ABSTRACT

Objective: Emergency ambulance use for problems that could be managed in primary care continues to rise owing to complex reasons that are poorly understood. The objective of this systematic review is to draw together published evidence across a variety of study methodologies and settings to gain a better understanding of why patients seek help from ambulance services for these problems.

Design: Systematic searches were undertaken across the MEDLINE, EMBASE, PsychINFO, CINAHL, Health Management Information Consortium and Health Management Information Service publication databases. Google Scholar, Web of Science, OpenSigle, ETHOS and DART databases were also systematically searched for reports, proceedings, book chapters and theses, along with hand-searching of grey literature sources. Studies were included if they reported on findings examining patient, carer, health professional or service management interactions with ambulance services for primary care problems. All study methodologies and perspectives were of interest. Data were extracted, quality assessed and systematically mapped according to key findings through generation of an iterative framework.

Results: A total of 31 studies met inclusion criteria. Findings were summarised across 5 broad categories: factors associated with individual patients; actions of care-givers and bystanders; population-level factors; health infrastructure factors; challenges faced by health professionals. A number of subcategories were developed to explore these factors in more detail.

Conclusions: This review reports important factors that may impact on ambulance use for primary care problems across a global setting, including demographic measures associated with deprivation, minority status and individual social circumstances. Categorising ambulance calls for primary care problems as ‘inappropriate’ is context dependant and may be unhelpful. Potential implications for triage and risk management strategies are discussed.

INTRODUCTION

The ways in which ambulance services are used have evolved significantly over the past two decades. Initially conceived as a system to transport the critically injured and unwell to hospital for emergency care,

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the majority of patient journeys are now no longer for cases of life-threatening injury or illness. Internationally, ambulance systems vary in the services they provide within the local health infrastructure. Many services are staffed by highly trained clinicians who are able to deliver advanced critical care at the scene of an incident, or provide enhanced medical treatment in a community setting. Others still perform a primarily transport role with more basic clinical capability. Despite these differences, the types of problems ambulances are being called for is changing. In the UK, demand for ambulances is rising at nearly 7% per annum. Contacts for conditions that would be amenable to management in primary care represent a substantial proportion of the workload. The reasons behind this shift are multifactorial and poorly understood. Previous work has focused on reducing...
so-called ‘inappropriate’ use of ambulances. However, there is evidence to suggest the definition of ‘inappropriate’ is complex and context dependent.\(^5\) If services are to provide sustainable, safe and relevant care, an appreciation of what underpins the use of ambulances for primary care problems is vital.\(^4\) This systematic literature search and mapping review seeks to draw together published evidence across a mixture of methods with an international perspective, to summarise what is currently known about why ambulance services are used for primary care sensitive problems. This understanding will inform future urgent care service design.

**METHODS**

We undertook a systematic mapping review of published journal articles and relevant grey literature, exploring the question “Why do patients with ‘primary care sensitive’ problems seek help from ambulance services?” A systematic map is a review methodology that aims to map out and categorise literature on a particular topic with a view to undertaking further more detailed work,\(^6\) and is increasingly used in health services research and policy development.\(^7\)\(^8\) This methodology is particularly useful for summarising and organising a broad, heterogeneous evidence base to identify a focus for more specific investigation.\(^9\) Our approach was based on the principles refined by the Social Care Institute for Excellence.\(^8\)

**Search strategy**

Searches were conducted on the following databases, for articles published between January 1980 and June 2014: MEDLINE, EMBASE, PsychINFO, CINAHL, Health Management Information Consortium and Health Management and Information Service. A Google Scholar and Web of Science search were undertaken to identify reports or proceedings not indexed in the above. Book chapters and theses were searched via the OpenSigle, EThOS and DART databases. Search terms were developed iteratively by discussion among the research team and a medical subject librarian, seeking a balance between comprehensiveness and focus. The final search strategy was piloted against a list of sample papers known to the research team to ensure that key references were reliably identified. The full review protocol and search strategy was published prospectively in the PROSPERO register (registration reference CRD42014009108). Forwards and backwards citation searching was undertaken with the aid of the reference management software EndNote (V.X7.1), with duplicate suppression. An updated search was undertaken prior to finalising the analysis. The comprehensive search strategy was supplemented with focussed hand-searches through key journals, and by approaching colleagues in collaborating institutions for relevant unpublished reports and ‘grey literature’. A total of 1424 documents were identified in the initial searching process.

**Inclusion and exclusion criteria**

The inclusion criteria were articles published in the English language between 1980 and June 2014, reporting the findings of the research examining patient, carer, healthcare professional or health service management interactions with ambulance services for ‘primary care sensitive’ health problems. This includes the perspectives and experiences of patients (or their caregivers) who access ambulance services directly, and of the health professionals and service managers they encounter. Studies that reported on any stage of an ambulance contact episode (including emergency telephone call or referral, ambulance attendance, ambulance journey, clinical treatment and conveyance outcome) were of interest and thus included. The ‘primary care-related’ nature of the contact could be defined prospectively or retrospectively and from any perspective, either by explicit reference to terms related to primary care or family medicine, or by reference to a comprehensive list of indicator presentations, developed and piloted in conjunction with a medical subject librarian. This included presentations where mental health or social care were the primary need, where the consensus among the research team (two of whom are primary care clinicians) was that these could feasibly be encountered in a primary care setting.

The Phenomena of Interest and Context model\(^10\) underpinned the categorisation and construction of search terms, and as such, the full range of study methodologies and potential interventions were of interest. These included studies reporting qualitative methods, quantitative and mixed method analysis of routinely collected service data, clinical trials, service evaluations, and reviews of any/all of the above, with an additional interpretative element (eg, the development of ‘third order’ constructs). Studies were excluded if they only reported on routine primary care without any involvement of ambulance services or resources, or if English language translations were unavailable. It had been intended to exclude studies that were not undertaken in a health service providing some form of primary care model of healthcare. However, no studies were found to fulfil these criteria and, therefore, none were excluded on this basis.

**Reference screening**

References and documents were managed with the aid of the reference management software EndNote (V. X7). A three-tier screening process was undertaken. The searches identified 1424 references. MJB initially suppressed duplicate references and removed incorrectly cited and foreign language references (n=14). The resulting list (n=1109) was then screened electronically, for obviously irrelevant papers, by title and abstract. The title and abstract of the remaining papers (n=318) were then screened against the eligibility criteria, and a sample (10%) of references excluded at this stage were independently verified by SP and AS with full
agreement. The full papers (n=114) were then read and screened against the eligibility criteria independently by two researchers, with any disagreement resolved by consensus discussion with the third researcher. A total of 31 papers were included in the final systematic mapping process. The PRISMA flow diagram is shown in figure 1.

Data extraction
Owing to the inclusive nature of this review, based on the relatively little relevant research literature, it was decided to include findings from studies of all methodologies. A customised data extraction tool was developed and piloted, based on a modification of the guidelines from the NHS Centre for Reviews and Dissemination. Standard author, date and citation data were extracted, along with details of setting, perspective and participants. Principal qualitative and quantitative findings were extracted, along with up to three ‘key messages’ from the discussion or conclusion sections (see online supplementary appendix table S1). One researcher (MJB) extracted the data, with verification undertaken by other members of the research team. Regular research meetings were held during the data extraction process, and any disagreement resolved by consensus discussion.

Quality assessment
There are inherent complexities of evenly assessing ‘quality’ in a methodologically heterogeneous group of studies such as these, and debate in the literature about how to integrate the findings (if at all) of studies assessed as lower quality. In this review, each study was assessed against the appropriate version of the Critical Appraisal Skills Programme checklist, which includes general and methodology-specific quality parameters. These tools were chosen as, with slight variations, they follow similar quality appraisal structures across a variety of quantitative study designs and qualitative research. This enables critical evaluation of quality according to a similar framework, despite the methodological heterogeneity. Following consensus discussion among the research team, none of the identified studies...
were excluded purely on quality grounds. However, limitations around study design and reporting were used to frame the discussion.

Framework development
Following data extraction, an inductive mapping framework was developed in a process similar to established framework analysis as used in primary research.13 The findings and key messages were grouped categorically.

RESULTS
We identified 31 papers relevant to this review. Table 1 summarises the characteristics of evidence included in the map. The framework resulted in five categories being identified, with 13 subcategories. Table 2 summarises the categories resulting from the mapping process, and Table 3 the distribution of categories by principle study methodology. Figure 2 provides a diagrammatic representation of the inductive mapping framework, indicating how—in this analysis—key messages from the literature were principally centred around one of the three domains—the effects of population characteristics, healthcare infrastructure characteristics or the perceptions or actions of healthcare staff. The majority (n=26) of studies contributed key messages to several subcategories within each domain. Only a minority (n=5) provided key messages that spanned more than one of the three domains.

Factors associated with individual patients (n=16 studies)
Notwithstanding the complexities of determining ‘appropriateness’ of ambulance use from a variety of care-giving and care-receiving standpoints, much of the literature explores how urgent and emergency clinical presentations are recognised and defined by the users of ambulance services, and how this shapes risk management strategies. Studies report wide variation in what both patients and carers deem to be clinical ‘emergencies’, and what would be appropriate self-management thresholds.

Category of clinical problem
One cross-sectional US study16 suggests overall poor physical health status is associated with ambulance use for low-acuity conditions rather than specific symptoms or conditions. This is supported by a similar study showing increased inappropriate use with increasing number of comorbidities, regardless of the actual presenting symptom.17 However, another similarly designed study reports chest pain, respiratory conditions and cardiac symptoms as the most likely clinical problems associated with a true need for ambulance attendance,18 while a Swedish paper reports that nearly half of abdominal pain and urinary presentations to emergency services unnecessarily used ambulances.19

Psychiatric conditions, behavioural disorders and drug and alcohol misuse present particular challenges for ambulance services across the full range of global settings. US studies analysing routinely collected national data sets20 and undertaking case note reviews in emergency departments21 both report high levels of excess ambulance usage among these groups.

Despite these specific symptom-related or diagnosis-related associations, other papers show unclear relationships between the clinical symptom and need for ambulance transport. One comprehensive review of the appropriateness of ambulance transport concludes that there is relatively little variation across study methodologies of ambulance contacts determined as inappropriate on the basis of clinical diagnosis (30–55%).5 These authors highlight the pitfalls of making this assignment retrospectively after clinical assessment, suggesting that basing judgement of appropriateness on information available after the contact (ie, a firm diagnosis) has many limitations in seeking to explain variation by clinical symptoms. Authors of another comprehensive review22 suggest that medical classification of urgency based on physiological measures contrasts with patient classification based on psychosocial factors, rendering distinctions by illness type less informative.

In addition, there is no clear relationship in the literature between whether the ambulance request was deemed to be ‘appropriate’ or not and whether the treatment was for a traumatic injury or a medical symptom. A UK case note review and patient interview study suggests 50% of calls for trauma-related

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<th>Table 1 Summary characteristics of included papers</th>
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conditions were unnecessary, compared with 20% for medical conditions. A Swedish study using similar methodology assesses the figure for trauma to be just 17%.23

Personal anxiety and risk management strategy

Two interview studies24,25 with patients from the UK highlight the importance of an individual’s risk management strategies when choosing ambulance care. One thematic analysis identifies patient and carer anxieties surrounding the relatively small risks associated with choosing alternative care options.24 Another identifies the process of recognising the need for help, overemphasising the urgency, and therefore accepting that only ambulance-based care will meet this need.25 Feeling isolated or alone during this decision-making process is the criterion in choosing the immediacy of an ambulance response in this analysis.26 Studies that included surveys of patients at the time of ambulance care report a genuine fear of a life-threatening condition in 60% of patients, but frequently acknowledge the role of lay bystanders in influencing this assessment.27

One UK study28 set in a rural area explored preemptive strategies used by patients to mitigate the perceived risks, suggesting that a common practice in this cohort was to arrange routine primary care appointments early in an illness just in case they became necessary. A different UK study29 that explored ambulance paramedic views through focus groups reports that some ambulance clinicians feel unsupported by their employers in leaving patients at home after a call, suggesting that appropriate risk management is a challenge for both providers and consumers of ambulance care.

Health knowledge

Only one UK study30 attempted to formally account for patient medical knowledge or training via online hypothetical case-vignettes to explore decision-making. This found a negative association between medically unnecessary ambulance use and formal first-aid training programmes.
may help the population discriminate between routine and emergency problems.

**Actions of care-givers and bystanders (n=5 studies)**

Of those studies that formally included the perspectives or actions of carers or bystanders (n=5), all were qualitative. All studies reported that the influence of carers and bystanders was towards the use of ambulances, rather than against.

**Formal carer responsibilities**

The actions of those with formal caring responsibilities, including those in loco parentis of children are often recognised in the literature as important components of the decision to seek help from ambulances. Several studies highlight the lower threshold of medical ‘risk’ tolerated by formal care-givers in these situations, with the default action during illness leaning towards ambulance care. Often, the voices of the relatives can be louder than those of the patient, who may be led down a less appropriate decision-making pathway by well meaning but misinformed relations. Two thematic studies make reference to the notion that the sick relative is perceived to be less able to make appropriate decisions about their care by virtue of their condition, resulting in de facto vicarious decision-making. Indeed, one interview study illustrates that the roles of relatives and formal carers continue to shape negotiations about non-conveyance even after assessment by the ambulance crew.

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*Figure 2* Relationships between categories derived from the mapping process.

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most clinically appropriate, or even in line with the patient’s preferred priorities.

**Bystander actions**

Two studies also note that unrelated bystanders often initiate calls for low acuity situations that occur in public places. The initiator of the ambulance call is important in determining how likely it is to be medically necessary, with some relationship between bystander knowledge of basic first aid and the ability to determine what is likely to be a relatively minor illness or injury. Members of the public appear to be able to appropriately determine the need for an emergency ambulance when they rate their condition as causing ‘severe pain’ or being ‘potentially life-threatening’. However, they can be influenced by bystanders towards requesting ambulance help if their condition is more minor.

**Population-level factors (n=11 studies)**

A number of studies (n=11 papers) directly analyse the impact of socioeconomic status and demographic variations in access to and use of ambulance services for non-serious conditions, using either self-reported questionnaire data or routinely collected data at the time of care episodes. Comparisons are complex, as these studies encompass a variety of global health systems and health economies, with varying levels of correcting for confounding. Some comparative studies use the regional level as the unit of comparison, some use national, and some international perspectives. Broadly, markers traditionally associated with deprivation were associated with increased ambulance use for non-urgent conditions. No UK-based studies exploring socioeconomic variation in detail met the inclusion criteria.

**Demographics**

Globally, ambulance usage for non-serious conditions shows considerable variation according to demographic factors. In Japan, the two studies that met the eligibility criteria used self-reported postal questionnaire methodologies to identify patterns of ambulance usage. Men and the elderly are more likely to use emergency ambulances for non-urgent problems. In addition, those who lived alone or without the family support network of younger relatives were more likely to call for an ambulance when questioned about hypothetical situations that did not require an emergency response. The authors conclude that access to support from younger family members with positive attitudes to assisting the elderly appears to be associated with seeking treatment from primary care services rather than emergency services.

Similar findings were reported in several US studies, demonstrating old age and male gender to be associated with increased inappropriate ambulance use. A separate US study approached the issue from a different perspective, exploring willingness to consider alternatives to emergency ambulances for acute care, by interviewing patients at the time of presentation to emergency services. This study supported the above findings, by showing a willingness to consider that non-ambulance care was associated with adults of working age (18–65 years) but, in contrast with other studies, unemployment.

Minority ethnicity was positively associated with ambulance use in two US studies, both of which were retrospective analyses of routinely collected national data sets.

Being located in a rural area showed mixed relationships with ambulance usage. A focus group and patient interview study on urgent care-seeking behaviour in Scotland indicated those in the more rural areas would delay seeking urgent ambulance assistance due to their remoteness, preferring a more ‘wait and see’ approach. However, a study in the USA that used a substantial national dataset of over 16 million ambulance journeys to emergency departments found that urban location had a corrected OR of 1.46 (1.2 to 1.7) of ambulance use. This was not the case in a study of children set in South Carolina (USA), reporting a higher odds ratio of 1.247 (1.041 to 1.492) of unnecessary ambulance transport in rural areas. Other studies have shown that patterns of consulting for perceived paediatric emergencies may be different, so the significance of this variation would require more detailed exploration.

**Socioeconomic status and deprivation**

One Japanese study found that those without their own transport were more likely to call ambulances for medically unnecessary situations. While increasing household income was associated with reducing rates of ambulance use, the demand for ambulances did not decrease consistently with a theoretical price paid by the user, suggesting the relationship is more complex than monetary cost alone. Socioeconomic factors associated with ambulance use in US-based studies include living in non-private (ie, social) housing, unemployment and homelessness—particularly in the elderly, where one retrospective analysis of demographic factors recorded by Fire Department paramedics concluded an eightfold increase in emergency ambulance use compared with matched controls. A self-administered cross-sectional survey of health-seeking behaviour in the USA demonstrated that higher educational level was associated with reduced use of ambulance services, and poverty (as defined by total household income) was associated with increased use.

**Health insurance status**

Several (n=4) US-based studies included health insurance status in their analysis of ambulance usage. For non-urgent conditions, ambulance usage was associated with social healthcare insurance in all three studies. Three studies found that being insured within the Medicaid programme (typically associated with low-income individuals and families) was associated with ambulance use.
whereas one study found the same for Medicare (typically associated with the elderly and disabled). As such, all four showed an indirect association with lower socioeconomic and health quality status.

**Healthcare infrastructure factors (n=10)**
A mixture of qualitative and quantitative studies evaluated access to and satisfaction with the urgent care health infrastructure, either regionally or nationally.

**Experience, satisfaction and misconceptions of health infrastructure**
Five qualitative papers directly explored patient-reported perceptions of the capacity and capability of the health infrastructure to deal with their perceived or actual problems. Several of these reported themes of misconception about the level or type of care that could be delivered by the ambulance crews or receiving emergency units. One study identified reassurance as a key element of the ambulance response that patients valued, which links with another study that identified the amount of time spent and thoroughness of the clinical assessment as features that differentiate an ambulance response from an alternative urgent care avenue. Satisfaction scores reduced sequentially with the number of different services a patient contacted prior to definitive care.

**Presence of a primary care model**
The presence (or absence) of a primary care model of health within the wider infrastructure was identified in varying degrees as related to ambulance use. One Swedish study estimates that urgent primary care services handle 42,500 potentially life-threatening presentations annually. In the Netherlands, a cross-sectional study concluded that 88% of all out-of-hours urgent care requests were handled by primary care. Japanese data indicates that the relatively limited existence of primary care and social isolation are important themes in driving inappropriate and expensive ambulance use. Those with access to urgent primary care services in Japan were less likely to use an ambulance inappropriately in hypothetical scenarios.

**Role of other services in unmet needs**
Several UK studies explored, qualitatively and quantitatively, patients’ use of services prior to contact with the ambulance service. Ambulances called after a triage-contact with NHS 24 (a telephone triage service) were more likely to be classified as inappropriate. One paper reports that 68% of service users had contact with more than one service during their urgent care need, with an average of two contacts per episode. Several studies specifically explored patient actions in the lead-up to an emergency call. In general, where primary care services existed, the majority of patients who ultimately were categorised as inappropriately receiving ambulance care had attempted to contact their GP beforehand. One study found that 1 in 20 calls required either ‘general assistance’, or were not regarding any illness or injury at all. Social care was usually the unmet need.

**Challenges faced by health professionals (n=21)**
Of the included evidence, 21 papers referred primarily or substantially to health professionals’ perspectives in the assessment of need for an ambulance.

**Inappropriateness as a concept**
The assessment of ‘inappropriateness’ of an ambulance contact is complex and varied in the included evidence; a result of methodological limitations and conceptual variation. The majority of studies sought to determine ‘inappropriateness’ retrospectively from case notes, using semiobjective scoring or coding systems. Assessments were performed by emergency department clinicians and pre-hospital staff.

Two included assessments of severity of illness undertaken by primary care staff. The professional background and seniority of staff varied. One meta-analysis of US paramedic decision-making reports an aggregate negative predictive value of 0.912 (0.707 to 0.978) for ambulance paramedic determination of necessity for transport at the scene, when compared with hospital physician assessment. Only one US study involving children utilised medical necessity criteria agreed at a consensus conference to make these assessments. Other studies used a mixture of one or more professional opinions, coding systems, or scores based on physiological parameters or clinical conditions, or standardised diagnosis codes such as the International Classification of Primary Care, or custom designed instruments or topic guides to explore provider perceptions of necessity.

Two comprehensive reviews explored the concept of ‘inappropriateness’ specifically and qualitatively. One reported the theme of inappropriateness as divided into two cohorts: those not experiencing a health emergency, and those experiencing an emergency but who do not seek ambulance care when they should. The other review concludes that assessment of appropriateness based on information available after clinical assessment will overestimate ‘inappropriate’ use, and neglects the complex psychosocial context of the request for help.

**Fitness for purpose of the triage process**
Several studies directly or indirectly address the role of telephone triage systems in supporting or confounding both patient and clinical decision-making. A UK study reports that 26% of ambulance calls coded as the highest clinical priority at triage resulted in no patient being conveyed to hospital. Another study highlighted the need for good real-time links between ambulance and primary care triage systems, due to the cross-over of calls. Other qualitative studies report the theme of validation of the urgent need for care which can be inferred from triage.
DISCUSSION
This review has highlighted some important factors that may impact ambulance use for primary care problems in a variety of international settings. Studies, in general, support an association with certain sociodemographic factors including minority ethnic category, lower income, public insurance (where this exists) and increasing age. Broadly, the individual patients’ social circumstances (including the structure of the household), their perceptions of urgency and the shaping influence of care-givers and bystanders appear to have more impact on excess ambulance use than the actual clinical problem or final diagnosis.

This analysis of the literature reveals a complex (and often unclear) relationship between ‘urgency’ of the clinical problem and ‘appropriateness’ of the use of ambulances. Primary care sensitive problems are not consistently defined in the literature, and are often categorised interchangeably with ‘non-emergency’ or ‘non-serious’ problems. Indeed, whether a problem is ‘primary care sensitive’ or not appears to vary depending on how accessible and developed a primary care model is, and on the capacity to respond to demands made of it. Developing a uniform definition of a ‘primary care sensitive problem’ applicable across contrasting ambulance systems presents a challenge for further research.

Mapping the literature reveals that many of the conflicts that exist around whether ambulance use was ‘appropriate’ or otherwise originate from contrasts between prospective and retrospective determinations. Those studies that seek to assign a measure of ‘appropriateness’ usually do so after clinical treatment and with the benefit of a clinical diagnosis, and almost universally from the healthcare provider’s perspective. The heterogeneity of ambulance systems in operation worldwide means ‘appropriateness’ can be evaluated from a variety of social and clinical perspectives with different conclusions. The presence of an established primary care model with dedicated, accessible urgent care channels does appear to have a positive impact. However, the difficulty in determining ‘appropriateness’ highlights the compounding effect of a concept that is situation sensitive and varies across international contexts, and the methodological limitations of studies that blur the notions of ‘unnecessary’ and ‘primary care sensitive’. Future work needs to focus on defining these overlapping but conceptually distinct entities.

The role of triage also appears complex. The literature suggests that—where detailed primary care-focussed triage exists—it can identify, redirect or often completely manage ‘primary care sensitive’ contacts. However, the literature also indicates that triage must be sensitive to patient and care-giver perceptions of risk, which can be magnified when presented with unforeseen and non-specific health symptoms. Recurring messages in the literature are patient and carer uncertainty around urgency, the fear of harm if treatment is delayed and the value placed on clinical assessment for reassurance. Bystander and care-giver decisions appear particularly moderated by perceptions of risk. While some studies suggest that public education can be helpful in reducing ambulance usage, it appears unlikely that education alone will substantially reduce this perception. Strategies that help patients and care-givers to mitigate perceived risk are likely to be beneficial.

This is the first comprehensive mapping review exploring why primary care sensitive problems present to ambulance services specifically. This is a highly inclusive systematic review conducted in accordance with a prospectively published protocol, encompassing a broad range of qualitative, quantitative and mixed methods studies and reviews with an interpretive element. This heterogeneity necessarily requires a narrative synthesis and prevents meta-analysis, and may limit the applicability of some results to contrasting ambulance systems. Studies vary in reporting quality, and although no studies were excluded on the grounds of quality alone, variation in study design and reporting meant no statistical analysis of quantitative data was possible. While there are obvious limitations in attempting to apply a standardised quality measure across such a variety of study types, the use of established tools enabled a consensus discussion within the research team of what a ‘fundamentally flawed’ study would look like, and was felt to be an appropriate compromise between robustness and pragmatism. Additionally, while it is known that children account for a substantial proportion of the urgent care workload, the majority of included studies were conducted on adult populations, limiting the conclusions for the paediatric subset.

Future work needs to focus on more precisely defining ‘primary care sensitive’ problems within the specific context of ambulance services, and on understanding how to respond to the complex psychosocial perception of urgency that appears to be driving increasing ambulance use. Exploring strategies to assist patients and bystanders in mitigating their perceptions of risk, and how these can be achieved through the triage process, is also likely to be important. Research and policy needs to acknowledge the frustrations felt by healthcare providers about so-called ‘unnecessary’ ambulance use, but be sensitive to the idea that patients and carers often do not know exactly what type of help they need when they contact urgent care services.

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Contributors MJB is the main systematic reviewer involved in all stages of the design, analysis and write-up. ARGS and SP contributed to the methodological approach, screening, data extraction, and verification of the analysis through regular research meetings. ARGS and SP contributed significant input to the written paper.

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References


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<th>Paper Reference</th>
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<th>Methodology</th>
<th>Context/Setting</th>
<th>Perspective</th>
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<td>Rademaker AW, Powell DG, Read JH. [43]</td>
<td>1987</td>
<td>Qualitative with descriptive statistics. Cross-sectional study of Emergency Department attendances, customised data collection instrument collecting patient demographics. Clinical case note review.</td>
<td>EDs in Alberta, Canada. Variety of pre-hospital systems (fire service tasked, hospital switchboard tasked and private company tasked ambulances.)</td>
<td>Nurse/clinician assigned assessment of need and medical severity, after arrival at ED by various methods. 'Inappropriate' status assigned retrospectively following clinical assessment. Comparison of cities with paramedic &amp; non-paramedic models.</td>
<td>Inappropriate use in 42% of transports, with unmet need (i.e. ambulance needed or indicated, but not used by patient) in 58% of cases. Both figures lower (34% and 48% respectively, P&lt;0.001) in cities with paramedic ambulance systems. No difference in unmet need or 'inappropriate use' between paramedic and non-paramedic systems in small cities and for older patients.</td>
<td>1. Paramedic staffed ambulance systems are beneficial to the general population of ED users, reducing unmet need and inappropriate use. 2. Inappropriate use and unmet need appear to be lowest in the older age categories. 3. The strongest statistical evidence of difference between paramedic and non-paramedic systems with respect to unmet need and inappropriate use is seen in the group of patients who are discharged from the ED.</td>
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<td>Gardner GL. [23]</td>
<td>1990</td>
<td>Qualitative with descriptive statistics. Patient interview pro-forma and case-note review. Simple descriptive statistics.</td>
<td>Emergency Department, Manchester, UK.</td>
<td>Emergency Department doctors retrospective opinions on medical urgency based on patient pro-forma facilitated questionnaire and clinical case note review.</td>
<td>38% of ambulance calls were deemed 'unjustified'. 50% of calls for trauma causes were deemed unjustified, whereas 20% of calls for medical causes were deemed unjustified. No significant differences between age distributions, or 'place of incident' were found between calls deemed necessary and unnecessary, but the 'initiator of the call' and the 'patient opinion of the severity/illness' did exhibit significant variation.</td>
<td>1. The initiator of the ambulance call is important in determining how likely the ambulance is to be medically necessary, with teachers, friends and bystanders being less able to 'appropriately' judge. 2. An increase in the public education (particularly in schools and workplaces) of first aid skills may improve decision making for more minor trauma cases, avoiding panic and allowing more reasoned decision making. 3. Patients appear to be able to more appropriately assess the urgency of their condition if they rate it as 'life threatening' or rated themselves as in 'severe pain'.</td>
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<td>Tanaka A, Takano T, Nakamura K. [33]</td>
<td>1994</td>
<td>Mixed methods. Secondary analysis of routinely collected database, simple descriptive statistics. Postal questionnaire of sample of general population regarding demographic factors and response to hypothetical ‘non emergency’ situations.</td>
<td>Tokyo, Japan. Contrasting wards.</td>
<td>Retrospective analysis of Fire Service records of ambulance transportation, compared with response to a postal survey of hypothetical ‘non emergency’ situations, sampling a cross-section of adults &gt;65 years in two wards of Tokyo.</td>
<td>Percentages of ambulance transports for minor problems, ambulance transports on Sundays and elderly people who would call ambulances for hypothetical ‘non emergency’ problems were highest in the ward with per capita fewer clinics, hospital beds and physicians. In both wards, percentages of elderly who would call an ambulance for hypothetical ‘non emergency’ problems were higher when living with other older</td>
<td>1. In areas where family support is weakening, elderly persons are more likely to ‘inappropriately’ use high-cost emergency ambulance services for a variety of conditions. Where attitudes to caring for elderly relatives were more positive, this was reduced. 2. Insufficient development of primary health care resources and systems is driving inappropriate ambulance use. Reorientation of health systems is required.</td>
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<td>Authors</td>
<td>Year</td>
<td>Methodology</td>
<td>Study Design</td>
<td>Key Findings</td>
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<tr>
<td>Billittier AJ, Moscati R, Janicke D, Lerne A. [36]</td>
<td>1996</td>
<td>Qualitative, descriptive statistics. Prospective survey on those arriving to ED by ambulance. Survey completed by Emergency Physician, and then second survey on those deemed medically unnecessary by research assistant. Descriptive statistics (multivariate logistic regression).</td>
<td>Emergency Departments (Urban and Suburban) in New York, USA</td>
<td>Emergency Physician determination of medical necessity of ambulance transport to the ED at the time of clinical assessment. 11.3% of transports deemed medically unnecessary, associated with lower age (below 40 years) and medical insurance status (Medicaid). 39% of medically unnecessary transports had chosen ambulance transport due to lack of availability of alternative transport, with 82% willing to consider an alternative. 77% of medically ‘unnecessary’ patients had not called the ambulance themselves, and 17% reported someone other than a health professional recommended calling.</td>
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<tr>
<td>Rucker DW, Edwards RA, Burstin HR et al. [16]</td>
<td>1997</td>
<td>Mixed methods. Cross-sectional study, self-administered demographic and health-status questionnaires (MOS-SF). Retrospective clinical case note review &amp; coding. Descriptive statistics of results.</td>
<td>USA, five urban teaching hospital Emergency Departments receiving patients by ambulance transport.</td>
<td>Associations between self-reported demographics and health-status as ascertained by questionnaire of adult patients presenting to Emergency Department. Retrospective Emergency Department clinician-coded assessment of medical severity from clinical records. Sample of 6 clinical conditions included. Emergency ambulance use (over all other methods of transport to ED) was associated with age &gt;65 (OR 1.95), clinician-coded clinical severity (OR 3.11), poverty (OR 1.4), and worsening in general physical function (OR 1.05 for each point of a 12-point scale). Race, sex, education, Medicaid coverage frequency of ED use, living arrangements, primary care physician availability were not associated with emergency ambulance use.</td>
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<tr>
<td>Snooks H, Wriglet H, George S et al. [5]</td>
<td>1998</td>
<td>Systematically searched comprehensive literature review, 10 articles included, spanning 1977 to 1996.</td>
<td>All eligible global studies included including USA, UK, Ireland, Canada, and Norway.</td>
<td>Comprehensive review of published (and relevant unpublished) literature using keywords pertaining to ambulance use including keywords. Little variation in measures of ‘inappropriateness’ was seen across the studies with differing methodologies, ranging from 30% to 52%. Quantification of ‘appropriateness’</td>
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1. Lower socioeconomic status, including insurance status and unemployment, is associated with medically unnecessary ambulance transportation.
2. The cost of operating alternative transportation methods (taxi, wheelchair van etc) is substantially less than an ambulance service, and as the majority of patients who did not clinically need an ambulance would consider this option, such a model may result in significant savings.
3. Despite a third of patients having a primary care physician, less than a quarter attempted to make contact. The advice of family, friends, bystanders and informal carers was significant in shaping the decision to use an ambulance, large proportion of ambulance calls were made on another’s behalf.

1. Ambulance use appears to be determined by a mixture of medical and socioeconomic factors. In particular there exists a complex relationship between income/education and type of medical insurance, which varies according to correction by physical function and geography.
2. Some of the use of ambulance services by patients with conditions of lower severity may be explained by worse global self-reported physical function.
exploring assignment of (in)appropriateness and abuse/misuse. was varied in terms of methodology, robustness, and frequently used a retrospective subjective clinician assessment. Objective scoring tools were sometimes rendered subjective by their application.

3. Determination of patient type/condition (inc social needs alongside clinical needs) is required to understand workload and appropriate responses to it.

<table>
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<th>Study</th>
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<th>Results</th>
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<tbody>
<tr>
<td>Palazzo FF, Warner OJ, Sadana A. [26]</td>
<td>1998</td>
<td>Mixed methods. Real-time and retrospective clinical case-coding, with simple descriptive statistics. Simple survey of some patients.</td>
<td>Emergency Department of a London (UK) Teaching Hospital</td>
<td>Real-time &amp; retrospective assessment of 'appropriateness' of sample of patients transported by ambulance (after treatment). Clinically scored. Some patient-reported reasons for attending by ambulance. 53.7% of ambulance arrivals were deemed 'appropriate', 15.7% were 'inappropriate', and consensus was not achieved on 19% (11% excluded due data quality). Of the inappropriate attendances, 60% of patients believed they had a serious/life threatening condition, 16% were unaware of emergency GP services, and 8% wished to avoid a long delay in seeing the Emergency Department doctor.</td>
</tr>
<tr>
<td>Richards JR, Ferrall SJ. [18]</td>
<td>1999</td>
<td>Mixed methods. Cross-sectional study, questionnaire completed by patients and Emergency Medical Services personnel. Descriptive statistics.</td>
<td>Urban Teaching Hospital, Level 1 Trauma Centre, USA.</td>
<td>Association of EMS provider’s assessment on the medical urgency of the patients they brought to the Emergency Department by ambulance (along with EMS-staff reported clinical parameters) against patient reported perception of urgency and demographic factors. 43% of EMS providers assessed the ambulance requirement as clinically 'inappropriate', against only 22% of patients who felt their condition as a true emergency, despite 47% of the overall cohort having access to alternative transport. Characteristics associated with EMS perception of a true emergency were: male gender, age &gt;51 years, higher education, chest pain or cardiac complains, shortness of breath and respiratory complains and Medicare insurance status. Characteristics associated with patient perception were: black ethnicity, higher education, shortness of breath and Medicare insurance.</td>
</tr>
<tr>
<td>Victor CR, Peacock JL, Chazot C et al. [42]</td>
<td>1999</td>
<td>Mixed methods. Retrospective review of</td>
<td>London Ambulance Service, UK.</td>
<td>Census of all routine incident forms across 64 Half of calls were made during GP working hours, with 70% of callers</td>
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<tr>
<td>Authors</td>
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<tr>
<td>Marks PJ, Daniel TD, Afolabi O et al. [45]</td>
<td>2002</td>
<td>Quantitative. Clinical case-note review, routinely collected database (dispatch code) data, researcher-generated coding scheme</td>
<td>United Kingdom, Ambulance Service in Nottinghamshire.</td>
<td>Retrospective researcher assessment of appropriateness of ambulance dispatch to calls where no patient transport to hospital occurred, as determined from clinical case notes.</td>
</tr>
<tr>
<td>Archer F, Morgans A, Allen F. [27]</td>
<td>2004</td>
<td>Qualitative. Self-administered surveys, discussion (focus) groups of emergency health workers, in-depth interviews with patients, discussion (focus) groups of health professionals.</td>
<td>Melbourne, Australia.</td>
<td>Perspectives of emergency service workers, emergency department health professionals and patients on the decision-process undertaken when calling for an ambulance, and the outcome of the call.</td>
</tr>
<tr>
<td>Ahl C, Nystrom M, Jansson L. [25]</td>
<td>2005</td>
<td>Qualitative. Semi-structured interviews, qualitative content analysis at three-levels.</td>
<td>Ambulance Service covering town and rural areas in South Sweden.</td>
<td>Patient reported experiences after calling an ambulance – retrospective, within 3 months of contact.</td>
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</table>
transport, and emphasising the need for urgent care. Theme of ‘waiting for help’ – experiencing the wait as long, being alone with one’s feelings whilst waiting for help, avoiding responsibility by virtue of needing help.

2. Definitions of ‘inappropriate’ ambulance use should not be based solely on health professional’s medical perspective, but should take account of patient’s reactions to experiencing a perceived serious health event.

3. Once the decision has been made to call, the experience of receiving ambulance care is accompanied with feelings of legitimacy and expectation of further care in the responsibility of another (the ambulance/hospital).

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Patterson PD, Baxley EG, Probst JC et al. [21]</td>
<td>2006</td>
<td>Quantitative audit. Case-note review, using expert consensus coding strategy for clinical impression. Descriptive statistics, including regression models.</td>
<td>Emergency Department billing records, South Carolina, USA</td>
<td>Retrospective clinician impression of necessity of ambulance transport based on expert consensus of Emergency Medical Technician/Paramedic ‘impression’ codes in medical notes, clinical Emergency Department diagnosis codes, Emergency Department procedure codes.</td>
<td>16.4% of EMS transports to hospital classified as medically ‘unnecessary’, with ages 0-2 having highest proportion of unnecessary trips (26.6%). Multivariable regression models indicate higher odds of medically unnecessary transport with younger age, higher odds in rural rather than urban populations, higher odds in African-American populations than other race groups, higher odds if insured with Medicaid, and higher odds if behavioural problem suspected when compared with trauma.</td>
</tr>
<tr>
<td>Yarris LM, Moreno R, Schmidt TA et al. [35]</td>
<td>2006</td>
<td>Qualitative with descriptive statistics. Structured researcher-administered face-to-face survey. Cross-sectional convenience sample. Descriptive statistics of categorical, continuous, binary and Likert responses.</td>
<td>Level 1 Trauma Emergency Department in Oregon, USA</td>
<td>Adult patient-reported preferences, opinions and decision-making factors when transported by ambulance to an Emergency Department, at time of treatment.</td>
<td>The majority (78%) of attendees were willing to consider alternative transport to hospital, by either car (62%) or taxi (56%). Factors associated with willingness included being 18-65, unemployed, using ED for routine care and not being admitted. Race, gender, health insurance status and medical interventions en route were not associated with willingness.</td>
</tr>
<tr>
<td>Larkin GL, Claassen CA, Pelletier AJ, Camargo CA. [34]</td>
<td>2006</td>
<td>Quantitative. Retrospective analysis of National routinely</td>
<td>USA</td>
<td>Ambulance utilisation patterns on a national level according to</td>
<td>For patients with mental health presentations, nearly one third (31%) arrived at the emergency</td>
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<tr>
<td>Campbell NC, Iverson L, Farmer J et al. [28]</td>
<td>2006</td>
<td>Qualitative. Focus groups and semi-structured interviews with patients, using case vignettes to stimulate discussion regarding decision making. Inductive thematic analysis and ‘conversation analysis’-style sequence analysis of transcripts.</td>
<td>Urban and rural general practice, Scotland, UK</td>
<td>Patient-reported decision making factors when assessing how and when to consult medical advice according to different levels of perceived medical urgency. Focus on routine and out-of-hours primary care, references to ambulance use during out-of-hours perceived emergencies.</td>
<td>Anticipated waiting times for appointments impacted on consulting intentions, especially if the severity of the underlying problem was uncertain. A variety of strategies developed by patients included early ‘just in case’ booking of appointments, being assertive, demanding visits or using out-of-hours services. Making a decision to consult out-of-hours was shaped by perceptions of urgency, which was itself influenced by personal opinions about the out-of-hours service (including how competent it was to deal with the described problem appropriately). Many would default to an emergency ambulance or emergency department, but less so if they were rurally located.</td>
</tr>
<tr>
<td>Kawakami C, Ohshige K, Kubota K, Tochikubo O. [32]</td>
<td>2007</td>
<td>Qualitative with descriptive statistics. Self-administered structured questionnaire, hypothetical non-Yokohama, Japan. (Random resident selection).</td>
<td>Public perceptions of the financial worth of ambulance responses to a variety of hypothetical ‘non-urgent’ cases.</td>
<td>Men, the elderly and those without a car were more likely to call an ambulance in a medically unnecessary circumstance. Higher household income and previous experience of the primary</td>
<td>1. Socioeconomic factors including age, gender, household income and access to own transport show a relationship with the threshold for calling an ambulance in a medically unnecessary circumstance, increasing</td>
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<td>Authors</td>
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<tr>
<td>Hjalte L, Suserud B, Herlitz J et al. [19]</td>
<td>Qualitative with simple descriptive statistics. Retrospective review of routinely collected ambulance dispatch database. Questionnaire of medical need administered at scene of ambulance response.</td>
<td>Sweden.</td>
<td>Percentage of patients not requiring medical intervention (and therefore deemed ‘unnecessary’) varied by condition: 42% for abdominal/urinary symptoms, 18% for chest pain, 17% for trauma/accidents. Over half (55%) of patients assessed as not having medical need for an ambulance could have travelled by car or taxi, whereas the remainder needed to be transported in a vehicle in which they could lie down. 1. Significant percentage of patients did not require any pre-hospital interventions at scene or en route to hospital, suggesting ‘unnecessary’ use of fully equipped and staffed ambulance as a method of transport. 2. Clearer criteria for the use of fully equipped and staffed emergency ambulances are required, appropriately highlighting individuals who need to travel on a stretcher but do not require emergency interventions or advanced skills during the journey.</td>
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<td>Porter A, Snooks H, Youren A et al. [29]</td>
<td>Qualitative. Facilitated focus groups of paramedics, thematically analysed according to modified-framework analysis principles.</td>
<td>UK, Ambulance Service.</td>
<td>Situations where conveyance was not required were broadly classified into elderly patients with no ongoing medical needs (e.g. falls) and calls where conveyance was clinically inappropriate after assessment - “rubbish” calls. Risk minimisation for both the crew and the patient was important in both. The patient’s wishes (autonomy), the perceived clinical risk and the perception of the patient’s capacity were key elements of non-conveyance decisions. However, crews felt the complexities of these assessments were not always clearly supported in the Ambulance Trusts’ formal policies. 1. There are mismatches between policy and the complex practicalities of non-conveyance decision making, which requires a number of hard-to-measure factors to be considered. Crews may feel exposed, unsupported or angry by these expectations which are unsupported by formal policy. 2. Friends, relatives and carers become involved in a de facto shared decision making process during non-conveyance discussions, which often involved an element of negotiation. However, many elements of the established shared decision making healthcare models are absent in the emergency pre-hospital setting, rendering these models of limited value. 3. There is sometimes confusion around what a patient is actually asking for when they request an ambulance, particularly if they refuse conveyance, which can leave ambulance crews in a difficult situation.</td>
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Moll van Charante EP, van Steenwijk-Opdam PCE, Bindels PLE. [41] 2007 Quantitative. Prospective cross-sectional analysis of demographic and clinical data of patients presenting to Out-Of-Hours co-operative, customised data-collection instrument. Retrospective analysis of routinely collected Emergency Department hospital data for direct comparison. Out-of-hours co-operative in Ijmuiden, Netherlands. Nurse and GP/GP trainee assigned clinical codes for presenting problems, diagnosis and clinical management. Comparison of management/follow-up between Emergency Department self-referrals, GP referrals and ambulance service referrals. GPs handled 88% of all out-of-hours contacts, with outcomes split between telephone advice (41.7%), consultation at the OOH centre (47.5%) and a home visit (10.7%). Women and children under 5 were more likely to attend OOH co-ops. Self referral represented majority of ED attendances (43%), most commonly young adult males with traumatic injuries. Those brought to ED by ambulance tended to be older, with complaints related most commonly to chest pain, syncope, shortness of breath or trauma. 1. GP out-of-hours co-operatives handle a substantial majority of the out-of-hours treatment contacts in this context. 2. Within the out-of-hours demand, self-referrals to Emergency Department constitute a small group of patients who— in general— appropriately select this treatment location. GP-referrals and ambulance service-referrals appeared to be ‘appropriate’ in this context, viewed from a clinical perspective, and select more appropriately than self-referrals.

Benger JR, Jones V. [31] 2008 Qualitative with descriptive statistics. Semi-structured questionnaire, descriptive statistics of categorical responses. Free-text replies analysed thematically— no further detail. UK Emergency Department Teaching Hospital, Inner City, South West England Patient-reported actions leading up to attending Emergency Department Direct attendance to Emergency Department more common when help sought by bystanders. 28.5% of patients attended ED directly without seeking advice from any other urgent care channel, with 79% of these dialling 999 for an ambulance. 1. Majority of patients who attended ED or dialled 999 and resulted in hospital admission for acute illness had attempted to seek professional help from primary care in the first instance. 2. Patients who attended ED directly by ambulance more likely to have had an ambulance called on their behalf by a bystander, or when they become ill in a public place. 3. Unfamiliarity with the arrangements for out-of-hours primary care is one factor driving the shift towards Emergency Department Care.

Zakariassen E, Hansen EH, Hunskaar S. [39] 2009 Quantitative. Cross-sectional analysis of routinely collected dataset. Descriptive statistics. National sample of Emergency Primary Healthcare Districts, Norway. Analysis of National prospectively established database commissioned to record patients’ ways of contacting ‘emergency primary health care services’, including coded level of urgency and records of first-actions taken by callers. Analysis of those contacts coded as ‘red’ (potentially life-threatening conditions. Of these, in 48% of cases a doctor and ambulance were simultaneously called out. 65% of the calls coded as potentially life-threatening were initiated by the patient, next-of-kin or a health professional. 2.3% of contacts to the emergency primary health care providers were coded as potentially life-threatening conditions. Of these, in 48% of cases a doctor and ambulance were simultaneously called out. 65% of the calls coded as potentially life-threatening were initiated by the patient, next-of-kin or a health professional. 1. GP-based emergency primary health care services constitute an important part of the emergency system, and handle a small but significant number (estimated 42,500 based on study population scaling) of potentially life-threatening conditions annually. 2. Good co-operation between primary and secondary health services is required to delivery good emergency care, as a substantial
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<td>Brown LH, Hubble MW, Cone DC et al. [44]</td>
<td>2009</td>
<td>Systematic search and meta-analysis of studies reporting US paramedic’s ability to determine medical necessity. Primary outcome: negative predictive value of paramedic determinations. Meta-analysis using random effects model.</td>
<td>Studies involving US paramedics.</td>
<td>Paramedic determination of medical necessity for ambulance transport, compared against reference of physician opinion, hospital admission, and composite of physician opinion and clinical condition.</td>
<td>Five studies included. Negative predictive values ranged from 0.61 to 0.997, model aggregate of 0.912 (0.707-0.978).</td>
<td>1. Data do not support the practice of paramedics determining medically necessity (and therefore necessity of transport) ‘at the scene’, with implications for Emergency Medical Services systems. There is considerable variation across a small number of studies.</td>
</tr>
<tr>
<td>Tangerlini N, Pletcher MJ, Covec MA et al. [17]</td>
<td>2010</td>
<td>Quantitative. Secondary analysis of routinely collected data and case-notes. Retrospective case-control design. Descriptive statistics – regression model.</td>
<td>Fire-service based Emergency Medical Service, Urban area, California USA.</td>
<td>Analysis of demographic and clinical factors recorded on patient clinical record charts by Paramedics, associated with transport to hospital of adults &gt;65 years old.</td>
<td>Factors associated with increased ambulance use: Male gender; black ethnicity; homelessness; increasing number of medical problems and medications; patients with asthma and no primary care physician. Factors showing no association with increased ambulance use: alcohol, substance misuse, psychiatric disorders.</td>
<td>1. Homelessness is strongly associated with ambulance use in the elderly (8 times greater in cases than controls). 2. Medical illness frequency and medication numbers, particularly when the patient does not have a primary care clinician, are associated with increased emergency ambulance use. 3. Providing housing to homeless elderly, and providing primary care clinicians to elderly with multiple medical diagnoses (particularly asthma) may reduce requirement for emergency ambulance transport in this setting.</td>
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<tr>
<td>Knowles E, O’Cathain A, Nicholl J. [37]</td>
<td>2011</td>
<td>Mixed methods. Telephone-administered qualitative questionnaire. Descriptive statistics</td>
<td>City in Central England.</td>
<td>Public perceptions of urgent and emergency care systems – random dialling telephone sample, respondents who had self-reported urgent care service use in the preceding three months.</td>
<td>Majority of users of urgent and emergency care (59%) contacted a GP in the first instance. Two-thirds of users (68%) contacted more than one service during their most recent urgent care event, with a mean of two services contacted per event. Satisfaction with all services diminished when four or more services are contacted per event.</td>
<td>1. The majority of patients experienced a ‘system’ of care, rather than a single service to meet their perceived urgent care need. 2. Longer care pathways (involving more services) result in lower levels of patient satisfaction. 3. People move ‘along’ pathways of services usually because they are informed to contact an alternative service to meet their needs, but in a minority of cases because they are</td>
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<td>Author(s)</td>
<td>Year</td>
<td>Study Type</td>
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<td>Patton GG, Thakore S. [40]</td>
<td>2012</td>
<td>Case note review audit.</td>
<td>Scottish Emergency Department Teaching Hospital, Urban and Remote Population</td>
<td>Emergency Department Consultant opinion on appropriateness of ambulance transport to Emergency Department through case note review.</td>
<td>70%/68% of ambulance attendances (from patient report form and Emergency Department notes) were classified as 'appropriate'. Patients who called for their own ambulance, and those called for after triage by NHS24 had higher rate of 'inappropriate' classification than 'appropriate' classification.</td>
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<tr>
<td>Kirkby HM, Roberts LM. [30]</td>
<td>2012</td>
<td>Mixed methods.</td>
<td>United Kingdom - general adult population.</td>
<td>Decision-making perspectives of general UK population, as invited by emailed forwarded to contacts of the research team.</td>
<td>Almost all participants identified need for ambulance when it was required according to case vignettes, but less so for a stroke vignette (74.8%). No participant characteristics were identified that were predictive of 'inappropriately' calling an ambulance once confounding was corrected for, although having received first aid training was negatively associated in some vignettes.</td>
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<td>Morgans A, Burgess S. [22]</td>
<td>2012</td>
<td>Comprehensive literature review.</td>
<td>Electronic search of global citation databases.</td>
<td>Definition and measurement of concept of 'inappropriate' emergency healthcare utilisation through literature review.</td>
<td>'Inappropriate' users of Emergency Services are divided in to two cohorts: those not experiencing a health emergency, and those who do not seek healthcare when they should. The literature suggests many patients try to avoid acute services if possible. Medical classification of urgency based on physiological measures contrasts with patient-based determination of urgency defined by psycho-social factors.</td>
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not satisfied with the response received from the previous.
multivariate logistic regression.

based on arrival triage scores, for a sample of adults transported to Emergency Department by Ambulance.

arrival between 11pm and 6:59am were associated with ambulance use. Ambulance use was positively associated with psychiatric, toxicological and psychological presentations. Patients arriving to ED by ambulance were more likely to receive lab tests, radiographic imaging and be admitted to hospital.

the homeless, non-privately housed and those who have public medical insurance.

2. Strong association exists between ambulance use for low-acuity conditions and psychiatric/mental health conditions, which may be because of the management challenges rather than the clinical need this group present.

3. Among patients with low-acuity conditions who arrive by ambulance, there is a higher rate of laboratory tests, diagnostic imaging and hospital admission, representing a target for more appropriate resource use.


1. Many calls to 999 based on fundamental misconceptions of what other urgent care can provide.

2. Patient and carer anxiety about serious illness drives ambulance calls, seen as ‘least risky’ strategy.

3. Callers with care responsibilities often default to the most immediate route into care, or that which is perceived as the ‘least risky’ option, which is often 999 ambulance

Togher FJ, O’Cathain A, Phung V et al. [38] 2014 Qualitative. Semi-structured face-to-face and telephone interviews, thematic framework analysis of verbatim transcripts.

United Kingdom, Ambulance Service (East Midlands), mix of urban and rural populations across five counties Perspectives of recent ambulance service adult users (variety of ‘hear and treat’, ‘see and treat’ and ‘see and convey’ responses).

Ambulance service users reported anxiety about their health, and valued reassurance about their advice, treatment and care. Professional behaviour of staff, good communication (including feeling listened to and being kept informed), a short wait for help and continuity during transfers between services/locations were perceived as delivering reassurance.

1. Users call services with a range of clinical conditions and a range of urgency, but value similar aspects of their care from the ambulance service, with most value attributed to actions that reduce anxiety.

2. Performance and quality metrics should include reference to the levels of anxiety felt by service users, and address processes which offer reassurance.

3. As the majority of ambulance contacts are unplanned, the values that patients place on aspects of the ambulance service may be unique to pre-hospital care systems.