Paper-based form | N | Y | Y | Y | Y |
| France 2005 | S | N | N | Wireless handheld computer device | N | N | N | Y | Y |
| Friedman 2005 | S | Y | N | Standardized collection form with one minute increments | Y | Y | NR | NR | Y |
| Hollingsworth 1998 | S | N | N | Paper-based form and a stop-watch | Y | Y | NR | NR | Y |
| Innes 2005 | S | Y | Y | Structured paper-based form | N | Y | NR | NR | Y |
| Kee 2012 | S | Y | Y | Handheld computer supported with software designed for the study. | Y | Y | NR | Y | Y |
| Mache 2012 | M | N | Y | Handheld computer | NR | Y | N | Y | Y |
| Perry 2013 | S | Y | N | Two iPods, one as a stopwatch and one as a data collection tool. | Y | Y | Y | Y | Y |
| Walter 2017 | S | N | Y | WOMBAT data collection tool specifically used for time and motion studies | N | Y | Y | Y | Y |
| Westbrook 2010 | S | N | Y | Personal digital assistant | N | Y | Y | N | Y |

NA, not applicable; NR, not reported; N, No; Y, yes; S, single-centre study; M, multiple-centre study

**Primary outcomes**

See **Table 6.**

**Direct patient care**

Direct patient care was reported in nine studies (125,127,129,131–136). The definition of direct care varied across the included studies. Five studies considered any activity directly related to the care of a patient at the bedside as the only form of direct care (127,129,132,134,136). Asaro, like Westbrook and Walter, added communication with relatives to their definitions of direct patient care (131,133,135). Finally, Chisholm 2010 considered ordering diagnostic tests and therapies and interpreting ECGs, in addition to patient care at the bedside, as direct patient care (125).

On the other hand, the remaining six out of the fifteen included studies classified the emergency doctors’ activities without labelling any of them as direct care (123,124,126,128,130,137). The percentage of time spent on direct patient care activities in these studies was calculated from the other reported categories (clinical, history and physical exam, time in the patient room, communication with patients and their family) to allow comparison of findings across the studies.

In seven studies, direct patient care occupied around one-quarter to more than one-third of the senior doctors’ time with a mean and median of 29.95% and 30% respectively (123,125,127,128,131,132,137). An American study by France reported that their pooled senior doctors group spent approximately 40% of all observed time on direct patient care tasks (136). This was similar to a large Canadian study which reported that senior doctors spent approximately 38% of direct patient care inside the patient room as well as on discussions with relatives (124). In the more recent study by Walter, emergency medicine consultants with at least 5 years of clinical experience spent only 8.7% on direct care. Yet this study, unlike the other included studies, did not count all activities at the patient bedside as direct care (133).

**Indirect patient care**

Seven studies reported the percentage of time spent on indirect patient care. These studies took different approaches to define indirect patient care.

Three studies considered indirect patient care as any activities apart from direct contact with the patient (direct patient care) and personal activities(125,127,135). In these studies, indirect patient care could include communication, documentation, and teaching. As expected, the percentage of time spent on indirect patient care in these studies was high and ranged from 45%-65.2% (125,127,135). On the other hand, in the remaining four studies, indirect patient care was defined as reviewing patients’ investigation and medical records (129,131–133). In these studies, time spent on indirect care was as low as 6.6% as reported by Chisholm 2001 (132) and as high as 24.83% and 25.7% as reported by the more recent Australian studies by Walters and Westbrook respectively (131,133).

**Documentation**

Documentation as an independent category was reported in eleven studies (124,126,128–134,136,137). Sometimes it was reported as charting or dictation (124,134,136), paperwork (130,137) or ‘data’ (126) but it basically referred to the recording of patient information on paper, or on the computer. In five of these studies, documentation occupied more than 20% of the senior doctors’ time (124,130,132,133,136). Time spent on documentation ranged from around 10% in the Australian study by Kee (128) to as high as 28% according to Chisholm 2001 (132).

**Communication**

Ten studies reported data on this outcome. Five studies reported time spent on professional communication as a task category (127,128,131,133,134). In another five studies, communication was calculated from similar categories. These were discussion and consultation with health care professionals in a study by Anderson (124) or exchanging patient information, phone calls and verbal orders with a provider (136) or care planning with other providers (135) or meetings (123). In another study, by Friedman, communication was calculated from two categories: consultation with a nurse and other health care professionals and answering the pager (126).

Time spent on communication ranged widely from around 5% to more than 40% (123,124,126–128,131,133–136). There was a big variation among the results. No particular trend was detected.

**Teaching**

Teaching or supervision was reported in eleven studies. This was either reported as an independent category (123,126,131,134–136) or as a subcategory (125,127,130,133). In a study by Anderson, teaching was calculated from two categories: consultation with medical students and consultation with medical trainees (124).

In all these studies except one by Brown (123), time spent on teaching and supervision was considerably lower than other categories and occupied less than 10% of the senior doctors’ time.

**Administrative**

Six studies reported data on administrative activities (123,126,129–131,134). Westbrook defined administrative duties as any activity not related to direct or indirect patient care such as employment issues and bed allocation. The remaining studies included phone calls and paperwork (126,129,130) or departmental problems (134) in this category. In four of these studies, administrative tasks occupied around 10% of the senior doctors’ time. However, in two studies by Brown and Mache, this increased to more than one-fifth of senior doctor’s time (123,129).

**Personal activities**

Nine studies reported the time senior emergency doctors spent on personal activities, which included restroom breaks, meal breaks and social conversations (125–132,135). In three studies, time spent waiting was included in the personal activities category (125,127,135). Personal time accounted for 3% to around 16% of the senior doctors’ time.

**Multi-tasking**

In the most recent TMS study by Benda, senior doctors undertook 1.9 tasks per minute (114 tasks/hour) (137). Similarly, Kee et al reported that consultants undertook more than 100 tasks an hour (128). This is higher than the 34 tasks per hour as reported by France 2005 (136) or 80 tasks per working day as reported by Mache (129).

Three studies reported the number of patients who were seen simultaneously by the senior emergency doctor (125,132,136). Chisholm 2001 reported that 1.2 patient were seen concurrently (132). This increased to five patients in the more recent study by Chisholm 2010 (125). In that study, emergency doctors who worked in academic EDs (EDs affiliated with teaching hospitals) seemed busier than those who worked in community EDs, supervising the management of an average of seven patients simultaneously (125). France, on the other hand, reported that senior emergency doctors were responsible for an average of 9.8 patients at the same time (136).

Four studies reported the percentage of time spent on multi-tasking by the senior doctors (129,131,132,135) which was variable across these studies: 23%, 16.4 %, 12.8% and 10.6% as reported by Mache, Asaro, Westbrook and Chisholm 2001 respectively (129,131,132,135).

| Study identifier | Direct care | Indirect  care | Documentation | Communication | | Teaching /supervision | | Administration | Personal/social activities | Multitasking |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Asaro 2004 | 28.1% | 65.2% | 12.8% | 18.6% | | 1.4% | NR | | 6.1% | 16.4% of tasks involved overlapping with another task |
| Benda 2015\* | 31.6% | NR | NR | NR | | NR | NR | | NR | 1.9 task per minute (114 per hour) |
| Brown 2000 | 30% | NR | NR | 14% | | 21% | 12-28% | | NR | NR |
| Chisholm 2001\* | 33% | 6.6% | 28% | NR | | NR | NR | | 16.5% | 10.6% of time was spent on multi-tasking  Number of patient seen concurrently = 1.2 |
| Chisholm 2010\* | 30% -34.1% † | 45% -53 % † | Reported as part of indirect care category | | | | NR | | 3%-6.5%† | Number of patient seen simultaneously = 5 |
| Anderson 2009\*\* | 37.6% ‡ | - | 20.9% | 8.8% | | 6% | NR | | NR | NR |
| France 2005\*\*\* | 40% | NR | 21% | 29% | | NR | NR | | NR | 34 tasks per hour, Number of patients simultaneously seen = 9.8 |
| Friedman 2005 | 29% | NR | 16.7% | 16.10% | | 5.67% | 1.85% | | 16.2% | 25 tasks per hour |
| Hollingsworth 1998\* | 32.2% | 51.3% | Reported as part of indirect care category | | | | NR | | 13.5% | NR |
| Innes 2005 \* | 31.2% | - | 19.3 % | 8.3% | | 7.3% | 9.4% | | NR | NR |
| Kee 2012\* | 35.5% | NR | 10.4% | 44.3% | | 1.6% | NR | | 9.1% | 100 task per hour |
| Mache 2012\* | NR | 15.5% | NR | NR | | 10% | 21% | | 5% | 80 task per 9 hour shift  23% of time was spent on multitasking |
| Perry 2013, | 24.2% | NR | 21.6% | NR as a separate category | NR as a separate category | | 2.4% | | 7.6% | NR |
| Walter 2016 | 8.7% | 24.8% | 22.7% | 4.7% | | 6% | NR | | NR | NR |
| Westbrook 2010\* | 28.6% | 25.7% | 13.3% | 24.2% | | 1.7% | 2.3% | | 5.7% | 12.8% of time was spent on multitasking was |

Yr. year; NR Not reported; \*recorded in minutes and converted to percentages ;\*\* in this study communication was reported as care planning with other providers or discussing patient care with nurses and other ED team and post-graduates , physicians and surgeons and teaching was reported as consultation with medical students; \*\* \*extracted from graph presentation in the study ;† represents findings for community EDs versus academic EDs in this study ;‡ calculated from adding up two categories ( inpatient room and discussion with patient family). If the study observed more than one subject type, for example nurses and senior doctors, only information related to the senior doctors were extracted. Authors were contacted if the study subject qualification and level of training is not clear

**Table** 6 **Summary of outcome measures of included studies**

**Secondary outcome**

As previously stated, studies used heterogeneous and variable task classification schemes. This, in turn, required additional effort to attempt to assemble similar categories together to produce meaningful and useful comparisons. In order to account for this limitation in future TMS of emergency doctors, it is proposed that future TMS can use the suggested task categorisation scheme that incorporates all the key categories reported in the individual studies. See **Table** 7**.**

**Table** 7 **Task list of suggested work activities of emergency doctors**

|  |  |
| --- | --- |
| **Duties performed at the emergency department** | |
| 1. Direct patient care | * History and physical examination * Procedures at bed side * Reviewing the patient’s file (case notes) * Thoughtful contemplation outside cubicle * Reading textbook in relation to the patient presentation * Communication with patient * Communication with the patient’s family * Any other activity involving direct interaction with patient |
| 2. Indirect patient care |  |
| Documentation | * Medical record, charting, dictation, discharge letter, sick certificate, other |
| Computer use | * Diagnostic tests ordering * Medication ordering * ED information system, tracking radiology, pathology results, medication reference, medical e-texts, other e-knowledge, other |
| Communication | * Face to face communication with staff (communication with nurses, physicians, social workers, other staff) * Phone calls and consults with staff |
| Teaching and supervision |  |
| Personal and other | * Personal (eating, restroom, social conversation with colleagues, surfing the net) * Waiting * Searching for staff - walking * Searching for patient file (board or screen viewing – interaction) * Procedure planning (washing hands, getting supplies, cleaning up,   processing lab specimens)   * Staffing cases for research |

|  |  |
| --- | --- |
| **Duties performed away from the emergency department** | |
| Administrative | * Administration - meetings, staffing, reports, e-mails * Research activities away from the emergency department * Education - Reading, continuous professional development |

**Discussion**

This systematic review identified fifteen time and motion observational studies. The majority were small single-site studies conducted in developed countries. Studies used different methods in terms of the number of observers, data collection tools, task categorisation and definitions. Generally, studies were liable to several biases including observer and Hawthorn biases.

Direct clinical care was mostly described as patient care at the bedside, although sometimes this term extended to cover planning patient care outside the cubicle as well as communication with the patient relatives. Overall, the median time spent on direct patient clinical care accounted for around a third of the senior emergency doctors’ time. It is questionable whether this arrangement has a positive impact on patient flow, safety, and quality of care. The mean proportion of time spent on direct clinical care is much lower than the 75% recommended by the Royal College of Emergency Medicine. However, the RCEM definition of direct clinical care is much more inclusive where it refers to all clinical duties in the ED and not merely face-to-face contact with the patient (61).

The other categories produced greater variation. Senior emergency doctors spent around a quarter of their time on administrative duties in the UK study by Brown (123). This contrasts with the more recent Australian study in which only around two per cent of the senior doctors’ time was spent on administrative duties (131). Certainly, this could be explained by the differences in design and methods of these two studies as well as the difference in health systems and job expectations. The Australian study by Westbrook monitored the senior emergency doctors in the ED only (131). In comparison, Brown 2000, asked senior doctors to keep a self-diary of their activities for one month (123). Similar to the findings of a previous systematic review of TMS of general physicians, our review showed no consistent reports on time spent on other non-direct clinical activities (121).

The evidence also revealed that senior emergency doctors frequently multitask. The review shows that senior emergency doctors often see several patients concurrently. When reported, the amount of time spent on multi-tasking ranged from 10 to 23% (129,131,132,135). This echoes previous studies which reported that ED staff frequently multitask (139).

The number of tasks performed by senior emergency doctors per hour ranged widely from 34 tasks to more than a hundred. This seems comparable to other health care professionals where a prospective study evaluating nursing staff, showed that nurses completed 72 tasks per hour with a mean task length of 55 seconds (118).

**Limitations**

There was an obvious heterogeneity in the classification of tasks across the studies. This impeded the comparisons made across the studies. In the synthesis and analysis, similar task categories (e.g. documentation, charting, paperwork) from different studies were compared against each other in an attempt to address this limitation. Furthermore, this review presented a new task classification scheme after consulting all categories in the individual studies. The task classification should assist ED clinicians and researchers to conduct future research in this field and allow cross-country comparisons to be made. A table of suggested task classification is presented (See **Table** 7).

It is also recognised that most of the evidence was drawn from USA and Canada where the 48-hour per week limit introduced in 1998 in Europe is not in effect. Finally, the initial literature search and data extraction were conducted by one researcher. However, an exhaustive search strategy was developed and run on all the relevant databases. Moreover, a uniform abstraction sheet was used for all the studies.

**Conclusion**

The review findings showed that around one-third of the emergency doctors’ time is spent on direct patient care. There are several suggestions that could be applied to reduce the burden of other tasks and optimise the time spent with the patient. These could include increasing staff resources – although this has cost implications – optimising documentation systems via speech or writing recognition systems, and reallocation of the doctors’ tasks to perform other duties and to delegate other tasks to appropriate staff.

What are the ED staff perspectives on senior doctor triage (SDT) process; a scoping review of literature

Introduction

Senior doctor initial assessment process usually refers to the formal process of early assessment of patients attending an emergency department (ED) by an experienced emergency physician. SDT has been implemented in a number of EDs worldwide in an attempt to improve patient flow, decrease door-to-doctor time and reduce left without being seen (LWBS) rates (81,83,140,141). SDT has also been deployed as one strategy to improve the operational efficiency in the ED, and its compliance with the national ED time targets set in a number of countries such as Australia and the United Kingdom (104,142).

As shown previously, a systematic review of 25 mostly observational studies indicated that SDT can reduce waiting times to see a doctor, the total length of stay in the ED and the percentage of patients who leave the ED without being seen (51).

A number of leading organisations in the UK recommended senior doctor initial assessment, as an approach to improve patient flow (4,38). Nevertheless, there is a lack of qualitative evidence that describes the ED clinicians’ views of this model of care which should be considered before widespread adoption of this process.

This study aims to explore if there is any qualitative evidence that describes the clinicians’ and other stakeholders’ views of senior doctor triage which can help to reveal the underlying logic of the emergency department activities and can help ED clinicians to re-evaluate their strategies and measure the impact of SDT. Knowledge of the perceived positive and negative aspects, enablers and facilitators of senior doctor triage can serve as an input to making evidence-informed decisions regarding such an intervention. Furthermore, insights from this study can assist to improve SDT process in EDs where SDT is currently implemented.

Methods

Searches and study selection

Three databases were searched; MEDLINE, CINHAL and WOS. See Appendix 6 for search terms and search strategy. The databases were searched for any qualitative research on the involvement of senior doctors in triage of emergency patients. The searches were limited to articles published in English language in the period from 2004 to 2018. These include qualitative interviews, focus groups or ethnography based studies. Studies that used pre-post survey design were excluded.

Quality appraisal

Consolidated criteria for reporting qualitative research (COREQ): a checklist for interviews and focus groups would be used to assess any included studies (143).

Data analysis

*Formal qualitative synthesis is the process of pooling qualitative data, and then drawing conclusions regarding the collective meaning of the research* (144). Thematic analysis technique would be followed to summarise evidence resulting from this review. This technique involves three main features: the mapping of key themes and concepts across studies; the identification and resolution of any contradictions and the building of a general interpretation based on the data (144).

Results

128 studies were retrieved (41 CINHAL, 13 Medline, 74 WoS). After title screening, 3 studies were included. Those were later excluded after evaluation of the abstract or full-text.

The first study by Eccles et al ‘Evaluating a service improvement intervention in GP out-of-hours: impact of 'expert triage model’ was excluded (145). This was because the expert triage model was run by expert general practitioners and therefore was outside the scope of this study. The second study by Li et al assessed the influence of physician seniority on patient disposition decisions not particularly in triage, was a quantitative study (146). The third study by Lamont et al assessed the factors behind the introduction and spread of ‘See and Treat’ model for designed for patients with minor presentations (147).

Discussion

This scoping review was conducted mainly to explore any previous qualitative evidence on senior doctor triage and validate the claim that this project produced the first qualitative study on senior doctor triage. It did not show any previous qualitative evidence specifically addressing any aspects of senior doctor triage process.

Summary

First, reviewing comparative studies on SDT showed that this process can provide valuable benefits to improve ED performance measures, yet, most of the evidence is based on observational studies that were conducted in USA and Australia. The first review found different models of SDT: single senior doctor triage, senior doctor and nurse triage, senior-doctor led team triage but it is not clear which model can produce the maximum benefit to improve patient quality of care. Moreover, studies often questioned the sustainability of SDT, especially in a resource-neutral model. Therefore, it is believed that evaluating different models of SDT in further depth is needed. No previous study has investigated the effectiveness of various models of SDT in a UK setting.

The second systematic review, on the other hand, gave an overview of the tasks and duties of senior emergency doctors. It showed that senior emergency doctors spend the majority of their time on indirect patient care-related tasks which may negatively affect patient outcomes, staff, and patient satisfaction. It is suggested that one way to enhance the distribution of the senior doctor’s time and optimise direct patient care, could be the re-allocation of the senior doctor’s tasks to perform senior doctor triage.

Searching the literature for any qualitative research that explores the ED staff perspectives on senior doctor triage showed no previous qualitative evidence on this matter. It is therefore valuable to conduct qualitative research to ask ED staff on their views on the pros and cons of SDT and any associated challenges of this intervention. This would be the first study that takes into account ED staff views on the challenges of establishing and sustaining SDT models.

# Chapter Three Methods

# Section I Mixed Methods

### Introduction

The methods chapter is formed of three sections (I, II, III). The first section describes the mixed methods design used in this study, the justification for using mixed methods, the underlying paradigm of the researcher, the planned integration of the study findings and the quality reporting tool that was used to assess the mixed methods study. The second and third sections are concerned with the quantitative and qualitative methods respectively. The ethical issues of the research are discussed in the third section.

### Mixed Methods Research

Mixed methods research is not new it can be traced back to the first 60 years of the 20th Century by works of sociologists and anthropologists, but it was not labelled by the term ‘mixed methods research’ until many years later (148). Despite this, it has been described as a new movement or a new research paradigm from the early 2000’s, with attempts to standardise its definitions and explain its purposes, designs, and techniques for reporting (148). After taking account of experts’ opinions in the field, Johnson et al defined a mixed methods research as *the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches for the broad purposes of breadth and depth of understanding and corroboration* (148). Numerous publications including books and journals dedicated to mixed methods research surfaced as well. Yet, there are areas and issues in mixed methods research which remained controversial, including the application of research paradigms and assessing the quality and rigour of mixed methods research. Nonetheless, what mixed methods research offers in terms of using both approaches (qualitative and quantitative) in tandem can lead to a greater overall strength of a study quality than either qualitative or quantitative research (149).

### Study design

A mixed methods design is implemented in this descriptive study. Both quantitative and qualitative research methods were used in a complementary way i.e. *to obtain different but complementary data on the same topic* (150). This design also serves to expand and help to explain the quantitative findings with the qualitative data.

The quantitative part is composed of two studies: a cross-sectional national online survey of ED triage practices in England, and a retrospective secondary analysis of routine ED performance data. The qualitative part is composed of semi-structured telephone interviews with ED staff. There is no dominant component of this mixed methods study i.e. both the quantitative part and qualitative part have equal importance (151).

In more detail, the survey was aimed at the ED consultants of all type I[[2]](#footnote-2) EDs to determine to which extent senior doctor triage is used and its various models. Then the data analysis study proceeded to test the theoretical assumption that EDs with senior doctor triage achieve superior ED performance than those without it. Subsequently, the qualitative study was conducted on a sample of ED health care professionals. The interviews sought to understand the clinicians’ experiences of this model, the reasons behind its establishment, and the barriers and enablers to implement and maintain this process through exploring the views and experiences of the ED staff in a sample of EDs across England. See Figure 7 Study design



Figure 7 Study design

SDT, senior doctor triage; ED, emergency department

### Justification for using a mixed methods design

The main justification for using a mixed methods approach was to address the different aspects of the overall research question. That is to say, a comprehensive approach was thought to be necessary due to the complexity of the intervention ‘senior doctor triage’ under study (Complementarity). The secondary purpose of using a mixed methods approach was development, where the national survey facilitated the sampling and recruitment for subsequent studies (Facilitation). The sequence, therefore, would be that national survey data analysis had to be completed first to act as a sampling frame for EDs to undertake the retrospective data analysis and qualitative staff interviews, in what is referred to as a sequential developmental design (151). The survey data was analysed, the results of which were used to sample a group of various ED staff, which helped to develop further insights and explanations to some aspects of the quantitative study findings.

### Research paradigm

It is an essential requirement, mostly in the context of qualitative and mixed methods research, to be clear on the researchers’ paradigm of choice. This is to allow the researcher to ‘situate’ themselves within the research and be aware of their own beliefs in relation to the research subjects. It is also advised to use the first person to describe where the researcher stands on the research paradigms (152).

A paradigm can be defined as *systems of beliefs and practices that influence how researchers select both the questions they study and methods that they use to study them* (152).

Yet, there are numerous other definitions. Lincoln and Guba used philosophical concepts of ontology (nature of reality), epistemology (relation between the researcher and what is being researched) and methodology to describe mainly three widely accepted paradigms: positivism, post-positivism for quantitative inquiry and constructivism or interpretivism for qualitative inquiry (153). Creswell, in his recent publication, gave them a similar classification but referred to them as philosophical schools (154).

The problem with the paradigms proposed by Lincoln and Guba is that there is too much emphasis on the philosophical concepts behind research and lack of corresponding attention to practical issues, especially issues that arise from combining qualitative and quantitative methods (152).

Therefore, it was difficult to choose one paradigm that would represent my beliefs, values and where I stand as a researcher. I agreed with the positivist (objectivist) paradigm with regard to conducting the quantitative study of the extent of use and types of senior doctor triage models and how it influences ED performance. I believed that there is only one version of the reality with regard to this quantitative part of my research question and that my views and values are my own and should not influence this study's findings and I pursued a quantitative designed study as a method. On the other hand, I inclined towards the constructivist paradigm when pursing the qualitative study of asking different ED staff about their opinions on senior doctor triage, that there may be more than one version of the reality, that my previous values and beliefs can influence my interpretation of the findings and that a qualitative study would best serve to answer the research question.

This scenario is referred to as paradigm incompatibility where it is impossible to combine quantitative and qualitative methods without violating the philosophical principles set by Lincoln and Guba (152).

Because of this disconnection between these paradigms, the philosophical assumptions behind them and the practical issues of conducting mixed methods research, the pragmatic paradigm was suggested by Morgan as a proposed potential solution to this problem. It is a paradigm that identifies and addresses the practical issues of adopting a set of beliefs in the context of a mixed methods study. The pragmatic approach proposes the concepts of abduction (connection of theory and data), intersubjectivity (relationship to the research process), and transferability (inference from the data) (152).

As a pragmatist, I agreed with the concept that the researcher can make ‘mind shifts’ back and forth between induction and deduction (firstly transforming observations into theories and then examining theories via action or vice versa) in what is referred to as abduction. I agreed with the pragmatic emphasis on intersubjective approach, where the relationship between myself and the research process cannot be forced into a subjective/objective dichotomy. Instead, I can work back and forth between various frames of reference. I similarly agreed with the concept of transferability, where not all qualitative research is context-specific, and equally not all quantitative research is generalizable, but a set of factors should be investigated to determine if the research findings are transferrable to other settings.

### Data integration

O’Cathain et al suggested that it is not necessary to report the studies in the order of data collection. In contrast, it is recommended to report mixed methods studies in a storytelling manner that best answers the research questions (151). Reporting a mixed methods study in an integrated model serves to increase the yield of the findings in a manner that serves to best answer the research questions (151).

Three main techniques were summarised by O’Cathain et al to combine the results of quantitative and qualitative studies: Triangulation protocol, following a thread and mixed methods matrix (155).

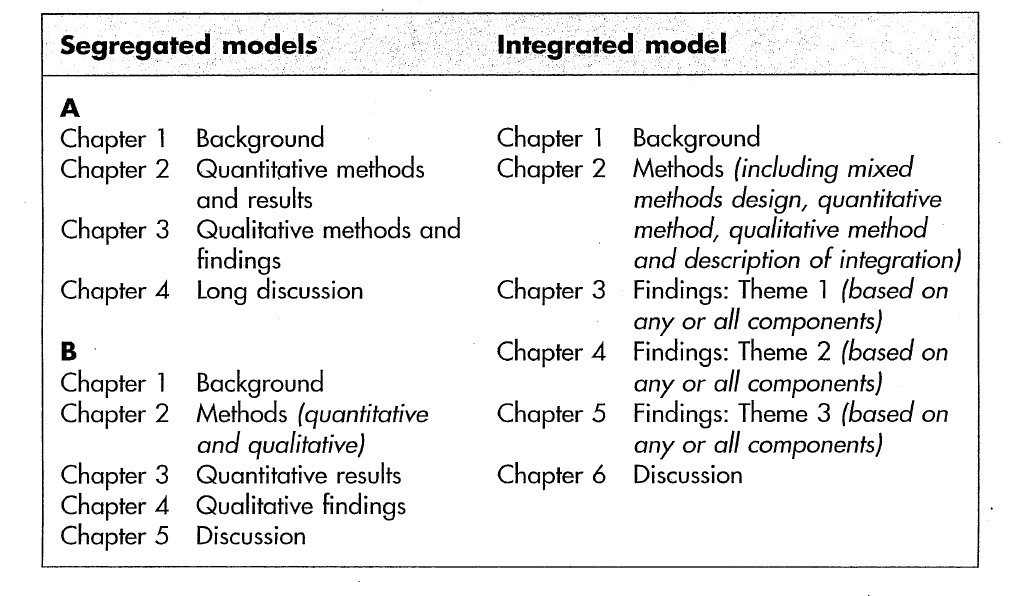
In this study, triangulation protocol was used. This integration method is recommended to be used when quantitative and qualitative methods serve to address different aspects of the research question. Triangulation protocol is used to integrate the results from a mixed methods study at the interpretation stage after findings from both quantitative and qualitative studies were analysed separately. This serves to show if the results from both elements diverge, converge or contradict each other. This is not always possible as each study answers different questions, but there are inferences that could be made from integrating the results in this manner (155).

Various techniques are described to triangulate the study findings but it mainly involves listing the findings from the different study components in one page and examining to see if there is convergence (agreement), divergence (partial agreement), or contradiction (complete disagreement) across the findings, or silence (which is expected when one method examines a different aspect of the research question) and then presenting the results in what Farmer et al refers to as Meta-themes that report findings from both qualitative and quantitative studies (156).

For this reason, the thesis was restructured, as findings were first reported separately for each study. The results chapter for this thesis is divided into three sections or meta-themes where each section can draw its findings from both the quantitative and qualitative studies. See the table below, sourced from O’Cathain et al, describing the integrated versus the segregated model of reporting results from a mixed methods study.

It is a recognised challenge to report mixed methods studies in an integrated versus a segregated model. Morgan referred to this as the 'Third effort' since it involves additional effort, and time to integrate the findings after completing data collection and analysis for each study separately (157). Other challenges can be associated with funding or structural issues amongst a team of researchers reporting a mixed methods study but these were not relevant to this project.

**Table** 8 **Outline of a Segregated and integrated model of the same doctoral thesis**



### Presentation of results

Three meta-themes were presented in the results chapter. The first meta-theme ‘Senior doctor triage, towards an evidence-based practice’, presents findings from the survey, the secondary routine ED data analysis study and the interviews. It describes the extent to which SDT is used in EDs across England. It then compares ED performance in those EDs with senior doctor triage model and those without senior doctor triage model. This is presented along with the reasons behind the establishment of senior doctor triage as described by the interviewees. Participants’ reasons for establishing SDT can provide insights onto the quantitative data analysis findings based on the individuals’ real experiences and accounts rather than mere speculations. The second section ‘Towards a clearer understanding of senior doctor triage’ draws data from the qualitative interviews only. It presents the participants’ understandings of senior doctor triage, its positive and negative aspects. The third meta-theme presents ‘The barriers and enablers of senior doctor triage’ and draws data from both the survey and the interviews.

### Good reporting checklist tool

Every effort was made to make use of the suggested list of issues that should be considered in reporting mixed methods research. The Good Reporting of A Mixed Methods Study (GRAMMS) checklist was used (158) which recommends including the following elements in the reporting of a mixed methods study. These are:

1. Justification for mixing methods

2. Design

3. Description of each method

4. Integration – what and how

5. Limitation of study on each method

6. Insights from mixing

### Conclusion

This section describes the mixed methods design used in this study and presents a transparent justification for using such an approach. It also presents the plan for data integration, the layout of the presentation of the results and the reporting checklist used.

# Section II Quantitative Methods

### Introduction

This section describes the rationale for the quantitative studies and their design. Two quantitative studies were undertaken. Firstly, a cross-sectional survey of ED triage practices in England and secondly, a retrospective secondary data analysis study of routine ED performance data.

### Study I Quantitative cross-sectional online survey

### Research question

What is the extent of use, and what are the types of senior doctor triage models used in type I EDs across England?

### Rationale

A descriptive cross-sectional online survey was carried out. In general, a descriptive survey is used to gain information on the present status of a phenomenon i.e. it describes ‘what exists’ with regard to variables or conditions (159). Therefore, this method was selected to capture a snapshot of ED triage practices and identify the number of EDs that currently apply or do not apply various models of senior doctor triage. A short online survey was chosen to increase the number of respondents, ease data collection and decrease the interviewer effect. One of the other advantages of an online survey is that it is associated with low cost of data collection and processing. In addition, it provides a convenient way for reaching respondents from widely dispersed addresses (160). This was highly relevant in this study where approaching consultants from all type I EDs across England was needed.

### Aims

The survey aimed to identify the following

* The number of EDs that apply or do not apply senior doctor triage models currently, and those EDs that previously used or piloted senior doctor triage in EDs in England (excluding Yorkshire and Humber region).
* The number of available ED services (number of facilities and services available in the emergency department e.g. co-located GP clinic, Thrombosis Unit, Mental health care clinic, Physiotherapy team, Chest pain clinic)

In addition, the survey identified interested respondents to participate in the qualitative interview study.

In EDs with senior doctor triage, the survey aimed to identify the following

* Models of senior doctor triage (single senior doctor triage, senior doctor and nurse triage, etc for ambulance arrivals or walk-in patients).
* Time of introduction of senior doctor triage models
* Hours of operation of senior doctor triage models
* Number of EDs with senior doctor triage model where a formal written protocol for this process was in place.
* Reasons behind the suspension of senior doctor triage in EDs which previously used or piloted senior doctor triage

See Appendix 7 Online survey study cover note and Appendix 8 Online survey data collection tool.

The survey was seen as an opportunity to draw a complete picture of the national triage practices in England. Therefore, a secondary aim of the survey was to identify the various triage scales (Manchester triage scale, Australian triage scale, etc) used in EDs across England (excluding EDs Yorkshire and Humber region) and the types of procedures (blood tests, x-rays, vital signs measurements) performed at the triage stage. This is reported as an Appendix 9 Since it did not directly serve to answer the main research questions to be presented in the meta-themes of the results chapter.

### Questionnaire development and data collection

This survey was modified from a structured face-to-face survey which was used to explore senior doctor triage models in Yorkshire and the Humber region, in a study conducted during the period (September 2014 - January 2015) (161). The face-to-face survey questionnaire of senior doctor triage models in Yorkshire and Humber provided a basis for the online survey which was conducted later within the year 2015 (July to September 2015). It was intended to compile the data from both the online survey and the face-to-face survey to offer a complete understanding of the use of various senior doctor triage models in all EDs in England, as will be explained under the survey analysis heading.

In more detail, the face-to-face questionnaire was abbreviated to develop a web-based survey, and questions regarding staffing levels and ED design were removed. The survey questionnaire was divided into four components: triage practices in general; the use of senior doctor triage (year of introduction of senior doctor triage, the hours of operation and whether senior doctor triage process was guided by locally developed written protocols); reasons behind its suspension if that was the case, and available ED services (the services available in the emergency department e.g. co-located GP clinic, Thrombosis Unit, Mental health care clinic, Physiotherapy team, Chest pain clinic). For the purpose of the survey questionnaire, senior doctor triage was defined as a senior doctor at registrar level or above who is involved in triage. This definition was provided next to the question that asks regarding the use of senior doctor triage.

The online survey was reviewed by the supervisors and original face-to-face survey questionnaire author and three rounds of feedback occurred. A convenience sample of two consultants was approached to complete the survey questions and fine amendments to the language were made accordingly. The final version of the survey included a maximum of ten multiple-choice questions according to whether the ED implemented a model of senior doctor triage or not.

The online survey tool was developed using an online based survey design tool - surveymonkey.com (162). This website allows designing, managing the survey, getting responses, retrieving the individual and collective responses in various formats (Excel, Pdf formats) and analysing the results (via charts and data tables which can be exported).

Although the online survey provides several advantages as explained earlier, online surveys can be associated with low response rate and its consequent biases. There is also no opportunity to correct misunderstandings or to probe or offer an explanation. Furthermore, there is no control over the order in which questions are answered, nor the opportunity to collect data based on observations that could be undertaken with a face-to-face survey (163).

In order to avoid the above difficulties associated with online surveys, several measures were implemented. The survey questions were short, clear and concise. The structure of the survey allowed respondents to answer one question at a time in a particular order. The survey was piloted first. The final version was adapted according to the input from the pilots and from supervisors as stated above. Reminder emails, telephone calls were used to maximise the response rate. All 24-hour doctor-led ED services (Type I EDs) for physically or mentally ill and injured patients of adult or mixed age groups in England were included (Apart from EDs in Yorkshire and Humber region). The questionnaire was sent via e-mail invitation that contained a web-link to the survey. The survey was distributed during the period (July - September 2015). Further reminders were sent in October and November 2015.

**Retrieval of contact details of ED consultants**

Three main steps were followed in order to obtain the contact details of the ED consultants of the targeted sample.

Firstly, a list of type I EDs in England was obtained from the Royal College of Emergency Medicine via e-mail request. This was obtained as an Excel sheet which listed all type I EDs in England. The total number of Type I EDs across England was 171 EDs including type I EDs of Yorkshire and Humber region.

Secondly, the names of the ED consultants for each ED were retrieved from the NHS Choices website and individual hospital websites (two consultant names were retrieved from each ED).

Thirdly, Binley’s directory of NHS management was consulted to obtain contact e-mail addresses for the targeted sample. This resource provides an for example e-mail address for each trust across the country e.g. [firstname.lastname@trustname.nhs.uk](mailto:firstname.lastname@trustname.nhs.uk) (164), and based on the list of names of ED consultants complied previously, a list of contact e-mails was created. Two consultants were contacted from each ED. Once e-mail invitations were sent, if an immediate automatic reply showed that the e-mail is incorrect or the consultant was no longer working in this post, the secretary of that particular ED was contacted by telephone where I asked whether they could forward the survey invitation e-mail to the clinical lead of their ED.

### Analysis of survey data

The survey data was downloaded from SurveyMonkey.com as an Excel sheet which listed all the individual responses. Initially, the survey responses were checked for missing information, incomplete answers or duplicates. It was decided to keep the incomplete responses if the respondents answered the main study question of whether their EDs employed senior doctor triage or not. This is the main outcome of the survey, which is also directly related to the following quantitative routine data analysis study. Incomplete responses were discarded in two cases: if they did not report the name of the ED or the type of triage practice. Other survey findings which relate to the year of introduction of senior doctor triage and its hours of operation showed a large amount of missing data. Therefore their effect on ED quality indicators in the subsequent quantitative study of routine data was not investigated to avoid bias arising from this missing information. In case of duplicates, where more than one response was received for the same ED, the responses which were completed more fully or were completed by the clinical lead (as reported by the respondent in the field ‘position’) were selected for analysis.

Then, each question of every individual survey response was coded (0,1,etc) according to the number of options and was entered into SPSS version 21 to assist analysis. The face-to-face survey of Yorkshire and Humber region ED triage practices was entered into SPSS as well at this stage to complete the dataset. Descriptive statistics and frequency tables were used to display the results. EDs were split into two groups: those with SDT models and those without SDT. The question regarding ED services (the services available in the ED e.g. co-located GP clinic, Thrombosis Unit, Mental health care clinic, Physiotherapy team, Chest pain clinic) was collected to be examined as a confounding variable when comparing the two ED groups – with or without SDT in the subsequent secondary routine data analysis study.

The results reported represent the compilation from regional Yorkshire and Humber face-to-face survey and the online survey to draw a complete national picture of the use of senior doctor triage of EDs in England.

### Study II Retrospective secondary routine ED performance data analysis study

This section starts by laying the research question, the research hypothesis and the rationale for selecting secondary routine data analysis. Then, it describes the nature of the data, how it was sourced, located, retrieved and the planned methods of analysis.

### Research question

How do NHS trusts with senior doctor triage compare on key performance metrics such as time to triage for ambulance arrivals and the number of patients waiting for more than four hours with their counterparts with no senior doctor triage?

The null hypothesis and alternative hypothesis are presented.

H0: There is no difference in ED quality indicators between NHS trusts with senior doctor triage and NHS trusts without senior doctor triage.

HA: There is a difference in ED quality indicators between NHS trusts with senior doctor triage and NHS trusts without senior doctor triage.

### Rationale for using secondary data analysis

A descriptive retrospective secondary data analysis study design was used. Secondary data analysis can be defined as *an analysis of existing data or information which was collected by another individual(s) or for other purpose than the one currently being considered* (165).

Retrospective secondary data analysis allows the opportunity to examine the use of senior doctor triage as it occurs in routine clinical care. It also gives the advantage of studying the influence of this triage model on ED performance in a large number of NHSTs with a large cohort of ED attendances over a relatively long observation period. This design provided a relatively inexpensive and expedient approach for answering the research questions within the limited study period. This secondary data analysis can also be helpful in designing subsequent primary research with regard to senior doctor triage where it can provide a baseline with which to compare primary data collection results (165).

On the other hand, a major disadvantage of secondary data analysis is that the secondary data analyst has no control over the quality of the dataset or the variables that are included in the dataset. Therefore, if errors were made in the original dataset, the secondary data analyst might not be able to appraise errors in the data because they may no longer be visible (165). However, it is believed that combining information from two sources: Hospital Episode Statistics (HES) and Situation Report (SitRep) datasets contained the majority of the variables of interest for the study and the feasibility and suitability of using these data sets was evaluated as will be described later in this section. Finally, confounding bias is a recognised issue in retrospective study designs. Every effort was made to use the information collected in the survey to try to account for some of the confounding variables but confounding remains a major limiting factor in the analysis.

### Locating the datasets

This section explains how the datasets of interest were located. Firstly, the specific research question was formulated as part of the research proposal. This was accompanied by a survey of literature to see if any previous similar research has been undertaken. Then, the inclusion criteria for the EDs were specified. The sample was not confined to a specific region. It was planned to analyse all EDs with a known triage practice as identified in the survey nationally across England. The outcomes of interest were also determined. Finally, a list of available datasets was created. This included Hospital Episode Statistics (HES) and Situation Report (SitRep) datasets.

Each dataset was screened to identify what information and outcomes it contains. It was decided to combine data sources from both these datasets to best answer the research question. These datasets were publically available online and therefore no specific permission to use them was required. However, NHS Trusts names were kept confidential in the secondary data analysis results. Trusts names would be available for interested parties upon request.

### The feasibility and suitability of using a dataset for secondary data analysis

Before undertaking the secondary data analysis, it was essential to determine if there is an appropriate fit between the research question and the available datasets. For that, the secondary data were studied and an effort was made to identify any limitations in the original datasets and the quality of the data presented. For that, seven of questions were considered as recommended by Mongan (165).

1. What was the original purpose for which the data was collected?

It is important to determine the original purpose of the data collection since this can help to evaluate the quality of the dataset and expose any potential bias. HES data was developed originally in 1987 to monitor patient and hospitals activity. It is a record based system that collects information regarding patient admissions, ED attendances, and outpatient appointments. It allows providers to be paid for the services they deliver.

HES data is designed in a manner that allows secondary use of the data by government policy makers and researchers. It has many benefits. In addition to monitoring patterns of patient activity, it allows to provide a picture of the ED performance based on measuring the clinical ED quality indicators.

2. Is there sufficient information in relation to the secondary data?

It is essential to examine if there is sufficient documentation describing the data collection and quality check measures used, otherwise it can be extremely difficult to come to any conclusions regarding its quality (165).

The HES dataset was accompanied by a number of documents which described how the data was collected and what measures were taken to ensure the data is of good quality. HES data for ED basically comes from an exchange of information between local health care providers (NHS trusts) and commissioners for NHS patients. The data is collected by local administrative and healthcare staff who, in turn, submit the dataset to Secondary Use Service (SUS). Afterwards, SUS forward the data to commissioners and a copy of the data is given to HES at pre-arranged dates throughout the year. Consequently, cleaning and data quality checks are undertaken before making the data available to the public (166). SitRep data is collected weekly from NHS trusts and the speed of its collection only allows minimal validation to be undertaken.

2. Does the data contain the variables of interest?

Firstly, the HES is published monthly and records data on accident and emergency attendances and ED performance with a lag period of three months. For each NHS trust, the following key indicators are reported:

- Number and percentage of patients who left before being seen for treatment

- Number and percentage of patients who had an unplanned re-attendance within 7 days

- Time to triage for ambulance arrivals (min; median and 95th centile, longest wait)

- Time to treatment (min; median, 95th centile and longest wait)

- Total time in the ED (min; median, 95th percentile and longest wait)

- Total time in the ED for admitted and non-admitted patients

These five quality measures are part of eight metrics developed by the National Clinical Director for Urgent & Emergency Care, working with the Royal College of Emergency Medicine, the Royal College of Nursing, and patient representatives. It is intended that this group of metrics should together provide a set of balanced measures to reflect the ED performance in terms of timeliness, quality, and safety (155). To allow current organisations to measure their performance, these five indicators were initially identified as representing potential triggers for intervention to improve current performance and establish reasons for under-achieving. The following cut-off points were determined.

These are:

- Left without being seen—a rate at or above 5%.

- Unplanned re-attendances—greater than 5%.

- Time to triage—95th percentile time to assessment above 15 minutes.

- Time to treatment—a median above 60 minutes from arrival to seeing a decision-making clinician.

- Total time in the ED—95th percentile above 4 hours.

On the other hand, SitRep data records data on accident and emergency attendances and ED performance that is updated on a weekly basis by the Department of Health in England. For each NHS trust the following data are reported:

- Number of attendance at ED, by type

- Number of emergency admissions

- Number and percentages of patients waiting more than four hours

- Number of emergency admissions waiting more than four hours

There is no formal ‘target’ for the number of ED admissions. Nevertheless, the NHS has an ‘operational standard’ of 95% of patients seen within 4 hours. This standard is measured using the aggregated quarterly data, rather than the weekly data, for all ED attendances.

Since the main aim is to compare ED performance indicators across the previously identified two groups of EDs (with and without senior doctor triage), the sample and variables of interest were available in the above datasets and therefore they were identified and extracted.

4. When were the data collected?

The date of data collection is critical to determine if the data is out of date or not. As mentioned previously, HES data is collected monthly. The most recent period available at the point of collecting data for this project was used i.e. from July 2014 – June 2015 at NHS trust level. SitRep data was collected weekly with additional monthly and quarterly reports.

5. What is the level of data aggregation?

The level of data aggregation or disaggregation refers to the extent to which the data are broken down (165). For example, disaggregate data can provide patient level information and can include information about patient characteristics. It was not possible to obtain disaggregated data due to confidentiality, ethical and practical reasons. HES and SitRep datasets provide aggregate data that combine patients’ data at a daily, weekly, monthly or quarterly basis.

6. What data cleaning procedures have been applied to the data?

A specific document described the data cleaning rules used for the datasets and what validation measures were used for each one of the ED indicators, was available on HES website. The document described how the data was collected and arranged in a consistent manner that is replicable (166). The data also contained all the variables required to answer the research question. Therefore, it can be argued that the dataset obliges to the traditional quality measures of reliability and validity.

7. What sampling procedures have been used?

Both datasets were inclusive of all NHS Trusts across England. The sample included all NHS Trusts with one or more Type I EDs which their triage practices have been identified in the survey. These included two groups: firstly, NHS Trusts which use senior doctor triage model for either walk-in or ambulance patients, and secondly, those NHS Trusts that do not use this model or have used it in the past.

**Planned data collection and analysis**

This retrospective study of UK EDs performance analysed ED quality indicators data from July 2014 – June 2015 at NHS trust level[[3]](#footnote-3). Trusts were divided into two main groups according to their triage practice as identified in the national survey of ED triage practices across England. The first model was a senior doctor triage model. This was compared to EDs that did not operate SDT including EDs that previously trialled SDT in the past. The performance of EDs with SDT was compared with the other group.

Firstly, monthly HES data was extracted and compiled for each NHS Trust. Then, the HES data for the 12 month period was averaged to provide a summary measure of performance for each outcome indicator for the whole year period for every individual Trust.

Outcome indicators extracted from SitRep data were also produced from compiling quarterly reported data for each NHS Trust for the same period. The percentage of admissions was calculated from the proportion of total number of admitted patients in relation to the total number of type I ED attendances for each NHS Trust. This was executed using Microsoft Excel programme. Then, once a yearly average of ED performance indicators for each NHS Trust was calculated, this data was transferred into SPSS 21 to assist the analysis. Also at this stage, the names of the Trusts were coded and the dataset was supplemented with information from the survey with regard to Trust triage group, staffing levels (for Yorkshire and Humber region only), and the available ED services.

### Primary outcomes

1. % Patients left without being seen
2. % Patients re-attended within 7 days
3. Time to triage for ambulance arrivals (min)
4. Time to treatment (min)
5. Total time spent in the ED for all patients (min)
6. % Patients seen within 4 hours
7. Admission rate

### Secondary outcomes

Total time in the ED for admitted patients

Total time in the ED for non-admitted patients

### Data checking

Following data entry into SPSS version 21, a process of data checking was undertaken. The dataset, scrutinised for potential errors or omissions, was done in accordance with the type of data.

For continuous data, such as time to triage for ambulance arrivals, this was achieved by simply arranging the data in ascending order and making sure that all values were logical and plausible. For categorical data, e.g. triage group category, this was completed by using frequency tables and making sure logical values (0, 1) were given.

If a missing record was identified, the original HES and SitRep data were referred to, to double check whether the missing observation was actually missing from original datasets. If the data was missing from the original dataset, the ‘Exclude case pairwise’ option was used in SPSS. This option allows the exclusion of cases only if there is missing data required for a specific analysis. So the cases will still be included in any of the analyses for which the necessary information is available.

### Outliers

If outliers - *values that lie away from the main body of the data* -(167) were identified, similarly, the original HES and SitRep datasets were checked to determine if these values were erroneous or if these values were actually genuine observations from individual NHS trusts with extreme values. Identified outliers were not removed, as it is recommended in the literature that these outliers should not be removed from the dataset for the sole reason that they are higher or lower than what would be expected (167). However, an amendment of the statistical tests might be required if skewed distribution happened as a result.

### Statistical tests

1. Statistical significance testing

Relevant statistical tests were undertaken to examine the possibility of a statistically significant difference in the ED quality indicators between Trusts with and without SDT. Normality test, Kolmogorov-Smirnov test, and histograms, were used to test the normality of the data. For normally distributed data, means and Standard Deviation (SD) were used as summary measures. In addition, a parametric test, Independent T-test, was used for normally distributed continuous variables. P value and confidence intervals (CI) were presented. For skewed data, medians and Interquartile range (IQR) were used as summary measures and the Mann-Whitney test was used to measure statistical significance between the two groups. P value was reported. Box and whisker plots were used to visually demonstrate the different summary measures of the quality indicators between the two groups (with SDT, without SDT). Results were considered statistically significant for P value 0.05 or less.

1. Subgroup analysis
2. NHS Trust that had single ED within the Trust

This subgroup analysis excluded all NHS Trusts that had more than one ED, which might have different triage practices within the same trust. Then, the effect of SDT on ED quality indicators was measured in this subgroup using the relevant statistical tests, depending on the statistical category and distribution of the individual ED quality indicators.

1. NHS Trusts with subtypes of senior doctor triage and those without senior doctor triage.

The other subgroup analysis was performed to examine if there were differences between four categories - single senior doctor triage for ambulance arrivals; senior doctor triage and registered nurse for ambulance arrivals; senior doctor triage and registered nurse for both walk-in patients and ambulance arrivals and the final category; no senior doctor triage. Single senior doctor triage for walk-in patients was not included as only two Trusts used this model. The Analysis of covariance (ANCOVA) test was used to investigate whether there is a difference between these groups for each ED performance indicator P value was adjusted to reflect the number of outcomes tested (Adjusted p value = 0.05/ number of outcomes tested). This was performed for normally distributed outcomes where the standardised residuals of these outcomes showed normal distribution. The Kruskal-Wallis test – a non-parametric test was used for the remaining outcomes between the groups where the assumptions of normality were not met. A multivariate analysis of variance (MANOVA test) which could be used to test all the outcomes together was not used since the condition of correlation between the outcomes required for this test was not satisfied.

1. Confounding

In an attempt to account for confounding, five variables were explored. These were: NHS Trust geographical location (North, South or Midlands and East of England, London(168)); the number of ED services (number of services available in the ED e.g. co-located GP clinic, Thrombosis Unit, Mental health care clinic, Physiotherapy team, Chest pain clinic); staffing levels (staffing levels available for EDs in Yorkshire and Humber region only – total number of doctors of all levels was obtained from the face-to-face survey) as well as the total number of patient attendances and the number of patients who arrive by ambulance. It is recognised that there are other variables reported in the literature which should be considered in relation to patient and ED characteristics (such as age, sex, case-mix of patient attendances, numbers of years of experience of staff, the catchment area of the hospital) due to the lack of this data, analysis of those variables was not completed.

A two-way analysis of covariance ANCOVA was conducted to compare the effectiveness of the two triage models (senior doctor triage, versus other/no triage model) whilst controlling for the above variables where Levene’s test and normality checks required for ANCOVA test were met. Adjusted means and CI were presented. Results were considered statistically significant for P value of 0.05 or less.

1. The relation between four-hour target, triage type, and other variables

The final statistical analysis was a multiple linear regression model, which was carried out to investigate the relationship between the percentage of patients who waited less than 4 hours, and the following set of variables (whether the ED operates senior doctor triage or not, total number of patient attendances, number of ED services). Preliminary analysis was conducted to ensure that there was no violation of the assumptions of normality, linearity, multi-collinearity and homoscedasticity.

1. Visual presentations of individual Trust performance

A traffic light visual presentation was conducted for each trust group with regard to their ED performance for each indicator. This provided a comprehensive picture of the performance of individual NHS trusts with different triage practices across all ED quality indicators. Each indicator was given a score from 1 to 3 depending on how well it is performing, 1 (red) for poor performance, 2 (yellow) for acceptable performance and 3 (green) for good performance. The scores for all indicators for each NHS trust were added together to indicate an overall performance score.

The 1-3 scores were derived from the recommendations by the National Clinical Director for Urgent & Emergency Care (169). For time-based quality indicators, these recommendations highlighted cut-off points for either the median or 95th percentile depending on the type of the time-based ED quality indicators. Score 1 and 2 showed that the performance on a specific indicator was below or just satisfying the recommended target. Score 3 was allocated when the indicators were within the recommended target for that indicator.

For the proportion of patients admitted from the ED i.e. admission rate, the scores were developed based on the available sampled data. NHSTs were given a high score (3) if their admission rate was either the average rate or within one standard deviation above or below the average admission rate for the sample; scored (2) if their admission rate was one standard deviation away from the mean and scored one if the admission rate was two or more standard deviations below or above the mean. Figure 8 provides a guide on the colour coding used in the tables in the result section.

Figure 8 Traffic light visual presentation scoring and colour coding guide for emergency department performance at NHS trust level

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indicator 1  % patient left without being seen | Indicator 2  % patient re-attended within 7 days | Indicator 3  Time to triage for ambulance arrivals (min; 95th centile) | Indicator 4  Time to treatment (min; median) | Indicator 5  Total time spent in the ED for all patients (min;95th percentile) | | Indicator 6  % of patients seen within 4 hours | Indicator 7  Admission rate | Score |
| <=4.99% | <=4.99% | <=14 | <=59 | | <=239 | <=94.99% | Mean or within 1 SD | 3 |
| 5% | 5% | 15 | 60 | | 240 | 95% | 1 SD | 2 |
| >5% | > 5% | >15 | > 60 | | > 240 | > 95% | 2 SDs | 1 |

SD; Standard deviation

### Issues with the data

1. Data collected weekly, monthly or quarterly

Most of the HES data was compiled monthly for each NHS trust while some of the data was compiled weekly. SitRep data was compiled weekly, monthly and quarterly (every four months). In order to overcome this difficulty, average estimates of the monthly ED performance indicators were calculated for a one-year period.

1. Data collection gaps

Data was missing for 7 trusts either for one or more outcomes for either one month or the whole period. In cases where there was missing data from the original dataset for one outcome, the trust was still included in the analyses for the other outcomes and the missed outcome was excluded from the corresponding analysis.

1. NHS Trust level data

In 28 NHS Trusts, the trust has more than one ED which might have different triage practices. The HES and SitRep data recorded ED indicators for these trusts based on average estimates of their EDs. In order to take this into account, if the trust has more than one ED with different triage practices, including one with senior doctor triage, it was classified in the senior doctor triage model group and data analysis was undertaken. In addition, a subgroup analysis of NHSTs with only a single ED was conducted.

# Section III Qualitative methods

### Study III Qualitative Study

This section describes the rationale for the qualitative study, and methods used. One qualitative study was undertaken in the form of semi-structured telephone interviews with healthcare professionals. Those included senior emergency physicians (emergency medicine consultants), nurses, paramedics, and ED managers.

### Research question

The key aim of the study was to understand ED staff perceptions on senior doctor triage and to explore the real ‘shop floor’ issues facing emergency departments when senior doctor triage was implemented.

A) What are ED staff views and perceptions on senior doctor triage?

A1) What are the positive and negative aspects of this model?

B) What were the reasons behind the establishment of senior doctor triage?

B1) What were the reasons behind its application in some emergency departments, explanations behind its suspension in other emergency departments?

B2) What challenges do EDs, which implement/implemented senior doctor triage, face and how might the senior doctor triage process be improved?

### Rationale

The qualitative research study was designed to acquire an in-depth understanding of the above-proposed questions and to explore the perceived advantages and disadvantages of senior doctor triage from the ED healthcare professionals’ perspective. A qualitative study was considered to be a suitable approach to reveal the possible variation in views and opinions towards senior doctor triage. This additional data was gathered to enrich the overall findings of the quantitative data. Another reason for conducting the qualitative study was to gain insights from a number of health care professionals with an understanding of senior doctor triage and therefore help the understanding of this model and why it is applied in different EDs. The views of healthcare professionals, including consultants, nurses, paramedics and ED managers, were sought. This section describes the qualitative research method for all groups with minor modifications highlighted for participants with managerial positions (ED operational managers).

### Data collection

There are numerous methodologies within qualitative research but the main widely used research methods are observation, interviewing and focus groups (170). Firstly, observation, which is a process where the researcher observes participants in their natural setting is a method which was not selected. This is because it was thought it would not be the ideal method to serve to answer the research question. In addition, it is a time consuming and intrusive process. Focus groups were also deemed not to be suitable since it was likely that different individuals with different job roles might not convey their real views and opinions. There were also logistical reasons in that focus groups would be difficult to arrange even for individuals with the same job roles in a study intending to capture the views of people working in different locations and settings across England. Interviews, therefore, were selected as the primary data collection method. Interviews offer a unique opportunity to capture the various insights and experiences of the range of healthcare professionals included in this study. The main strength of the qualitative interviews is that participants can express their thoughts with their own words so that the research subjects have their own voice that describes their experiences (171).

### Interview type

In order to choose the right tool to conduct the interviews, interview types were explored. Unstructured interviews were thought not to serve the aim of the study as a degree of structure and standardisation was deemed necessary to ensure all of the questions were explored. Semi-structured interviews were adopted as the appropriate approach to answer the research questions. Semi-structured interviews offer the opportunity to ask all participants the same research questions and yet retain the flexibility necessary to elaborate on specific issues raised by individual participants (171).

Open-ended questions were asked to allow respondents the opportunity to answer the questions without being influenced by the researcher and encourage them to engage and describe their opinions. The interview was always concluded by giving the participants the chance to comment on anything that was not covered by the interview or ask any questions. This was important since it allowed the participants to complement the interview with new insights or aspects which would enrich the data generated.

Telephone interviews, rather than face-to-face interviews were devised as the mode of inquiry. Although telephone interviews can be limited in detecting detailed information, and emotional expressions which can help to interpret what is being said, telephone interviews have clear advantages. It is cheaper and more convenient, particularly in the context of interviewing healthcare professionals in the emergency department and ambulance service working in different locations and settings on a national level across England (163).

The interviews were originally planned to last around 20-30 minutes. This time period was chosen as it was thought that it would cover the interview questions and at the same time would not result in any inconvenience for the research participants. It is acknowledged that this might be considered a short time but it was important to keep the interview short, particularly when arranging interviews with busy working clinicians in the ED and ambulance crew who were often on duty.

### Interview Schedule

The interview schedule was developed to include questions according to the status of use of senior doctor triage. Questions differed slightly if the department currently operated senior triage, had trialled this process in the past, or had never experienced the implementation of such an approach. For each intervention type, the interview schedule was broadly the same for all participants of different health roles, but an emphasis on some questions and deletion of some questions was required for participants from managerial and ambulance crew groups.

The interview schedule was shaped by the literature and reading about senior triage, in addition to informal visits to consultants in the Yorkshire and Humber region in collaboration with the Improvement Academy. The content was also developed based on the quantitative survey study that captured the respondents’ comments in the ‘free-text’ regarding the senior triage process and its current challenges. The schedule was also reviewed by the supervisors and was piloted with two consultants. Some modification to the language and content of the questions was undertaken.

The interview schedule started with questions regarding a description of senior doctor triage or the history of it, followed by the positive and negative aspects of this process, the reasons behind its establishment or suspension, and its challenges and ways to improve these. The order of the questions was not strictly followed. Rather, a flexible approach was adopted and if a participant brought up an issue , this was explored first. Participants were free to pursue or bring up other issues which were followed up (or not) depending on whether these were related to the study research questions.

### Sampling

When sampling for this study, two main considerations were taken into account as illustrated by Mays and Pope (172). Firstly, it was important to sample a full range of possible views and settings to allow conceptual rather than statistical generalisation. And secondly, efforts were made to obtain views that might contradict or modify the analysis (by extending the sample to include various settings or different informants) (173). Therefore, the following criteria were considered to sample the participants

1. Reflect the quantitative study

The sample chosen sought to reflect the findings of the quantitative study which identified staff working in various emergency departments across different regions with different triage models and multiple levels of performance. It was important to capture these complex differences by selecting a sample that replicated the quantitative findings. This was in order to gain a clear and inclusive understanding of participant perspectives on the senior doctor triage process in the emergency department.

2. Different job roles

A key criterion was that the sample should include health care professionals of different job roles, yet together working ultimately to provide quality patient care in the emergency department. It was apparent from the initial informal visits to emergency departments that different health care professionals might have various opinions generated by their own background and experiences. Therefore, the sample included nurses, paramedics, junior doctors, and ED managers, in addition to the main population of interest which is the emergency medicine senior doctors’ body.

The senior doctors who answered the online survey were asked to document their interest in participating in a follow up interview study. From this pool of potential senior doctor participants, a sample of senior doctors was approached from a mix of departments of variable performances, regions and triage models.

The selection of nurses, junior doctors, and ED managers followed convenience sampling i.e. the recruitment of those health care professionals was conducted via a snow-ball method where the lead senior doctor was asked to electronically send the interview invitations to ED staff.

With regard to recruitment of paramedics, convenience sampling was also undertaken. A senior Yorkshire Ambulance Service College of Paramedic representative was approached to promote the study to paramedics in the Yorkshire and Humber region via e-mail communication. In addition, study invitation advertisement posters were placed in Sheffield teaching hospital’s ED staff room to invite paramedic participants. Interested paramedics were directed to contact me via e-mail to participate in the study.

3. Years of work experience and gender

Although the study aimed to include participants of both genders with a wide range of numbers of years of work experience, it was not possible to draw a sample that is proportionate to the whole population, particularly since convenience sampling was applied. There are other reasons which hindered this approach; firstly, lack of literature describing the gender ratio and range of work experiences amongst ED staff and secondly, lack of evidence that these differences might affect staff views on the senior doctor triage in the ED.

Please see **Table** 9. It is recognised that this table documents the sample used in the study and normally would be presented in the results chapter. However, due to the layout of the thesis, and the mixed methodology used,it was thought best to present the final sample results here.

**Table** 9 **Sampling frame used in the qualitative study**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Senior doctor triage** | **No senior doctor triage** | **Previous senior doctor triage** |
| **ED performance (number of sites)** |  |  |  |
| Total ED performance score 14 or above \* | 3 | 1 | 3 |
| Total ED performance score below 14 \* | 3 | 1 | 1 |
| **Job role (number of participants)** |  |  |  |
| Consultants | 3 | 2 | 8 |
| Juniors | 1 | - | - |
| Paramedics | 5 | 2 | - |
| Nurses | 3 | - | 1 |
| ED managers | - | - | 2 |
| **Gender** |  |  |  |
| Male | 18 |  |  |
| Female | 9 \*\* |  |  |
| **Numbers of years in practice(number of participants)** |  |  |  |
| =<5 years | 16 |  |  |
| >5 years | 11 |  |  |
| **Total** | **27** |  |  |

\*Based on the total performance score of the quality indicators for each sampled ED as reported in the results chapter. Refer to table **Table** 25 and **Table** 26.

\*\*(1 junior doctor, 3 nurses, 1 ED manager, 2 consultants, and 2 paramedics); ED, emergency department.

**Consent**

Participants were asked to give their informed consent before undertaking the interviews. The same participant information sheet (PIS) and consent form were used for participants of different job roles.

The PIS and consent form were sent to participants via e-mail in order to allow them to read through the information and clarify any concerns, at least two weeks prior to scheduling the interview. On two occasions, participants asked some specific questions with regard to data confidentiality and anonymity and clarification were given.

The PIS specifically covered the purpose of the study, who can access the study data, how the data will be used, who is funding the study and what is the role of the participant (171).

With regard to the consent form, it was designed as a checklist which was read via the telephone to make the consent process easier and in order not to discourage interested participants. This was discussed in advance and agreed with the University of Sheffield Research Ethics Committee. On two occasions, participants volunteered to send their signed consent as scanned documents via e-mail.

On the day of the telephone interview, participants were reminded of the purpose of the interview, that they were free to decline to answer any questions, and that they could withdraw from the interview at any point without giving an excuse. Then, the consent form ‘checklist’ was read out to participants and their verbal consent was recorded. There were no specific issues or difficulties at this stage. Four participants chose to re-arrange the interview time at short notice. This was appreciated due to the unpredictable nature and demands of the working environment of the emergency department.

### Data collection (Recording and Transcribing)

The interviews were audio-recorded via two recorders, this allowed full attention to be devoted to listening and responsive questioning (171). The audio-record provided an accurate verbatim account of what was said, including hesitations and poses. The telephone interviews were conducted in a conference room at the Innovation centre at the University of Sheffield.

The audio records were then downloaded to the University network on password encrypted file and labelled (from P1-27). There were no technical difficulties and the sound quality was generally good.

All the 27 interviews were transcribed by the investigator i.e. myself. The transcript files were also anonymised and labelled from P1-P27 and any potentially identifiable data, mentioned in the transcripts, was removed and replaced by a pseudonym. The transcripts were then stored on a password encrypted computer at the University of Sheffield. The audio records were listened to once more to check the accuracy of the transcriptions and add any missing data.

### Reflexivity

One of the potential shortfalls of qualitative research is the concern that qualitative data analysis and coding may result in different and multiple interpretations amongst researchers. What is suggested, therefore, is that emphasis should be made on reflexivity of the researcher which is a written reflection of the biases, values and experiences a researchers brings to the study and how that might affect the participants (154). As Creswell recommended, the reflexivity section should cover three aspects: the background of the researcher, how that might affect the data analysis and finally, the expected reaction of participants and general literature readers to the study findings (154). Therefore, the following paragraph reports on my background and how that affected my interpretation of the data, and what impact the study findings are likely to have on the general EM literature readers and participants.

Short notes were kept throughout the qualitative study and reflexive comments were noted on what was being experienced in the interviews, and my consciousness about how my presence disturbed or did not disturb the research.

My interest in this study was sparked by my own role as a junior doctor in a busy emergency department in Iraq where I have experienced triaging patients under immense pressure. Given the centrality of the researcher as a qualitative research tool, it was essential to monitor the subjective factors I assume about the senior doctors and other health care professionals who often differ in their views on senior doctor triage. Although my outsider position may have blinded me, my experience as a junior doctor affected my view that senior doctors are an invaluable tool to initially assess patients at the front door in the ED. These experiences also affected my interpretation by drawing attention to the sensitivities between different health care professionals and presenting the consultant views and other health care individuals in a professional, sometimes conscious language.

To speculate on how participants, EM readers and policy makers might be influenced by this account, firstly, with regard to participants, I decided to avoid presenting my background as a medical doctor as I thought that participants would potentially be self-conscious of their views or hide their true perspectives. On one occasion, I was asked directly if I were a medical doctor. Many participants were most interested in hearing about the study findings and reading the final report. Of course, there are various views on this subject and therefore, some participants might welcome reading different opinions and experiences to theirs. Secondly, to reflect on how the general EM readers and policy makers react to the study finding. It could be suggested that this study might give them some insight into formulating future recommendations, and provide them with a clearer understanding of what senior doctor triage can and cannot offer in the present environment and other suggestions derived from interview data that could be tested in the future.

### Data analysis

The text data produced from the interviews were analysed using a form of thematic analysis which is called Template analysis (TA). The main feature of this approach is that the researcher produces a list of codes (a template) which represents the initial key themes identified in the text data which can later be modified and supplemented with lower order codes during data analysis. This method is described by King (174–177). It differs from the conventional thematic analysis as it allows the use of the template of initial themes to start the analysis. The initial template is often constructed based on the interview schedule, the academic literature, the researcher’s own personal experience, anecdotal and informal evidence and exploratory research.

1. Justification of the analysis method chosen
2. Corresponds with the research method: This technique is most often applied to analyse interview data alongside other qualitative research methods (174).
3. Within and across case analysis: while other approaches require the researcher to analyse each transcript separately before attempting any integration of the full set of cases, this technique means that the researcher does not need to begin preliminary coding for the next and subsequent transcripts. The analysis is carried out through an iterative process of applying, modifying and re-applying the initial template. The researcher can, therefore, handle larger data sets more comfortably (174–177).
4. Corresponds with the sample size: It is recommended that this technique is more suitable to analyse interviews of a sample size higher than 10 participants. Therefore, since the study sample size was 27 individuals, this technique was used (174–177).
5. Use of priori themes and use of initial template: This technique allows the researcher to develop themes *in priori* i.e. in advance which can be withdrawn from the literature and exploratory work and can later be amended during data analysis. The initial themes were developed based on the survey and the interview schedule that reflect the key concepts of the study. TA also insists that the initial template is used tentatively, with the possibility that priori themes may need to be refined or discarded (174–177).
6. Practicality: This technique is easier to apply than other forms of qualitative analysis, especially in analysing a large amount of text data. The use of priori themes, the initial template, and the flexibility in continuously developing the final template as guided by the interview data means it is less time-consuming than other methods (174–177).

Regarding disadvantages of this technique, it can be argued that the lack of substantial methodological literature on this kind of analysis may result in over simplistic or over complicated templates (176). Yet, the literature has greatly evolved since its description in the 1990’s and several chapters on this mode of analysis in several sources were published.

1. The analysis process

*Priori themes*

Main ideas for priori themes were developed during the transcription process and were drawn from the survey and interview questionnaire. A sheet listing and defining these themes was used. Six main themes were identified in priori before starting the preliminary coding. See **Table** 10.

The next step was reading through the transcripts for familiarisation and checking for any possible errors in transcription. The first transcript was taken and every section of text that appeared to offer something relevant to answer the research question was marked and a preliminary code was given. If a section of text emerged that could be encompassed by one of the priori themes, this was noted in the margin. This was done using Nvivo 11 software.

**Table** 10 **Priori themes and their definitions**

|  |  |
| --- | --- |
| Description of senior doctor triage | Include: frontloading investigations |
| Positive aspects of SDT | Include: frontloading investigations |
| Negative aspects of SDT | Include: holding up ambulance queue |
| Reasons behind SDT establishment | Include: clinician-led, managerial-led |
| Challenges and barriers to continuing SDT | Include: Staffing, ED crowding |
| Solutions proposed to improve SDT | Include : Resources |

*Parallel coding*

TA allows parallel coding which is a process where the same segment of text is classified within one or more different codes at the same level. This was used where one segment of text reflected more than one code.

*Initial template*

A key aspect of TA is the decision of when to start to develop an initial template which is normally based on a sub-set of data. Generally, the more diverse the transcripts, the more transcripts are needed to be analysed before producing an amendable initial template (174). In the case of this study, there were four groups of staff interviewed and therefore, transcripts from each staff group were read before formulating the initial template. This was developed by grouping the preliminary codes into meaningful clusters so hierarchical and lateral relations between themes can be defined. There were a number of priori themes that did not fit on the template and simply marked as uncategorised at this stage. See **Table** 11 for the initial template, Table 12 for the modified template.

*Integrative theme*

The initial template included one integrative theme which is referred to as a theme that pervades much of the data, cross-cutting all or the majority of the thematic clusters. In this study, many participants referred to ED crowding and exit block consistently and continually throughout the interviews.

**Table** 11 **The initial template**

|  |
| --- |
| 1. Description of SDT   - Early diagnosis of time critical cases  - Focusing initial investigations  - Improving ED targets and ED disposition rate |
| 1. Positive aspects of SDT  * Related to the interviewee   + - SDT purpose changes with ED crowding     - Job satisfaction * Related to patient experience * SDT as a safety mechanism * Early assessment and diagnosis * Early patient interaction with a doctor * Related to overall ED environment   + - Sense of control over patient flow     - Could have an influence on disposition rate |
| 1. Negative aspects of SDT      * Related to the interviewee   + - Process can be repetitive and boring     - High intensity and turnover of patients may result in burnout     - Lack of consistency of approach between and across clinicians and across times of the day.  1. Leaving unpredicted gaps in triage 2. Approachability of senior clinicians    * + Some clinicians are better suited to perform rapid assessment than others  * Related to patient experience * Often lack of confidentiality and privacy * Related to overall ED environment * SDT personnel distracted by other issues in the department * Questionable use of consultant resource * Might affect junior doctors’ training |
| 1. Decisions leading to SDT establishment    * Organisational/Managerial    * Target-led    * Evidence-based    * Clinician-led |
| 1. Barriers and difficulties interfere with SDT  * Barriers identified at personal level * Lack of interest from some clinicians * Lack of training in rapid assessment * Barriers identified at organisational level   + - ED crowding     - Lack of appropriate space to perform SDT     - Insufficient staffing     - Exit block |
| 1. Solution proposed to improve SDT process  * Solution directed at staff   + - Staff to be able to choose to ‘ sign up’ to undertaken SDT shifts     - Sufficient training in rapid assessment and pre-hospital triage     - Dedicated personnel for SDT     - Support from other health care professionals * Solution directed at ED environment   Resources   * + - Dedicated space/cubicle for SDT     - IT support     - Staffing * Solution directed at wider NHS level * Creating exits ‘outs’ to improve patient flow following SDT. |
| Integrative theme  ED crowding   1. The business of the department can determine SDT purpose 2. Rate/pace of patient arrivals can determine the success of SDT process. |

SDT, senior doctor triage

Table 12 The modified template

|  |
| --- |
| 1.Description of SDT  - Early diagnosis of time critical cases  - Focusing initial investigations  - Improving ED targets and ED disposition rate |
| 2.Positive aspects of SDT   * Related to the interviewee   + - SDT purpose changes with ED crowding     - Job satisfaction * Related to patient experience * SDT as a Safety Mechanism * Early assessment and diagnosis * Early patient interaction with a doctor * Direct handover from paramedics * Focus investigations and avoid unnecessary tests * Early treatment * Early referral to specialities * Related to overall ED environment   + - Sense of control over patient flow     - Could have an influence on disposition rate     - Could speed up triage     - Could improve handover targets |
| 3.Negative aspects of SDT     * Related to the interviewee   + - Process can be repetitive and boring     - High intensity and turn-over of patients may result in burnout     - Lack of consistency of approach between and across clinicians and across times of the day.   1.Leaving unpredicted gaps in triage  2.Approachability of senior clinicians   * + - Some clinicians are better suited to perform rapid assessment than others     - Unrealistic expectations from senior doctors     - Limited amount of time per patient * Related to patient experience * Lack of confidentiality and privacy * Related to overall ED environment * SDT personnel distracted by other issues in the department * Questionable use of consultant resource * Might affect junior doctors’ training * Lack of exists 'outs' * Lack of IT tools to make it worthwhile |
| 4.Decisions leading to SDT establishment   * + Organisational/Managerial   + Target-led   + Evidence-based   + Clinician-led   + Patient volume -led safety mechanism |
| 5.Barriers and difficulties interfere with SDT   * Barriers identified at personal level * Lack of interest from some clinicians * Lack of training in rapid assessment * Degree of antipathy towards it * Barriers identified at organisational level   + - ED crowding     - Lack of appropriate space to perform SDT     - Insufficient staffing     - Exit block * Specialities reluctant to take patients who are not fully assessed * Discharges rates, ED targets were not necessarily changed * Patient cohort and ageing population |
| 6.Solution proposed to improve SDT process   * Solution directed at staff   + - Staff to be able to choose to ‘ sign up’ to undertaken SDT shifts     - Sufficient training in rapid assessment and pre-hospital triage     - Dedicated personnel for SDT     - Support from other health care professionals     - Minimising unwanted variability and clear definition of tasks expected of each member of triage team     - Training of senior doctors in rapid assessment and pre-hospital triage     - Training and empowering junior staff and paramedics and include the senior doctor triage in new joining staff induction package if this model is used in their department. * Solution directed at ED environment      * + - Dedicated space/cubicle for SDT     - IT support     - Staffing     - More research * Solution directed at wider NHS level * Creating exits ‘outs’ to improve patient flow following the assessment process. |
| Integrative theme  ED crowding  The business of the department can determine SDT purpose  Rate/pace of patient arrivals can determine the success of SDT process. |

IT, Information technology

*Final template*

On reviewing the previous template with my supervisors, several categories were thought to be repetitive; others thought to be too detailed. These categories were collapsed together. The final template was structured as follows and contained six major themes. See **Table** 13

**Table** 13 **The final template**

|  |
| --- |
| 1 Participants’ experience with senior doctor triage in the ED and their understanding of its purpose(s)  - Early diagnosis of time critical cases / Patient safety mechanism  - Focusing initial investigations  - Improving ED targets and ED disposition rate  2 Reasons behind establishment of senior doctor triage in the ED  - Organisational or managerial – led  - Target-led  - Evidence-based  - Clinician-led  - Patient safety-led  3 What are the positive aspects of senior doctor triage in the ED  - Risk management and safety mechanism  - Early patient focused investigation and treatment  - Educational opportunities  4 What are the negative aspects of senior doctor triage in the ED  - Questionable use of the senior doctor resource  - Unrealistic expectation of what can be achieved by senior doctors at the front door  - Person-dependent practice  - Influence on other ED staff    5 Barriers to implement and maintain senior doctor triage in triage (SDT)  - Team structure  - ED services  - ED flow  - Patient demography  6 Suggested solutions for EDs considering establishing or maintaining senior doctor  initial assessment in the ED  - Training and definition of tasks, expectations.  - Structure of team  - Resources  - More research |

### Trustworthiness of the data

The quality and rigour of qualitative research continue to be criticised by positivists. To combat this, a range of strategies were developed by qualitative research advocates to make sure that qualitative work is academically sound. The following four trustworthiness criteria widely described by qualitative research experts were adopted and applied to this particular study (178,179). See **Table** 14.

1. Credibility or ‘Truth value’ is where the researcher attempts to demonstrate and present a true picture of the phenomenon under scrutiny. This is considered as one of the most important criteria for establishing trustworthiness. Several techniques were used to meet this criterion (178,179).
2. The adoption of a well-established research method (178,179)

Semi-structured qualitative interviews were conducted with health care professionals via the telephone. This is a well-established qualitative research method which was used repeatedly in healthcare settings. The line of questioning i.e. the topic guide, was developed based on the literature and expert reviews. It was also piloted with two participants. Therefore, a well-designed study is ought to enhance the credibility and therefore the trustworthiness of the data.

1. One of the described techniques to enhance credibility is the development of early familiarity with the participating organisations (178). This serves to assist the research to develop an understanding of the organisation and establish trust between the researcher and the participants. This was not achieved in every case because of the nationwide distribution of the participating sites and issues with obtaining authorised access to these sites. However, this was partly achieved by preliminary visits to Sheffield teaching hospital EDs and consultation of the participating hospital websites.
2. Triangulation (178,179)

This may take two forms, the use of different methods to collect the data, for example, observation and interviews. The other form of triangulation involves the use of a wide range of informants or data sources. Some researchers also refer to site triangulation where the researcher aims to recruit participants from different sites rather than a single site. This can eliminate or reduce the effect of particular local factors peculiar to one institution on the study. In this interview study, various health care professionals from different emergency departments across England were recruited. This can verify individual experiences and viewpoints against each other and therefore increase the credibility of the study.

1. Tactics to ensure honesty in informants when contributing data

Potential participants were sent a study invitation and information sheet and were free to decide whether or not to participate in the study. They were free to ask questions or inquire about any possible issues with regard to data security and confidentially. An emphasis that data would be coded and no one apart from the research team would have access to the identifiable participant list. Participants were encouraged to be open, express their opinions and share their experiences.

1. Frequent debriefing sessions with my supervisors (178,179)

Discussion of my encounters and progress with my supervisors during the course of the pilot interviews and the interviews served to widen my vision and horizon. Supervisors were able to share their experiences and commented on several issues. These included the addition of ED managers to the study population which required an ethics amendment, revision of the topic guide and revision of the initial template.

1. Peer scrutiny of the research project (178,179)

The study was presented to delegates and professionals at the Royal College of Emergency Medicine Conference, where questions and observations from the audience helped to develop a greater explanation of the results. Such individuals provided a fresh perspective on the data, that I might not be able to bring with a real detachment as the study investigator.

1. The researcher’s ‘reflective commentary’ (178,179)

A reflective commentary to evaluate the project as it developed was kept; this served to evaluate the effectiveness of the techniques that were used. Writing informal short reflective comments assisted me to perform better as an interviewer with each subsequent interview. The reflective comments also assisted me to enhance my tactics, ensure honesty in informants and build rapport with the participants.

1. Background, qualification, and experience of the researcher(178,179)

In qualitative research, the credibility of the researcher is particularly important since as it is the person who has the major responsibility for data collection and analysis. Although this is the first qualitative study that I have undertaken, I had appropriate training during my master’s and my PhD through taught modules in qualitative methods. This, along with consultation of relative resources and literature, served to ensure that I acquired the appropriate skills to conduct this study.

1. Member checks (178,179)

This is considered as an important element to strengthen the study credibility. Although the investigator did not have the opportunity to undertake individual member checks due to time constraints, a sample of participants, including a nurse and a senior doctor, were asked to verify whether the investigators’ emerging themes and inferences truly captured the participants’ opinions. They agreed on the emerging themes but the senior doctor suggested the emphasis on cost implications of senior doctor triage should be made clearer.

1. A detailed description of the phenomenon under study can help to promote credibility as it means that the actual situations investigated under the study are conveyed (178,179). In the results sections, a dense description of the participants’ viewpoints and experience of senior doctor triage was provided and any clear contrasting perspectives were highlighted.
2. Examination of previous research findings can evaluate whether the study findings corresponded with the available literature (178,179)

There is the first qualitative study in this respect, but there are several quantitative studies which were examined (51). Initial findings confirmed similar concerns documented previously in the literature with regard to this model.

1. Transferability

In quantitative research, external validity refers to the extent to which the results of one study can be applied to the wider population. Qualitative research, on the other hand, is concerned with a small number of individuals and environments and therefore it is widely argued whether it is possible to conclude that its findings are transferable to other situations and populations (178,179). Experts in qualitative research have proposed several elements that should be described by the researchers to assist the reader to decide whether they can relate the findings of the study to their own institution (178,179).

a) The number of organisations taking part in the study and where they are based;

b) Any restrictions on the type of people who contributed data;

c) The number of participants involved in the fieldwork;

d) The data collection methods that were employed;

e) The number and length of the data collection sessions;

f) The time period over which the data was collected.

Therefore, a detailed description of the above elements was provided in the methods and the results section but the location of the trusts was not revealed to protect the confidentiality of the participants.

1. Dependability

Dependability in qualitative research is equivalent to the concept of reliability in quantitative research, where it refers to the concept that if the work is to be repeated by a different individual in similar circumstances, it would be possible for them to make similar conclusions (178,179). While this proves to be difficult in qualitative research, since analysis can depend on the interpretation of the individual researcher, the researcher should make a detailed description of their method and analysis in a way that allows others to repeat the study. In this project, every effort was made to describe the research design, methods, and data collection in detail.

1. Confirmability

Confirmability in qualitative research is comparable to the concept of objectivity in quantitative research, where the investigator must take steps to ensure that the study findings convey the experiences and views of the participants, rather than the ideas and preferences of the researcher(178,179).

Several strategies were adopted to maximise confirmability of the study findings(178). Firstly, triangulation of the data sources where participants with different backgrounds in healthcare were interviewed in order to enrich the data and reduce investigator bias. In addition, a clear admission of the researcher’s belief and assumptions was provided in the reflexivity section. Another strategy was to provide an in-depth description of the methods to allow for research results to be scrutinised. The researcher also highlighted the possible shortcomings in the study’s methods and their possible consequences on the study findings. Finally, an audit trail was used to keep a record of steps taken from the interviews to final results reporting, this included keeping a record of the coded transcripts, a record of various versions of the templates, and summary of the discussions with the supervisors with regard to data collection and analysis. This serves to make the process as transparent as possible, to increase the integrity of the research.

**Table** 14 **Trustworthiness quality measures used in this study**

|  |  |
| --- | --- |
| **Criteria** | **Quality measures used** |
| Credibility | Detailed description of methods  Triangulation of data sources  Tactics to ensure honesty and openness in participants  Frequent debriefing sessions with my supervisors  Peer scrutiny of the research project  Researchers’ reflective commentary  Members checks |
| Transferability | Detailed description of study participants and participating sites  In-depth description of the methods |
| Dependability | In-depth description of the methods  Reflexivity section |
| Conformability | In-depth description of the methods  Triangulation of data sources |

### Summary of main ethical issues and how they were addressed

Navigating one’s way through the appropriate approvals process is described as an essential part of a learning experience of a student researcher such as myself (180). As mentioned earlier, this study involved surveying and interviewing health care professionals and analysing retrospective data. Appropriate ethical approvals were sought from the School of Health and Related Research Ethics Committee (ScHARR). Two ScHARR ethics committee approvals were granted for surveying and interviewing healthcare professionals respectively. With regard to the quantitative study, both data sets (HES and SitRep) used in the retrospective data analysis study were publically available online and therefore, no ethical approval was needed to access or use this data.

### Anonymity, confidentiality and data storage

The names and identities of participants were coded during data collection and analysis with regard to the survey and interviews. The names of hospital sites were also coded for the retrospective secondary data analysis study. The data was stored in an encrypted computer in a locked office in the Innovation Centre at the University of Sheffield. This information was only accessible to the student investigator and project supervisors. This project was supported by the Collaboration for Leadership in Applied Health Research and Care (CLAHRC) and University of Sheffield, School of Health and Related Research. These two bodies have very strict data storage criteria which were followed stringently by the student. All research information will be destroyed 5 years after the study ends.

### Conclusion

This chapter described the qualitative methods, their purpose, and data collection and analysis techniques used. It finally incorporated a section on the ethical considerations taken in the quantitative and qualitative studies.

# Chapter Four Results

# Section I Senior doctor triage; towards an evidence-based practice

### Introduction

This meta-theme draws findings from both the qualitative and quantitative studies. It first reports the extent to which senior doctor triage is used in English EDs and whether it can truly make a difference in ED performance based on the survey and secondary data analysis findings. This is followed by the description of the healthcare professionals and other participants’ perceived reasons behind the application of this model. The participants’ documented reasons behind the establishment of senior doctor triage can assist to interpret and understand the quantitative data findings based on the participants’ experiences rather than mere assumptions.

### 4.1.1 What is the extent to which senior doctor triage is used in EDs across England and the typology of the SDT models used?

For the survey purposes, senior doctor triage was defined as an EM senior doctor at registrar level or above involved in the initial assessment of patients at the front door.

Responses were received for more than two-thirds of the 171 surveyed EDs with a 69.6% response rate (119/171). Responses were received from a variety of ED sites situated in different parts of England with around 29 EDs (24%, 29/119) affiliated with teaching hospitals. Senior doctor triage was applied in a large number of the responding EDs (**51**/119, 42.8%) across England for either ambulance arrivals (n=49) or walk-in patients (n=21) including 19 EDs that used this model for both patient categories. Clinicians reported different models for senior doctor triage including single senior doctor triage, senior doctor triage with registered nurses, advanced nurse practitioners or general practitioners. According to the survey, the most commonly used SDT model was combined senior doctor and registered nurse triage which was used, for ambulance arrivals in 32 EDs (26%,32/119) and for walk-in patients in 11 EDs (9%, 11/119). See **Table** 15.

**Table** 15 **Types of senior doctor triage reported for both ambulance arrivals and walk-in patients**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Senior Doctor Triage model | For ambulance  arrivals (N=30) | For walk-in  patients (N=2) | EDs with SDT for both walk-in patients and ambulance arrivals  N = 19 | |  |
| For ambulance arrivals | For walk-in patients |  |
| Single senior doctor triage | 5 | - | 4 | 3 |  |
| Senior doctor triage with registered nurse (RN) | 23 | 1 | 9 | 10 |  |
| Senior doctor with advanced nurse practitioner (ANP) | 2 | 1 | 4 | 1 |  |
| Senior doctor with RN and ANP | - | - | 2 | 3 |  |
| Senior doctor triage with RN and General practitioner (GP) | - | - | - | 1 |  |
| Senior doctor triage with RN, ANP and GP | - | - | - | 1 |  |
| Total | **30** | *2* | **19\*** | *19\** | Total n of SDT for ambulance arrivals **49**  Total n of SDT for walk-in patients 21 |
|  |  |  |  |  |  |

ANP; advanced nurse practitioner; RN, registered nurse; SDT, senior doctor triage

\* In the same 19 EDs, senior doctor triage was used for both walk-in patients and ambulance arrivals.

Out of the fifty-one EDs with SDT, thirty-seven established senior doctor triage in 2012 with the earliest reported year being 2004 (31%, 37/119). This was only guided by a locally developed written protocol in 29 responding EDs (24%, 29/119). SeeTable 16**.**

**Table 16 Time of introduction of senior doctor triage and whether it was guided by locally developed protocols**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year of introduction of senior doctor triage** | **Number of EDs** | **Development of written protocol on senior doctor triage** | **Number of EDs** |
| Before 2012 | 4 | EDs with written protocol | 29 |
| 2012 | 37 | EDs without written protocol | 17 |
| 2014 | 17 |  |  |
| Missing | 10 | Missing | 5 |
| **Total** | **51** |  | **51** |
|  |  |  |  |

With regard to the hours of operation of senior doctor triage, this differed according to the mode of patient presentation but it was mostly implemented from late morning to evening on weekdays only. ED clinicians also described in free-text that the hours of operations depended on ED crowding and that this model can be used when ‘the ED begins to fill up’ (Response #5). See **Table** 17

On the other hand, of remaining 68 EDs (57.1%, 68/119) that did implement senior doctor triage, 29 EDs (24%, 29/119) trialled SDT in the past which was then suspended for different reasons reported later in this chapter.

**Table** 17 **Hours of operation of senior doctor triage for ambulance arrivals and walk-in patients**

|  |  |  |
| --- | --- | --- |
| **Hours of operations of senior doctor triage** | **SDT For ambulance arrivals**  **Number of EDs** | **SDT For walk-in patients**  **Number of EDs** |
| 9 am to 5 pm Monday-Friday  9 am to 5 pm seven days a week  Late morning to evening Monday-Friday  Late morning to evening seven days a week  Sporadic, dependent on ED crowding  Missing data | 3  4  6  4  5  27 | 3  4  6  3  3  2 |
| **Total 51\*** | **49\*** | **21 \*\*** |

\*49 EDs include 30 EDs where senior doctor triage was used for ambulance patients only and 19 EDs where this model was used for ambulance and walk-in patients. This column focused on hours of operation of senior doctor triage model when it was used for ambulance arrivals

\*\*21 EDs include 2 EDs where senior doctor triage was used for walk-in patients only and 19 EDs where senior doctor triage was used for both walk-in patients and ambulance arrivals. This column focused on hours of operation of the model when used for walk-in patients

Finally, **Table** 18 shows the number of ED services in EDs with senior doctor triage versus those without SDT. This information was collected to serve as a confounding variable for the secondary data analysis study. It showed that number of facilities in EDs with SDT is generally higher than those without senior doctor triage (mean number of ED services is 7 in EDs with SDT versus 4 in those EDs without SDT).

**Table** 18 **ED services used for improved patient flow for EDs with and without senior doctor triage**

|  |  |  |  |
| --- | --- | --- | --- |
| **ED services and facilities** | | EDs with senior doctor triage  for either walk-in patients or  ambulance arrivals  (N=48, missing 3, Total = 51) | EDs without senior doctor triage  (N=64, missing 4, Total = 68) |
| Clinical decision unit |  | 29 (60.4%) | 26 (40.6%) |
| Ambulatory care unit |  | 32 (66.6) | 24 (37.5%) |
| Urgent care centre |  | 24 (50%) | 16 (25%) |
| Co-located GP clinic |  | 30 (62.5%) | 29 (45.3%) |
| Thrombosis Unit |  | 6 (12.5%) | 5 (7.8%) |
| Chest pain clinic |  | 4 (8.3%) | 3 (4.6%) |
| Stroke unit |  | 18 (37.5%) | 16 (25%) |
| Advanced nurse practitioner service |  | 20 (41.6%) | 15 (23.4%) |
| Pre-hospital triage service |  | 6 (12.5%) | 1 (1.56%) |
| See and treat service for minors patients |  | 28 (58.3%) | 27 (42.1%) |
| Nurse requested X-ray service |  | 32 (66.6%) | 37 (57.8%) |
| Occupational and Physiotherapy service |  | 30 (62.5%) | 26 (40.6%) |
| Mental health service |  | 30 (62.5%) | 26 (40.6%) |
| Other |  | 2 (4.1%) | 5 (7.8%) |
| **Total** |  | **291(606%)\*** | **265(414)\*** |

\* EDs could report more than one facility which is why the sums add up to more than 100%

### 4.1.2 Do Trusts with a senior doctor triage model achieve better or worse with regard to emergency department quality indicators?

After identifying the two groups of EDs with senior doctor triage 51/119 (42.8%) versus without senior doctor triage 68/119 (57.1%) via the national survey, a retrospective study comparing the ED performance of the two groups against ED quality indicators from July 2014 – June 2015 at NHS Trust (NHST) level using statistical significance testing, subgroup analysis and visual traffic light table presentation as described in the methods. This time period was selected as it covered the most up-to-date ED performance data available at the time of the secondary data analysis study.

Although the survey identified the triage practices in 119 EDs, the results shown here represent NHST level data of 107 NHSTs. The number of trusts with senior doctor triage is 49 (45.7%). The number of NHS Trusts without senior doctor triage was 58 (54.2%). This is to reflect that there were 28 Trusts with multiple EDs and in 12 cases, both EDs that belonged to the same Trust responded to the survey questionnaire. In case multiple ED Trusts practised various triage models, they were classified in the senior doctor triage group if at least one of the EDs applied a form of senior doctor triage.

1. Statistical significance testing across ED quality indicators (primary and secondary outcomes)

Firstly, K-S normality test along with histograms were used to examine the normality of data distribution across ED quality indicators, it showed that the primary outcomes 1, 6 and 7 were normally distributed (data distributions were not significantly different), and therefore a parametric test, Independent T-test was used while a Mann-Whitney test was used for remaining outcomes because of the skewed distribution of the data. See **Table** 19**.**

**Table** 19 **Kolmogorov-Smirnov Test of normality of data for each of the measured outcomes**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Kolmogorov-Smirnova | | |
| Statistic | df | Sig. |
| **Primary outcomes**  Outcome 1 % Patients who left without being seen/treated | .065 | 101 | .200 |
| Outcome 2 % Patient re-attendances within 7 days | .171 | 101 | .000 |
| Outcome 3 Time to initial assess ambulance arrivals in minutes | .383 | 101 | .000 |
| Outcome 4 Time to treatment in minutes | .099 | 101 | .016 |
| Outcome 5 Total time in ED For all patients in minutes | .136 | 101 | .000 |
| Outcome 6 % Patients who waited 4 hours or less via | .075 | 101 | .181 |
| Outcome7 % Emergency Admissions | .049 | 101 | .200 |
| **Secondary outcomes**  Outcome 1 Total time in ED for admitted patients | 0.161 | 46 | 0.004 |
| Outcome 2 Total time in ED for non-admitted patients | 0.291 | 46 | 0.000 |

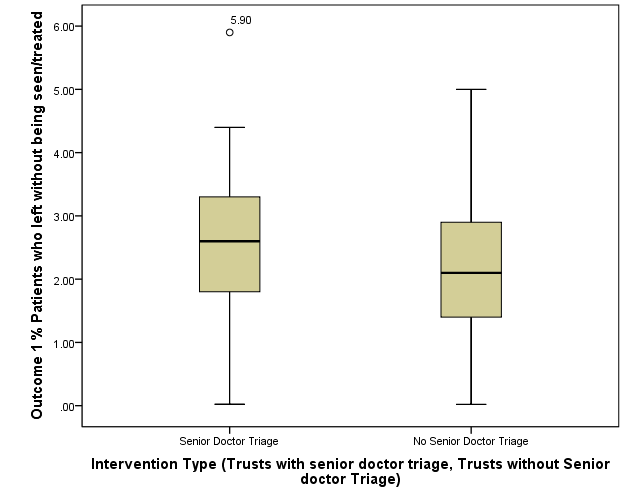
ED emergency department

**Primary outcomes**

1. Percentage of patients who left without being seen or treated

The percentage of patients who left without being seen (LWBS) was similar amongst NHSTs regardless of their triage practice. The mean percentage of patients who LWBS for NHSTs with SDT was 2.51 % (SD 1.19) versus 2.13 % (SD 1.14) for those trusts where SDT process was either suspended or had not been introduced into their emergency department triage practices (P value 0.102, CI – 0.77-0.83). Therefore, both NHST groups performed well within the recommended cut-off point of 5%. See **Figure** 9

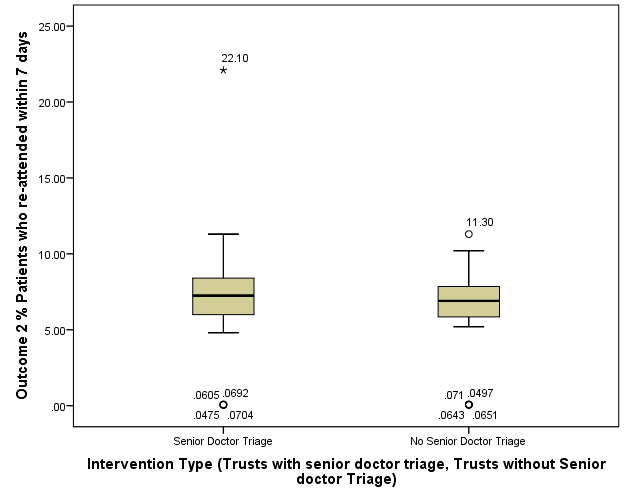
As can be seen, there is one outlier in the senior doctor triage group where the proportion of LWBS was 5.9% of the total patient population of this hospital which received an average of 91, 785 patient attendances in the 2014-2015 year period (NHST code 15).



**Figure** 9 **Comparison of % of patients who left without being seen in NHS Trusts with and without senior doctor triage**

1. Unplanned re-attendances within 7 days

There was no significant difference between NHSTs with or without SDT. Both appear to perform poorly on this ED indicator with its highest accepted limit of 5%, with a median of 7.25% (IQR 6-8.4%) and 6.9% (IRQ 5.8-7.9%) for NHS Trusts with and without SDT respectively (P 0.275). See **Figure** 10. There is one Trust in the SDT group that performed particularly poorly on this indicator. This Trust had a single ED but received in excess of 254,000 patient attendances for the studied period. It performed poorly in all indicators except LWBS (NHST code 37).

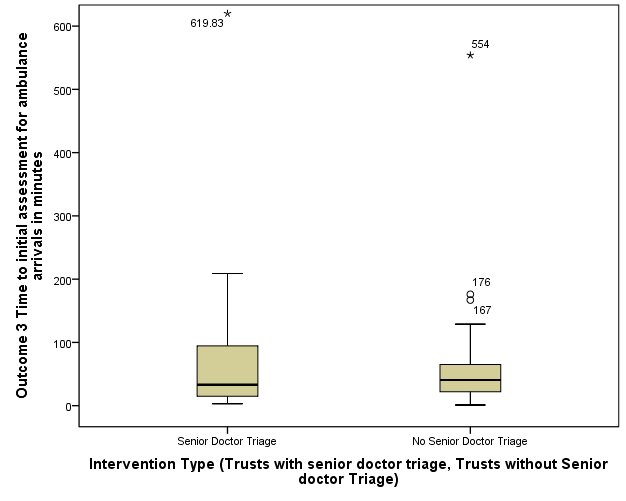


**Figure** 10 **Comparison of % of Patients who re-attend within seven days in NHS Trusts with and without senior doctor triage**

1. Time to initial assessment for ambulance arrivals

The performance of all Trusts with regard to time to initial assessment for ambulance arrivals was similar. There was a small subset of trusts that met the target of 15 minutes and the remaining trusts did not achieve this target. This applied to all NHSTs despite the fact that some applied senior doctor triage while the others did not. In NHS Trusts with SDT, the median time to triage was 33 minutes (IQR 15-95) compared to 41 minutes (IQR 22-65, P-value 0.617) in those without SDT. Although there was an 8-minute difference in favour of SDT, this difference was not statistically significant and arguably not clinically significant.

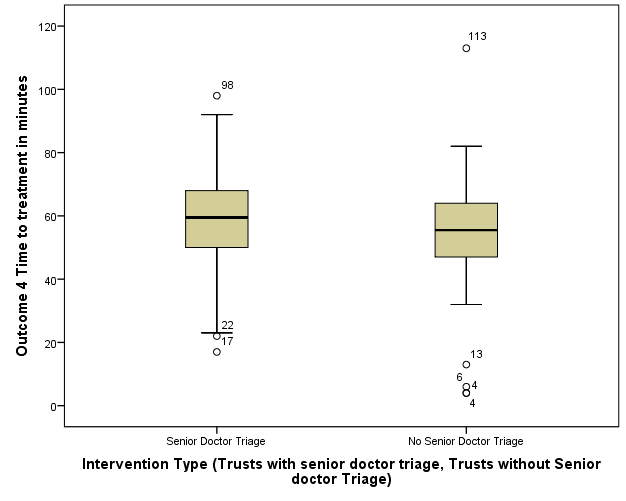
There are a couple of outliers that are shown in **Figure** 11 where time to initial assessment was more than 9 hours (NHST code 52, no SDT) and 10 hours (NHST code 46, SDT). This was checked with the original dataset and found to be accurate. Both of these NHS Trusts have a single ED with less than 100,000 attendances per year.



**Figure** 11 **Comparison of Time to initial assessment (minutes) in NHS Trusts with and without senior doctor triage**

1. Time to treatment

Once again, the performance of different NHS Trusts in relation to time to treatment did not vary greatly in relation to the adoption of the process of senior triage. The median time to treatment in NHSTs with SDT was 60 minutes (IQR 50-68). In comparison, NHSTs without SDT achieved a median time to treatment of 56 minutes (IQR 47-64, P-value 0.171). See **Figure** 12. Again, the figure shows a number of outliers, but upon checking the original data, both of the outliers above the IQR were Trusts with a single ED. Patient attendances varied (Code 79, no SDT, time to treatment 113 minutes, 62 251 patient attendances/year; Code 5, SDT, time to treatment 98 minutes, 153 825 patient attendances/year). The other NHS Trusts outlying below the IQR, were all single ED Trusts receiving a mean of around 79 000 patient attendances a year.



**Figure** 12 **Comparison of Time to treatment (minutes) in NHS Trusts with and without senior doctor triage**

1. Total time spent in the emergency department for all patient attendances (Length of stay)

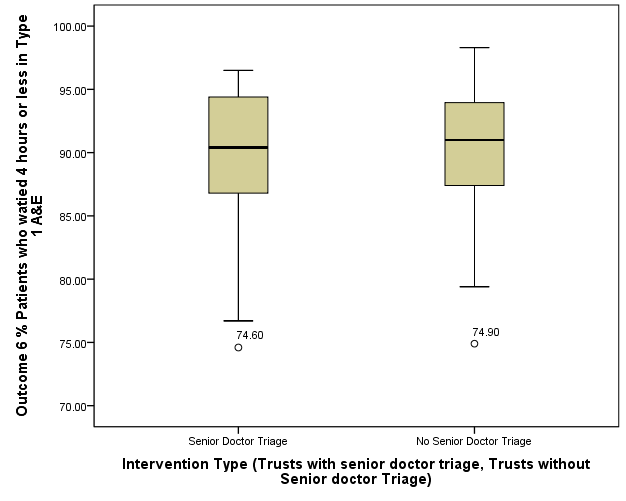
There was no statistically significant difference in the total time spent in the emergency department for all patient attendances with a median of 334 minutes (IQR 270-408) for NHSTs with SDT compared to a median of 317 minutes (IQR 266-408, P value 0.383) for NHSTs without SDT. See **Figure** 13. The figure also shows one outlier in the SDT group where the total time spent in the ED for all patient attendances was more than 13 hours in the SDT group (NHS Trust Code 21, 91 569 patient attendances/year).



**Figure** 13 **Comparison of total time (in minutes) patients spent in NHS Trusts with senior doctor triage versus those without senior doctor triage**

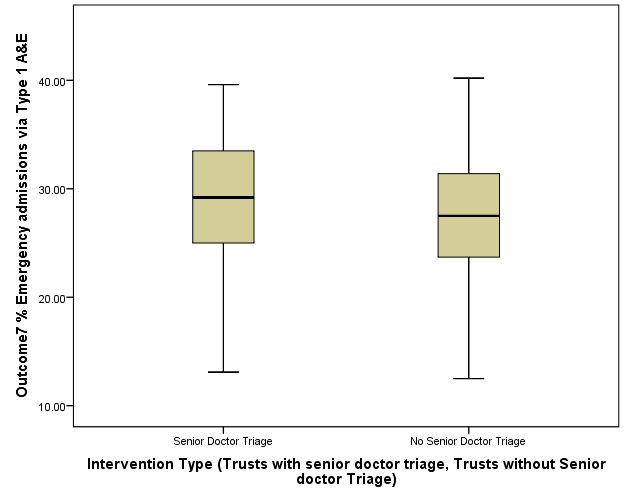
1. Percentage of patients who spent 4 hours or less in the emergency department

There was no statistically significant difference in the percentage of patients who spent 4 hours or less in the emergency department with a mean of 89.97% (SD 4.77) for NHSTs with SDT compared to a mean of 90.3% (SD 4.71) for NHSTs without SDT (P value 0.728, CI-2.16-1.5). See **Figure** 14.



**Figure** 14 **Comparison of % of patients who waited 4 hours or more in NHS Trusts with senior doctor triage versus those without senior doctor triage**

1. Percentage of patients who were admitted to the hospital (from type I EDs).Finally, there was no measurable effect of senior doctor triage on the percentage of admitted patients as compared to NHSTs without senior doctor triage. There was only a slight difference in admission rates between the two groups with a mean of 28.53% (SD 5.9) versus 27.32% (SD 5.8) in NHS Trusts with senior doctor triage and those with no senior doctor triage respectively (P value 0.297, CI -1.07 - 3.48). See **Figure** 15**.**



**Figure** 15 **Comparison of % of emergency admissions in NHS Trusts with and without senior doctor triage**

**Secondary outcomes**

### The impact of senior doctor triage on total length of stay for admitted and non-admitted patients

1. Total time in the ED for admitted patients (length of stay)

The median total time for admitted patients spent in the emergency department was 468 min (IQR 424-603) in Trusts with senior doctor triage versus 487 min (IQR 378-579) in NHS Trusts without senior doctor triage. There was no statistically significant difference (P value, 0.234).

1. Total time in the ED for non-admitted patients (length of stay)

Similarly, there was no statistically significant difference in the amount of time the non-admitted patients group spent in the emergency department. The total length of stay in the emergency department for non-admitted patients in NHSTs with senior doctor triage was 8 minutes shorter than the length of stay for the same group in NHSTs without senior doctor triage (median LOS 250 minutes (236-266) versus 242 minutes (235-273), P value 0.714). See **Table** 20

**Table** 20 **Comparison of Emergency department quality indicators between NHS Trusts that employ (or did not employ) senior doctor triage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality indicators** | **NHS Trusts with Senior doctor triage (n=49, 45.7%)** | **NHS Trusts without Senior doctor triage (n=58. 54.2%)** | **P Value (Confidence Interval)** |
| Proportion of patients who left without being seen (mean %,SD) | 2.51 (1.19) | 2.13 (SD 1.14) | 0.102 (-0.77 - 0.83) |
| Proportion of patients who re-attend within 7 days (median, IQR, %) | 7.25(6-8.4) | 6.9(5.8-7.9) | 0.275 |
| Time to triage for ambulance arrivals (median, IQR, min) | 33(15-95) | 41(22-65) | 0.617 |
| Time to treatment (median, IQR, min) | 60 (50-68) | 56(47-64) | 0.171 |
| Total time spent in the ED (median, IQR, min) | 334 (270-408) | 317(266-408) | 0.383 |
| Percentage of patients who spent 4 hours or less in the ED (%, mean, SD) | 89.97 (4.77) | 90.3(4.71) | 0.728 (-2.16-1.5) |
| Proportion of ED patients who were admitted to the hospital  (%, mean, SD) | 28.53(5.9) | 27.32 (5.8) | 0.297(-1.07-3.48) |
| Total time in ED for admitted patients (median, IQR, min) | 468 (424-603) | 487 (378-597) | 0.234 |
| Total time in ED for non-admitted patients  (median, IQR, min) | 250 (236-266) | 242 (235-273) | 0.714 |

\*Data extracted from Hospital Episode Statistics (HES) and situation reports (SitRep ) data and compiled into yearly averages and percentages calculated based on a total number of patients attendance ( July 14 – June 15). n represents the number of NHS trusts – not the number of emergency departments.

1. **Subgroup analysis**
2. Subgroup analysis was conducted for Trusts with a single ED only. This was performed in an attempt to eliminate the effect of Trusts with multiple EDs with different triage practices. Twenty-eight NHS trusts with multiple EDs were excluded. Relevant statistical tests were performed for the remaining seventy-nine NHS Trusts with data missing for two trusts. **Table** 21 demonstrates that NHSTs without senior doctor triage performed slightly better on all measured outcomes apart from time to initial assessment (40 minutes versus 34 minutes, P 0.915) than NHSTs with senior doctor triage. Once again, there was no statistically significant difference in ED performance between the two trust groups. Therefore, subgroup analysis could not explain the fact that there was no difference in ED performance between the two groups.

**Table** 21 **Comparison of emergency department quality indicators for Trusts with a single type I emergency department (Trusts with more than one ED were excluded)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality indicators** | **NHS Trusts with Senior Doctor-led Triage (n=38, 49%)** | **NHS Trust without Senior Doctor-led**  **Triage (n=39, 50.6%)** | **P Value (Confidence Interval)** |
| Proportion of patients who left without being seen (mean %,SD) | 2.54 (1.14) | 2.2 (1.1) | 0.224(-1.97-0.832) |
| Proportion of patients who re-attend within 7 days (median, IQR, %) | 7.10 (6.2-8.3) | 6.5 (5.8-7.8) | 0.219 |
| Time to initial assessment for ambulance arrivals (median, IQR, min) | 34 (15-95) | 40 (22-69) | 0.915 |
| Time to treatment (median, IQR, min) | 58 (50-66) | 57 (47-70) | 0.618 |
| Total time spent in the ED (median, IQR, min) | 337 (288-401) | 311 (258-399) | 0.164 |
| Percentage of patients who spent 4 hours or less in the ED (%, mean, SD) | 89.72 (5.79) | 91.14 (4.18) | 0.177 |
| Proportion of ED patients who were admitted to the hospital  (%, mean, SD) | 29.09(5.79) | 27.92 (6.31) | 0.399 (-1.58-3.93) |
| Total time in ED for admitted patients(median, IQR, min) | 436 (429-597) | 426 (361-589) | 0.136 |
| Total time in ED for non-admitted patients  (median, IQR, min) | 250 (237-241) | 241 (235-273) | 0.211 |

**\*28 NHS trusts were excluded. Data is presented for 77 NHS trusts with single type 1 emergency department only. Data missing for 2 Trusts; ED, emergency department.**

1. Subgroup analysis

A one-way between-group analysis of variance was conducted to explore the impact of different models of senior doctor triage on three normally distributed outcomes (proportion of patients who left without being seen, percentage of patients who spent four hours or less in the ED and the admission rate). NHS Trusts were divided into four groups (Group 1: SDT and registered nurse for ambulance arrivals, Group 2: SDT and registered nurse for ambulance arrivals and walk-in patients, Group 3: Single SDT for ambulance arrivals, Group 4: No SDT). There was no statistically significant difference in any of the outcomes at the adjusted P level of 0.016.

A Kruskal-Wallis test did not provide an evidence of a difference (p> 0.05) between the groups across the remaining outcomes where the assumption of normality for ANOVA was not met. See **Table** 22**.**

**Table** 22 **Subgroup analysis of different models of senior doctor triage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Intervention type**  **Outcomes** | **SDT and registered nurse for ambulance arrivals (n=22, 44.8%)** | **SDT and registered nurse for ambulance arrivals and walk in patients (n=17, 15.8%)** | **Single SDT for ambulance arrivals (n=5, 10.4%)** | **No SDT**  **(n=58, 54.2%)** | **P value** |
| Proportion of patients who left without being seen (mean %,SD) | 2.45 (0.938) | 2.78 (1.262) | 2.02 (1.262) | 2.14 (1.156) | 0.197 |
| Proportion of patients who re-attend within 7 days (median %, IQR) | 7.1(5.9-82) | 7.6 (7-9.2) | 6.6 (0.07-9.8) | 6.7(5.8-7.9) | 0.238 |
| Time to triage for ambulance arrivals (median, IQR, min) | 36 (16-94) | 29 (15-102) | 34 (3-620) | 41 (22-65) | 0.883 |
| Time to treatment (median, IQR, min) | 55 (49-66) | 58 (53-82) | 68 (51-77) | 56 (47-64) | 0.203 |
| Total time spent in the ED (median, IQR, min) | 346 (270-421) | 306 (266-360) | 484 (298-519) | 320 (266-408) | 0.152 |
| Percentage of patients who spent 4 hours or less in the ED (mean, SD) | 89.69 (4.28) | 91.35 (4.037) | 87.65 (6.97) | 90.29 (4.47) | 0.347 |
| Proportion of ED patients who were admitted to the hospital (%, mean, SD) | 29.06(5.21) | 27.95(6.66) | 28.57(6.49) | 27.26(5.87) | 0.647 |
| Total time in ED for admitted patients (median, IQR, min) | 463 (428-597) | 462 (424-550) | 631 (424-786) | 460 (378-597) | 0.334 |
| Total time in ED for non-admitted patients  (media, IQR, min) | 255 (236-266) | 244 (236-250) | 254 (237-317) | 242 (235-273) | 0.518 |

SDT, senior doctor triage

1. Confounding

The following 5 variables were investigated to consider their effect on NHSTs performance. Those were - NHST geographical location; number of ED services; staffing levels (for the Yorkshire and Humber region); the total number of patient attendances and their mode of arrival.

**Table** 23 demonstrates that in 3 out of the 5 variables, there was a statistically significant difference between the two NHST groups. Firstly, in NHSTs where SDT was implemented; the average number of patient attendances was significantly higher at 137 529 (SD 63011). In comparison, only 107 377 (SD 51576, P 0.008) attendances for the year 2014-2015 were seen in NHSTs without SDT. Similarly, there was a statistically significant difference in the number of patients arriving by ambulance where NHSTs with senior doctor triage received a median of 33 797 patients by ambulance (IQR 28 791- 44 877) compared to 27 602 (IQR 21 862-34 555) patients in NHSTs without senior doctor triage with a P value of 0.002. In addition, the number of ED services in terms of facilities available was statistically significantly higher in NHSTs with SDT (7, SD 3) compared with NHST without SDT (4.1, SD 2). See **Table** 23.

**Table** 23 **Patient and emergency department explanatory variables in NHS Trusts in England, stratified by the status of senior doctor triage**

|  |  |  |  |
| --- | --- | --- | --- |
| **Patient and Emergency Department Characteristics** | **NHS Trusts with Senior doctor triage (n=49,45.7%)** | **NHS Trust without Senior doctor triage (n=58, 54.2%)** | **P Value (95th CI)** |
| Geographical location (n)  North of England  South of England  Midlands and East of  England  London | 17  9  12  11 | 20  18  13  7 | 0.135 |
| Number of patient attendances to Type 1 ED (July 2014 –June 2015)  (mean, SD) | 137 529 (63011) | 107 377(51576) | 0.008 \* |
| Mode of Arrivals  (Number of patients arriving by ambulance (July 2014 –June 2015) (median, IQR) | 33 797 (28 791-44 877) | 27 602 (21 862-34 555) | 0.002 \* |
| Number of ED services (mean, SD)\*\* | 7 (3) | 4.1 (2) | 0.001 (0.8-2.9) \* |
| Total number of ED staff in Yorkshire and Humber EDs only\*\*\*(mean, SD) | 60 (19) | 43 (6) | 0.08 (- 2.5 – 37.5) |

\*Significant factor,\*\* Data from the national survey, \*\*\* Information sourced from Yorkshire and Humber Senior doctor triage face-to face survey

A two-way ANCOVA was conducted to compare the influence of senior doctor triage on ED quality indicators after adjusting for the following variables (the number of patient attendances, ED services). Levene’s test and normality checks were carried out and the assumptions were met. This was repeated for three normally distributed quality indicators (dependent variable at a time) as showen in the table below. NHSTs with and without SDT showed similar performance with regard to all measured outcomes. It should be noted that the performance of NHSTs with senior doctor triage slightly improved on all measured outcomes after adjusting for the confounding factors mentioned above. However, this was not statistically significant. See **Table** 24

**Table** 24 **The association between the senior doctor triage model and ED quality indicators by logistic regression and univariate analysis of covariance, adjusted for a total number of patient attendances, and ED services.**

|  |  |  |  |
| --- | --- | --- | --- |
| Patient and Emergency Department Characteristics | NHS Trusts with Senior doctor triage (n=49,45.7%) | NHS Trusts without Senior doctor triage (n=58, 54.2%) | P value |
| Proportion of patients who left without being seen (adjusted mean %, CI) | 2.496a (1.802-3.191) | 2.184a (1.316 – 3.334) | 0.409 |
| Percentage of patients who spent 4 hours or less in the ED(adjusted mean %, CI) | 90.18 a (87.61-92.74) | 90.54 a (88.05-93.03) | 0.461 |
| Proportion of ED patients who were admitted to the hospital (adjusted mean %, CI) | 28.22 a (24.68-31.76) | 28.22 a (28.07-30.33) | 0.96 |

a: Adjusted means and CIs

|  |
| --- |
| Covariates appearing in the model are evaluated at the following values: Number Of Facilities Available for ED = 5.99, Total Number of  ED attendances (July 2014-June 2015) = 120491.18 |

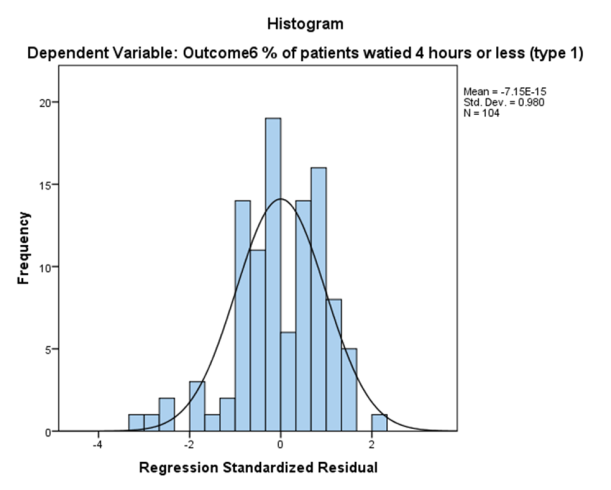
1. The relation between the four-hour target, senior doctor triage, and other variables

Multiple linear regression was carried out to investigate the relationship between % of patients who waited four hours or less and the number of patient attendances as a measure of crowding, number of ED services and whether the NHS Trust employed senior doctor triage.

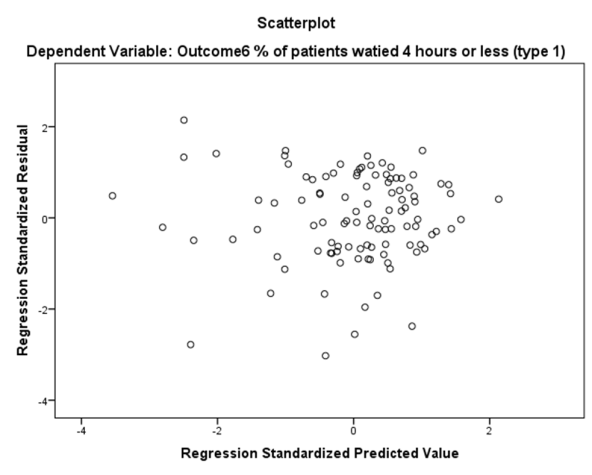
The analysis showed that there was a statistically significant relationship between the % of patients who spent 4 hours or less in the ED and a total number of patient attendances in the year 2014-15 (P 0.02). However, there was no significant relationship between the percentage of patients who spent 4 hours or less in the ED and the mode of patient arrival (P 0.702), the number of ED services (P 0.06) and the triage intervention type (P 0.725).

The regression analysis also showed that only 12.5 % of the variation in the percentage of patients who spent 4 hours or less in the ED can be explained by this model incorporating: the number of patient attendances, the number of ED services and facilities and the triage intervention type.

The scatterplot of standardised predicted values versus standardised residuals showed that data met the assumptions of homogeneity of variance and linearity, and the residuals were approximately normally distributed. See **Figure** 16 **Figure** 17.



**Figure** 16 **Normality of residuals (the residuals are approximately normally distributed)**



**Figure** 17 **Homoscedasticity (there is no pattern in the scatter. The width of the scatter, as predicted value increase, is roughly the same, therefore the assumption has been met)**

1. Traffic light visual presentation for all NHS Trusts across all indicators

The **Table** 25 below shows, at a national level, how Trusts with SDT perform against the main ED quality indicators. Each cell represents a value for the relevant quality indicator as stated in the first row of the table. There are two main observations that can be seen. Firstly, the table shows an overall variable performance across NHS Trusts that implement SDT in at least one emergency department. This ranged from a Trust score of 19 to as low as 11.

The second observation is that there is a grossly similar pattern of performance across each ED quality indicator for all NHS Trusts with senior doctor triage. For example, all NHS Trusts performed consistently well across three outcomes. These were the percentage of patients who left without being seen, time to initial assessment of patients, and admission rate. At the same time, there is also quite a similar performance across all trusts in other outcomes such as the percentage of patient re-attended within seven days, total time spent in the ED in minutes and the 4-hour target where NHS trusts scored fairly consistently poor in these outcomes. For the remaining outcome, time to treatment, there was a divide within these Trusts, where 25 NHS Trusts scored 3 (<=59 minutes) compared to 23 NHS Trusts scored 1 (more than 60 minutes) in this group.

The best performing NHS Trusts with SDT model was the NHS Trust coded 31. This NHS Trust performed within the recommended targets in 5 out of the 6 main ED quality indicators. In addition, the admission rate for this hospital was within the mean average for all NHS trusts across England. The lowest scoring NHS Trust was the NHS Trust coded 90 where only one of the main quality indicators was satisfying the recommended targets.

**Table** 26 shows the performance of the second group of NHS Trusts that do not currently implement SDT. With careful interpretation of the data shown, it is clear that the performance of this group of NHS Trusts is strikingly similar to those NHS Trusts that implement SDT (**Table** 25). The total scores ranged from 10-19. Again, the level of similarity to **Table** 25 in the performance across all the indicators is remarkable. The two observations mentioned above can similarly be applied to this group of NHS Trusts. Firstly, NHS Trusts scored similarly across most of the indicators and the one indicator where there was some variation in performance was time to treatment.

The best scoring NHS Trust was the NHS Trust coded 43 where 5 out of the 6 main quality indicators were well within the recommended limits. The lowest scoring NHS Trust, on the other hand, was NHS Trust 59 with a score of 11. This Trust failed on all ED indicators, apart from the proportion of patients who left without being seen, and admission rate in relation to the relevant recommended targets.

**Table** 25 **Emergency department clinical quality indicators scores in NHS Trusts with senior doctor triage**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **NHSTs with senior doctor triage model** | **Number of ED attendances in 2014-15** | **LWBS score** | **Patient re-attendances score** | **TTIA score** | **TTT score** | **TT score** | **4-hour target score** | **Admission rate score** | **Total score** |
| 1 | 31 | 76441 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 19 |
| 2 | 5 | 67025 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 17 |
| 3 | 73 | 58776 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 17 |
| 4 | 106 | 148269 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 17 |
| 5 | 107 | 130726 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 16 |
| 6 | 12 | 113105 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 15 |
| 7 | 25 | 185449 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 15 |
| 8 | 28 | 272310 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 9 | 55 | 74900 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 10 | 57 | 149694 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 11 | 74 | 98169 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 12 | 82 | 96308 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 13 | 85 | 120537 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 15 |
| 14 | 86 | 180070 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 15 | 93 | 133309 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 16 | 97 | 198962 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 17 | 98 | 75262 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 18 | 24 | 117608 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 14 |
| 19 | 40 | 88118 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 14 |
| 20 | 41 | 78776 | 2 | 1 | 3 | 3 | 1 | 1 | 3 | 14 |
| 21 | 42 | 113498 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 22 | 46 | 108191 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 14 |
| 23 | 51 | 90865 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 24 | 62 | 208943 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 25 | 6 | 81902 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 26 | 8 | 150873 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 27 | 10 | 259500 | 3 | 3 | 1 | 1 | 1 | 1 | 3 | 13 |
| 28 | 14 | 67850 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 13 |
| 29 | 18 | 201448 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 30 | 19 | 181055 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 13 |
| 31 | 50 | 93158 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 32 | 66 | 71449 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 13 |
| 33 | 69 | 153825 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 13 |
| 34 | 76 | 97842 | 3 | 3 | 1 | 3 | 1 | 1 | 1 | 13 |
| 35 | 77 | 56053 | 3 | 1 | 3 | 3 | 1 | 1 | 1 | 13 |
| 36 | 80 | 34304 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 37 | 13 | 70432 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 12 |
| 38 | 23 | 124486 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 12 |
| 39 | 81 | 131273 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 12 |
| 40 | 92 | 62251 | 3 | 1 |  | 1 | 1 | 3 | 3 | 12 |
| 41 | 101 | 71440 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 12 |
| 42 | 38 | 99676 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 11 |
| 43 | 44 | 78714 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 11 |
| 44 | 49 | 311797 | 3 | 1 | 3 | 1 | 1 | 1 | 1 | 11 |
| 45 | 67 | 85346 | 3 | 1 | 3 | 1 | 1 | 1 | 1 | 11 |
| 46 | 1 | 109445 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 10 |
| 47 | 64 | 75576 | 3 | 1 |  | 1 | 1 | 1 | 3 | 10 |
| 48 | 90 | 131040 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 8 |
| 49 | 21 | 146958 |  |  |  |  |  |  |  | 0 |

LWBS: left without being seen; Re-attendance: Unplanned re-attendance within 7 days; TIAA: Time to initial assessment for ambulance arrivals; TTT: Time to treatment for total patients; TT; Total time spend in the department for total patients.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indicator 1  % patient left without being seen | Indicator 2  % patient re-attended within 7 days | Indicator 3  Time to triage for ambulance arrivals (min; 95th centile) | Indicator 4  Time to treatment (min; median) | Indicator 5  Total time spent in the ED for all patients (min;95th percentile) | | Indicator 6  % of patients seen within 4 hours | Indicator 7  Admission rate | Score |
| <=4.99% | <=4.99% | <=14 | <=59 | | <=239 | <=94.99% | Mean or within 1 SD | 3 |
| 5% | 5% | 15 | 60 | | 240 | 95% | 1 SD | 2 |
| >5% | > 5% | >15 | > 60 | | > 240 | > 95% | 2 SDs | 1 |

**Table** 26 **Emergency department quality indicators scores in NHS trusts without senior doctor triage**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **NHSTs without senior doctor triage model** | **Number of ED attendances** | **LWBS score** | **Patient re-attendances score** | **TTIA score** | **TTT score** | **TT score** | **-hour target score** | **Admission rate score** | **Total score** |
| 1 | 43 | 88544 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 19 |
| 2 | 2 | 91997 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 17 |
| 3 | 48 | 187463 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 17 |
| 4 | 70 | 102957 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 17 |
| 5 | 84 | 102432 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 17 |
| 6 | 91 | 58786 | 3 | 1 | 3 | 3 | 3 | 1 | 2 | 16 |
| 7 | 3 | 220967 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 8 | 7 | 110746 | 3 | 1 | 1 | 3 | 1 | 3 | 3 | 15 |
| 9 | 9 | 103189 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 10 | 11 | 114992 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 11 | 15 | 132760 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 15 |
| 12 | 20 | 109456 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 13 | 22 | 103723 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 14 | 27 | 123552 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 15 | 32 | 226443 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 15 |
| 16 | 33 | 123113 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 15 |
| 17 | 35 | 269660 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 15 |
| 18 | 37 | 130008 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 19 | 39 | 77013 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 20 | 45 | 86734 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 21 | 52 | 65132 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 22 | 53 | 132499 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 23 | 56 | 102575 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 24 | 58 | 108440 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 25 | 60 | 78294 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 26 | 71 | 91569 | 3 | 1 | 1 | 3 | 1 | 3 | 3 | 15 |
| 27 | 72 | 81468 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 28 | 78 | 105841 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 29 | 89 |  | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 30 | 96 | 53364 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 31 | 99 | 227478 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 32 | 105 | 145730 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 15 |
| 33 | 16 | 42285 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 34 | 61 | 43809 | 3 | 1 | 3 | 2 | 1 | 1 | 3 | 14 |
| 35 | 65 | 122905 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 36 | 75 | 181045 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 37 | 102 | 45912 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 14 |
| 38 | 17 |  | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 40 | 29 | 86790 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 41 | 30 | 70501 | 3 | 1 | 3 | 3 | 1 | 1 | 1 | 13 |
| 42 | 36 | 91438 | 3 | 1 | 1 | 3 | 1 | 3 | 1 | 13 |
| 43 | 47 | 81590 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 44 | 54 | 112479 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 45 | 83 | 114660 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 46 | 87 | 254345 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 47 | 88 | 86301 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 48 | 95 | 133309 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 49 | 103 | 128011 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 13 |
| 50 | 104 | 139755 | 3 | 1 | 1 | 1 | 1 | 3 | 3 | 13 |
| 51 | 26 | 127193 | 3 | 1 | 2 | 1 | 1 | 1 | 3 | 12 |
| 52 | 68 | 104763 | 3 | 1 | 1 | 3 | 1 | 1 | 2 | 12 |
| 53 | 79 | 91785 | 3 | 1 | 1 | 3 | 1 | 1 | 2 | 12 |
| 54 | 94 | 171497 | 3 | 1 | 3 | 1 | 1 | 1 | 2 | 12 |
| 55 | 59 | 69469 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 11 |
| 56 | 4 | 338466 | 3 | 1 |  | 1 | 1 | 1 | 3 | 10 |
| 57 | 63 | 105841 |  | 3 | 3 |  | 1 | 1 | 1 | 9 |
| 58 | 100 | 145320 |  |  |  |  |  | 1 | 2 | 3 |

LWBS: left without being seen; Re-attendance: Unplanned re-attendance within 7 days; TIAA: Time to initial assessment for ambulance arrivals; TTT: Time to treatment; TT; Total time spend in the department for all patients.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indicator 1  % patient left without being seen | Indicator 2  % patient re-attended within 7 days | Indicator 3  Time to triage for ambulance arrivals (min; 95th centile) | Indicator 4  Time to treatment (min; median) | Indicator 5  Total time spent in the ED for all patients (min;95th percentile) | | Indicator 6  % of patients seen within 4 hours | Indicator 7  Admission rate | Score |
| <=4.99% | <=4.99% | <=14 | <=59 | | <=239 | <=94.99% | Mean or within 1 SD | 3 |
| 5% | 5% | 15 | 60 | | 240 | 95% | 1 SD | 2 |
| >5% | > 5% | >15 | > 60 | | > 240 | > 95% | 2 SDs | 1 |

### 4.1.3 The perceived reasons behind the establishment or piloting of senior doctor triage - Evidence from the semi-structured interviews

In total, 27 interviews were conducted with 13 consultants, 4 nurses, 7 paramedics, 2 ED managers and one junior doctor. The participating senior doctors included consultants with experience ranging from 3 to 10 years; all of the nurses were registered nurses with experience ranging from 3 to 20 years. With regard to the paramedics, their experience ranged from 6 months to 20 years.

Participants were recruited from 13 Trusts from different regions across England, seven of these hospitals applied senior doctor triage in their ED, while the remaining sites followed traditional nurse triage including four sites where SDT was trialled in the past. The performance score of these EDs ranged from 11 to 17 while the number of ED attendances in these participating sites ranged from 56 053 to 259 500 per year with a mean of 132 230 attendances per year. See **Table** 27.

**Table** 27 **Characteristics of emergency department sites participating in the interview study**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sites** | **Code** | **SDT status** | **Region** | **Number of attendances per year** | **Performance score** |
| Site 1 | 48 | No | Midlands and East of England | 187463 | 17 |
| Site 2 | 105 | No | North | 145730 | 15 |
| Site 3 | 10 | Yes | North | 259500 | 13 |
| Site 4 | 9 | No | South | 103189 | 15 |
| Site 5 | 59 | No | South | 69469 | 11 |
| Site 6 | 51 | Yes | South | 90865 | 14 |
| Site 7 | 53 | No | South | 132499 | 15 |
| Site 8 | 12 | Yes | North | 113105 | 15 |
| Site 9 | 57 | Yes | London | 149694 | 15 |
| Site 10 | 68 | No | South | 104763 | 12 |
| Site 11 | 79 | Yes | London | 91785 | 12 |
| Site 12 | 77 | Yes | London | 56053 | 13 |
| Site 13 | 23 | Yes | Midlands and east of England | 124486 | 12 |

Participants were asked to describe reasons which led them or their departments to either fully embed or trial the process of senior doctor triage, to understand whether this process was based on trial and error approach or on any particular evidence. The participants identified various reasons behind the establishment of senior doctor triage in their EDs. These ranged from senior doctor triage being a ‘popular’ model at the time to more sophisticated agendas. In one ED, the process was fully integrated for a long period of time and therefore, participants could not firmly pinpoint or recall the precise motivations behind the establishment of this process.

Some consultants described the managerial-led adoption of the process of senior doctor triage. These were typically directions or instructions from external organisations such as the Care Quality Commission (CQC). In these cases, there was a lack of a two-way negotiation or involvement of senior doctors in the decision-making process to establish senior doctor triage.

Typical comments from participants included

*‘We had a visit from the CQC, and it was them who put in the suggested action plan. So that what led to us to formally trying it, in order to prove to them that we were right and we could not do it all the time’ (Consultant P1, Site 10)*

*‘We were required to start it, we were told we could have another three consultants if we ran ratting [rapid assessment and treatment at the front door] process in the department…. I‘ve got CQC coming in a month and I am sure they are going to require it again’ (Consultant P18, Site 5)*

*‘We had a visit from the emergency care intensive support team and they said that this is one of the things that we should be doing to improve patient flow…..It was kind of an instruction really’ (ED manager P17, Site 5)*

In addition to external and managerial-initiated senior doctor triage model, in some EDs, it was a clinician-led and initiated process derived mainly by evidence from the RCEM reports or from attending conferences. However, once the clinicians initiated this triage model at their ED, ED managerial involvement also manifested later, as one consultant indicated

*‘It was just keeping an eye on the international case studies and evidence that came out but of course once you say something….then you do find the managerial team sort of jump on that, you have to take a step back and say, yes we can deliver it but it would take that number of consultants’ (Consultant P2, Site 8).*

A nurse participant also noted that *‘senior doctors wanted to take over triage ….it was actually driven by the doctors rather than by the nursing staff as far as I can tell’ (Nurse P 4, Site 2)*

Although participants quoted clinician or managerial-led SDT, some participants used SDT as a means for achieving the ambulance handover targets. Participants commented on the perceived effect of senior doctor triage on ED performance measures mainly; time to see a decision maker and disposition rate. Six participants (five senior doctors and one junior doctor) felt that early assessment of patients at the front door can positively affect ED targets and ED flow.

*‘One of the things that senior doctor triage does actually is put another person in the room and we find [that] it speeds triage up’ (Consultant P1, Site 10)*

One participant noted that ‘*part of it is trying to meet the target’* but that it was not always possible to achieve this objective.

*‘But our finding ..that by doing senior doctor triage, you certainly improve the time to see a clinician but all you did was to put people at the front of a queue of an exit blocked department’ (Consultant P12, Site 4)*

Participants commented that the senior doctor triage model can probably improve ED indicators in EDs which struggle to achieve the targets. Otherwise, in EDs where these indicators are met, senior doctor triage does not tend to make an impact.

*‘I know for lots of departments that have senior doctor triage, they improve their time to [see a] decision maker, but actually because their time to [see a] decision maker was so bad whereas ours has not been, apart from the lack of flow, we would have been consistently hitting all of the quality standards, certainly pretty consistently.’ (Consultant P22, Site 12)*

In addition to ED target-led implementation of SDT, some consultants explained that their ED employed SDT aiming for effects that manifest themselves in the present moment i.e. when the department is extremely busy and crowded to reduce the likelihood of any adverse events.

*‘The last two winters we have been extremely busy, we have brought a senior in triage, but it has not been a formalised process. It has been a case of this is where I think I am going to be most effective’ (Consultant P1, Site 10)*

*And one nurse explained ‘We started to change the programme in the ED, we reviewed our processes …. what we used to do is just bring all the ambulances in, take handover and leave them in the majors area, so actually we realised that we are not managing risk’ (Nurse P5, Site 1)*

To summarise, participants indicated five central explanations to support the launch or pilot the process of senior doctor triage. These included internal factors i.e. clinician-initiated or evidence-led, target led and patient volume controlling measure i.e. a safety mechanism, or external organisational and managerial-led factors. Yet, in almost every interview these factors appeared to be largely interwoven, intertwined and highly influenced by each other. See **Table** 28

**Table** 28 **The perceived reasons behind the application of senior doctor triage**

|  |  |
| --- | --- |
| **Reason** | **Quote** |
| External organizational or managerial led | *‘We struggled because it was imposed upon us and we were told by inspection that it would be a very good thing to do … without really engaging us and trying to understand our point of view’ (Consultant P12, Site 4)* |
| Clinician- led and / or Evidence-led | *‘It was an internal process in the ED, it is something that we were keen to set up to optimise patient care and make the most use of the senior doctors we have in the department’ (Consultant 26, Site 6)*  *‘We had a discussion and because in the literature, doctor triage is always written in a positive light, we sort of felt we couldn’t not give it a go’ (Consultant 22, Site)* |
| ED target-led | *‘You actually increase the number of people who can go in as a non-breach’ (Consultant P2, Site 8)* |
| Patient-safety measure | *‘ it tends to be something that people revert to at times of crisis, you know …listen I will just go help out in triage for a couple of hours …. To make sure people are safe rather than, you know, seeing and treating patients at the front door’ (Consultant P9, Site 13)* |

### Summary

The national online survey findings showed the extent to which senior doctor triage is applied in English EDs with around 70% response rate. Although the majority of EDs continued to use the traditional nurse triage model, there appeared to be a considerable shift towards the use of a joint senior doctor triage along with a registered nurse triage in EDs across England especially from the year 2012. Various models of senior doctor triage were reported, including single senior doctor triage, senior doctor and registered nurse or advanced nurse practitioner or both, amongst others.

But does the employment of senior doctor triage in these EDs translate to better performance in the national ED quality indicators? The retrospective data analysis study revealed the senior doctor triage model did not have an influence on any of the indicators including time to initial assessment of patients and the 4-hour target. NHSTs with and without senior doctor triage showed a similar performance with regard to all measured outcomes.

The analysis also showed that in 49 NHSTs where a senior doctor triage model was implemented, the average number of patient attendances was significantly higher compared to those 58 NHSTs without senior doctor triage model for the year 2014-2015. It should be noted that the performance of NHSTs with senior doctor triage slightly improved on all measured outcomes after adjusting a number of confounding factors. However, this was not statistically significant.

In short, examining the output of the analysis and relative statistical tests, there is insufficient evidence to suggest that senior doctor triage improves ED performance.

It can be suggested that NHSTs with high patient volume and crowded EDs revert to senior doctor triage model at times of crisis as a safety mechanism and that this model is used as a last resort in these circumstances; these speculations were confirmed when participants were asked regarding the reasons behind the establishment of senior doctor triage in their EDs in the interview study. Several explanations were quoted. These ranged from clinician-led or managerial-led initiatives to following recent evidence and case studies but some participants identified that their EDs resort to this model when their departments were failing to achieve the recommended targets.

# Section II Towards a clearer understanding of senior doctor triage

### Introduction

This section draws its findings from the qualitative interviews and presents three themes: the participants’ understandings of senior doctor triage, its positive and negative aspects. Participants were then asked to identify and elaborate the strengths and weaknesses of senior doctor triage based on their current or previous experience of this model.

### 4.2.1 The participants’ experiences of senior doctor triage

Participants shared their experiences of senior doctor triage and what this process involves. Some EDs apply such a model for walk-in patients while others for ambulance arrivals. When senior doctor triage targeted ambulance arrivals, participants described the following (subheadings in italics represent the main points):

***Managing patients’ risk – patient safety mechanism***

Several EM consultants (seven consultants) described how for them, senior doctor triage was about managing patient risk and treating acutely unwell patients quickly. An emergency consultant and ED clinical lead explained

*‘…It was about keeping patients safe’ (Consultant P2, Site 8).*

Although one junior doctor participated in this research, the junior doctor completely agreed with the previous comment. Two of the four interviewed nurses also identified patient safety as a key component of early involvement of the senior doctor where senior doctor triage was focused on the early diagnosis of time-critical cases.

Some consultants expressed the view that their role in senior doctor triage supplemented them with a sense of control over patient flow and enabled the consultant to *‘have an idea of what is going on in the emergency department’* (Consultant P25, Site 11) and ‘*have a better overview of patients in the ED especially over the winter’* (Consultant P1, Site 10).

***Early assessment, diagnostic, and treatment***

To a large number of participants, SDT was about early request of investigations and urgent interventions, twenty-one participants mentioned that senior doctor involvement at an early stage allows early accessing of focused and accurate investigation and promotes earlier decision making *‘Because you got rid of that waiting for unnecessary investigations and tests and the delay that sometimes happened’* (Consultant P1, Site 10) as one consultant explained.

One nurse highlighted that the main difference in their experience between doctor and nurse-led triage, that doctors write a provisional plan while nurses request initial relevant investigations only.

Conversely, a few participants had a different perspective including two consultants, one nurse, and one ED manager. Their view was that empowering nursing staff and further development of their nursing role and responsibilities means that senior nursing staff and advanced nurse practitioners are authorised to request investigations and prescribe treatment, therefore, can provide early initial assessment independently.

An ED consultant also stressed that occasionally, and due to the brief assessment, senior doctors might be *‘Over precautious around the use of investigation so you can end up ordering unnecessary investigations…’ (Consultant P14, Site 2).*

***Appropriate patient referral and disposition***

Participants identified early senior involvement as a means to direct the patient to the appropriate care pathway where consultants were able to make direct referrals to relevant specialities or ambulatory care pathways, or allocate the patient to the most appropriate part in the ED, or occasionally discharge the patient home. Participants commented that senior doctor triage for ambulance arrivals is mainly concerned with the ‘logistics’. Twelve participants stated that placing a senior doctor at the front door, was about making direct referrals and earlier disposition decisions regarding whether or not to admit or refer a patient and to which speciality.

*‘Try to identify what the main issues are.. try and resolve them, early accessing of required investigations……. alterations of locations, or for example, getting other inpatients team involved in their care early if that is appropriate.’ (Consultant P21, Site 7)*

*‘… Referring to ambulatory care, sometimes redirecting ...actually also identifying appropriate patients to see our GP’ (Nurse P4, Site 2)*

One participant argued that senior doctor triage should, therefore, be distinct from triage since the triage process does not involve making disposition decisions but mainly prioritising patients according to their clinical presentations.

*‘Triage is simply sorting out patients’ acuity and prioritising patients. It does not give any comment about which patients you are going to send home. I think it is important to make a distinction in language here, there is a difference between triage and having a senior doctor who can send people home’ (Consultant P12, Site 4)*

Nevertheless, patient referral and disposition at the point of triage seemed to happen in ideal circumstances only. Otherwise, participants explained that it might take a period of time to contact the person to make the referral. Participants also mentioned that specialities might be reluctant to receive patients unless fully assessed. An ED manager also highlighted that sometimes nursing staff *‘got a better grasp of what the alternatives are and what is available than medical staff because of the turnover of the medical staff in terms of their location’ (ED manager P17, Site 5).*

***Senior doctor triage for walk-in patients***

While the above-represented participants’ views on senior doctor triage for ambulance arrivals, alternatively, when this model was implemented for walk-in patients, participants noted that the senior doctor was employed as someone who can provide quick fixes to patients with minor health conditions and direct them to appropriate services. SDT was also seen as a means of identifying walk-in patients who may need urgent treatment.

Participants highlighted that senior doctor triage could include all these elements (identify critical patients and/or request investigations, and/or make referrals), yet, the practice could vary in each department with regard to which element is manifested the most. See **Table** 29and

**Figure** 18**.**

**Table** 29 **Participants understandings of senior doctor triage**

|  |  |  |
| --- | --- | --- |
| Understanding of senior doctor triage | | Quote |
| Patient safety measure in crowded EDs | | *‘It is about earlier care of sick patients… so the sick ones get picked up off the waiting queue very quickly...It is much safer [than traditional triage]’ (Junior doctor P7, Site 9)* |
| Early senior decision making | Early focused accurate investigations | *‘We make sure that the right bloods and x-rays are requested. The right immediate interventions are carried out’ (Consultant P25, Site 11)* |
| Early management planning | *‘Depending on the skill of the nurse, and also how much time they have, they will either request further investigations or not, the doctor triage will also in most cases put a provisional plan for the patient, whereas the nurses do not.’ (Nurse P4, Site 2)* |
| Logistics | *‘The kind of the thing we were told to rating [rapid assessment and treatment] is to do a quick direct referral to medics or a quick direct referral to geriatrics’ (Consultant P18, Site 5)* |
| Quick fixes | | *‘If you’re gonna [going to] have someone in triage for walk-in patients .. It should be somebody who can see something and then fix it and discharge the patient or make sure they end up going the right way’ (Consultant P9, Site 13)* |

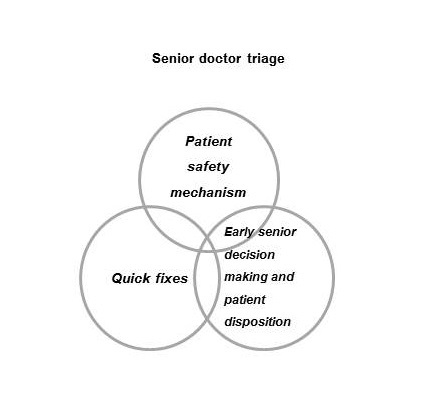
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Figure 18 The participants' experiences and views of senior doctor triage

### 4.2.2 The positive aspects of senior doctor triage

One of the main objectives of undertaking the interviews was to understand the clinicians’ perspectives of the pros and cons of the involvement of senior doctors in triage. Clinicians were asked to elaborate on ‘what has gone well and what hasn’t with senior doctor triage’.

Most of the positive aspects of deploying a senior doctor in the triage area were parallel coded with the previous theme: ‘Participants’ experiences of senior doctor triage’. The key positive aspects of senior doctor triage experienced in various sites included managing patients’ risk and promoting patient safety. In addition, early senior decision making in the patient journey, was achieved by the initiation of early focused and accurate diagnostic tests and urgent treatment by a senior experienced doctor who has the ability to send the patient to the ‘right part of the department’. More broadly, participants identified other positive aspects of senior doctor triage which included the following:

***Patient-related gains***

Participants commented that senior doctor triage is ‘good for patients’. Patients may benefit from seeing an experienced emergency doctor who can guide their management and direct their way through the department.

*‘I think senior doctor triage changes the whole atmosphere of the consultation, in as much as it is very much reassuring for relatives, I think it is reassuring for patients, I think that they see that there is somebody in charge, and that person is aware that they are in the department’ (Consultant P2, Site 8)*

*‘You can speed up things (for example sepsis) and we thrombolyse strokes as well ..so those have to be picked up quickly…so it is definitely good for patients if you can have a senior doctor at the front door’ (Consultant P1, Site 10)*

In the same context, one paramedic explained,

*‘I definitely see the benefit of seeing a doctor on arrival, because obviously they have far more clinical skills than we have, and they can start off any tests that might be required’ (Paramedic P6)*

Many participants, including paramedics, named continuity of patient care amongst the benefits of direct handover to a senior doctor for ambulance arrivals allowing direct exchange of detailed clinical information from a ‘real witness’ and preventing the loss of information along the patient journey.

*‘….a lot of your history is actually taken by the time you helped the paramedics transfer the patients from the trolley to the bed.. you’ve also got that real witness history, you don’t have to go back and look at what the paramedics wrote’ (Consultant P2, Site 8)*

*‘It feels more in depth and you have been able to give all the information that is needed …they are really listening, they want to know everything, they are paying attention to what and why you brought the person in for, they want all the details and they are figuring out where that patient is going’ (Paramedic P19)*

Otherwise, where there is no senior doctor who receives the ambulance handover, then the information can become *‘third hand and can certainly be lost’* (Paramedic P16). However, one paramedic indicated that the ability to give a detailed handover is dependent on ED crowding and patients’ volume.

*‘I think it has to do with demand because if there is a lot of demand, handover tends to be a lot briefer’ (Paramedic P6)*

***Consultant-related gains***

In terms of consultant related gains, ED consultants identified that working in the triage area improved their overview of the ED and provided them with a sense of control over patient flow as documented in the previous theme. It also allowed ED consultants to work closely with the nurse in charge and/or the ED shift coordinator and ‘that is only ever a good thing’ (Consultant P18, Site 5)

Additionally, one EM consultant revealed that they felt that using their expertise in the triage area can be a meaningful and enjoyable experience for a number of reasons.

*‘I honestly enjoy triage and personally kind of base myself around the front door …It is very one sided because I do not have lots of data to back up but I feel that when you are at the front door you kind of send people away immediately, or start investigations, by just getting people out, even if only 3 or 4 a shift, it just reduces crowding in the rest of the department’ (Consultant P1, Site 10)*

***Organisation-level gains***

With regard to ED targets, especially handover targets and time to see a doctor, these were quoted by some senior doctors to be part of the positive consequences of senior doctor triage who thought that this practice can serve to improve these ED clinical quality indicators. However, there was a quite a sharp divide and conflicting views with this regard. Most admitted that their views were not supported by any particular evidence or, at best, these opinions were based on locally conducted audits. Participants, in general, thought that the rate of ED attendances and ED crowding can determine the success of senior doctor triage.

***Other staff-related gains***

Along the aforementioned aspects, one of the other advantages of senior doctor triage at the front door for ambulance arrivals, as described by all of the ambulance clinicians and some of the consultants, was the opportunities for education and training for junior members of staff although it was acknowledged that this depended on time constraints and approachability of the doctor.

Typical comments included:

*‘I think when you have a junior doctor with you, it is a good training exercise for the junior doctor’ (Consultant P18, Site 5)*

One paramedic who also worked as a clinical supervisor explained that they encouraged paramedics to get feedback during and after handover *‘to ensure they can learn whether the treatment is correct or whether they missed the diagnosis’ (Paramedic P16)*

**Table** 30 summarises the concepts described in this theme. See below.

**Table** 30 **The positive aspects of senior doctor triage**

|  |  |
| --- | --- |
| **Positive aspect of senior doctor triage – ideally** | **Quote** |
| Patient-related gains | |
| 1.Patient safety measure (Identify the sick patients) | *‘Really sick patients get triaged straight to resus [resuscitation room], then you are managing acutely unwell patients in a much more expeditious fashion and increasing at the front door care so analgesia, anti-pyretic, and antibiotics’(Junior doctor P7, Site 9)* |
| 2.Patient interaction with a senior doctor and consultation (A senior doctor provides reassurance on the next steps in the patient journey) | *‘If you flip it and think what patients want, they are keen to be seen by someone who can make a decision early in their patient pathway, and this could be achieved by involving senior doctors in the triage’ (Consultant P26, Site 6)* |
| 3.Senior decision making (Early senior decision making of what’s going on, early investigation and treatment) | *‘The positives are I suppose is that the patient is seen really early in their way through the department by somebody very experienced and knowledgeable who can start early intervention’ (Nurse P11, Site 2)* |
| 4.Continuity of patient care (Direct handover from paramedics for ambulance arrivals) | *‘I think you get more continuity in the patient's care rather than it being a third handover … I believe that patient care is more methodical’ (Paramedic P8)* |
| Consultant-related gains | |
| 5.Job satisfaction (Enjoying the triage role) | *‘I honestly enjoy triage and personally kind of base myself around the front door’ (Consultant P1, Site 10)* |
| 6.ED management (Feeling in control of patient flow, working collaboratively with the nurse in charge) | *‘It is a good way to ensure that you know the patients in your department, you know the patients who’ve potentially got a problem, where they are, so you can keep an eye on them’ (Consultant P14, Site 2)* |
| Organisation related gains | |
| 7.Better use of resources (Avoidance of unnecessary investigations) | *‘I think senior involvement at an early stage, both shortens and focuses a patient’s journey and that is not just in the ED but that is within every hospital speciality… if you are seen by somebody who makes decisions’ (Consultant P21, Site 7)* |
| 8.Logistics (Patient allocation to appropriate care pathways) |
| Other staff-related gains | |
| 9. Opportunities for education and training | *‘I suppose a pro would obviously be education… we sometimes come with things like ECG, for example, obviously as a senior doctor, they may be able to notice something we did not, so that is always a pro’ (Paramedic P10)* |

**4.2.3** **The negative aspects of senior doctor triage**

This theme reports the perceived negative aspects of senior doctor triage at the front door according to the participants’ perspectives.

***Cost implications of senior doctor triage (Doubts over the added value of senior doctor triage)***

The first negative aspect of senior doctor triage described by twelve participants (including six consultants, two ED managers, three nurses and one paramedic) were the doubts over the added value of the use of a senior doctor to lead the triage of patients at the front door. Participants expressed concerns relating to the opportunity cost of such an intervention and explained that senior doctors might undertake repetitive tasks, which could represent an inefficient use of resources. Hence, the resource implications for establishing and maintaining senior doctor triage should be explored thoroughly before embarking on the implementation of this process.

*‘The negatives are the expense of use of the doctor really just to sit in triage, they have skills that could be used elsewhere, there are very few EDs that can spare a senior doctor at triage, where actually they needed to be at the backend, by predicting the unwell patients or helping the junior doctors or driving the department …’ (Consultant P9, Site 13)*

A consultant also highlighted that senior doctors might not add value if they undertake that very brief assessment, since the experienced nursing staff have the authority to request investigations in some EDs.

*‘Because we have a good nursing staff, we often find that patients, had the investigations already anyway, so I think in some ways putting a senior doctor in triage was taking a senior doctor off the floor to do something quite similar to what the triage nurses were doing’ (Consultant P25, Site 11).* The participant continued to describe that in EDs where there is limited consultant resource, it is important to prioritise the senior doctors’ opinion at the backend. This will, in turn, assist the consultant in making definitive decisions regarding patient care, considering that all the necessary patient information would be available at this later stage.

Although the majority of paramedic participants, in general, recognised the strengths of senior doctor triage, one paramedic participant also referred to the cost implications of the use of senior doctor triage, particularly in light of the current crisis of staff shortages.

*‘We all know that as a country we are short on doctors, so why put one behind a desk taking a handover. In my eyes, this is wasting resources’ (Paramedic P10)*

With regard to three out of the four interviewed nurses, they seemed to similarly question the use of senior doctor at the front door in terms of the cost-benefit angle.

*‘The negative can sometimes come from [that] it does not always feel like the best use of our consultant resource to have them at the front door, and whether that senior kind of doctor would be more beneficial to have them in the department supervising junior doctors and junior staff’ (Nurse P11, Site 2)*

The two ED managers who were interviewed in this study, both emphasised that senior doctors are a valuable resource to the ED. They described that senior doctor role should include managing higher intensity patients, supervising junior staff, as well as directing the department as opposed to being involved at the frontline. They also thought that it could be ‘a mistake’ to operate a medical-led triage, in terms of placement of resources.

*‘I think in terms of the negatives, I think they [senior doctors] obviously going to see patients who are seen unnecessarily by them, and that are better managed by somebody else, not with such seniority’ (ED operation manager P17, Site 5)*

***Conflicting priorities***

Another common source of criticism of this model by the majority of senior doctors (seven consultants) was the ‘unrealistic expectations’ of what can be achieved by the senior doctors, during their brief encounter with the patient.

After the triage, the senior doctor was expected to undertake initial investigations, start urgent interventions, document an initial plan, allocate the patient to a suitable space, and hand over to an appropriate member of staff, all within the space of a few minutes.

The senior doctors, particularly if not supported by a team, could be overwhelmed with the turnover of patients. This can create delays and exacerbate the patient queue at the front door.

In addition, senior doctors described how they were continuously interrupted by other responsibilities in the department. The role of senior doctor triage was, therefore, described as stressful and unrealistic.

Participants also pinpointed the fact that senior doctors were afraid of being perceived as a mere ‘receiver’ of patients and consequently might undertake a full assessment of patients, which can subsequently cause further delays.

*‘You try for a bit and then, you have been called out to do something else, and then actually it can create a little bit of a conflict because the expectation for what you can achieve is unrealistic really’ (Consultant P1, Site 10)*

*‘When you are firefighting the rest of the department, you cannot do both [senior doctor triage and ED cover]’ (Consultant P21, Site 7)*

Four paramedics and two nursing staff described their frustration with the consequences of the above. They commented that the senior doctors can ‘disappear’ from the triage area to perform other duties without communicating that to the ED staff, or get asked for their advice by junior members of staff. These conflicting demands, then, created staffing gaps in the triage area and prolonged patient queues at the front door.

*‘When the doctor deems that there is something that is more important, such as a patient going into resus, they often abandon triage …so it gets discovered by the nurse in charge, then suddenly we have to leave our nurse in charge job to cover the triage’ (Nurse P4, Site 2)*

*‘Junior doctors come in and get advice on patients who are in the department already, which again might only be a couple of minutes, but it all tends to build up’ (Paramedic P6)*

The combination of high patient volume and turnover, paralleled with unrealistic expectations of what can be attained by senior doctors in the triage role, and the tendency to create a bottleneck at the front door caused these senior doctors to consider this role as unsustainable.

***Lack of role clarity (A person-dependent practice)***

Participants described that one of the other weaknesses of senior doctor triage is that it is a person-dependant practice. There is a lack of standardisation of the process, probably stemming from the lack of clear written policies and any sort of training to perform this role. The variability of the approach of different senior doctors again created an inconsistent approach on how much gets done at this triage. This consequently provoked a degree of antipathy towards this process by senior doctors and other ED staff.

*‘I think there are complaints about the inconsistency of the process, probably inevitable because it is a very poorly defined process, no one ever actually documented what they expect me to do at senior doctor triage, so I tend to sort of make it up on the spot’ (Consultant P14, Site 2)*

Furthermore, participants expressed a view that there are specific individual characteristics which must be available in senior doctors willing to undertake this role. Certainly, the senior doctor has to be able to make quite significant decisions based on a very brief assessment. Participants noted that these personal traits should be accounted for in the staff cohort, in the implementation phase of senior doctor triage process.

*‘I think that individual people are better suited to do it than others, so I think you have to bear that in mind in your staffing structure when you are doing it… there may be some consultants who are not very good at it and therefore, they should not do it’ (Consultant P24, Site 1)*

*‘If you get someone who is slower … and not very good at dipping in and out, not finishing the story as they were, they tend to be not good people to have in the rating [rapid assessment and treatment] environment’ (Junior doctor P7, Site 9)*

Otherwise, the longer the period of triage can result in longer waiting times at the front door. For example, some consultants explained how they experienced this issue in their ED when they trialled senior doctor triage for ambulance arrivals. One of the interviewed ED managers encountered the same issue of building up of ambulance queues when they piloted senior doctor triage in their ED for ambulance arrivals.

*‘What you get is a queue of people who are waiting to be triaged and actually that defeats the purpose of a triage if you are waiting to be triaged’ (ED manager P 13, Site 4)*

***Some undesirable consequences of this model on ED staff and paramedics***

Participants elucidated on the influence of senior doctor triage on other ED staff such as junior doctors and paramedics.

Consultants and nurses thought that there could be a negative influence on the development of junior doctors’ diagnostic skills. Some commented that senior doctors’ initial treatment plan could reduce junior doctors’ autonomy i.e. the ability to make decisions independently. Participants noted that there is a risk that the ‘authority gradient’ might discourage the junior doctors from challenging the senior doctor initial diagnostic opinion when necessary.

*‘I have seen it several times when the guidance given at triage, actually following a thorough history and examination is actually no longer relevant. Yet, junior doctors do not seem to deviate from the plan because it has been made by a senior doctor’ (Nurse P4, Site 2)*

Conversely, other participants (including two nurses, one junior doctor, and four consultants) thought that a senior doctor triage plan could yield valuable educational lessons for junior doctors. They believed that the patient should be a priority, and therefore, the risk of negatively influencing junior doctors’ autonomy should not interfere with the patient care, commenting that ensuring quality care for patients should become the clinician’s priority rather than training junior staff.

Participants also highlighted that this risk is present in different clinical situations, when patient care is transferred from one clinician to another, for example, if the patient was referred from the General Practitioner with a working diagnosis. Similarly, inpatient teams seem to follow the ED clinicians’ initial diagnostic plan. These participants highlighted the importance of having a working culture within the department that encourages open discussion and dialogue amongst junior and senior staff.

*‘I think the probably more significant effect is that junior doctors are not working in the dark, they are working with a guide that has been provided by a more senior doctor seeing the patient first’ (Consultant P 25, Site 11)*

*‘I think from the patient point of view, I think it is old fashioned to say, come back at the end of the day and know they [junior doctors] have done a whole load of unnecessary things, and then you tell them how to do it properly, I think the primary thing is to do stuff the right way for the patient and then the education can follow that’ (Consultant P24, Site 13)*

The influence of senior doctor triage on other health care professionals, particularly paramedics, was explored as well. One of the strengths of senior doctor triage was the opportunity for education for paramedics as highlighted in the positive aspects of senior doctor triage theme. However, there were some undesirable aspects of paramedics’ interaction with the senior doctor as illustrated by the interviewed paramedics.

Six paramedics explained that the experience of handing over to a senior doctor, as part of the triage, can be intimidating, particularly for junior paramedics. Paramedics attributed that to the fact that consultants are highly experienced, knowledgeable and placed higher up in the job hierarchy, and therefore they might not be as approachable, so it would be normal to feel intimidated by anyone who is in a leadership position.

Although paramedics acknowledged that senior doctors take a more detailed and in-depth handover, they found that senior doctors can challenge the paramedics’ decisions to bring patients to the hospital and make comments on certain aspects of patient care. Paramedics explained that they felt that senior doctors can lack the understanding of the challenges of the pre-hospital environment as well as the confines of the paramedics’ role, especially junior paramedics, as opposed to the senior doctors’ experience and training.

*‘… the doctors do have the tendency to quiz you a bit more…which considering the amount of training they had and the amount of training we had, kind of feels a bit uneasy, you know what I mean? They are senior doctors and the staff that might be handing over to them have had 10 weeks clinical training, there is no comparison’ (Paramedic P6).* See Table 31.

**Table** 31 **The negative aspects of senior doctor triage**

|  |  |
| --- | --- |
| **Negative aspects of senior doctor triage** | **Quote** |
| 1. The cost implications of senior doctor triage (cost of employing a senior doctor to perform the triage role) | *‘Clearly, it is good for patients to see a consultant early but when you see it in the context of the resources… we were finding that trying to free up a consultant to do rating [rapid assessment and treatment ]was detrimental to the rest of the department.’ (Consultant P22, Site 12)* |
| 2. Conflicting priorities (supervision, other ED responsibilities)  The unrealistic demands on senior doctors performing this role  and interruptions ( junior members of staff asking questions about other patients in the department) | *‘It seems sometimes that you are doing 100 things at once, and you have to be really aware of how tired you are, and the safety of juggling lots of competing demands’ (Consultant P2, Site 8)* |
| 3. Lack of role clarity (The inconsistency of approach of what should/should not be achieved at this initial stage) and its consequences | *‘One of the other downs is that there isn't an overly consistent approach to have each of the doctors do that, so it will be very variable, which can be quite difficult from a nursing point of view, to kind of what to expect from who’ (NurseP11, Site 2)*  *‘Although you might have a specific programme where it might be a consultant who does the triaging, if that consultant is busy and there are nurses available to do the triage, then the nurses will do it’ (Paramedic P15)*  *‘We sort of ended up actually seeing the patients and seeing them fully, and then the knock on effect of that, clearly the more you do at the beginning, the longer it takes to do the triage, because it’s supposed to take 10 minutes, but if we then get involved, it can take longer, and then you risk delaying your ambulance off-loads’ (Consultant P 22, Site 12)* |
| 4. Some undesirable consequences of this model on ED staff and paramedics  A. Anchoring bias\* for junior doctors  B. Consultant paramedics handover issues | *‘I think you should have a real think about how would you measure the educational junior doctors’ experience, [otherwise] they just become clerking machines to refer patients to the medical team’ (Consultant P1, Site 10)*  *‘Personally I find it a little intimidating because you have to be ready and you have to get all your facts right and your observations and everything perfect really’ (Paramedic P8)* |

**\*** Anchoring bias: *a cognitive bias that describes the common human tendency to rely too heavily on the first piece of information offered (the "anchor") when making decisions* (181).

**Summary**

The interview findings elaborated that participants had various understandings of senior doctor triage and what it involves. Participants described senior doctor triage as a means to identify critical patients, produce initial management plans and make appropriate disposition decisions. Some participants thought of this model as a safety measure and a process that allowed them to have a sense of control over patient flow in the department.

Participants elucidated on what has worked well or poorly and why, discussing the positive and negative aspects, commenting on the questionable use of senior doctor resource, the unrealistic demands on senior doctors performing this role, the inconsistency of approach of what should/should not be achieved at this initial stage, and finally pinpointed some undesirable consequences of this model on ED staff and paramedics.

# Section III Barriers and facilitators of senior doctor triage

### Introduction

This section presents the barriers and challenges that faced emergency departments which employed senior doctor triage or have trialled it in the past as well as the suggested solutions to improve the senior doctor triage process. The findings are sourced from two studies. Firstly, the national online survey provided an overview of reasons for the discontinuation of senior doctor triage in some emergency departments where participants were able to select a one, or more than one, option from a list. It also provided the opportunity to add in free text any issues which have led their department to suspend the use of senior doctor triage. Secondly, the interviews provided an in-depth explanation and real individual experience of the barriers and facilitators of establishing and maintaining senior doctor triage and served to enrich the survey findings.

### 4.3.1 What are the reasons behind the discontinuation of senior doctor triage in some EDs according to the national survey?

Findings from the survey showed that 51 out of the 119 (42.8%) EDs applied senior doctor triage. In the survey, we asked if the remaining 68 EDs (57.1%) had previously operated or implemented senior doctor triage for either ambulance or non-ambulance patients. The survey showed that 29/68 (24% of the total 119 EDs) EDs have previously used or piloted SDT but this was discontinued for several reasons. The most commonly cited reasons were the lack of staff (19 EDs, 65.5%) and exit block (17 EDs, 62.9%).

In 10 EDs, clinicians stated ‘other’ reasons in free text as responsible for ceasing senior doctor triage in their departments. These were: lack of nursing staff and lack of space - cited three times as barriers to the continued employment of the SDT model in those EDs. Other documented causes were related to patient safety due to several transfers involved in one particular ED, and poor patient experience in another. See **Table** 32.

**Table** 32 **Reasons for the discontinuation of senior doctor triage model in emergency departments as identified in the national survey**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reasons behind senior doctor triage discontinuation in surveyed EDs** | | **Frequency of reason** | |  |
| Lack of Staff | | 19(65.5%) |  |  |
| Time-consuming and resource intensive process | | 8(27.5%) |  |  |
| Potential negative impact on junior doctors | | 5(17.2%) |  |  |
| Not all patients need senior doctor review | | 9(31%) |  |  |
| Senior doctor triage did not enhance patient quality of care | | 7(24.1%) |  |  |
| Exit block which senior doctor triage does not address | | 17(62.9%) |  |  |
| Other  We did not find flow was enhanced  Too many transfers involved in our model increasing risk of medical error  Insufficient resources  CQC considered it poor patient experience  Lack of nursing staff, healthcare assistants to undertake investigations  Lack of space | | 10(34.3%)  1  1  2  1  3  2 |  |  |
| **Total** | 75(258.6%)\* | | | |

\*The total adds up to more than 100% since for each emergency department, more than one option could be selected; CQC, Care Quality Commission

### 4.3.2 The barriers to establishing and maintaining senior doctor triage?

In the interviews, participants described four main barriers that posed challenges to the process of senior doctor triage.

***Single effort***

All the participating ED senior doctors referred to the importance of back up, support and teamwork in order for senior doctor triage to be functioning optimally. One consultant noted that *‘it takes a group of people to make it work’* and that single senior doctor triage *‘came to a halt’ (Consultant P26, Site 6).*

The majority of participants emphasised the pivotal role of the nursing team and health care assistants in the smooth running of the rapid assessment model. Participants described how having a consistent dedicated team can have a great impact on stability and throughput.

One consultant described the experience of working in senior doctor triage on their own as *‘inefficient and frustrating’ (Consultant P25, Site 11).*

This is because the senior doctor was responsible for undertaking a number of tasks in addition to carrying out the rapid assessment of patients as one consultant described;

*‘What we found was that the senior doctor was seeing the patient, taking the bloods, dressing the patient and doing the portering’ (Consultant P 18, Site 5).*

One consultant who experienced working in senior doctor triage within a team of nursing staff and health care workers, highlighted the importance of maintaining appropriate team structure, particularly during breaks, and referred to the value of replacing team members during these periods as well.

One nurse, on the other hand, had a different experience in their ED where the nurse elaborated how their ED trialled different team structures, including consultants with advanced nurse practitioners and/or heath care support workers, but this senior doctor triage model did not succeed since *‘some consultants actually felt that their biggest benefit was at the back door’ (Nurse P4, Site 2).*

***Resource barriers***

Participants seem to recognise that having an appropriate team structure ties in well with having appropriate resources. As one consultant stated;

*‘We do not have the staff to be able to put someone there [at rapid assessment and treatment area] without losing care from somewhere else’ (Consultant P9, Site 13).*

The three main challenges repeatedly mentioned by participants were: Staffing, IT/computer systems, and dedicated space to operate senior doctor triage.

One of the major challenges that was indicated by fifteen of the participants was staff shortages. Typical comments from emergency consultants included the following:

*‘ And certainly, at times of pressure, we could see anywhere between 60 patients or so in the majors area, all needing discussions, that is still being covered by two [consultants] which is manageable but as soon as you take one [consultant] out to the triage side then it is still manageable but really unsafe’ (Consultant P23, Site 12)*

*'We really only had the resource to staff it for 4 hours in the afternoon….and that has been quite patchy because of staffing problems’ (Consultant P9, Site 13)*

In addition to human resources, the lack of private dedicated area was a major issue across EDs, where EDs struggled to allocate appropriate space to run senior triage in a way that respected patient privacy and confidentiality. Eleven participants with various clinical backgrounds have highlighted this as one of the main problems to maintain the process of senior doctor triage.

*‘We consistently found it is difficult to dedicate a cubicle, you get somebody with diarrhoea and vomiting and they have to go into that cubicle’ (Consultant P18, Site 5)*

*‘It is done in a very limited area …we often end up having to examine people in public areas…which again is not good for privacy and patient confidentiality’ (Nurse P11, Site 2)*

One paramedic, on the other hand, had a different opinion on the use of a large clinical area for senior doctor triage, particularly ambulance arrivals:

*‘You can have a bigger bay for ambulance [arrivals] but that is not actually going to solve any problems … because nobody is able to go anywhere’ (Paramedic P 15)*

Although the lack of staffing and appropriate space troubled many ED clinicians, six participants also expressed the lack of support of a good and functioning IT system to run senior doctor triage.

One consultant said *‘It [senior initial doctor assessment] is not helped by a poor IT system so we have to make the assessment and at the same time, document this assessment, we were slowed by the IT system’ (Consultant P14, Site 2)*

Another consultant explained how the IT system caused some concerns about patient safety since ED clinicians used to document the patient assessment and initial plan, which could be erroneously interpreted by other doctors that this particular patient had been fully assessed, although this was not the necessarily the case.

*‘What we did not want for the patient, is to be seen by the early treatment team, that being documented, and because you have to put your name on it [on the patient’s case on the system], so people think “oh this patient has been seen”… that was a real concern and a real risk’ (Consultant P22, Site 12)*

***Psychological barriers (ED clinicians’ attitudes, beliefs, values and previous negative experiences and individuals’ willingness to engage in such an intervention)***

Resource and staffing shortages are intermingled with another issue that was elaborated by a small number of participants where several clinicians of different backgrounds commented that some consultants do not seem to see senior doctor triage as their role.

One consultant said *‘…so there is actually a small pool of senior doctors and, in all honesty, not all of them are capable or willing to work in triage either’ (Consultant P1, Site 10)*

Another nursing staff participant stated *‘there are not the doctors available and we’ve already seen that they are not engaged …’ (Nurse P4, Site 2)*

One paramedic also explained how some senior doctors might be pressurised to undertake this role: *‘It seems [that] it is just something they are lumbered with, I can understand to an extent because for a long time, it was the nursing staff doing it’ (Paramedic P6)*

***Organisational barriers***

Along with team structure and ED services, participants described the consequences, of exit block and how it directly interfered with the operation of senior doctor triage. Consultants, nurses and paramedics recognised that improving ED flow with senior doctor triage requires a *‘whole organisational buy-in’ (Consultant P18, Site 5).*

Consultants knew the negative influence of exit block and the value of the availability of other services on the functionality of senior doctor triage.

One consultant believed that exit block makes the whole process *‘less efficient and effective’ (Consultant 21, Site 7)*

Another consultant described that the senior doctor triage model contributed to enhancing flow in the ED *‘except of course when we ran out of beds, in which case it did not really make a difference’ (Consultant P1, Site 10)*

Another ED consultant highlighted the importance of making sure that *‘Fast track options’ or ‘outs’* are available to the doctor undertaking an early assessment of patients, otherwise, it was thought that this process *‘is not worth your time to do it’ (Consultant P2, Site 8)*

Paramedics also seem to recognise that the limited amount of hospital beds raise challenges for the senior doctor triage model

*‘It does not matter who takes the triage, if there is nowhere for people to go, there is nowhere for people to go’ (Paramedic P15)*

Even when quick direct referrals were made to inpatient teams by ED consultants, there was a difficulty in changing the working culture in the hospital where inpatient clinical teams expected that the referred patients from the emergency department should be thoroughly assessed by ED staff. It was often noticed by participants, including one consultant, that inpatient clinical teams were *‘reluctant to come and see somebody who has not been assessed a little bit more fully’ (Consultant P12, Site 4)*

On the other hand, only three participants, including two nurses, highlighted that exit block should not be seen as a barrier to the senior doctor triage process since *‘it happens regardless [of the triage model]’ (Nurse P 3, Site 3)*

*‘I suppose if you’ve got people waiting, then it is good to have them waiting and to be using their time productively' (Consultant P24, Site 13)*

In short, few participants identified exit block as a major problem but noted that it should not influence initiatives like senior doctor triage.

***Service user-related barriers (Increasing patient complexity and elderly population)***

Finally, one of the challenges highlighted by five participants was patient complexity. An elderly patient population with multiple co-morbidities and complex health and social problems may not necessarily benefit from a rapid senior review at the front door as participants described.

*‘You might get stuck up with one patient, that makes things more complex than it should be …If you are simply doing triage, you are not going to deal with the complex medical issues, complex social issues there and then’ (Consultant P9, Site 13)*

See Table 33

**Table 33 The barriers of senior doctor triage**

|  |  |
| --- | --- |
| **Barriers** | **Quote** |
| Single effort (Lack of support from other Healthcare professionals, teamwork and effective communication) | *‘ I don’t think there is any point having a senior doctor on their own …you need a team of people, otherwise, the senior doctor ends up spending their time writing out blood forms…rather than directing patient investigations and management’ (Consultant P 21, Site 7).* |
| Resource barriers  (insufficient staff, clinical areas, and appropriate IT tools) | *‘What we found is our modelling is a bit optimistic …..Really we probably need a much larger team and a much larger space’ (Consultant P25, Site 11)* |
| Psychological barriers ( ED clinicians’ attitudes, beliefs, values and previous negative experiences and individuals’ willingness to engage in such an intervention) | *‘Part of it also is that a lot of doctors do not like doing it they see it as inefficient, they see it as boring .., so there is a degree of antipathy towards it’ ( Consultant P12, Site 4)* |
| Organisational barriers  (ED flow and exit block, lack of alternative care pathways  , challenges in making patient referrals (organisation culture and resistance to change and adapt to new processes) | *‘For it to be productive you need somewhere to flow the patients to....if there is nowhere to move the patient onto, you don't particularly gain anything’ (ED manager P13, Site 4)* |
| Service user-related barriers (Increasing patient complexity and elderly population) | *‘**It worked very inefficiently…because a lot of patients coming to the hospital were elderly frail people with multiple falls and complex co-morbidities, it is inevitable that they are going to come to the hospital, so organizing blood tests, and organizing early tests probably does not make a great impact’ (Consultant P12, Site 4)* |

### 4.3.3 **The suggested solutions (facilitators) to improve the senior doctor triage process?**

In the previous theme, the barriers to senior doctor triage at the front door were summarised. Conversely, this theme captures the suggested facilitators to improve the senior doctor triage process. Participants suggested solutions and expressed their opinions regarding the ‘ideal’ senior doctor triage model.

***Research, education and training***

One of the suggested solutions is to produce clear guidelines and policies that explain what should/should not be achieved at this triage, the purpose and appropriate timing of the process. These guidelines should be guided by scientific research.

*‘We simply don’t know what senior doctor triage is for, what is good senior doctor triage and what is bad senior doctor triage? And until we do that there is probably no point trying to push people to do it one way or another’* (Consultant P14, Site 2)

This should be followed by appropriate training for existing staff, including senior doctors, nurses, junior doctors and paramedics (if involved). Training was suggested to be included in induction sessions for new staff joining the ED. Teaching and training could focus on various aspects, training the team members in what is expected from them each in terms of clinical duties, and encouraging open discussion and dialogue amongst team members.

*‘I think we need a model that creates a consistent approach so it is more standardised so that all the patients have the same input at that point’* (Nurse P11, Site 2)

*‘Structured performas for kind of the process that you do which actually guide people through it…. you can structure it more rather than relying on individuals’* (Consultant P 24)

*‘… so we teach our juniors, that it does not matter who examined the patient at the front door, that rapid assessment is very rapid, and it does not mean this is a closure’* ( Nurse P5, Site 1)

Some participants also suggested that the senior doctor might benefit from training in the pre-hospital environment. This is in order to understand the challenges that face the paramedic crews. Similarly, training paramedics in the ED environment is suggested to strengthen the existing bonds with senior doctors and assist them in gaining a better understanding of the working environment in the ED.

***Flexible individualised senior doctor triage approach***

As was explained in the negative aspects of senior doctor triage, not all staff were engaged or willing to get involved in the senior doctor triage process. One suggested solution was the recognition of staff preferences regarding whether or not to participate in this role. The ED staff should be able to opt in or out of participation in this model according to their inclinations and capabilities.

In addition, participants suggested that the senior doctor triage team who perform at triage at the front door could benefit from having regular planned breaks.

*‘Possibly having shorter periods, so you know if they are not keen particularly on doing it, at least they know that you are only doing it for an hour and then someone else is taking over’* (Paramedic P6)

*‘So if you do a 4 hour period of triage, then you may well need a break and someone else to take over from you, I would not suggest that doing a 12 hour shift doing that process is an inappropriate use of time, I think that you probably need a break after a much shorter period of time’* (Consultant P26, Site 6)

Yet, one participant noted that there might be a risk of a ‘drop in speed’ in assessing patients when another senior doctor takes over to lead the senior doctor triage process.

***Sufficient support and resources***

One of the important aspects that were emphasised by participants of different backgrounds is that senior doctor triage has to be appropriately resourced.

Resources included: staffing, dedicated clinical space, advanced technology tools, and exits (availability of appropriate care pathways).

Appropriate staffing and team structure were described as an essential requirement for the smooth running of senior doctor triage. Dedicated clinical space was also suggested as a factor that could enhance the clinical setup and protect patient privacy and patient confidentiality.

Another key resource is appropriate technology tools. Firstly, participants emphasised the importance of having a sufficient supply of computers. Participants noted that IT tools could be used in various ways to enhance the efficiency of the senior doctor triage process. Some participants described ‘electronic investigation and treatment sets’. For example, an investigation set for abdominal pain, or for a septic screen. Other participants described how a Dictaphone can be used to help senior doctors write GP letters, particularly when the senior doctor triage model was used for walk-in patients.

Other participants described the use of a direct phone instead of a pager to make the necessary referrals to appropriate specialities directly. The use of point of care testing technology was also suggested to optimise triage at the front door, drive patient safety and flow through the ED.

*‘I saw a model in X where a consultant and four health care assistants see all the walk-in patients, the consultant has a Dictaphone and dictate the notes and can get through 10 or 12 patients an hour, I think I would be happy with that, because there the consultant is working optimally, someone is seeing the patient in the cubicle and getting them undressed, doing the blood tests, ordering the investigation, moving the patients and all the doctor has to do is the actual medical part of it.’* (Consultant P25, Site 11)

In parallel with the above, the availability of referral care pathways was quoted as an important resource to facilitate senior doctor triage.

*‘I would say that another learning point we had is that there is no point getting a consultant to see them [patients] early if you don’t give them what I call ‘outs’, so if you don’t give them exits for the patients, then there is no point doing it’* ( Consultant P2, Site 8)

***Alternative models***

Finally, some participants also suggested alternative arrangements of senior doctor triage. This included ‘Roving rapid assessment and treatment’ where a senior doctor supported by nursing staff, healthcare assistants and/or junior doctors can rotate in the ED to assess patient cases and produce initial management plans. This is to replace SDT at the front door, which usually takes place in a specific geographical area in the ED. This alternative roving SDT model may prevent creating a ‘bottleneck’ at the front door. In this case, a nurse would be responsible for triaging patients and then the senior doctor supported by a team can assess the patient and direct initial management.

*‘If there is a long time to be seen by a doctor in the majors then we do something called SWAT, see with a team, which is a roving team, there is a senior doctor and a junior doctor going around, troubleshooting those patients, yeah, but it is not every afternoon in a dedicated room, it is in response to long waiting time’* (Consultant P18, Site 5)

Some participants also suggested limiting the use of senior doctor triage to a specific patient population or ‘Selective’ senior doctor triage. They suggested that there are certain categories of patients where senior doctor triage might provide greater benefit according to their experience. The most cited conditions where senior doctor triage was thought to yield great benefit, included sepsis, head injury, cerebrovascular injury, loss of consciousness and chest pain.

*‘I think if you do not do it selectively, I think that is just too much, and I don’t think you necessarily add value to each case’* (Consultant P2, Site 8)

*‘…So it was the agreement of the red flags and issues whereby the nurses would now need to get another opinion or another assessment of these cases such as trauma and hip fractures.’* (Consultant P25, Site 11)

In other words, senior doctors can do the triage selectively, and the nursing staff can be empowered to lead the triage process while the senior doctor can supervise or intervene when required.

*‘…For example, if a patient came with a head injury and we know that they need a scan … If we have certain criteria that this patient needs to go for a CT then if we empower nurses to request those investigations then there should not be actually any detrimental effect on the patient.’* (Nurse P4, Site 4)

Therefore, the main suggested solutions that might facilitate senior doctor triage process incorporated research, education and training and, flexible and individualised, yet consistent team approach, and finally, appropriate support and resources. Moreover, alternative models of senior doctor triage were suggested by some participants. See **Table** 34.

**Table** 34 **The identified facilitators of senior doctor triage**

|  |  |
| --- | --- |
| **Facilitators** | **Quote** |
| Research, education and training   * Formal training and clear definition of expected tasks to minimise unwanted variability guided by research * Encouragement of an open-discussion culture and inter-agency working between junior doctors, paramedics and senior doctors | *‘Break down the barriers between the hospital and pre-hospital care and give ED staff more understanding of what we have to do. I would like to see more senior doctors and I appreciate that they are busy.., but I would like to see more interagency working. And a flip side of that, more paramedics and ambulance staff spending time in the ED, with triage nurses, in the hospitals’ (Paramedic P20)* |
| Individualised flexible senior doctor triage approach | *‘We have what we call sessions, so we have ‘ see and manage’ sessions from 6 am to 10 pm…and people basically sign up to these as extra to their normal working week’ (Consultant P2, Site 8)* |
| Sufficient support and resources (Sufficient staffing, dedicated space for senior doctor triage, appropriate IT support, creating exits ‘outs’ to improve patient flow following the triage process) | *‘I think, in an ideal world, you will have a triage team and a senior clinician, you could have people who could be tasked, patients would move to a place and then they will get picked up by that person [senior clinician]… it does need a dedicated team and space at the front door.’ (Consultant P24)*  *‘…You have to make sure I think, that if you are seeing patients early then, you have got fast track options to begin with, if you’ve got no fast track options, it is just not worth your time to do it’ (Consultant P2, Site 8)* |

### Summary

This section summarises the barriers and facilitators of the senior doctor triage model. Clearly, the survey provided an initial insight into the some of these challenges and highlighted staffing and exit block as the main problems. Yet, the interviews addressed these challenges with a fine grain detail and presented a broader picture of the specific constraints behind establishing senior doctor triage and the suggested facilitators to improve the senior doctor triage process.

**Chapter 5 Discussion**

**Introduction**

This chapter starts by reminding the reader of the aims and methods of this research study, then it discusses key findings from the literature reviews, qualitative and quantitative elements of the study with an emphasis on presenting an integration of the findings of this mixed method study. Finally, this chapter highlights the strengths and limitations of each study and suggests implications for practice and recommendations for future research.

Initially, the systematic literature review provided a critical summary of the available evidence on senior doctor triage and identified areas for further exploration and research. During the review process, it was apparent that there was a lack of understanding of the tasks and duties of senior emergency doctors. It was challenging to assess the process of senior doctor triage without the full understanding the current role of senior doctors, in terms of how they spend their time in the ED and the type of activities which they undertake. Therefore, a review to summarise and critically appraise the literature that examined senior doctors’ duties in the ED was conducted.

The aim of the empirical research was to provide a clearer understanding of senior doctor triage, the extent to which it is applied in English EDs, identify the various models used, and whether senior doctor triage was related to better ED performance in terms of key performance metrics, such as time to initial assessment for ambulance arrivals and the number of patients waiting four hours or less in the ED. In addition, this research aimed to understand the ED clinician’s views on senior doctor triage, the reasons behind its introduction or suspension in some EDs, the positive and negative aspects and the suggested measures to improve this process.

The empirical study used a sequential mixed method design. The research questions examined various issues in relation to the use of a form of senior doctor triage process in English EDs. This presented a difficulty during the integration of the results from both elements of the study, since if all studies covered the same research questions, the comparison between the quantitative and qualitative elements would be easier. This is a recognised limitation of integration of mixed method studies. For that reason, an effort was made to compare and integrate the presentation and interpretation of the different types of data, simultaneously where possible, to increase the yield of the study in terms of the insights gained.

One aspect of the study where the integration was particularly advantageous was where the analysis combined two forms of the data to seek convergence or divergence of results. This was achieved in the meta-theme that described the challenges and barriers to senior doctor triage in English EDs. In this meta-theme, the qualitative interviews with emergency clinicians and ambulance staff assisted elaboration and cross-validation of the survey results. The barriers to successful implementation of senior doctor triage were quantified in the survey and later confirmed and explored further in the qualitative interviews.

**Key findings**

Table 35 presents the key findings of the study and illustrates the methods used to draw these findings including the literature reviews, the survey, the secondary data analysis and the interviews with ED clinicians, managers and ambulance staff. The previous evidence of mostly observational studies showed promising results where senior doctor involvement in triage resulted in better ED performance, while a review of time and motion studies of senior doctors demonstrated that the senior doctor role may be flexible to accommodate new roles such as early initial assessment in triage (Key finding 1,2). Despite this, the empirical study revealed that the involvement of senior doctors in triage in different forms (single, team approach aimed at ambulance or walk-in patients), although relatively widely used in English EDs, did not result in an overall improvement in ED performance or disposition rate in these EDs (Key finding 3,4). In addition, there is no clear consensus and clarity on the process of senior doctor triage as evidenced in the interviews (Key finding 5A). This is probably due to a combination of internal and external factors such as the complexity of defining a process that is primarily person-dependent and the relatively unpredictable nature of emergency medicine. The qualitative study also demonstrated that the application of senior doctor triage was driven by a number of factors which stems from the individual ED and staff experience (Key finding 5B).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Key findings** | **Literature review** | **Survey data** | **Secondary Data Analysis** | **Interviews with ED clinicians** |
| 1. Senior doctor triage resulted in improved ED performance in terms of a number of indicators | **Y** |  | **X** |  |
| 1. Senior emergency doctors spend one-third of their time on direct patient care, responsible for multiple patients and perform multiple tasks | **Y** |  |  |  |
| 1. The process of senior doctor triage is a relatively widely used practice in English EDs |  | **Y** |  |  |
| 1. There is no relationship between the use of different models of senior doctor triage and better performance on the key ED quality indicators. | **X** |  | **Y** |  |
| 1. A ) Emergency department clinicians have various understanding of senior doctor triage |  |  |  | **Y** |
| B ) The use of different models of senior doctor triage was driven by a number of factors  ED, emergency department |  |  |  | **Y** |

Table 35 list of key findings and its source

### Key finding 1: Previous evidence suggests that senior doctor triage can result in improved ED performance in terms of a number of indicators

A systematic review of all relevant comparative studies suggested that senior doctor involvement in triage has a number of quantifiable positive impacts on emergency department quality indicators. This included waiting time to see a doctor, total length of stay in the emergency department and percentage of patients who left without being seen. However, the evidence was mostly sourced from observational before and after studies of limited methodological quality. There were only two studies conducted in UK health care settings, both in 2004 (102,104). Subash et al conducted an RCT which employed a team of one consultant, one middle-grade doctor, two senior house officers and one triage nurse, using a resource-neutral model. The RCT duration of 8 days (where the senior doctor team was randomised to 4 days) was not long enough to make concrete conclusions (102). Although the team approach resulted in a 30-minute reduction in waiting time and a 45-minute decrease in total length of stay, the results cannot be generalised due to the limited quality of this RCT. The other English study by Terris et al 2004 was of 3 months duration and involved a team of a consultant and a senior nurse using a resource-additive model (104). However, it was also rated weak according to the EPHPP quality assessment tool. The review did not have sufficient evidence to support or reject the involvement of senior doctors in the early assessment of patients in triage, particularly in the context of the NHS.

### Key finding 2: Senior emergency doctors spend one-third of their time on direct patient care

A review of observational time and motion studies of senior emergency doctors revealed a greater understanding and useful background knowledge on the senior doctor’s roles and activities in the emergency department. This review showed that senior doctors are busy clinicians, responsible for multiple tasks. It also reported that senior doctors were responsible for seeing more than one patient concurrently. At the same time, the majority of the studies revealed that senior doctors spent a large percentage of their time on activities related to indirect patient care. However, only one of the fifteen included studies was conducted in the UK in 2000. It was a diary-based study of emergency consultants from nine emergency departments. This study did not determine any specific task categories in advance and asked consultants to report their activities on a paper-based diary. Despite the mentioned limitations, this study found that no consultant spent more than 48% of their time on direct clinical contact. This study concluded that emergency medicine is a speciality where there is no consistency between the activities of senior doctors and where there are opportunities to pursue special interests. The review of time and motion studies provided a time analysis of senior doctors which is useful to take into account when proposing an intervention to re-allocate the senior emergency doctor’s tasks to the front door.

**Key finding 3: The process of senior doctor triage is a relatively widely used practice in English EDs**

The survey study findings showed that many EDs across England apply a form of senior doctor triage and that there appears to be a considerable shift towards the use of a joint senior doctor triage along with a registered nurse in EDs across England, especially from the year 2012. However, the majority of EDs continued to use the traditional triage model where a registered nurse is designated to triage patients. There is no previous study that attempted to map out triage types and personnel involved in triage in EDs across the UK. However, anecdotal evidence suggests that nurse triage was largely used before the introduction of the ED targets which consequently led many EDs to introduce models of care to facilitate early disposition decision making in the UK and Australia (182). This has led to a need to evaluate this model of care and examine whether it can deliver safe high-quality and timely care for emergency patients.

### Key finding 4: There is no relationship between the use of different models of senior doctor triage and better performance on the key ED quality indicators

The retrospective data analysis study revealed that the senior doctor triage model did not translate to better performance in the national ED quality indicators including the 4-hour target. NHS Trusts, with and without senior initial assessment in triage, showed similar performance with regard to all measured outcomes. The analysis also showed in 50 NHSTs where a form of senior doctor triage model was implemented, the average number of patient attendances was significantly higher compared to those 57 NHSTs without a senior doctor triage model for the year 2014-2015. The performance of NHSTs with senior doctor triage slightly improved on all measured outcomes after adjusting for a number of confounding factors. However, this was not statistically significant.

Adding a senior doctor in triage was expected to decrease time to initial assessment by a doctor, however, the analysis showed in EDs with senior doctor triage that there was an insignificant decrease of 8 minutes in waiting time to see a doctor. This contrasts with the systematic review findings of previous studies that assessed SDT models, where all 11 studies showed a decrease in waiting time of around 15 minutes. Similarly, time to treatment was not significantly different between the two groups. This could be attributed to several factors. Firstly, patient volume is significantly higher in EDs with a form of senior doctor triage. Although in the surgical literature, increased patient volume is associated with better patient outcomes, in the medical literature, this association between patient volume and outcomes is less clear (183). Secondly, these findings might be explained by unmeasured confounders such as illness severity, co-morbidities and socioeconomic factors of patients as well as ED staffing levels and other available ED services.

EDs with senior doctor triage were associated with an insignificant increase of 17 minutes in ED length of stay (LOS) compared to those EDs without senior doctor triage. In comparison, the majority of the included studies in the systematic literature review of this model were associated with a decrease in ED LOS except for one randomised controlled trial by Davis et al conducted in Australia. In this study, senior work-up and assessment model was associated with a 6 min increase in ED LOS (98). A recently published study by Traub similarly reported a worsening ED LOS with senior initial assessment, and attributed this to the sequential process of SDT and a lack of coordination between the management suggested by the receiving doctor and the second ED doctor (184). It is difficult to generalise findings across different studies, but it could be argued that these issues were relevant to at least some of the English EDs where the interviewed ED clinicians raised similar challenges experienced with their model as those described by Traub (184).

The secondary data analysis study again revealed no significant changes in left without being seen rate (LWBS). These findings were not supported by the systematic review findings where 10 out of the 14 studies reported a significant decrease in LWBS rates.

Despatching a senior doctor to undertake an early assessment of patients did not improve the percentage of patients who spent 4 hours or less in the emergency department. The impact of senior doctor triage on the 4-hour target was not among the measured outcomes in the systematic literature review since it was only relevant to the UK and Australia. On reassessing the evidence, it appears that the influence of SDT on the 4-hour target, also known as NEAT (National Emergency Access Target) in Australia, was reported in three studies out of the 25 studies included in the review with variable conclusions. A comparative study in Sweden compared the percentage of patients who spend 4 hours or less across two hospital sites, it found that the senior doctor triage model was superior to nurse triage where the percentage of patients waiting four hours or less was 76% versus 59% with nurse triage (98)**.** Similarly, Asha et al found a 15% improvement in NEAT associated with the intervention of early senior assessment model (97). However, both these studies were descriptive and the latter study compared the intervention which ran on weekdays only to patients presenting the rest of the week. Both previous studies have adjusted for several possible confounders but despite that, they were limited by the difficulty of controlling all the possible confounders in complex health system related interventions.

In comparison, a randomised controlled trial by Davis showed that there was no difference in NEAT performance with a senior work up assessment and treatment model (41% (95% CI 37, 45) vs 46% (95% CI 41, *50), P = 0.09)* *(103)*. The study authors attributed that to hospital-wide issues of patient flow, namely access block. Other explanations could be the fact that waiting times can be influenced by other factors that occur after triage such as waiting for radiology and laboratory services (83).

Finally, the addition of senior doctor triage had no measurable effect on the percentage of admitted patients compared to NHSTs without senior doctor triage. The effect of senior doctor triage on patient disposition is not widely described and was not assessed in the systematic literature review, but on re-examining the 25 included studies in the review, only five studies looked at admission rate as an outcome measure. One before and after study by Imperato showed favourable results where admission rate was reduced significantly from 30% to 27.2% with Physician In Triage (PIT) (86). The remaining four studies, including two RCTs showed that disposition rate was similar with or without senior doctor assessment model (86,91,97,100).

A recent retrospective observational study by Li et al observed the impact of emergency doctors’ seniority on clinical efficiency, ED resource use, patient outcomes and disposition rate in three EDs in Taiwan for one year period. It showed that senior emergency doctors (with more than 10 years of clinical experience) take more time for order prescription and patient disposition. Yet, they order less investigations, especially for non-urgent patients and are associated with lower ED mortality rate (146). It seems therefore that the dependence of time-based measures to evaluate senior doctor triage might not show the true impact of this process since it neglects other aspects such as ED resource use and patient outcomes.

The secondary data analysis study additionally attempted to differentiate the ED performance of various models of senior doctor triage including single senior doctor triage versus senior doctor and nurse triage, targeting either ambulance arrivals or both walk-in patients and ambulance arrivals. The subgroup analysis could not find any significant differences in ED performance related to any specific model. This was also applicable to previous studies evaluating various models of senior doctor triage, where there was no evidence of a superior model in the subgroup analysis of the literature review. Despite this, evidence from the interviews suggests that participants, both senior doctors and nurses, are in favour of a team approach when it comes to early assessment and treatment of patients.

**Key finding 5A: Emergency department clinicians have variable understandings of senior doctor triage**

This was elaborated in the qualitative interviews with various clinicians. Participants adopted various understandings of the nature and degree of involvement of senior doctors in the initial assessment of emergency patients. However, it was universally understood as a process that allowed the identification and management of the ‘sick’ patients in a timely manner. The interview results found that participants had various understandings of the term ‘senior doctor triage’ and what it involves. Participants described senior doctor triage as a means to recognise the critical patients, produce initial management plans and make appropriate disposition decisions. Participants also emphasised that this model is considered a safety measure, and a process that allowed them to have a sense of control over patient flow in the department. Having said this, a recently published repeated cross-sectional survey study that evaluated the change in patient safety culture, as perceived by ED staff in two EDs, before and after the implementation of a senior initial assessment team, found a relatively small improvement in the overall perception of patient safety (185). The authors attributed that to the lack of a systematic implementation of the process as well as the lack of formal leadership or team training, which are well-documented improvement measures for patient safety (185).

### **Key finding 5B: The use of different models of senior doctor triage was driven by a number of factors**

The results suggest that ED clinicians and policy makers might not share the same aims behind this intervention. In the literature, throughput solutions, including initiatives like senior doctor triage at the front door, are usually attractive to administrators and managerial staff with a focus to reduce ED wait times, ED crowding and achieve ED performance targets (14).

Several clinicians identified that crowded EDs revert to senior doctor triage at peak times when patient volume increases and their EDs struggle to meet the recommended ED targets. Evidence from the interviews also showed that if the emergency department performance was within the recommended target, then SDT was not applied, since it was not seen as a detrimental intervention as to when the ED performance is below the recommended targets. This implies that the performance of EDs with SDT was already poor prior to the introduction of senior doctor triage leading them to resort to this intervention as a safety mechanism to recognise and treat the ‘sick’ patients in these circumstances.

*‘It often tends to be something that is instigated as a crisis management. You know we have got 5 patients waiting at the ambulance, let’s just have a quick look at the ambulance side to make sure that they are safe’* (Consultant P9, Site 13)

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**Discussion of the qualitative study findings not discussed in the key findings table**

**1: The positive aspects of senior doctor triage**

The positive aspects of senior doctor triage included a patient safety mechanism, early patient consultation with a senior doctor, early senior decision making, early patient allocation to appropriate care pathways, and continuity of patient care through direct handover to a senior doctor. Additionally, it was mentioned that this role boosted senior doctors’ job satisfaction, allowed them to focus investigations and control patient flow. Nurses, paramedics and junior doctors described the training and educational opportunities from working with senior doctors filling this role.

There is no qualitative research undertaken in this area but previous research into senior-doctor initial assessment highlighted potential benefits from this process in terms of quantifiable aspects such as enhancing patient flow and ED targets. A review of studies with variable methodological quality showed that consultant delivered care might be associated with positive aspects in several specialities including acute medicine and anaesthesia (186). Yet, it is not entirely clear how that is achieved and if additional resources might play a role in these findings.

A quantitative study by Fielding et al, on the other hand, emphasised that consultant-delivered care combined with a multidisciplinary team approach in acute medicine settings, did not make a difference to patient safety but subjective advantages identified by the team included more effective decision-making and knowledge of the hospital system (187). Additionally, a recent pre-post interventional study conducted in Switzerland by Lauks et al, showed that an early medical evaluation team was associated with an 11% increase in diagnostic radiology testing (188). This agrees with the concerns voiced by some participants in the qualitative study regarding a possible increase in investigation requests. Lauks et al recommended that future studies should discern if additional radiology tests result in a better outcome in the form of more information for colleagues downstream, or if other interpretations exist (188).

**2: The negative aspects of senior doctor triage**

The perceived negative aspects of senior doctor triage included the cost implications of employing a senior doctor to perform the triage role. Other aspects described the conflicting demands and responsibilities of senior doctors performing this role, such as ED supervision and the need for senior opinion in other areas in the ED, which can result in staffing gaps in triage and build up the patient queue at the front door.

The majority of participants expressed their concern regarding the cost value of senior doctor initial assessment at the front door. The cost-effectiveness of rapid assessment and treatment models has not been thoroughly studied. A recent Canadian study of a physician-nurse supplementary triage assessment team concluded that this it is not a cost-effective daytime strategy compared to nurse triage (189). However, it reported that this intervention has the potential to save costs if implemented during busy periods (noon to midnight), in Canadian healthcare system settings.

One of the other mentioned issues was the lack of clarity about what the role of the senior doctor is in this process, making this intervention variable and person-dependent. It could be argued that it is not possible to produce strict policies to guide this process, as the main purpose of this model is to take advantage of the senior doctors’ experience and judgment skills that could be applied differently to different presenting cases and different clinical and organisational settings. It is important to emphasise, though, that SDT should ideally be focused and brief to allow further assessment of patients by junior ED clinicians.

In this interview study, participants suggested that the high ED workload, combined with unrealistic expectations of what can be achieved by the senior doctor at this initial stage, may sometimes result in staffing gaps in triage and building up of patient queues at the front door. This contrasts with the Emergency Care Intensive support team paper which claimed that one of the advantages of SDT model is that the queues for triage and waits after triage are eliminated (1).

Interviews with paramedics suggested that senior doctors might not be well-informed about the pre-hospital environment and challenges and the bounds of the paramedic role. This is highlighted in a literature review of studies focusing on paramedic-doctor handover (190,191).

Participants also identified a number of undesirable consequences on junior doctors such as anchoring bias (*a cognitive bias that describes the common human tendency to rely too heavily on the first piece of information offered (the "anchor") when making decisions* (181)). They suggested that senior doctor initial assessment might propose a risk to junior doctors’ diagnostic skills. A recent Australian study surveyed clinicians and junior doctors after introducing senior doctor triage. In this Australian study, the participants felt that early senior input at the front door did not have any particular influence on the junior doctors’ autonomy and capability to produce a differential diagnosis (182). But there is no quantitative evidence which assesses the impact of senior doctor triage on junior doctors’ clinical and diagnostic skills.

**3: The challenges and barriers to the application of senior doctor triage**

Participants identified several barriers to establish and maintain senior doctor triage. These encompassed the senior initial doctor team structure, ED services (staff, space and IT tools), changing patient population and exit block.

One of the key cited barriers to implement senior doctor triage was the insufficient ED resources, particularly staffing. The NHS clinical workforce analysis report documented an increasing difficulty in recruiting consultants and spending on locums in mainstream specialities including emergency medicine (192). Moreover, all grades (consultants to non-training), in emergency medicine are included in the Home Office shortage occupation list (192). It is logical to suggest, therefore, that a senior doctor triage model cannot function without a properly resourced ED.

Participants described that the senior doctor triage is further complicated by a change in ED patients’ demographics with rising elderly population and their need for complex and lengthy evaluations. Various studies, mostly of a retrospective nature, examined the effect of the population ageing on emergency department speed and efficiency and concluded that time taken to manage patients increases with their age (193–195). There is no surprise that participants suggested that elderly patients with multiple co-morbidities would pose challenges to the senior doctor assessment model.

Exit block or access block was featured repeatedly in the interviews as a determinant factor in the operation of senior doctor triage at the front door. Senior front door assessment tends to focus on one segment of the emergency department. It does not tend to address wider organisational factors including exit block. A recent paper by Kreindler criticised such focused initiatives since they do not represent a coherent system-level strategy (196). Yet, Kreindler emphasised that it is important to distinguish between implementation failure and intervention failure (196). Staff described insufficient resources in terms of staffing, space and IT facilities, issues with team structure and support from other health care professionals. These barriers represent ‘implementation’ failure and do not necessarily represent the shortcomings of the intervention itself.

**4: The facilitators to improve the senior doctor triage process**

Participants suggested that there were three main concepts that might facilitate the senior doctor triage. These incorporated firstly, the delivery of a flexible individualised approach, secondly research, education and training and finally, resources.

These suggested solutions are not new to healthcare. Studies that focus on improving performance in healthcare suggest similar strategies. For example, ergonomics or human factors and system design studies in healthcare emphasise similar aspects such as the importance of optimisation of the workplace conditions for healthcare workers as well as the provision of training and support for healthcare workers (197).

It is recognised that putting those solutions into effect might not be easy. There are various known challenges to implement these solutions. Firstly, there is a loss of trained and skilled healthcare individuals due to the high turnover of healthcare staff. There is no easy solution to that, apart from wide organisational initiatives to retain trained staff. There is, secondly, the cost-consequences of the provision of all required services. Yet, a well-studied and implanted ergonomics-based model should always yield more benefit and save more money than they cost (197). And finally, the delivery of a consistent team approach is not about standardisation or reducing professional autonomy. Rather, it is about minimising unwanted variability where every doctor would have discretion to tune in the treatment to their individual patient needs yet guided by an overall structure or timeline.

**Strengths and limitations**

**1 - Mixed methods**

The use of mixed methods provided a clearer understanding of senior doctor triage than might have been attained using a one research method approach. The choice of bringing two methods together within this study was agreed upon to quantify the use of senior doctor triage practice in England and to add rich descriptions of the experiences of the various health care professionals and managerial staff regarding this model of care. The use of a mixed methods approach enabled a richer and more comprehensive understanding of the senior doctor triage process as well as providing a means to re-evaluate the secondary data analysis study findings.

The main study hypothesis was that the use of various models of senior doctor triage can result in a change in emergency department performance. It was anticipated that patterns would arise from the secondary data analysis of ED quality indicators, with the anticipation that it may show an enhanced ED performance in EDs where senior doctor triage is implemented. However, the secondary data analysis study produced an indifferent relationship between the implementation of senior doctor triage practice and ED quality indicators. The qualitative study served to understand these findings where the limited quantitative dataset prevented further scrutiny of this relationship. The qualitative interviews revealed that the reported triage model in the survey was not necessarily implemented on a consistent basis and was subject to staffing levels and ED crowding. It also revealed that there are far more factors that should be controlled in the quantitative data analysis study such as accounting for any other quality improvement projects that were taking place in the hospitals with or without senior doctor triage. These issues were identified in the qualitative study and were then used to provide an interpretation of the dataset of the descriptive quantitative study. Therefore, the use of both quantitative and qualitative approaches shed light on different aspects of the senior doctor triage model and led to a unique contribution to the available literature.

In the same way, the initial survey results identified a number of causes for the suspension of the senior doctor triage model in a number of emergency departments while the qualitative study expanded on these challenges and gave the participants the chance to describe the complex nature of these issues and enrich the survey findings. This interaction between the quantitative and the qualitative parts of the study is a main advantage of the mixed methods approach and allowed to provide a more sophisticated reporting of the study findings.

Maintaining the quality of mixed methods studies is one of the limitations of this approach where both individual components of the study must be conducted well and the resultant data is reported in an integrated model where appropriate. In order to account for this, the relevant quality assessment checks were undertaken for each study (See methods chapter), the limitations of each study were clearly acknowledged and described later in this chapter. Therefore, the overall quality of the mixed methods study was assessed.

This mixed methods study adopted a sequential explanatory design where the quantitative study facilitated the sampling of the qualitative study and the qualitative study was designed to extend the quantitative study findings. One drawback of this design is the length of time required for data collection and analysis for the two separate phases of the study. Nonetheless, the early identification of the interested participants via the survey study facilitated the good progress of the subsequent qualitative data collection.

The sample of participants in the qualitative interviews was recruited to explore a range of experiences of senior doctor triage model(s) from various health care professionals working in the emergency department. The study evolved to include the experiences and views of the paramedics, ideally, this sample would have been recruited from the same sites sampled in the interviews but this was not possible given that senior doctors did not always have the contact details of ambulance staff. Despite that, paramedics were recruited from a large geographical region with hospitals with various triage models including SDT. The ambulance staff experiences and perceptions of senior doctor triage were beneficial since it looked at a different angle of the senior doctor triage process and was informed by working with various triage models with a range of hospitals.

**2 - Quantitative studies**

1. **The Online Survey**

The online survey study identified EDs that employ different models of SDT as well as those that do not currently employ such a model. The main strength of the survey is that it was a cost-efficient and practical method. The use of an online survey allowed for a low cost and a generous reach (198). An additional strength of this survey is that the questionnaire development benefited from the previous face-to-face survey of ED triage practices used in the Yorkshire and Humber region in 2014.

Yet, one of the main limitations of the national survey study is that not all EDs in England responded to the survey. However, the participating EDs included different sized EDs situated in various areas across England and responses were received from a total of 119 EDs. Another limitation of this study is the fact that an abbreviated short online questionnaire was used which may have limited more detailed information to be collected. Still, the nature of the study and busy shift type working schedule of the respondents necessitated producing a short survey in order to obtain a good response rate. There is a potential problem that the participants might have provided the answers they believed the researcher wanted to hear, rather than their true views of the triage practices in their departments. Nevertheless, in addition to being a practical method, the online survey allowed the respondents to complete their answers without any time pressure or pressure from the researcher being present. Moreover, respondents were given the opportunity to provide anonymous answers to minimise this problem.

1. **Secondary data analysis study**

The main strength of the quantitative study was that it analysed of an up-to-date large dataset of ED quality indicators for all EDs in England for a relatively long duration of 12 months. This provided a feasible and cheaper alternative to primary data collection and analysis and allowed me to focus my efforts on combining and analysing the secondary data set in a timely manner. This was particularly important because the considerable costs and time associated with gathering the original data was eliminated. The secondary data analysis allowed me to examine the reported ED indicators in further detail than was originally reported by grouping the hospitals according to their triage practices and undertake statistical analysis to test the study hypothesis and more sophisticated statistical tests to undertake subgroup analysis and reduce potential confounding bias.

There were, however, several issues with the secondary data analysis. The main limitation of the study is that grouping hospitals to those with and without senior doctor triage was arbitrary. Senior doctor triage was not a standardised practice across these hospitals with variable purposes, structure, target patient population and times of operation. In addition, this dataset was collected at NHS Trust level where multi-ED Trusts were given the average ED indicators of their individual emergency departments. In order to account for this, two subgroup analyses were performed for NHS Trusts with a single ED only and for the different models of SDT.

Additionally, there were the limitations common to all comparative retrospective secondary data analysis studies: the dataset was not collected to answer the specific research question and therefore might lack the required rigour. Confounding is another key limitation where arguably there are numerous confounding factors that might be responsible for the apparent result of the analysis. An attempt was made to control for confounding using data from the survey and the available dataset using regression and analysis of variance tests.

The scoring system added a visual representation to the secondary data analysis and showed the striking similarities in ED performance across EDs (with, without SDT). The main drawback is that the scoring system tended to give Trusts similar scores despite the range of variation of the performance of outcomes. This is because it was created according to the recommended cut-off points. For example, if the Trust reported 61 minutes or 200 minutes for time to treatment, it would be scored red (since it is more than the recommended 60 min). Yet, these were the national targets that are currently recommended and monitored. The Trust performance was considered unsatisfactory if they failed to achieve the recommended targets by any margin. I found it too subjective to create new targets or cut-off points that lacked any evidence-base and would not reflect the current ED monitoring practices, for the sake of enhancing or manipulating the ED performance of the various NHS Trusts included in the analysis.

1. **Qualitative study**

There are a number of strengths to the qualitative study. Firstly, the semi-structured interview schedule allowed the attainment of rich information and comprehensive descriptions of variable experiences of the participants with senior doctor triage.

The one-to-one telephone interviews were also advantageous for practical reasons because of the geographical distribution of participants. It offered a convenient and flexible means to arrange and sometimes re-arrange the interviews to accommodate for any changes in the participants’ working schedule.

Although it is recognised that telephone interviews do not allow for capturing the participants’ emotional expressions and body language, my feeling is that it allowed participants to be more open about some sensitive issues such as the inter-professional working structure of senior doctor triage. This was also facilitated by my relative independence as a University PhD student researcher where participants were able to be transparent about any aspects of their experience with this model.

The findings of this study were limited by several aspects. Firstly, the dependence on convenience sampling of participants could present a limitation, yet in order to combat this, clinicians of different backgrounds as well as managerial staff, were recruited. This provided multiple data sources i.e. triangulation of data sources from clinicians with various job roles has enriched the study findings by providing a broader viewpoint into the senior doctor triage process.

There was a difficulty in recruiting a sufficient number of participants with managerial roles. Managers can provide an overall observant viewpoint into senior doctor initial assessment model. Yet, although only two managers were recruited, the overall number of participants in the study is similar to other qualitative studies and was adequate to saturate the major themes presented in the results. It is acknowledged that this research would have benefited from recruiting more participants of ED managerial positions.

Additionally, there was a gender imbalance in the sample, where male participants were twice as many as female participants. This could be a reflection of the staffing demographics of emergency medicine health care professionals. If not, the study would have benefited from interviewing more female ED clinicians to explore whether there are any issues relevant to senior doctor triage that are peculiar to them.

It could also be argued that the short duration of the telephone interviews, rather than the face-to-face long interviews, affected the study negatively. Despite that, it was essential for the interviews to be conducted in this manner to reach participants working in different EDs across England.

When interviewees were asked about the negative and positive aspects of senior doctor triage, the aim was to sensitise the readers to new ways of thinking or the potential views of the participants. Since this is a relatively under-researched area, the issue of generalizability is less relevant than to sensitise the readers to the varied experiences of respondents with this model. It was difficult to ascertain the number of participants with or against senior doctor triage because sometimes the same participants would praise and criticise a certain aspect of this process. Therefore, in this qualitative study, the focus was not on how far the data was representative of the population or how generalizable the study findings are in the pragmatic sense; what mattered was the theoretical usefulness of the concepts i.e. even if these positive or negative aspects were experienced by few EDs, it is appropriate to evaluate these issues when implementing or evaluating this process in another ED. According to Green and Thorogood, *the most appropriate way to think about generalizability in qualitative research is in terms of conceptual generalizability* (199) i.e. as many theoretical concepts were captured that other EDs could benefit from.

It is possible that the reliance of a single coder in the analysis of the interviews carried a risk of bias. Nevertheless, the fact that this study was part of student project necessitated that producing codes for the data should be carried out by the student. Besides, the supervisors scrutinised the initial template and codes and provided criticism and feedback. Additionally, to maximise reliability, a couple of participants were presented with the first draft of the data analysis to assess the primitive interpretation and provide any comments and insights (199).

Although the interviews were undertaken with a wide range of health care professionals in an attempt to achieve a maximum variation of opinions and experiences sought, it is recognised that this project lacks patients and public involvement (PPI) in the design or implementation stage. This could have enriched the study by taking into account the patients’ perspective, but due to time constraints, it was not possible to embed PPI within the project.

**Implications for practice**

The study suggests that traditional nurse triage remained the most commonly practised triage model. Facing increased ED crowding, numerous departments have implemented other triage models, notably senior doctor triage. Evidence from the interviews and the literature showed that a senior doctor triage was encouraged by different inspecting organisations such as the Care Quality Commission (CQC) and Emergency Care Intensive Support Team (ECIST). The motivation behind this is not fully understood. It could be that these bodies have adopted a narrow perspective with a poor understanding of flow improvement principles. Flow-improvement principles suggest that for any initiative to be successful, a triad of process, capacity and population should be taken into account (196). In other words, any new process should also take into account the population needs (if there is any target population – patients that would benefit more than others) and capacity (if there are other constraints in the patient journey that would limit the introduced process) (196).

Therefore, as evidence from the interviews suggests, it is essential to include ED staff in the formulation and evaluation of initiatives such as senior initial assessment. In addition, staff must have the appropriate training, level of support and sufficient resources for this model to function optimally.

The anticipated beneficiaries of this study are primarily ED managers and leading clinicians who typically have been following a ‘trial and error’ approach to establish or change the triage practices in their EDs.

Certainly, this study can provide useful insights for decision-making clinicians who are considering the introduction of innovative interventions to their EDs nationally and internationally. Based on this study, there is no significant influence of senior doctor triage on emergency department performance. However, the limited secondary data analysis study cannot serve as a ‘start-stopping’ recommendation i.e. the limited nature of the secondary data analysis is not sufficient to suggest that SDT should no longer be implemented. For EDs where senior doctor triage is implemented and where there are concerns about the efficiency of this process, it is recommended to first conduct local pilot studies without this model to see what differences may ensue before completely abandoning the process.

**Implications for research**

The systematic review revealed that previous approach to evaluate such intervention has been in the form of pre-post design studies or RCTs which do not address the multiple complex dimensions of this intervention. There are several aspects of senior doctor triage that would categorise it as a complex intervention according to Medical Research Council guidance (200). These include firstly, the *number and differences of behaviours required by those delivering or receiving the intervention* (200)*.* The qualitative study clearly suggested that SDT is a person-dependant approach that varied according to the delivering senior doctor. Secondly, *the number of groups or organisational levels targeted by the intervention* (200)*.* Senior doctor triage is targeted at different patient groups in different hospitals. This in turn interact with wider issues such as the hospital capacity and the available primary and secondary care referral pathways. There are also some concerns of the impact of SDT on junior doctors training and ability to produce a differential diagnosis. Thirdly, *the number and variability of outcomes* (200)*.* A careful consideration should be paid to the range of outcomes that should be assessed and why*.* In addition to the ED performance indicators widely used in the UK, other outcomes related to patient safety and satisfaction such as time to analgesia and time to antibiotics should be considered. Other outcomes could include monitoring any change in the patterns of investigations requests and the implications of that in terms of usefulness for colleagues down the line as well as any financial gains or losses. Besides, an attempt to measure the impact of SDT on patient outcomes such as patient mortality, near miss events, in addition to its impact on ED targets is critical. Finally, *the degree of flexibility or tailoring of the intervention permitted* (200)*.* Senior doctor triage is inconsistently implemented intervention according to the local contextual factors. Evidence from the interviews suggested that SDT was applied differently in different Trusts. It was also continuously altered and adopted according to patient demand and staffing levels within the same Trust.

Therefore, a process evaluation that utilizes both quantitative and qualitative components in a carefully phased approach to develop, test, evaluate and implement senior doctor triage is a logical next step.

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### Conclusion

This mixed methods study revealed that SDT is a complex intervention with no clear impact on ED quality indicators. The resulting insights from this study will set the stage for future work to examine the clinical effectiveness of this model accompanied by the relevant economic analysis that takes into account different local contextual factors in the form of a process evaluation study.

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# Appendices

### Search Strategy of the first systematic review: impact of senior doctor triage on ED performance measures

The following terms were used to search all specified databases from 1994 to August 2014 limited to English language publications.

**MELDINE 1994- 7 August 2014**

1. emergency department.mp. or exp Emergency Service, Hospital/

2. (accident and emergency department).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

3. exp Trauma Centres/ or trauma cent$.mp. or exp "Wounds and Injuries"/

4. exp Crowding/ or overcrowding.mp.

5. casual\*.mp.

6. or/1-5

7. exp Consultants/

8. exp Physicians/

9. doctor.mp.

10. (attending$ physician or attending doctor).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

11. (faculty physician$ or faculty doctor$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

12. senior.mp.

13. specialist.mp. or exp Specialization/

14. hospitalist.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

15. (experienced physician or experienced doctor).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

16. or/7-15

17. exp Time Factors/ or exp Waiting Lists/

18. exp "Length of Stay"/

19. exp Quality Indicators, Health Care/

20. exp Efficiency, Organizational/

21. exp Patient Satisfaction/

22. adverse events.mp.

23. exp Mortality/

24. exp Patient Readmission/ or re-attendance$.mp.

25. exp "Costs and Cost Analysis"/

26. left without being seen.mp.

27. (outcome$ or indicator$ or assess$ or scale$ or index or indices or status or questionnaire$ or instrument$ or monitor$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

28. performance measure$.mp.

29. or/17-28

30. exp Triage/

31. streaming.mp.

32. screening.mp.

33. initial assessment.mp.

34. front-end.mp.

35. front-line.mp.

36. or/30-35

37. 6 and 16 and 29 and 36

38. limit 37 to (english language and yr="1994 -Current")

### List of excluded studies of the first systematic review: impact of senior doctor triage on ED performance measures

|  |  |
| --- | --- |
| Ardagh MW 2002 | exclusion criteria : intervention ;See and treat / fast track intervention  for low acuity patients |
| Boyle 2012 | exclusion criteria : intervention evaluating the combining of AMU and ED |
| Chan 2005 | exclusion criteria : intervention ; change in Information technology staffing |
| Christmas 2013 | exclusion criteria : intervention; Consultant not involved in triage |
| Debehnke 2002 | exclusion criteria ; intervention; Emergency medicine faculty physicians were not assigned to any particular patient care team and supervised all patient care in the ED. |
| Dirando 2007 | exclusion criteria; study design : non comparative study |
| Donald 2005 | exclusion criteria ; intervention ;senior cover in ED in general rather than triage |
| Gardner 2007 | exclusion criteria; study design : non comparative study |
| Geelhoed 2008 | exclusion criteria: population ; paediatric ED |
| Goodacre 2004 | exclusion criteria ; intervention; senior cover after triage |
| Hamda 2014 | exclusion criteria; outcome measures; evaluating efficiency and accuracy of triage scales for major trauma patients |
| Holliman1995 | exclusion criteria: intervention; senior cover after triage |
| Horwitz 2009 | exclusion criteria; study design ; non comparative study |
| Kinsman 2008 | exclusion criteria; intervention; nurse triage |
| Levsky 2008 | exclusion criteria; intervention; contamination ;      'TNT team," consisting of an emergency physician or physician's assistant, a registered nurse, and a medic or civilian emergency medical technician |
| Lyons 2007 | exclusion criteria : study design ; non-comparative study design |
| Martin-Sanchez 2007 | exclusion criteria; study design ; non comparative study |
| Martyn Harvey 2008 | exclusion criteria: intervention; senior cover in ED in general |
| Nestler 2014 | exclusion criteria ; intervention; physician assistant |
| O’Connor 2004 | exclusion criteria; intervention; senior cover after triage |
| Process 1999 | Exclusion criteria; intervention; The role of consultant was to provide consults service for resident doctors regarding admission process. |
| Redmond 1993 | exclusion criteria : intervention ; see and treat model low acuity patients |
| Robinson 2008 | exclusion criteria ; intervention ; senior cover in ED in general |
| Rogers 2004 | exclusion criteria : intervention;   Author stated that ‘Consultants needed to be available for advice and supervision in other areas of the department, so could not guarantee to remain in see and treat team’ |
| Russ 2010 | exclusion criteria; intervention; senior orders at triage |
| Sanning 2012 | exclusion criteria; intervention; not fully qualified EM physician |
| Sen 2012 | exclusion criteria; intervention; senior cover in ED in general |
| Sharma 2013 | Exclusion criteria; setting; adult urgent care centre where only low acuity patients are seen. |
| Shrimpling 2002 | exclusion criteria; intervention ; contamination ;   Author stated that ‘Either nurse practitioner or a doctor were put in triage’ |
| Soong 2013 | exclusion criteria; intervention; 'We implemented a novel intervention using education, goal setting and real-time performance feedback to improve time to admission for patients referred to general internal medicine (GIM)' |
| Thornton 2008 | exclusion criteria; intervention; senior cover in ED in general. |
| White 2010 | Exclusion criteria; intervention; seeing clerked patients. Patients were initially seen by a junior doctor who completed a plan for the patient before seeking senior advice. |

### Search Strategy of the second systematic review: Understanding better how emergency doctors work

1. emergency room.mp. or Emergency Service, Hospital/

2. accident and emergency.mp.

3. exp Emergency Service, Hospital/ or accident & emergency.mp.

4. Trauma Centers/ or trauma cent\*.mp.

5. or/1-4

6. time.mp. or "Time and Motion Studies"/ or Interrupted Time Series Analysis/

7. exp Work Performance/ or work.mp.

8. exp "Task Performance and Analysis"/ or work sampling.mp.

9. exp Work Simplification/

10. time utilisation.mp.

11. time utilization.mp.

12. exp Workflow/

13. work pattern\*.mp.

14. or/6-13

15. exp Physicians/ or exp Physician's Role/ or physicians.mp.

16. attending.mp.

17. specialist\*.mp.

18. senior.mp.

19. exp Medical Staff, Hospital/ or doctor\*.mp.

20. or/15-19

21. 5 and 14 and 20

22. limit 21 to (english language and yr="1998 -Current")

### STAMP Data extraction sheet used in the review of emergency doctors’ activities

|  |  |  |  |
| --- | --- | --- | --- |
| Study author, year , country | |  | |
| Study title | |  | |
| Area and element | Ref Code | Description | Data extracted |
| Intervention | | | |
| Type | INT.1 | The system studied (intervention) |  |
| System genre | INT.2 | Origin or lineage of the system (eg, commercial product, homegrown system, open source software) |  |
| Maturity | INT.3 | Time elapsed since intervention, including the amount of time that study subjects have been exposed to the intervention |  |
| Empirical setting | | | |
| Institution type | ES.1 | Type of the healthcare facility or facilities where empirical observations are conducted (eg, academic vs non-academic) |  |
| Yearly attendance , bed capacity |
| Care area | ES.2 | Area of patient care services (eg, inpatient, outpatient, emergency department) |  |
| Locale | ES.3 | Geographic characteristics (eg, urban vs rural) |  |
| Research design | | | |
| Protocol | RD.1 | Research protocol (eg, RCT, before and after, after only) |  |
| Duration | RD.2 | Length of fieldwork (eg, whether all observations are completed within a month, or occur sporadically over the course of a year) |  |
| Shift distribution | RD.3 | Clinical shifts observed (eg, morning, afternoon, night, if applicable, weekend, weekdays ) |  |
|  |  | How subject observed ( continuously over 1 shift , shift over coarse of several days, part of a shift …) |  |
| Observation hours | RD.4 | Total number of direct observation hours, in addition to how the hours are distributed across study phases or RCT study arms (if applicable) |  |
|  |  | Number of hours observed per subject |  |
| Task category | | | |
| Definition and classification  ( number of categories) | TC.1 | Definition of tasks and description of all major and minor task categories |  |
| Acknowledgment of prior work | TC.2 | Acknowledgment of task classification schemas previously used in the same or similar settings, and justifications if modifications are made |  |
| New development | TC.3 | Development and validation of task definition and task classification, if no prior work can be leveraged |  |
| Observer | | | |
| Size of field team | OBS.1 | Total number of independent human observers |  |
| Training | OBS.2 | Type and amount of training provided to human observers, including pre-study pilot observation sessions |  |
| Background | OBS.3 | Professional background of observers (eg, residents, nurses, industrial engineering students) and their prior experiences in conducting observational studies in clinical settings |  |
| Inter-observer uniformity | OBS.4 | If and how inter-observer agreements are calibrated |  |
| Continuity | OBS.5 | Continuity of observers across multiple study phases (if applicable) |  |
| Assignment | OBS.6 | How observers are assigned to shadow different research subjects and in particular, research subjects enrolled in different study phases or RCT study arms (if applicable) |  |
| Subject | | | |
| Size | SUB.1 | Number of research subjects enrolled | NR |
| Recruitment and randomization | SUB.2 | How research subjects are recruited (and randomized, if applicable) |  |
| Continuity | SUB.3 | Continuity of subjects across multiple study phases (if applicable) |  |
| Background | SUB.4 | Background information about research subjects such as clinician type and level of training (eg, residents vs attending physicians); if conditions allow, other individual characteristics such as gender, age, and computer literacy (eg, accessed using tools such as that of Cork *et al*[48](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b48)) |  |
|  |  | More than one type of subjects |  |
| Data recording | | | |
| Multitasking | DR.1 | If and how multi-tasking is taken into account; in particular, if only the primary task is recorded or all concurrent tasks are recorded |  |
| Non-observed periods | DR.2 | If there are periods of time not covered by independent observers |  |
| Between-task transition | DR.3 | If and how transition periods between consecutive tasks are handled |  |
| Collection tool | DR.4 | Device and software used to collect field data, for example, the AHRQ tool,[9](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b9) WOMBAT,[45](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b45) and the medical work assessment tool developed by Mache *et al*[49](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b49) |  |
| Data analysis | | | |
| Definition of key measures | DA.1 | Key measures used in analysis and results reporting, for example, average time spent on ordering activities vs on direct patient care,[7](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b7) [8](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b8) TOT,[47](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b47) and average continuous time that assesses workflow fragmentation and task switching frequency[11](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168304/#b11) |  |
| Analytical methods | DA.2 | Statistical or other types of analytical methods used to analyze the data |  |
| Ancillary data | | | |
| Interruption | AD.1 | A descriptor specifying if a task represents an interruption to prior tasks |  |
| Interaction | AD.2 | Interpersonal interactions/communications necessary for task execution; for example, with whom and via what method (eg, in person, by telephone, via a computerized system) |  |
| Location | AD.3 | The location where the activities take place (eg, in a patient ward, in a hallway, at computer workstations) |  |

### List of excluded studies: Review of time and motion studies, understanding better how emergency doctors work

|  |  |  |
| --- | --- | --- |
| **Author** | **Title** | **Reason for exclusion** |
| Abraham , 2012 | Bridging gaps in handoffs: a continuity of care approach | Different outcomes |
| Allard 2012 | Do you really need to ask me that now?: a self-audit of interruptions to the ‘shop floor’ practice of a UK consultant emergency physician | Different focus and outcomes: only look at interruptions |
| Armstrong 2008 | Senior house officers and foundation year doctors in emergency medicine: do they perform equally? A prospective observational study | Different population |
| Baker 2009 | Six months in an Irish emergency department: the experience of a senior house officer | Different population |
| Berg 2013 | Interruptions in emergency department work: an observational and interview study | Different subjects ( Doctors and nurses) |
| Berg 2016 | An observational study of activities and multitasking performed by clinicians in two Swedish emergency departments. European journal of emergency medicine : official journal of the European | Different population -author was contacted |
| Berger T 2004 | The Impact of the demand for clinical productivity on student teaching in academic emergency departments | Different outcomes |
| Blouin, 2007 | Performance criteria for emergency medicine residents: a job analysis | Different design |
| Brazil, 2011 | Enhancing capacity for intern training in the Emergency Department: The MoLIE Project | Different outcomes/design |
| Brennen, 2007 | Progression of emergency medicine resident productivity | Different outcomes |
| Brixey 2007 | Initiators and recipients of interruption in workflow: a role-based event | different outcome |
| Bryan Brown C 2004 | Procrastination is the thief of time: surviving guidelines | Article |
| Chisholm 2000 | Emergency department workplace interruptions: Are emergency physicians "interrupt-driven" and "multitasking"? | Different outcomes - interruptions |
| Chisholm 2004 | An evaluation of emergency medicine resident interaction time with faculty in different teaching venues | Different outcomes - Only measures interaction time with residents |
| Craig, 2013 | Registrar in charge shifts': Learning how to run a busy emergency department | Different focus , population and outcomes |
| Cushman 2003 | Emergency medicine resident scheduling and patient exposure | Different subjects |
| Debehnke D 2000 | Emergency medicine resident work productivity in an academic emergency department | Different subjects |
| Devita M 2005 | Improving medical emergency team (MET) performance using a novel curriculum and a computerized human patient simulator | Different outcomes |
| Dorfsman M 2009 | Direct observation of residents in the emergency department: A structured educational program | Different outcomes |
| Dubinsky,2012 | Emergency physician workload modeling | Review article |
| Fairbanks R 2007 | Emergency department communication links and patterns. | Different focus and outcomes |
| Fuchtbauer 2013 | Emergency department physicians spend only 25% of their working time on direct patient care | Different population: observe 9 residents only |
| Henning DJ 2013 | Evaluating the effect of emergency residency training on productivity in the emergency department | Different method and outcomes-Workload |
| Hertzum 2013 | Work-practice changes associated with an electronic emergency department whiteboard | Different outcomes |
| Hertzum 2016 | Effects of electronic emergency-department whiteboards on clinicians' time distribution and mental workload | Different outcomes |
| Laxmisan, 2006 | The multitasking clinician: decision-making and cognitive demand during and after team handoffs in emergency care. | Different outcomes |
| Levin S 2006 | Tracking Workload in the Emergency Department | Different focus and outcomes |
| Mansukhani M 2012 | Sleep Deprivation in Resident Physicians, Work Hour Limitations, and Related Outcomes: A Systematic Review of the Literature | Review article |
| Munk, 2009 | Influence of introduction of medical director on Emergency system | Different focus and outcomes |
| Robert 2013 | 4000 Clicks: a productivity analysis of electronic medical records in a community hospital ED | Different subjects include nurses 3% of the participants , no separation of the results |
| Schneider,2011 | How Do We Spend Our Time at Work? A Community Emergency Department Experience | Abstract-only |
| Soong 2013 | A novel approach to improving emergency department consultant response times | Different intervention and outcome |
| Tipping et al | Systematic review of time studies evaluating physicians in the hospital setting. | Review , Different population |
| Walker 2016 | Medical scribes in emergency medicine produce financially significant productivity gains for some, but not all emergency physicians | Different focus and outcomes |
| Walter 2014 | Managing competing demands through task-switching and multitasking: a multi-setting observational study of 200 clinicians over 1000 hours | Repeated study : Included study of interest by Westbrook which is included |
| Ward 2014 | The Effect of Electronic Health Record Implementation on Community Emergency Department Operational Measures of Performance | Different outcomes |
| Weigl 2012 | The association of workflow interruptions and hospital doctors’ workload: a prospective observational study | Different population ( doctors in surgery and internal medicine – also different aims to measure interruptions ) |
| Weigl M,2011,2013 | Relationships of multitasking, physicians' strain, and performance: An observational study in ward physicians | Different population |
| Yen, 2009 | Time Motion Study in a Paediatric Emergency Department Before and After Computer Physician Order Entry | Different settings -Paediatric ED |

Summary

Different outcomes 21

Different population 11

Different design or settings 2

Abstract or commentary or review 4

Same study reported as part of a bigger study 1

* + - 1. Scoping review of qualitative evidence on senior doctor triage Search Strategy

Web of science search strategy

16 #15 AND #14 AND #13 AND #12

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=2004-2018

# 15 TS=(qualitative stud\*) OR TS=(Interview\*) OR TS=(focus group\*) OR TS=(qualitative research) OR TS=(ethnograph\*)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 14 #11 OR #10 OR #9 OR #8 OR #7

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 13 #6 OR #5 OR #4 OR #3 OR #2 OR #1

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 12 (TS=(triage\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 11 (TS=(experienced emergency physician\*) or TS=( experienced physician\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 10 (TS=(attending emergency physician\*) or TS=(attending physician\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

#9 (TS=(emergency medicine consultant\*) OR TS=( emergency consultant\*) OR TS=( A&E consultant\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 8 (TS=(senior emergency physician\*) OR TS=(senior emergency doctor\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 7(TS=(emergency physician\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 6 (TS=(A&E)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 5 (TS=(Emergency department overcrowding\*) OR TS=( ED overcrowding\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 4 (TS=(ED)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 3 (TS=(casualt\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 2 (TS=(trauma centre\*) OR TS=(Trauma center\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

# 1 (TS = (emergency department\*)) AND LANGUAGE: (English)

Indexes=SCI-EXPANDED, SSCI, A&HCI, BKCI-S, BKCI-SSH, IC Timespan=1900-2018

Medline Search Strategy

1. ED.mp.

2. A&E.mp.

3. exp Trauma Centers/ or trauma cent$.mp. or exp "Wounds and Injuries"/

4. exp Crowding/ or overcrowding.mp.

5. casual\*.mp.

6. or/1-6

7. exp Consultants/

8. exp Physicians/

9. doctor.mp.

10. attending$.mp.

11. senior.mp.

12. specialist.mp. or exp Specialization

13. hospitalist.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

14.experienced.mp.

15. or/8-15

16. exp Triage/

17. qualitative stud\* or qualitative research or interview\* or focus group\* or ethnograph\* {Including Related Terms}

8. 7 and 16 and 17 and 18

19. qualitative stud\* {Including Related Terms}

20. 7 and 16 and 17 and 20

CINHAL

S19 (qualitative OR qualitative research OR qualitative study OR interview OR focus group OR ethnography) AND (S14 AND S15 AND S16 AND S17)

S18 qualitative OR qualitative research OR qualitative study OR interview OR focus group OR ethnography

S17 qualitative OR qualitative research OR qualitative study OR interview OR focus group OR ethnography

S16 S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13

S15 S1 OR S2 OR S3 OR S4 OR S5 OR S6

S14 (MH "Triage")

S13 "specialist"

S12 "experienced"

S11 (MH "Medical Staff, Hospital+") OR "attending physician"

S10 (MH "Consultants+") OR "consultant"

S9 "senior doctor" OR (MH "Physicians+")

S8 "senior emergency physician"

S7 (MM "Physicians, Emergency")

S6 "A&E" OR (MH "Emergency Service+")

S5 emergency department overcrowding OR ED overcrowding

S4 casualty department

S3 (MM "Trauma Centers") OR "trauma cent\*"

S2 "ED"

S1 (MH "Emergency Service+") OR "emergency department"

### **7. Online survey study cover note**

Dear [Name of Consultant or clinical lead]

You are invited to take part in this short online questionnaire “National survey of Emergency Departments Triage and Interventions for Improved Patient Flows 2015 in England”.

This survey will take approximately 5-10 minutes to complete. It includes multiple choice questions. The aim of the survey is to assess the current status and planned development   
of emergency department triage and patient flow processes in England.

To take the survey, please click on this link: <https://www.surveymonkey.com/s/7RHWDZF>

 This project is supported the by the Collaboration for Leadership in Applied Health  
Research and Care (CLAHRC) in Yorkshire and Humber and the, School of Health and  
Related Research (ScHARR) at the University of Sheffield –Lead by Prof. Suzanne Mason).

This research has been approved by the ScHARR Research Ethics Committee.

If you have any questions or need any further information please contact the project lead Maysam Abdulwahid [maabdulwahid1@sheffield.ac.uk](mailto:maabdulwahid1@sheffield.ac.uk)

You have the right to withdraw from the survey at any point.

The answers you provide will be anonymised during data analysis. Collected data will be anonymised and stored confidentially and securely in password storage device at Innovation Centre, University of Sheffield. This information will only be accessible to the student investigator and project supervisors. However, we plan to publish the findings of the survey.

Kind regards,

Maysam Ali Abdulwahid [Maabdulwahid1@sheffield.ac.uk](mailto:Maabdulwahid1@sheffield.ac.uk)

Professor Suzanne Mason [s.mason@sheffield.ac.uk](mailto:s.mason@sheffield.ac.uk)

P.S In case of any concerns or complaints you would like to rise, you can contact Mr.Jonathan P Nicholl at [j.nicholl@sheffield.ac.uk](mailto:j.nicholl@sheffield.ac.uk)

### 8. Online survey data collection tool

**Welcome to the National Survey of**   
**Emergency Department Triage Practices and**  
**Interventions for Improved Patient Flows**   
**2015**  
  
You are invited to complete this short online  
survey which will take approximately 5-10 minutes to complete.

The aim of the survey is to assess the current status and planned development   
of emergency department triage and patient flow processes in England.  
  
This project is supported the by the Yorkshire and Humber Collaboration for Leadership

in Applied Health Research and Care (CLAHRC) and the School of Health and  
Related Research (ScHARR) at the University of Sheffield [lead by Prof. Suzanne Mason].

This research has been approved by the ScHARR Research Ethics Committee.   
  
If you have any questions or need any further information

please contact the project lead Dr Maysam Abdulwahid at

maabdulwahid1@sheffield.ac.uk   
  
You have the right to withdraw from the survey at any point.  
The answers you provide will be anonymised during data analysis.  
However, we plan to publish the findings of the survey (name of EDs and their triage practices)

and it may be possible for the respondents to be identified.

**1. For walk-in patients, please select which health care personnel are involved in first contact and initial assessment of patients at triage? (You can select more than one option)**

Example: At your ED; walk-in patients are met by receptionist followed by combined nurse and consultant triage. Please tick: Nurse, Consultant. Please tick all that apply

No triage

Registered nurse triage

Advanced nurse practitioner (ANP)

Health care worker (HCW)

Consultant

Middle grade physician (Specialty registrar level)

Junior physician

General practitioner

Other (please specify)

**2. For ambulance arrivals, please select which health care personnel are involved in first contact and initial assessment of patients at triage? (You can select more than one option)**

No triage

Registered nurse

Advanced nurse practitioner (ANP)

Health Care Worker (HCW)

Consultant

Middle grade physician (Specialty registrar level)

Junior physician

General practitioner

Other (please specify)

**3. Are any of these processes undertaken on initial assessment of patients at triage? (You can select more than one option)**

Request bloods

Request x-ray

Request CT scan

Discharge

Prescribe medication

Other (please specify)

**4. Do you use a triage scale for assessing patients?**

No

Five point triage national scale

Manchester triage scale

Own hospital triage scale

Other (please specify)

**5. Do you operate Senior Doctor Triage?**

(Senior doctor refers to either an emergency medicine consultant or senior specialty registrar working on the consultant rota)

Yes

No

**6. Do you have written guidelines or a protocol for your Senior Doctor Triage?**

Yes

No

**7. Please select hours of operation of Senior Doctor Triage for walk-in patients?**

On working days (Monday-Friday)

On weekends (Saterday& Sunday)

**8. Please select hours of operations of Senior Doctor Triage for ambulance arrivals?**

On working days (Monday-Friday)

On weekends (Saterday& Sunday)

**9. Are any of the following interventions currently in use or going to be implemented in your ED in the next 12 months?**

(You can select more than one option)

Senior doctor triage

Advanced nurse practitioner triage

Pre-hospital triage

See and treat/ Fast track

Nurse-requested X-ray at triage

Clinical decision unit

Ambulatory care centre

Urgent care centre

GP out of hours

X-ray facility in the ED

CT scan facility in the ED

Thrombosis unit in the ED

Chest pain clinic in the ED

Stroke health care professional in the ED

Occupational health care professional and physiotherapist in the ED

Mental health care professional in the ED

None

Other (please specify)

**10. Please fill in your Accident and Emergency department details**

We plan to publish our results (EDs names and their triage practices) and readers might be able to identify respondents based on their ED location.

Completed by

Name of Hospital and Trust

E-mail

Telephone number

Any further comments

### 9. National online survey report - Triage scales and processes performed at triage in EDs across England.

This appendix reports on three questions of the survey which were not reported in the main section of the thesis since there were only collected to draw a complete picture of the general triage practices in EDs in England. The survey was seen as an opportunity to collect data and describe the national triage practices in England. We aim to publish this as part of descriptive study of triage practices in England.

**Triage models**

1. **Ambulance arrivals**

Patient arriving by ambulance were triaged by a registered nurse in 52 out of the 119 participating EDs (43%) while four out of 119 EDs (3%) applied an individual ANP triage model.

The next most triage type was senior doctor triage in various models in 49 out of 119 EDs (41%). Combined SDT and RNT was the most frequently used model applied in 32 EDs while 8 EDs employed a combination of SDT with ANP triage or with both ANP and RNT. In addition, 9 EDs applied a single senior doctor triage.

The further 13 out of the 119 participating EDs (11%) implemented ‘Other’ triage models. Those included: nurse in charge ED coordinator, rapid ambulatory initial decision team, nursing early assessment team, paramedics crew employed to triage patients and finally, auto-triage where a nurse assisted by a computer recorded the patients’ vital signs score which helped to determine the triage category.

The *single* remaining ED of the 119 EDs (~1%) did not designate a registered health professional to triage ambulance patients where ‘no triage’ was selected as the current method for triaging patients arriving by ambulance.

1. **Walk-in patients**

Registered nurse triage (RNT) remained the most common triage type where 80 out of 119 EDs (67%) implemented RNT for walk-in patients either individually or as a combination with other triage. Forty-seven EDs depended on individual RNT for prioritising patients. Another 15 departments applied combined RNT and ANP triage. Only 2 EDs depended on individual ANP for triage.

Senior doctor triage in various models was reported in 21 out of 119 EDs (18%). Nevertheless, senior doctor triage model was most commonly used jointly with other triage models. In 16 EDs, senior doctors undertook triage in combination with either registered nurses or advanced nurse practitioners, while 3 EDs operated an isolated senior doctor triage model. Finally, another 2 involved a GP with SDT.

Ten out of 119 EDs (8%) stated the use of a General practitioner for triaging walk-in patients. Similarly, GP triage was most often used in conjugation with other triage types. One department described the use of a GP deflector prior to booking where the GP works jointly with a nurse. One ED implemented single GP triage.

Finally, 8 out of the 119 EDs (6%) described the application of other triage models for non-ambulance arrivals. Four of these EDs designated a ‘hello’ nurse in the waiting area followed by registered nurse triage. One ED defined the use of a meet and greet nurse in waiting room, utilizing a computer, the patient presenting complaint, and direct observation of the patient to assess those who need to be seen first. The use of CCG (clinical commission group) streamers as triage model for walk-in patients was stated in one ED – no further details were provided. Two EDs reported using no triage/ receptionist streaming as the sole triage ‘model’ for self-presenting patients.

**Triage Scales**

Triage scales were reported for 117 EDs out the 119 participating EDs. Manchester Triage Scale (MTS) was the most frequently implemented triage scale with around two-thirds of the EDs (70 out of 117, 58.8%) describing the use of MTS. The next most common triage scale was the Australian triage scale (ATS) where 13 EDs used this scale for triaging patients (13 out of 117, 11%). An additional ten EDs applied locally developed standardized protocols to prioritise patients (own hospital triage scale) (10 out of 117, 8.5%).

Furthermore, seven EDs operated ‘other’ triage scales (7 out of 117, 5.9%). Emergency Severity Index was used in two EDs, whereas SOAPE (subjective symptoms, objective signs and quantitative assessment; action taken that day, plan, and evaluation) was used in one ED. One ED reported the use of modified MTS. Another three EDs used early warning score and pain score for prioritising patients.

The remaining seventeen EDs (17 out of 117, 14.5%) did not implement any triage scale for triaging patients – it is assumed that they depended on staff clinical experience for assessing patients.

1. **Access to investigations and disposition pathways at triage**

The access to perform various tests (drawing bloods samples, requesting x-rays or scans), administer medication and discharge or refer patients at point of triage, was dependent on the patients’ presentation. This was reported for 106 EDs out of 119 participating EDs.

1. **Ambulance arrivals**

In most of the surveyed EDs, triage personnel had access to request x-ray (86%), laboratory tests (85%), and prescribe medication (83%). The proportion of EDs where triage professionals can request CT was considerably less at around 50%. On the other hand, more than two-thirds (63%) of the 106 EDs documented the capacity to discharge or refer patients at the point of triage. In addition, six EDs described ‘other’ categories like the ability to start a clinical pathway e.g. sepsis, or allocate a bed, undertake electrocardiograms and weigh the patient. See table below.

1. **Walk-in patients**

For walk-in patients, x-ray requested at triage seemed to be a common practice 88% of respondents describing the access to requesting x-ray for self-presenting patients at point of triage. In comparison, blood sampling for laboratory investigations was undertaken less frequently with around two-thirds of the participating EDs (65%). Finally, triage personnel had access to requesting scans for self-presenting patients in a limited number of EDs (21%).

The ability to either prescribe medication, or discharge and refer self-presenting patients was high at around 78% and 68% respectively. Some EDs described that referrals were usually directed to out-of-hours GPs and particular specialties in the hospital such as eye casualty or pregnancy unit. See Table below.

**Triage facilities available for walk-in patients and ambulance arrivals for 106 EDs out of the 119 participating EDs**

|  |  |  |
| --- | --- | --- |
| **Triage facilities** | **For ambulance arrivals N (%)** | **For walk-in patients N (%)** |
| Request x-ray | 89 (86%) | 94 (88%) |
| Initiate Laboratory investigations | 91 (85%) | 69 (65%) |
| Request CT scan | 53 (50%) | 22 (21%) |
| Prescribe medications | 89 (83%) | 83 (78%) |
| Discharge or refer | 67 (63%) | 73 (68%) |
| **Total \*** | 355(334%) | 317 (299%) |

The total adds up to more than 100% since for each emergency department, more than one option could be selected.

### 10.. Qualitative study topic guide

* + - 1. What your job role, how long have you been working in the ED?
      2. What do you think of senior doctor triage model in your ED and why?
      3. What do you think is particularly good about SDT at your ED?
      4. What do you think is particularly bad or negative about SDT at your ED?
      5. What are the challenges associated with SDT at your ED?
      6. How do you think SDT in your hospital can be improved?
      7. Can you envisage an ideal model for you if you were a patient?

### 11.. Participant information sheet



**Research Project Title:**

Identification of key factors influencing the success of senior doctor triage model and the challenges associated with setting these systems up and sustaining them through staff interviews.

You are being invited to take part in a research project. Before you decide to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

**What is the project’s purpose?**

This study is part of a larger study that aims to determine the effectiveness of senior doctor triage when compared with other triage models used in a sample of emergency departments across the UK by using national College of Emergency Medicine quality indicators and routine patient data.

This study aims to report staff views on the factors that influence the success of senior doctor triage model and the challenges associated with setting these systems up and sustaining them.

This project is supported the by Collaboration for Leadership in Applied Health Research and Care (CLAHRC) and University of Sheffield, School of Health and Related Research (ScHARR - Prof. Suzanne Mason). This research has been granted ethical approval by ScHARR.

**Why have I been chosen?**

We aim to recruit nurses or doctors with at least one year experience of working in the emergency department in order to be familiar with their work environment.

We chose participants depending on the triage models and level of performance and location of the emergency departments.

**Do I have to take part?**

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time without it affecting any benefits that you are entitled to in any way. You do not have to give a reason.



**What will happen to me if I take part?**

You will be interviewed by the researcher by telephone. The interview will take around 30-35 minutes. You will be asked several questions about your views on the factors that influence the success and failure of senior doctor triage model and the challenges of setting these systems up and sustaining them. These recordings will be transcribed and analysed by the researcher.

**What are the possible disadvantages and risks of taking part?**

There are no disadvantages or risks that result from your participation in the interview. If you do feel uncomfortable about completing the interview, we will stop the interview. We hope that your participation will help to improve emergency care service delivery in the UK.

**What if there is a problem?**

If you have a concern about any aspect of this study, you should contact the research supervisor, Suzanne Mason. Her contact details are at the end of this Information Sheet.

In the unlikely event that you are harmed by taking part in this research project, there are no special compensation arrangements. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been approached or treated during the course of this study, then you can contact the Principal Investigator for this research study, Suzanne Mason. Her contact details are: Telephone: 0114 2220694; email: [s.mason@sheffield.ac.uk](mailto:s.mason@sheffield.ac.uk) ; postal address: University of Sheffield, ScHARR, Regent Court, 30 Regent Street, Sheffield, S1 4DA.

**Will my taking part in the study be kept confidential?**

All information you give the researcher will be confidential, kept safe and later destroyed. The researcher will transcribe the audio-records and notes. No one else apart from the researchers in the study can access this information. Regulatory authorities may look at your consent form to check that the study is being carried out correctly. Your name, however, will not be disclosed outside the research team.

All research information will be kept in a locked cupboard in a locked office and then destroyed 5 years after the study ends. This is in case the University wants to monitor the quality of the research.



**Will I be recorded, and how will the recorded media be used?**

**The interview will be recorded in order to assist in accurate and unbiased analysis of the results.** No one else apart from the researcher in the study can access this information. Any publication or report as a result of the interview will not mention or refer to your identity in anyway.

**What will happen to the results of the research study?**

The results will be analysed by the researcher and a report will be written about the research study. Anonymous reference quotes will be used in future publication of results. No information which could identify you or anyone else would be contained in the report. However, there is a chance that the interviewee could be identified based on the location and name of their Trust. Please let us know if you would like to be sent a summary of the findings of the study, and we will send one to you.

**Who is organising and funding the research?**

The study is being organised by a PhD Student from the University of Sheffield. It is part of a larger programme of research that is taking place, called CLAHRC (Collaboration for Leadership in Applied Health Research and Care) and it is funded by the National Institute of Health Research (NIHR). See<http://clahrc-yh.nihr.ac.uk/> for more information.

**Who has reviewed the study?**

Before any research goes ahead it has to be checked by an independent group of people (a Research Ethics Committee). They make sure that the research is fair and that people’s safety, rights, wellbeing and dignity are protected.

**Further information and contact details**

If you want to talk to someone about the study, please contact Maysam Abdulwahid, PhD student. She can be contacted at University of Sheffield, The Innovation Centre 217 Portobello Sheffield S1 4DP  
E-mail:[maabdulwahid1@sheffield.ac.uk](mailto:maabdulwahid1@sheffield.ac.uk)

**Thank you for taking part in the study**

### 12.. Consent form for participation in the interview study

**Participant Consent Form**

|  |
| --- |
| **Title of Research Project**: Effectiveness of senior doctor triage  Identification of key factors influencing the success of senior doctor triage model and the challenges associated with setting these systems up and sustaining them through staff interviews  Name of Researcher: Maysam Ali Abdulwahid  **Participant Identification Number for this project: Please initial box**   1. I confirm that I have read and understand the information sheet explaining the above research project and I have had the opportunity   to ask questions about the project.   1. I understand that my participation is voluntary and that I am free to   withdraw at any time without giving any reason and without there being  any negative consequences. In addition, should I not wish to answer any  particular question or questions, I am free to decline.   1. I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to   my anonymised responses. I understand that my name will not be linked  with the research materials, and I will not be identified or identifiable in  the report or reports that result from the research.  4. I agree for the data collected from me to be used in future research.  I agree to take part in the above research project.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name of Participant Date Signature  (*or legal representative*)  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Lead Researcher Date Signature  *To be signed and dated in presence of the participant* |

1. In three American studies , LWBS is defined as proportion of patient who left without being seen as well as those who left without their treatment being complete (84,86,101)(84,86,101)(84,86,101)(84,86,101)(84,86,101)(84,86,101)(84,86,101)(84,86,101)(84,86,101)(84,86,101). [↑](#footnote-ref-1)
2. Type I ED: refers to major EDs, providing a consultant-led 24 hour service with full resuscitation facilities. [↑](#footnote-ref-2)
3. NHS trust is used to refer to both NHS trusts and NHS foundation trusts in this report [↑](#footnote-ref-3)