

## Increasing utilisation of emergency ambulances

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### Abstract

**Background.** Increased ambulance utilisation is closely linked with Emergency Department (ED) attendances. Pressures on hospital systems are widely acknowledged with ED overcrowding reported regularly in the media and peer-reviewed literature. Strains on ambulance services are less well-documented or studied.

**Aims.** To review the literature to determine the trends in utilisation of emergency ambulances throughout the developed world and to discuss the major underlying drivers perceived as contributing to this increase.

**Method.** A search of online databases, search engines, peer-reviewed journals and audit reports was undertaken.

**Findings.** Ambulance utilisation has increased in many developed countries over the past 20 years. Annual growth rates throughout Australia and the United Kingdom are similar. Population ageing, changes in social support, accessibility and pricing, and increasing community health awareness have been proposed as associated factors. As the extent of their contribution has not yet been established these factors were reviewed.

**Conclusion.** The continued rise in utilisation of emergency ambulances is placing increasing demands on ambulance services and the wider health system, potentially compromising access, quality, safety and outcomes. A variety of factors may contribute to this increase and targeted strategies to reduce utilisation will require an accurate identification of the major drivers of demand.

**What is known about the topic?** Ambulance utilisation is increasing annually throughout the developed world, with previous research suggesting numerous underlying factors.

**What does this paper add?** These factors have not been previously synthesised in the international literature. This narrative review clearly articulates the underlying problems.

**What are the implications for practitioners?** This paper outlines the need for further research of the causes of increased emergency ambulance utilisation, to enable the development of appropriate strategies to manage demand in the future.

**Additional keywords:** ambulances transportation, pre-hospital services, trends.

## Background

In Australia, as in other developed countries, there is an expectation that the health system will fulfil our care needs, especially those that are acute, urgent and life threatening. The role of ambulance services has evolved over the past 20 years into a vital community resource embedded in the health system. Initially designed as an emergency transport service, ambulance services now provide a range of healthcare needs, including pre-hospital emergency and urgent primary care, emergency and non-emergency patient transport, and referrals to alternative healthcare professionals.

In recent years escalating growth in demand for emergency patient services has placed increasing strain on both ambulance and hospital resources. Rising utilisation of ambulances is occurring in common with increased Emergency Department (ED) attendances<sup>1</sup>. Pressures on hospital systems are well recognised, with congestion and overcrowding reported regularly in the media<sup>2</sup> and peer-reviewed literature.<sup>3</sup>

The aim of this paper has been to review the literature concerning trends in utilisation of emergency ambulances throughout the developed world and to discuss the major underlying drivers perceived to be contributing to this increase. A better understanding of causes of increased demand is essential to enable the development of strategies to manage demand in the future.

## Method

For this review, a search was conducted of the online databases of Ovid Medline and PubMed from 1996 to 2009. Keywords used included 'ambulances', 'pre-hospital care' (Ovid), 'paramedic', 'paramedic prehospital' (PubMed), 'utilisation', 'ambulance transport', 'trends', 'health services needs and demand', and 'healthcare utilisation' (see Appendix).

The titles of manuscripts were initially screened for inclusion; and abstracts of ambiguous titled papers were reviewed (where available). This search was supplemented by a web-based search through Google and Google Scholar. Finally, references of the chosen articles and audit reports were scanned by the first author, in an attempt to ensure relevant papers had not been overlooked by the initial search. In addition manual searches were conducted of relevant journals and grey literature including service provider reports from Australia, New Zealand, the United Kingdom, Canada and the United States of America. This search was limited to literature written in English that described usage of emergency ambulances in developed countries.

Articles were included if they focussed on trends in transportation by emergency road ambulances, or described the factors underlying the increase. Excluded manuscripts are described in Fig. 1.

## Findings

This search yielded various service provider reports and 298 peer-reviewed articles pertaining to trends in patterns of utilisation of emergency ambulances. After screening for relevance, 45 articles and reports were drawn on for this review (Fig. 1).

Demand on ambulance services encompasses several aspects of service provision by the service provider, including receipt of calls for assistance, emergency vehicle dispatch, paramedic

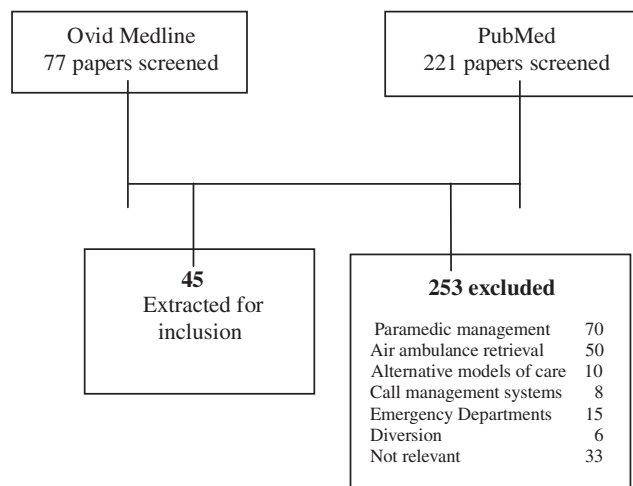


Fig. 1. Results of peer-reviewed literature searches.

attendance at the scene, and treatment or transportation of patients. In order to tease out the underlying factors that drive overall demand, we reviewed papers focussing on trends and patient characteristics associated with transportation by emergency ambulances.

In the studies identified, it was apparent that the research to date, and the information collected by service providers, has focussed principally on the volume of reported events and patient transports over varying time periods. Few studies have investigated the possible association between the rise in usage with patient, community or health system factors.

## Evidence of increasing utilisation of emergency ambulances

The majority of peer-reviewed publications identified were from the UK, and the USA, with additional reports from service providers sourced from the Internet. International studies and service provider reports identified by this review covered different time periods, hindering a comparative analysis over time. However, there was evidence that the numbers of patients transported by emergency ambulance services has increased over the past two decades in many developed countries.

In summary:

- The emergency workload of the London Ambulance Service 'doubled' between 1989 and 1999,<sup>4</sup> the number of patients transported to EDs having increased at an average annual rate of 8.9%.<sup>5</sup> This trend has continued with 7% growth in London between 2007–08 and 2008–09<sup>6</sup>;
- In the USA, a national survey of ambulatory care in 2005 reported a 25% increase in all ambulance arrivals at EDs since 1997<sup>7</sup>;
- In Canada there was a rise of 20% over between 2003–04 to 2008–09<sup>8</sup>; and
- In New Zealand growth in incidents in the year ending 2007–08 was 20%.<sup>9</sup>

Three Australian papers were identified, with each describing increased utilisation; however, their prime focus was to

describe possible predictive factors.<sup>10–12</sup> Ambulance services are organised at a State level. Service providers, the Council of Ambulance Authorities Inc. and the Productivity Commission provide data on all aspects of services rendered annually to the Federal Government. These reports indicate an annual rise in ambulance responses ranging from 7% per annum to 12.5% per annum since 1996.<sup>1,13–18</sup> In the year ending 30 June 2008, the number of patients transported increased across Australia by 5.4%.<sup>9</sup>

## Discussion

The sustained increase in emergency ambulance demand throughout the developed world has been attributed to a range of drivers. Population ageing, changes in social support, accessibility and pricing, and increasing community health awareness have been postulated. The extent of their contribution has not yet been established; as such it is reasonable to review these factors.

### Population growth and ageing

Generally demand for ambulances is growing faster than can be explained by population growth. Australia's annual population growth is currently 1.7%,<sup>19</sup> making little contribution to increased utilisation of emergency ambulances. However, the population is ageing, which has been cited as contributing to the rise since the early 1980s. American researchers Gerson and Shvach,<sup>20</sup> McConnell and Wilson<sup>21</sup> and Rucker *et al.*<sup>22</sup> identified patients aged  $\geq 65$  years were almost twice as likely to use emergency ambulances compared with those  $< 65$  years, with a concomitant incremental increase in usage from 65 to 85+ years of age.<sup>23</sup> Australian and British studies found a similar association in the late 1990s.<sup>10,11</sup> Review of London Ambulance Service's workload at that time showed consistently high rates for patients greater than 75 years old over a 10-year period. Despite this there was no statistical evidence that call rates had increased disproportionately in any particular age group.<sup>4</sup>

The associated increase in utilisation with ageing is likely due to the growing prevalence of chronic medical conditions and incidence of age-related acute illnesses and cognitive or physical dysfunction.<sup>21</sup> In support of this, over half of the Australian population aged  $> 65$  years reported a disability, with 19% reporting profound limitations.<sup>24</sup> The impact of age-related health conditions on ambulance services is demonstrated by a study showing that 85+ year olds utilised ambulances at five times the rate of patients aged 45–64 years, due to cardio-respiratory problems, fall-related injuries or advanced life support needs.<sup>25</sup> Recent data from Ambulance Victoria demonstrates the incremental increase in utilisation by patients aged 65+ years (Fig. 2) (Ambulance Victoria, Historical utilisation rates, pers. comm., 2008).

Although some evidence supports the association of increasing age and associated morbidities with increased emergency services usage, analysis of one Australian service provider indicated that only 25% of growth in emergency ambulance usage between 1996 and 2001 was attributable to ageing and population growth.<sup>26</sup> This indicates that other factors may make a substantial contribution.

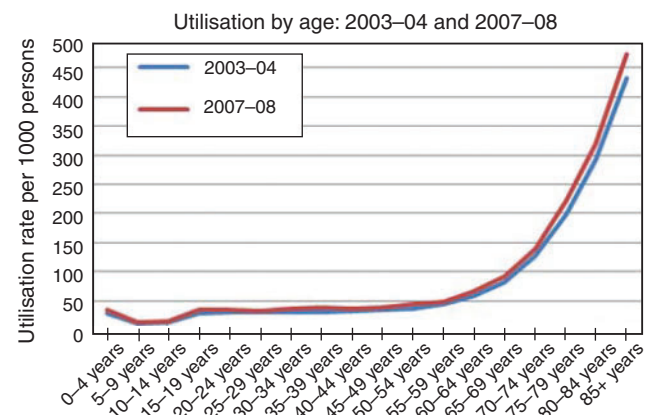


Fig. 2. Utilisation per 1000 persons by age 2003–04 to 2007–08. Source: data courtesy of Ambulance Victoria.

### Social support

Changes in social support may contribute to rising ambulance utilisation. Increased usage was associated with living alone,<sup>22</sup> and limited access to alternative transport has been cited as a contributing factor to rising usage.<sup>27</sup> In contrast, patients with a current or previous partner were less likely to use ambulance resources than those who remained single.<sup>10</sup>

The number of Australians approaching older age who are living alone, divorced, widowed or never married has increased over the past thirty years.<sup>28</sup> Simultaneously, wider participation of middle-aged women in the workforce, and erosion of the extended family has resulted in a decreased capacity to care for older relatives.<sup>29</sup> In addition, government policies encourage older people to remain living in their homes, with the majority of over 65 year olds doing so. Just 7% of those over 65 years live in retirement or aged care accommodation.<sup>28</sup> Of those living in private dwellings, 62% live alone.<sup>30</sup> It is projected that by 2026, the number of people living alone over 65 years will continue increasing by an estimated 57–100%.<sup>28</sup>

Subsequent fragmentation of support can leave the elderly with limited access to alternative transport and access to health-care. Therefore decreasing social support and social isolation is a plausible driver of increased ambulance utilisation.

### Pricing and accessibility

American studies have associated higher rates of ambulance use by patients entitled to free transport in their insurance coverage.<sup>22,31</sup> Similarly, in Australia, at a time when the majority of the Queensland population (~60%) was covered by a low-cost annual subscription scheme, there was an increased likelihood of ambulance use by subscribers compared with non-subscribers ( $P = 1.54$ , 95% CI 1.40–1.71).<sup>10</sup> Some years later the introduction of a small universal levy, following abolition of any direct patient fees, realised an increase in usage.<sup>12</sup> Of particular interest, was an increase in use by a younger age group with lower clinical acuity. A survey recently conducted in Japan investigated the effect of introducing user charges on demand. Responses suggested that a 'reasonable' charge (US\$190) for transport by

ambulance might in fact reduce the unnecessary calls that compound demand without reducing medically necessary calls.<sup>32</sup>

Improved accessibility and pricing raises the question of moral hazard as a potential driver of demand. Moral hazard describes the tendency to use more health services when people are covered by some form of insurance and therefore their out-of-pocket expenses at the time of service are lower or non-existent.<sup>33</sup> An ambulance subscriber in need of urgent medical attention may default to telephoning the ambulance service which provides an immediate response and specialised treatment at low or no cost. This may contrast with a perception of the costs and waiting time involved with seeking consultation with the local doctor.<sup>34</sup>

#### *Reduced access to traditional primary care services*

Gradual changes in practice by community-based primary care doctors seeking 'work-life balance' have resulted in shorter working hours and more General Practitioners (GPs) working part-time. Workforce shortages have also affected GP availability and access.<sup>35,36</sup> One Australian study noted that the majority of ED patients cited lack of access to a GP as their reason for attendance.<sup>16</sup> Reduced primary care may therefore impact on ambulance usage; however, there were no studies identified directly investigating this as a contributing factor.

#### *Increased health awareness*

A variety of health promotion activities and mass media campaigns have raised general public awareness about the desirability of seeking early medical attention for a variety of conditions.<sup>37</sup> In the USA, mass media promotion about acute myocardial infarction increased emergency ambulance usage,<sup>38</sup> whereas in Canada, an increase in stroke presentations to EDs followed a stroke awareness media campaign.<sup>39</sup> Although ambulance use was not measured, this would be expected to increase concomitantly. These findings suggest that ongoing national and international 'Think FAST for Stroke Awareness' campaigns<sup>40</sup> are likely to increase emergency ambulance utilisation.

Media campaigns have been shown to have a sustained impact on health awareness.<sup>41</sup> Indeed, a Japanese campaign was effective in decreasing ambulance usage.<sup>42</sup> Therefore it is possible that a targeted campaign could educate the community on appropriate use of emergency health resources.

#### *Changing community expectations*

Changing community expectations may contribute to rising ambulance usage. These are rising as expectations increase regarding accessibility, quality and accountability of providers.<sup>43</sup> No attempts to quantify this effect on emergency healthcare have been identified in the published literature. However, the consistent pattern of increased utilisation regardless of age group or diagnostic category suggests that this may be an important factor.

#### *Appropriate use and accessibility to alternative services*

The rise in demand has facilitated investigation into the appropriateness of utilisation. Up to 40–50% of patient requests for emergency transport have been described as potentially avoidable or unnecessary,<sup>44–50</sup> being more suited to alternative community

services, such as social, psychiatric or district nursing services<sup>44</sup>; or warranting transport to the ED by alternative means such as a non-emergency vehicle.<sup>49</sup> However, it is difficult to define what is inappropriate or unnecessary, as clinicians and patients may hold different viewpoints. To date inappropriate usage has been mostly defined only from the clinician's perspective.

Governments and service providers have attempted to reduce unnecessary usage of emergency health services with the introduction of 24-h health telephone call lines and telephone triage. Initiatives such as the UK's NHS Direct and Victoria's Nurse-On-Call have improved access to telephone advice<sup>51</sup>; however, there is some evidence suggesting they have had little impact on reducing demand on emergency resources.<sup>52</sup>

Telephone triage, where structured call-taking systems prioritise requests for emergency response, is now used by most ambulance services. A second level of telephone triage based on standardised protocols is also used to manage lower priority calls in London and Melbourne. This has enabled referral to alternative community services or the dispatch of a non-emergency vehicle to some lower priority callers. In Melbourne 7.2% of requests for an emergency response received an alternative to an emergency ambulance in 2008–09.<sup>53</sup> However, telephone triage is constrained by the capacity of the patient or carer to provide reliable information. Service providers are appropriately risk-averse, limiting the scope for referral to alternative care out of necessity. This may contribute to a reduced threshold for seeking medical care. However, the occasional problems reported by the media reinforce the need for systems to ensure patients genuinely requiring a rapid response are not overlooked.

## **Conclusion**

This review found evidence that patient transportation by emergency ambulances has been increasing over the past two decades. Such continued rise in demand places increasing stress on ambulance services and the wider health system, potentially compromising access, quality and safety of care and patient outcomes.

Many contributing factors have been postulated, related to changes in the needs of the community arising from ageing, declining health, social structural change, and changes in organisation of primary healthcare. Limited price signals and improved accessibility of ambulances, alongside improved community health awareness and expectations possibly contribute to a degree of avoidable use. The relative contribution of these factors to the continuing rise in transportations has not been well studied.

We recommend further investigation of the major causes of rising demand. For this to be undertaken, there must be collection and recording of standardised data with common definitions of demographic, socioeconomic and health-related factors. Effective management of future demand will depend on a comprehensive analysis that goes beyond simple demographics of age and population growth.

## **Competing interests**

Judy Lowthian is the recipient of an NHMRC postgraduate research scholarship to undertake her doctorate on emergency demand. Alex Currell is employed by Ambulance Victoria in the



capacity as General Manager of Strategy & Planning. However, this literature review was conducted independently and was not influenced by the scholarship or the employment.

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**Appendix. Search strategy**

| Online databases  | Ovid Medline, PubMed  |         |
|---|---|---------|
| Cross-checking of references  | Published reviews, original articles, audit reports (1996–2009)   |         |
| Manual searches: relevant journals and ambulance service reports            | Australia, New Zealand, United Kingdom, United States of America, Canada  |         |
| Keywords  | Ambulances, pre-hospital care, paramedic, paramedic prehospital, utilisation, ambulance transport, trends, health services needs and demand, healthcare utilisation |         |
| Ovid Medline search   |   |         |
|   | Number of papers  |         |
| 1   | Exp Ambulances/ut [Utilization]   | 251     |
| 2   | 'pre-hospital care'.mp  | 150     |
| 3   | 'paramedic'.mp  | 731     |
| 4   | 1 or 2 or 3   | 1106    |
| 5   | utilization.mp  | 55 469  |
| 6   | trends.mp   | 46 860  |
| 7   | 'health services utilization'.mp  | 33      |
| 8   | 5 or 6 or 7   | 101 089 |
| 9   | 4 and 8   | 85      |
| 10  | Limit 9 to (English language and humans and year = '1996–2009')   | 77      |
| PubMed (excluding Medline) [English language, humans, items with abstracts] |   |         |
|   | Number of papers  |         |
| 1   | Ambulance transport   | 1048    |
| 2   | Paramedic prehospital   | 837     |
| 3   | Healthcare utilization  | 58 733  |
| 4   | Trends  | 134 209 |
| 5   | 1 or 2  | 4768    |
| 6   | 3 or 4  | 186 737 |
| 7   | 5 and 6   | 221     |