Key words: clinical dispatch, specialist dispatch, emergency medical service, emergency medical dispatch, AMPDS.

Key Points:

1, Optimising patient care through the delivery of specialist resource allocation, at the point of injury improves patient outcomes.

2, The literature discourages the dispatch of specialist teams based solely on computer triage software generated codes.

3, The literature supported the use of clinicians in dispatching specialist resources to best meet the needs of those critically ill or injuries

4, High quality call handling and dispatch of the right response, first time, is critical to these outcomes

5, Specialist paramedic dispatchers were found to have a better understanding of the clinical and ethical position

Abstract

Optimising patient care through the delivery of specialist resource allocation, at the point of injury improves patient outcomes. As identified by the NHS high quality call handling and dispatch of the right response, first time, is critical to these outcomes (NHS, 2015). This paper presents an objective literature review and critical analysis of the evidence base concerning clinical dispatch, to ascertain best practice. A structured literature review was undertaken and thematic analysis was utilised to explore the findings of the literature, leading to the establishment of recommendation for best practice in this area. The literature discourages the dispatch of specialist teams based solely on computer triage codes and recognises that specialist paramedic dispatchers have a better understanding of the clinical and ethical challenges. In conclusion the literature supported the use of clinicians in dispatching specialist resources to best meet the needs of those critically ill or injuries.

Introduction

> *"Efficient call handling, robust call prioritization and intelligent tasking of resources,"*

are an essential element of delivering high quality pre-hospital care (Thurgood and Boylan, 2013, p.3). This demonstrates the critical role dispatch provides in the chain of survival for critically ill or injured patients, and where the patient's journey truly begins. Historically, ambulance services gauged the quality of the service it delivered by its response times to the patient. This changed based on the findings of the Ambulance Response Programme (Turner et al, 2017). The new model advocates responding to the sickest patient quickest, while providing a more appropriate response to other patients (Turner and Jacques, 2018).

In the United Kingdom (UK), ambulance services select the software they wish to use in control centres to triage and allocate emergency calls. While other packages are available, the Advanced Medical Priority Dispatch System (AMPDS) is widely used. The call triage process commences when the call is answered by an Emergency Medical Dispatcher (EMD) in the control room. A strict process is followed, as dictated by the software system, which supports the identification of life threatening emergencies, early in the call process. As more information is received the call category can be further refined, which finally provides a code of letters and numbers displaying the clinical severity of the patient's condition, based entirely on the answers they give to predefined questions. The code generated, dictates the immediacy of the response required or may suggest alternative options. The categorisations range from a life-threatening emergency, through to a call identified as suitable for telephone

triage by a clinician, or signposting to alternative care providers. This categorisation process supports dispatchers in allocating resources appropriately.

Specialist resources, such as a Helicopter Emergency Medical Service (HEMS) can be activated independently of the computer software system, due to the clinical autonomy the air desk paramedic retains, and further information regarding the incident is achieved by direct contact with the original caller, which can provide a clearer clinical picture prior to allocation. Unfortunately, other alternative resources which provide a specialist skillset are managed differently. A rich supply of doctors working voluntarily, and governed by the British Association of Immediate Care (BASICS), provide clinical interventions beyond the scope of many paramedics. They are commonly activated through a pager system, alerting them if the code generated for the call is within a pre-defined group of codes. Following the pager message, any BASICS doctor available to respond, will contact the ambulance control centre to receive the call details. As this is a voluntary role, there is no assurance of a response. A further resource, the Hazardous Area Response Team (HART), are mandated to respond to incidents involving hazardous materials, search and rescue, inland water rescue and tactical medicine. This valuable resource provides niche specialist skills, however, the dispatch of this team varies throughout the UK. Often they also rely on receiving a pager message, based on a code generated by the control room triage software system, or to be activated by a dispatcher who has the foresight to recognise the potential requirement on scene, or at the request of an attending ambulance clinician. While these resources are vastly beneficial to the care of ill and injured patients, and can significantly reduce on-scene times, they are often not supported by

the focused dispatch provided to the HEMS service, therefore falling short of recommendations made by Turner and Jacques (2018).

Identifying the incidents where specialist responders can be best utilised, is essential for optimum patient care. The aim of this study is to scrutinise the triage and dispatch processes of specialist resources, to identify best practice in the dispatch of these finite, specialist resource.
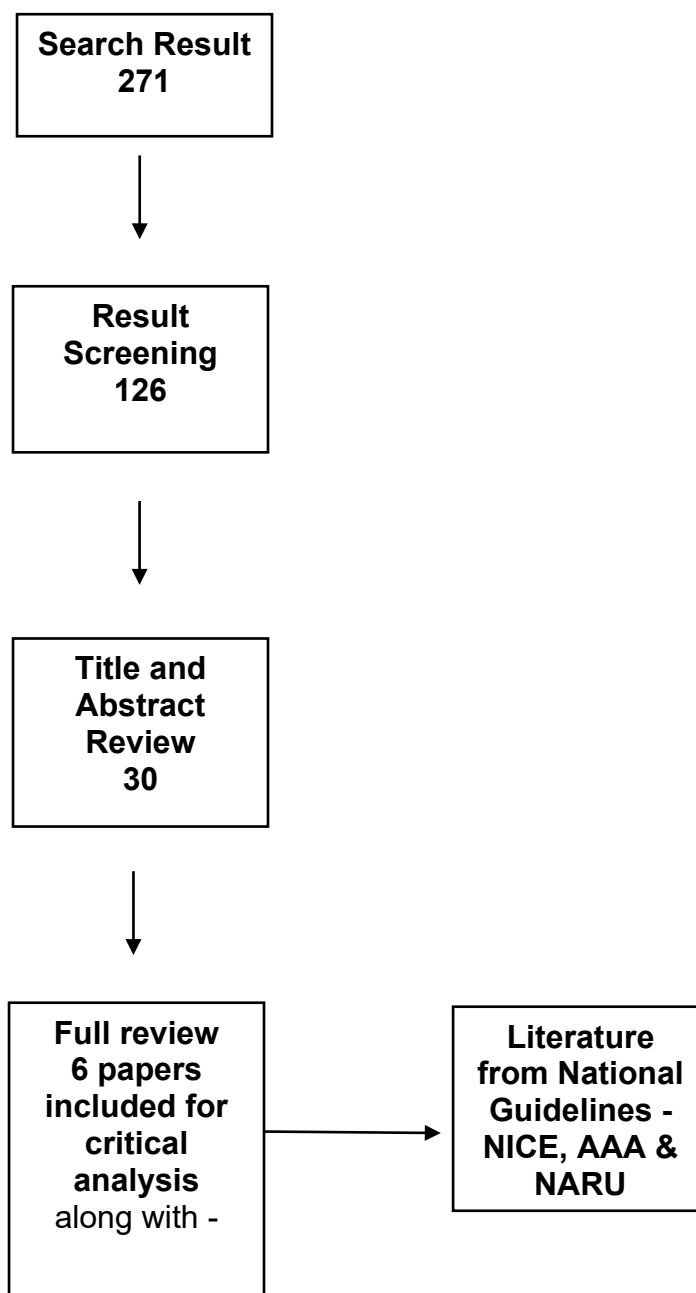
Method

A wide variety of search terms were identified to cover the various roles considered within ambulance service specialist dispatch. These search terms were entered into medical databases, CINHALComplete and All Ovid Databases. Term truncation and Boolean operators were utilised as required, to assist in identifying the most appropriate literature. Limiters were placed on results; the search years were 2000-2020, and literature type was limited to 'full text', 'English language' and 'academic journal', to ensure the literature discovered was of appropriate quality.

A review of 271 results from searches took place. Literature titles were interrogated, firstly to identify those papers most appropriate to the topic, and then abstracts were reviewed to ensure the literature was relevant. Table 1 diagrammatically displays this process.

Table 1

<u>Search Results Review Flow Chart</u>

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            ┌─────────────────┐
            │  Search Result  │
            │      271        │
            └─────────────────┘
                     │
                     ▼
            ┌─────────────────┐
            │     Result      │
            │   Screening     │
            │      126        │
            └─────────────────┘
                     │
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            ┌─────────────────┐
            │   Title and     │
            │    Abstract     │
            │     Review      │
            │       30        │
            └─────────────────┘
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     ┌──────────────────┐        ┌──────────────────┐
     │  Full review     │        │   Literature     │
     │  6 papers        │        │  from National   │
     │  included for    │───────▶│  Guidelines -    │
     │  critical        │        │  NICE, AAA &     │
     │  analysis        │        │     NARU         │
     │  along with -    │        └──────────────────┘
     └──────────────────┘
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Results

Air ambulance services provide a wealth of research surrounding this topic. The Association of Air Ambulances (AAA) Best Practice Guidelines: HEMS Tasking (Chalk, 2016) provide a national document for air ambulance tasking, however a single author would suggest a somewhat eminence-based approach. The author of the document is also involved in a research study produced by the London Air Ambulance (LAA) which addressed a clear question through a retrospective review of data (Wilmer et al, 2015). The findings of this study reflect recommendations made in the AAA guidelines, highlighting a potential bias.

Bohm and Kurland (2018) undertook a systematic review regarding the accuracy of medical dispatch. While this study was clearly defined and primary data was a key feature, the timeframe of five years for published papers was narrow considering the paucity of studies, and risks omitting relevant papers. Levels of evidence was generally very low; low and moderate papers had less relevance. Paper selection was appropriate in relation to the review title, and search terms used in numerous databases were comprehensive. Nonetheless, due to the heterogeneity of the findings, meta-analysis was again excluded.

A study by Sinclair et al (2018) examines the tasking to major trauma patients before and after the introduction of clinical dispatch. This was a retrospective review of data over a two-year period using national data from ambulance trauma registries. The data used, aided in reducing bias and confounders, as parameters were clearly set and unambiguous. Although retrospective studies are considered a low level of evidence, the strength in this case over Wilmer et al (2015) is in analysis of dispatch against Injury Severity Score (ISS), which is outcomes based, and calculated

retrospectively. Unfortunately, there is no identification or analysis of the interventions at the scene, which would have further strengthened this study.

Munro et al (2018) report, prospectively collated data from a pre-post study examining paramedic dispatch, compared to a non-clinical dispatcher (NCD), who uses an algorithm to guide decision making. Issues with this process are clearly related to biases, data is extracted from a database completed by operational staff, and whilst this database provides predefined fields for data entry, there is no reported process of verifying the accuracy of the inputted data. The authors accept that outcomes based on ISS would have been preferable, however this was not available, nor was ambulance service data to assess the potential for missed trauma calls.

The Scottish Ambulance Service (SAS) published the Major Trauma Clinical Coordination Evaluation Report. Parker et al (2015) highlight the role of the Trauma Desk (TD) within their Ambulance Control Centre (ACC) in Glasgow. This report follows a project supported by the Scottish government to provide a resource to identify instances of major trauma. The study was a retrospective review and all data was cross-checked between the ACC and operational data. Non-conformant information was queried and corrected, although it is unclear how this data was repaired. Missed calls were recorded, however it is unclear how these were identified. It would be clearly evident if the team were unavailable or committed to a mission; what is unclear is when "the clinician was busy with another call," and how this could be recognised (Parker et al, 2015, p.43).

A scarcity of literature was discovered relating to HART and BASICS; letters and commentaries were included based on the lack of alternatives. This evidence is of low grade, however it does display an enthusiasm for these roles, and the specialist care they deliver to patients. Greenhalgh (1999) highlights, there is both a science

and an art to clinical proficiency, therefore dismissing these articles would lose the insights of these experienced clinicians. A view echoed by Wieten (2018) who highlights expert opinion individually is categorised as low grade, nevertheless, when combined with external evidence and patient expectations, it is considered stronger.

Discussion

As a variety of literature is reviewed, a thematic analysis will be used to summarise the findings (Finlay and Ballinger, 2006). Key themes include over triaging, clinical and non-clinical dispatch, dispatch training, methods of identifying missions for primary dispatch, and dispatching by AMPDS codes. The National Institute for Health and Care Excellence (NICE) (2016) highlight the financial impact of over triaging calls, a view echoed by Sinclair et al (2018). Bohm and Kurland (2018) suggest this increases the risk of occupational injury. It must also be acknowledged that over triaging deploys resources unnecessarily, rendering them unavailable for more appropriate tasking. A view support by Wilmer et al (2015) who also emphasise the cost implication and increased risk to responders in over triage, while also acknowledging that a certain degree of over triage is unavoidable and to an extent necessary to avoid under triage; clearly demonstrating the significant challenges in identifying appropriate missions for these finite resources. Bohm and Kurland (2018) propose, there is insufficient evidence to suggest telecommunicators hold the necessary skills for accurate clinical dispatch, within a system which was designed to over triage, to reduce the risk of missing critically ill or injured patients. NICE (2016) supports this by recognising the clinical benefit of over triage for patient safety. These findings dismiss the need for accuracy, as the dispatcher can rely on the system. Bohm and Kurland (2018, p.8) highlight, the aim of dispatch is to deliver, "the right

treatment to the right patient at the right time," while acknowledging challenges exist in identifying a small cohort of patients who require specialist care. Although this study suggests that by improving dispatcher accuracy, over triage could be reduced; many studies accept that over triage is more acceptable than missing an appropriate call, however there are no considerations regarding processes to reduce the over triage rate, which may be due to the complexity of the task.

Bohm and Kurland (2018) encourage clinicians to cherry pick emergency calls where they believe a specialist resource could benefit the patient. While clinical dispatch is supported by many studies, a single study casts doubt on this popular method; instead, supporting Non Clinical Dispatchers (NCD) using an algorithm (Munro et al, 2018). This study refutes arguments for clinical dispatch, highlighting NCD to be as accurate, whilst accumulating more experience and expertise in a shorter time (Munro et al, 2018). NICE (2016) raises concerns regarding the cost of clinical dispatch, conversely the study by Munro et al (2018) suggests a financial benefit to their model, while also providing greater service resilience. This study suggests how improving the training of EMDs, could provide a robust service of similar quality to that which is provided by a clinician. Wilmer et al (2014) describe training in this area as supervised practice, while Munro et al (2018) describe a more involved process of induction, development and observation, prior to peer supervised practice, displaying a lack of uniformity in the training for this dispatch role.

Bazyar et al (2020) promote triage as delivering the maximum benefit to the most casualties, however deciding between patients at different incidents, with often in-complete information, creates an ethical dilemma regarding justice for each patient, and the potential moral injury for the dispatcher. Coleman (1997) highlights how clinicians involved in telephone triage are supported by algorithms, to guide their

decisions. Conversely, the literature reviewed displays call interrogation by clinicians was unscripted and guided by the gestalt and clinical acumen of the interrogator, exposing a risk, and questioning the ethics and governance of this system. Sinclair et al (2018) believe the clinicians involved in delivering the care should also be involved in dispatching the team, due to their intimate understanding of the care available. A view supported by Wilmer et al (2014) who recognise that call "interrogation is often challenging and requires the paramedic to obtain a mental imagine of the incident" which is only available with the hindsight of experience. This is often not the case for an NCD, as they have no first-hand experience of the pre hospital environment, which suggests they are less suited to deliver this nuanced dispatch role.

Chalk (2016) and Wilmer et al (2015) advise, many services utilise three methods of identifying HEMS missions. Mechanism of Injury (MOI) for primary dispatch is unsupported, and a weak method of identifying calls for specialist responders, potentially due to this method relying upon accurate detail from the caller. It remains however, a useful method for rapidly identifying potential missions. Interrogation of callers is an ambiguous process, which is unregulated and difficult to describe accurately, therefore the modelling and reproduction of this process is difficult. Wilmer et al (2015) posit that a clinician's telephone interrogation is as accurate as that of the arriving ambulance clinician. Waiting for a crew request delays the response of the specialist resource, possibly significantly, which undoubtedly has a negative impact on this cohort of patients (Sinclair et al, 2018). This method also relies upon the clinician at the scene, identifying the need for additional specialist intervention, which has been acknowledged as unreliable (Wilmer et al, 2014). There is no alignment of opinion regarding a standard model which may be veridical, as dispatch varies depending on geography and skill set of the resources. Although Sinclair et al (2018)

support a combination of methods to achieve appropriate dispatch decision, they continue to advocate that these decisions should be made by clinicians.

BASICS and HART evidence is exiguous. Evidence suggest BASICS often respond to pager messages, based on the code generated through the call triage process. Price (2015) continue to advise that HART teams are activated in a similar rudimentary style, which is an outdated method of dispatching a specialist resource.

NICE published guidelines, Major Trauma: Service Delivery (2016), recognises the importance of triage, and dispatching the correct personnel to major trauma, however no further recommendations are made within these guidelines. Resemblances to this document can be made with the National Ambulance Resilience Unit (NARU) (2016) who are responsible for coordinating interoperability capabilities in relation to high risk incidents. This document lays out the role of HART from an operational position, however, similarly to NICE (2016), they provide little contribution in relation to the dispatching of these resources. The lack of exploration surrounding dispatch in these national documents, highlights a potential unawareness around this critical role.

Summary

This study aimed to explore the triage and dispatch of specialist resources through a literature review and thematic analysis, to establish best practice in this complex field. The literature discourages the dispatch of specialist teams based solely on codes, generated through computer triage software systems, as these are sensitive but non-specific, could result in over triage, and therefore potentially inappropriate dispatches which increase risk to responders and cost to the service. Common methods of identifying potentially suitable missions is through MOI, which is considered weak, as this information is based on the caller's opinion, and answers to fixed questions. Crew

request is also not a reliable method, as there can be a significant delay if specialist responders wait for an update from the first clinicians on scene, which could have a negative impact on the patient. There is also evidence that arriving crews are unaware of what some specialist responders can offer, and therefore the response is not requested. While there is disagreement over dispatch by clinician versus non-clinician, the stronger studies support clinical involvement, particularly from an ethical perspective, as clinicians can articulate their decision making, which provides greater governance. The literature analysed supports clinicians further triaging calls, beyond that of the computer software systems, as these specialist paramedics understand the unique, specialist skills these additional resources contribute to an incident. Therefore, a combination of MOI and caller interrogation is considered the strongest method of providing appropriate dispatch, when delivered by a clinician.

Development of training and triage tools to support this role could be very beneficial, as it could support clinicians in the cherry-picking of calls, rather than relying on gestalt and clinical acumen. A key area for potentially rapid improvement, could be found through clearly displaying, for all clinicians, what specialist services are available and the skillset they can provide, as this could deliver a faster, more streamlined delivery of optimal patient care. Ambulance trust leaders must embrace clinical input, within the emergency control room. This is critical for any service who wish to provide the most appropriate response to their patients, and paramedics are able to provide a unique skillset, combining operational experience and triage skills. While many studies support the use of clinicians for the dispatch of HEMS services or critical care teams, further research could go into using the same model for the dispatch of HART teams and BASICS, to ensure appropriate dispatch to scenes where their specialist

skills are truly required, for both patients and responders. In summary, it is recognised that clinicians provide a critical role in delivering intelligent tasking of specialist resources. Standard computer based triage software cannot currently provide this level of specificity or recognise the multidisciplinary requirements. Given the unique experience of paramedics in prehospital care and patient triage, they are in a prime position to fulfil this specialist dispatch role, and further strengthen the chain of survival.

Summary of Changes

Changes to the introduction to provide a more gripping first sentence. Further changes in the introduction to provide some context around telephone triage, as advised in the comments. Changes at the end of the introduction to provide a clearly aim for this study. Large sections were cut form the methods section and from the results, less papers were used and references were cut to reflect this change. Small adjustments to the discussion section due to the removal of some references. Significant changes to the Conclusion section to provide a clearer argument, key recommendations for both managers and clinicians, and future research/ development opportunities

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Reflective questions

1, What is the decision-making process that your trust utilise to dispatch services?

2, On reflection, do you believe this is the best method of dispatching this resource?

3, Based on the benefits described in this article, how could you see this fitting in with your own service?

4, This article brings together the tension between systems and processes and highly skilled clinicians, what do you think are the challenges for these clinicians?