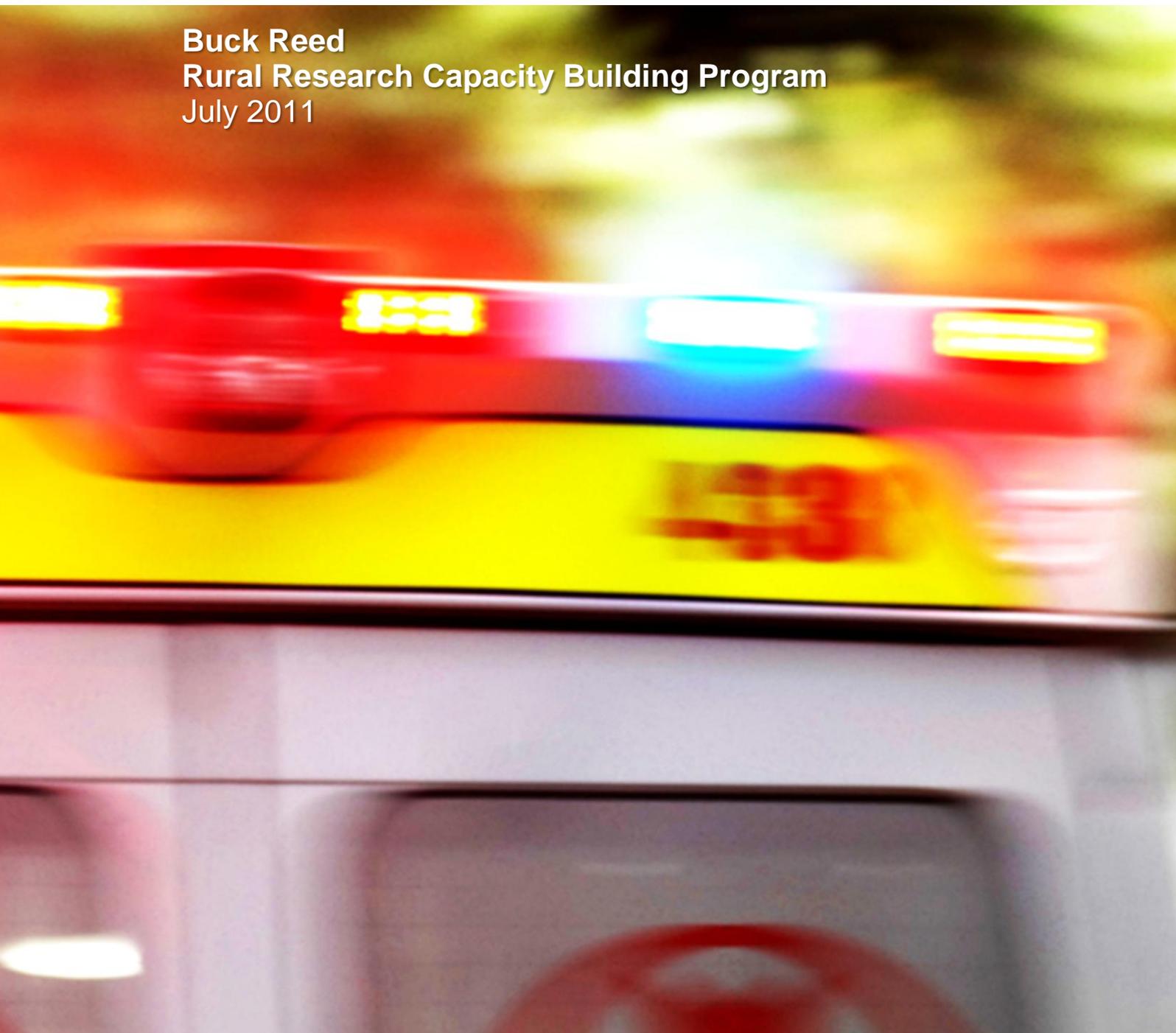


# **Ambulance utilisation in serious health emergencies in rural populations measuring unmet need**

**Buck Reed**  
**Rural Research Capacity Building Program**  
July 2011



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# Ambulance utilisation in serious health emergencies in rural populations: measuring unmet need

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## ABBREVIATIONS

ARIA	Accessibility/Remoteness Index of Australia
ASGC	Australian Standard Geographical Classification
ASNSW	Ambulance Service of New South Wales
ATS	Australasian Triage Scale
ATSI	Aboriginal / Torres Strait Islander
AWARD	All Wales Alliance for Research and Development in Health and Social Care
CRI	Coping Responses Inventory
ED	Emergency Department
HNEAHS	Hunter New England Area Health Service
HREC	Human Research Ethics Committee
ICD-10	International Classification of Disease – 10 <sup>th</sup> Revision
MHLOC	Multidimensional Health Locus of Control
MPS	Multi-Purpose Service

Note: In those situations where the word "Ambulance" is capitalised, it is a reference to the Ambulance Service of New South Wales. Use of "ambulance" uncapitalised refers to ambulance services or activities in general.



## Abstract

### INTRODUCTION

Ambulance use in rural and remote parts of Australia has been reported to anecdotally to be lower than in urban areas based on anecdotal reports. Experiences of paramedics in rural and remote locations gave rise to the question of whether this phenomenon was occurring and what was the basis for lower utilisation of ambulances in these communities.

### BACKGROUND

Calling an ambulance in a serious health emergency requires a complex set of decisions ranging from recognising that an emergency is occurring to making a risk-benefit analysis of potential courses of action. A number of psychological models of behaviour have been applied to ambulance use and largely recognise that ambulance calling behaviour is heavily influenced by socio-emotional factors.

### METHODS

Data from Emergency Department records was obtained from the Hunter New England Area Health Service (HNEAHS) from 1 July 2008 to 30 June 2009. In total, 354,909 records were obtained. These records were de-identified and contained 11 characteristics for analysis. This data was analysed to determine the method of arrival across the sample and specifically in high acuity patients. Logistic regression modelling was used to determine if any specific characteristics were indicators of ambulance use.

### RESULTS

People from Inner Regional areas are 41.5% less likely to use ambulances overall and 27.7% less likely to use ambulance in serious health emergencies than people living in Major Cities. People from Outer Regional and Remote areas are 55.1% less likely to use ambulance overall and 27.9% less likely to use ambulances in serious health emergencies than people living in Major Cities. Logistic regression modelling indicated that rurality was a significant factor in ambulance use in adults in all areas outside Major Cities and in children in Inner Regional areas. Gender was not a determinant of ambulance use, however, age was a significant predictor of ambulance demand with older people using ambulance more, although the rate of increase with age was much greater in Major Cities than in regional areas.

### DISCUSSION

This study indicates that there is a disparity between rates of ambulance use in urban and non-urban areas. The concept of unmet need should be considered as a more complex phenomenon than simply a utilisation gap and exploration of true levels of unmet need is warranted. It is likely that rural residents operate under a different paradigm of problem solving than urban residents which focuses more on self-sufficiency and action planning. Likewise, some studies have shown that health literacy and knowledge of ambulance capacity may be limited in rural and remote areas, and this is a critical factor in the risk-benefit decisions people make when deciding to call an ambulance. A clearer understanding of how rurality affects ambulance use has a number of implications for ambulance services both in terms of demand management and workforce issues.

### CONCLUSION

Poor understanding of the benefit of ambulance use in serious health emergencies combined with psycho-social features of rural problem solving paradigms are likely to result in lower ambulance use. This potentially denies rural populations access to a critical health resource which can potentially increase health outcomes in health emergencies in rural communities.

### RECOMMENDATIONS

- 1) Targeted ambulance community education campaigns which address specific health literacy issues.
- 2) Increased community engagement by ambulance services
- 3) Use of Medical Emergency Plans specific to each rural residence

## Executive Summary

### INTRODUCTION

Demand management is an increasing issue for ambulance services in all Australian jurisdictions. Traditionally, demand management has largely been focused on managing “inappropriate use” primarily in urban areas. While this issue persists there is, conversely, anecdotal evidence of underutilisation in rural and remote areas. People experiencing serious health emergencies may potentially be placing themselves at risk during self-transport and do not benefit from ambulance clinical interventions. Underutilisation has significant impacts on ambulance services including workforce and resourcing implications.

The phenomena of unmet need and underutilisation are largely unmeasured and have not been fully explored. In NSW there is excellent data capture around Ambulance activity, but few mechanisms to measure the number of potential patients not accessing Ambulance, especially in serious health emergencies. This leads to a number of questions, principally: *are there differences in ambulance utilisation in serious health emergencies between patients in metropolitan areas and patients in rural and remote areas?*

### METHODS

An exhaustive search of available literature around rural ambulance use, decision making in calling ambulances and unmet need/inappropriate use was undertaken. In total, 157 items on a number of related topics were thoroughly reviewed. For the purposes of this study, a definition of “health emergency” and “serious health emergency” were created in line with existing work. A large body of work has been directed at quantifying inappropriate use as well as quantifying ambulance demand in different geographic areas.

To measure underutilisation and unmet need a retrospective cohort study was undertaken using Emergency Department (ED) data from the Hunter New England Area Health Service. Analysis of ED presentation data was undertaken to measure the gaps in ambulance use between urban and rural populations and build a profile of the effect of rurality and other characteristics on ambulance use. The study received appropriate ethics approval from the Royal Prince Alfred HREC.

A variety of data was collected including age, gender, home postcode, hospital, presenting problem, ED diagnosis code (by ICM-10), ED diagnosis description, ATSI status, triage category and mode of arrival. All ED activity from 1 July 2008 to 30 June 2009 was included in the cohort which constituted 354,909 records. Patient postcodes were stratified in line with the Australian Standard Geographic Category (ASGC). Hospitals were stratified to service type. Triage categories were stratified to “high acuity” (ATS 1&2) and “low acuity” (ATS 3-5).

The data set was large and involved a unique mix of urban and rural populations. The sample area include very little “remote’ area and no “very remote’ area. The substantial size of the data set supported generalisability. Triage score as the measure of health emergency severity is influenced by subjective triaging practices. Rural hospitals have been shown to have lower levels of inter-rater reliability in emergency triage.

The study was underpinned by a number of assumptions. Firstly it is assumed that ambulances provided benefit to high acuity patients – this is borne out in a number of studies of specific conditions which ambulance attend. Secondly it is assumed that most people present to a hospital near their place of residence. As such, hospital size can be used as a defacto measure of rurality as the smallest hospitals are largely in the smallest locations.

Data analysis was undertaken using SAS 9.2. Several statistical tests were used depending on the data type. Logistic regression was used to test relationships between variables.

### LITERATURE REVIEW

Within work done on demand management and inappropriate use, there is a predominant paradigm of viewing the concept of appropriateness from a clinician point of view. Some recent articles have indicated incongruities between clinician and patient views of appropriateness which warrant consideration when considering unmet need.

A number of theoretical models exist to explain patient decision making around health issues. Models broadly fall in two groups. Cognitive models revolve around logical and objective solutions to problems. They revolve around risk/benefit decision making but are limited by a poor understanding of clinical risk by those in the community.

Socio-emotional models account for complex issues of situation, values and social expectations. A diverse range of socio-emotional models exist. Those best suited to understanding decision making in health emergencies include the Normative-Affective Model, the Health Belief Model, and Leventhal’s Self-Regulatory Model of Illness

Behaviour. These models still include components of logical decision making but allow for more subjective influences. Those making decisions in health emergencies may be influenced by assumptions and perceptions such as beliefs about the presence or time frames ambulance resources, inability to effectively assess the seriousness of the health emergency, or by confusion created by bystanders. Morgans has synthesised a number of theories into a model specifically designed for health emergencies. This four step process involves a decision making pathway where:

- 1) The patient must decide that the symptoms they are experiencing are not normal.
- 2) The patient must determine that the abnormal experience constitutes an emergency.
- 3) The patient must decide to seek help either by determining that they are unwell and that they need assistance or by seeking the approval of others to access assistance.
- 4) Finally, there is a decision to specifically seek some kind of medical assistance.

The All Wales Alliance for Research and Development in Health and Social Care (AWARD) examined unscheduled care in both rural and urban Welsh populations. The AWARD report found that patients juggled a multitude of situational variables when deciding on their course of action for unscheduled health care needs. The AWARD group found that most respondents held significant fears of being branded as “inappropriate” ambulance users. What choices patients made about their choice of unscheduled health care, including the choice of ambulance, they largely considered “appropriate” at the time. Patients who used unscheduled care services were found to often have been experiencing high levels of emotional response, severe symptoms, believed their health symptoms would not stop and believed their health issue would have serious consequences. Several other papers also highlighted the complex and subjective influences which affected decision making in health emergencies.

Oshige’s analysis of a public campaign regarding “inappropriate use” also highlighted the influence that such campaigns run about ambulance use had over behaviour. In this study it was found that there was a 7% drop in low acuity presentations and an 8% decrease in high acuity presentations. This study highlights the poor understanding within the community of what constitutes high and low acuity conditions from a clinical risk perspective.

Morgans’ study into patient decision making utilised the Multidimensional Health Locus of Control (MHLOC) and the Coping Responses Inventory (CRI) to measure coping strategies in health emergencies. Morgans found that people whose coping mechanisms tended towards positive reappraisal and resignation and those whose MHLOC tended towards “powerful others” were more likely to use ambulance services in health emergencies. In people who tended towards problem solving or avoidance were less likely to use an ambulance.

Several studies into rural ambulance use found that rural people were likely to have relatively lower levels of “inappropriate” use than metropolitan ambulance users and as well as an overall lower ambulance utilisation rate for transportation to hospital. Equally, several papers highlighted the complexities of health care access and service choices in rural areas. Service choice is often linked to relationships with those in the community including health professionals. Rural people are more likely to use health services if there is an explicit invitation or instruction from a respected person such as a General Practitioner. Rural people commonly accept less service for fear of being branded as “troublesome” by health providers. Several papers indicated that cost was not a factor in health care choice for rural population.

## RESULTS

Of the 354,746 cases analysed, 20,164 were considered high acuity. Ambulance use varied by severity with 80.3% of ATS 1 patients and 4.5% for ATS 5 patients. When stratified for age and rurality, children still have very low ambulance use rates (Major Cities 10.3%-Outer Regional 4.8%) and older adults had higher rates of use (Major Cities 59.3%-Outer Regional 28.6%). When only high acuity cases were analysed, the pattern was similar but with a smaller difference between age groups.

**Table A. Ambulance use by patient home postcode stratified to ASGC for all patients and high acuity patients**

	All Patients (ATS 1-5)			High Acuity Patients (ATS 1&2)		
	Major Cities	Inner Regional	Outer Regional*	Major Cities	Inner Regional	Outer Regional*
Other Transport	73.4%	84.5%	88.1%	43.0%	58.8%	58.9%
Ambulance	26.6%	15.6%	11.9%	57.0%	41.2%	41.1%

\* Includes Remote population in the sample.

Notable differences were seen when comparing the health services utilised by patients experiencing serious health emergencies. In high acuity patients, those which attended a Community Hospital (eg MPS facilities) had used ambulances less often to get there (24.9%) than those who attended Tertiary Referral Hospitals (65.9%). Logistic regression was undertaken to determine the impact of rurality and found that in children in Inner Regional areas and adults outside Major Cities, rurality was an indicator of reduced ambulance use when compared to populations living in Major Cities. Gender was not a factor in ambulance use in adults and a very weak indicator in children. Differences were also found when comparing presenting conditions. Slow onset conditions (chest pain) tended to have lower ambulance use than sudden onset conditions (seizures).

## DISCUSSION

The differences in ambulance use found in this study indicate a significant level of underutilisation which would suggest the existence of unmet need. The level of underutilisation found would extrapolate to 27,480 patients state-wide with serious health emergencies who are not accessing ambulance services or an access gap between urban and regional areas of around 7,150 patients. While high acuity patients are relatively small in their numbers per capita they do represent the market most suited for ambulance services.

The decision making models described in the literature review suggest that underutilisation is a phenomenon linked to rural problem solving paradigms and community values. Implications from the data are that there are lower levels of low acuity ambulance transports in rural areas but also an appreciably lower level of high acuity use. Specific conditions influence people's decision to use ambulance services and that suggests that the population has a poor capacity to recognise health emergencies, especially those with a slow onset.

Unmet need poses a unique issue for ambulance services. In an era where increased ambulance use is a major issue for ambulance resource management, there is a clear underservicing in high acuity users who would be considered the target market for ambulance services. Any attempts to increase "market share" of high acuity patients needs to be undertaken in the context of demand management. The focus should be on getting the ambulance to the right patients rather than simply increasing use. Addressing unmet need in low utilisation areas is likely to carry benefit for ambulance services through positive impacts on their workforce. Increased use by high acuity patients is likely to make paramedics feel more valued in the community and increase use of paramedic skills and knowledge.

## CONCLUSION

Underutilisation of ambulance services in high acuity patients may potentially exclude patients from access to emergency health services which can have a significant impact on their health outcomes. Paramedics operating in rural areas are also potentially impacted by non-utilisation in terms of both their sense of purpose and value and their maintenance of skills and knowledge. Choosing to access an ambulance services in health emergencies relies on a series of complex decisions made by people under duress generally with a poor grasp of clinical risk or health literacy and is complicated by various community perceptions. Increasing utilisation in patients who may benefit will require complex strategies which account for the myriad of factors which are involved in decisions to use ambulance services. Such strategies also need to recognise the resource management risks of increasing ambulance workload.

## RECOMMENDATIONS

A range of strategies may potentially begin to address the issues of underutilisation and unmet need:

**Targeted Ambulance Community Education Campaigns** should be undertaken specifically addressing the barriers identified by rural people to accessing ambulances. They should be based around positive campaigns which identify the benefit ambulance may provide in health emergencies, support the decision making processes and address issues of health literacy which often provide barriers to informed decision making.

**Increased Community Engagement by Ambulance Services** seeks to build relationships which underpin choices of service providers made by rural communities. Activities which assist individuals to understand the role and capacity of ambulance services, provide permission to communities to access services, and demonstrate to the community that paramedics are trusted health professionals.

**Medical Emergency Plans** assist the complex process of decision making by both educating the community on the process of decision making and creating predetermined decision outcomes like access arrangements, meeting points and triggers for seeking ambulance assistance.

## Introduction

The Ambulance Service of New South Wales (ASNSW) has provided ambulance transport in some form to residents of the state of New South Wales (NSW) for over 100 years. During this time, significant changes have occurred in ambulance workload and community perceptions of ambulance roles. Equally, there have been significant advances in the last twenty years in the capacity of paramedics to respond to and provide complex treatment for a wide range of medical emergencies.

In recent years there has been a significant focus across all ambulance jurisdictions on inappropriate use, that is, patients who access ambulance services who could have been managed through other health services such as primary care services. Anecdotally, this is seen by paramedics as a largely urban issue with a converse experience found in rural locations. In these areas, there are numerous stories of patients with serious life threatening emergencies self-presenting at hospital instead of utilising ambulance services. The impact of this is significant. Not only does it create potential patient safety issues (for example, patients driving while in pain, while confused or with distracting injuries), it may delay access to treatment and excludes patients from strategies such as trauma bypass and aeromedical retrieval from the site of the incident. These strategies exist to ensure patients receive appropriate care as many small rural hospitals are poorly resourced and staffed for serious medical emergencies, especially trauma, due to the uncommon presentation of those types of emergencies at those facilities.

Non-use of ambulance services also has an impact on paramedics. Paramedics train for long periods of time to provide benefit for their community. In low workload locations, those skills are often rarely challenged which creates a risk of skills loss. The non-use of ambulance services by seriously unwell patients may lead paramedics to feel undervalued in their community, and in a sense “robbed” of the opportunity to make a significant difference using their skills. This leads to difficulties of staff retention in small rural locations, frustration with the community, and a feeling that they are not contributing.

While there is a great deal of anecdotal evidence regarding unmet need and ambulance non-use in rural and remote areas, the phenomenon is poorly understood and poorly measured. The Ambulance Service has a range of mechanisms in place to measure workload, however, there are essentially no mechanisms for measuring the absence of workload. As a result, the Ambulance Service has an excellent understanding of the work it does but the work it does NOT do is unquantified.

The aims of this study are to:

- Explore theoretical models of patient decision making and use them to help explain ambulance use and non-use
- Identify disparities between rates of ambulance usage in urban and rural areas with specific reference to high acuity patients Examine the impact of rurality on ambulance use behaviour with specific reference to high acuity patients
- Develop potential strategies to improve access to ambulance services for rural people experiencing serious health emergencies

These key questioned are addressed through two main strategies. Firstly, a literature search was undertaken to explore the relationship between rurality and ambulance use in other jurisdictions and describe theoretical models of decision making which people apply to health emergencies. Secondly an data review from both rural and metropolitan Emergency Departments (EDs) was used to compare rural and metropolitan ambulance usage, establish differences in usage patterns, and identify predictors of ambulance use.



## Key Questions

**Is ambulance usage different between major cities and country areas?**

**Do country people use ambulances differently in serious medical emergencies?**

**What influences how people they make decisions about if and when to call an ambulance in a serious health emergency?**

## Methods

### LITERATURE REVIEW

The purpose of the literature review was to examine previous work which examined measurements of rural ambulance use, establish theoretical models of patient decision making and explore issues of providing community education around health emergencies.

#### Search Strategy

A wide number of databases were searched including MEDLINE, CINAHL, Sage, ScienceDirect, Emerald, ProQuest, SpringerLink, UMich Deep Blue and RURAL using the search terms “Ambulance”, “unmet need”, “rural” “decision making” and “utilisation” in various combinations. Journal specific searches were undertaken for journals likely to have a high level of content on either rural health or ambulance practice including Journal of Emergency Primary Healthcare, Academic Emergency Medicine, Rural and Remote Health and the Australian Journal of Rural Health. In addition a number of public reports were located using Google. Papers were also obtained directly from authors who emailed suggested works as well as through a snowballing process utilising the reference lists of papers found during the database search process.

Non-English papers were excluded. Additionally abstracts were manually reviewed on relevance to the aims of the study and excluded if they did not address core areas of the research study aims.



### DATABASE REVIEW

The purpose of the database review was to examine the phenomenon of ambulance use in an Australian context including both metropolitan and rural populations.

#### Study Design

To measure the level of underutilisation and inform the discussion of unmet need, a retrospective database analysis of (ED) data was undertaken. The purpose of this data analysis was to measure the disparities in utilisation between rural and urban ED users with specific reference to their mode of arrival. Secondary goals of the data analysis were to attempt to identify a profile of ambulance users and non-users, identify disparities in presentations rates between types of presentations and determine the impact of rurality on ambulance usage in health emergencies.

#### Ethics

To support the ethical use of data, all data was de-identified. Ethics approval was received from the Royal Prince Alfred Human Research Ethics Committee (HREC) on 25 February 2010 for application X10-0033 & HREC/10/RPAH/52. Protocols were put in place for the storage and usage of data. The RPA HREC is the lead ethics committee for ASNSW research. Ethical design of this study was consistent with the National Health and Medical Research Council (NHMRC) National statement on Ethical Conduct in Human Research.

## Data

To undertake the ambulance usage analysis, data was obtained from the Hunter New England Area Health Service (HNEAHS). A data request was made for data from all patients who presented to an ED at any hospital in HNEAHS between 1 July 2008 and 30 June 2009. Thirteen data fields were requested and are described in the box to the right.

In total, 354,909 records were obtained which represents 365 days of activity from EDs at 37 facilities. Data was obtained from HNEAHS as an Access database. This represents 14.59% of all ED presentations in NSW during this period.<sup>3</sup>

The Hunter New England Area Health Service Coverage Area services a population of 865,482 people, or 12.59% of the total state population of NSW in 2007.<sup>4</sup>

## DATA GROUPINGS

### Service Classifications

Hospital services were classified by type based on the system used by Hunter New England Health.<sup>5</sup> The types of hospital services analysed were:

- Community Hospitals (including Multi-Purpose Service facilities)
- District Hospitals
- Rural Referral Hospitals
- Tertiary Referral Hospitals

For the purposes of analysis, in some cases Community Hospitals and District Hospitals were grouped as “Local” hospitals and Rural Referral Hospitals and Tertiary Referral Hospitals were grouped as “Referral” hospitals. Community and District Hospitals were largely in Outer and Inner Regional areas.

### Triage Category Groupings

For the purposes of the study “serious health emergency” or “high acuity patient” is defined as a patient who presents to an ED and received an ATS category of one or two. This is consistent with other studies differentiating between behaviours in high and low triage category patients.<sup>6</sup>



## Data Fields

- **Age:** This is the age of the patient at the time of contact with the ED.
- **Gender**
- **Home Postcode:** This is the postcode of the residence that the patient gave as part of their hospital record.
- **Hospital Facility:** This is the name and data code of that facility.
- **Presenting Problem:** This is a description of the chief complaint of the patient by the triage nurse – normally a pre-determined problem from a selection in the ED database but sometimes free text.
- **ED Diagnosis Code:** This is a retrospective entry made by the treating health professional of the end diagnosis the patient was managed for. These are represented as ICD-10-CM codes.<sup>2</sup>
- **ED Diagnosis Description:** This is a description of the ICD-10-CM code used to describe the patient’s diagnosed condition in the ED.<sup>2</sup>
- **ATSI Status:** This is the self-reported Aboriginal or Torres Strait Islander status of the patient.
- **Triage Category:** This is the triage category given under the Australasian Triage Scale.
- **Mode of Arrival:** was the way in which the patient arrived at ED. Options included: state ambulance vehicle, community/public transport, private car, helicopter rescue service, air ambulance, internal (health) ambulance, police/corrections, other (normally undertaker/contractor), and no transport (walked).
- **Ambulance Arrival:** was a composite where “yes” included ASNSW controlled assets, that is: state ambulance vehicle, helicopter rescue service and air ambulance.

## Australian Standard Geographical Classification (ASGC)

Patient home postcodes were stratified into the ASGC which is a system of classifying Australia into broad regions for purposes of statistical comparison. The ASGC is in turn based on the Accessibility/Remoteness Index of Australia. This system of comparison calculates the relative remoteness of a location based on its distance by road to four key service areas. The ARIA scored is extrapolated into one of the following ASGC categories:

- Major cities                      ARIA Score  $>0 \leq 0.2$
- Inner Regional                  ARIA Score  $> 0.2 \leq 2.4$
- Outer Regional                 ARIA Score  $>2.4 \leq 5.92$
- Remote                            ARIA Score  $>5.92 \leq 10.53$
- Very Remote                    ARIA Score  $>10.53 \leq 12.00$ <sup>7</sup>

For ease of analysis in some cases the “Outer Regional” and “Remote” classifications are combined. There were no “Very Remote” areas in the study footprint.

## KEY ASSUMPTIONS

### Benefit of Ambulance

In the analysis of ambulance unmet need, there is a core assumption that ambulance attendance will be of benefit for patients who have serious health emergencies. A number of studies outline the benefit of ambulance attendance in a wide range of conditions including trauma, acute coronary syndrome, and asthma.<sup>8,9</sup> There is likewise evidence that non-use of ambulance in some conditions may predispose a patient to an adverse outcome.<sup>10</sup>

### Rural People Present to Rural Hospitals

Within the analysis it is assumed that the bulk of users of various hospitals are largely resident near those hospitals. As such hospital type is used as a de-facto measure of rurality as smaller hospitals tend to exist in smaller rural locations. A review of hospital locations and workload indicated that 18 of the 19 Community Hospital level facilities were within the 18 lowest workload locations and 19 lowest local populations within the data set. Likewise the two Tertiary Referral Hospitals and four Rural Referral Hospitals are all located in the top eight positions for both workload and population.<sup>11</sup>

## DATA ANALYSIS

Data was analysed using SAS 9.2. Descriptive statistics are presented as mean +/- SD for normally distributed variables, median (Q1-Q3) for non-normal variables and proportions as percentaged as appropriate. Differences between means were analysed with Student's t-tests or equivalent non-parametric statistics as appropriate. Nominal variables were analysed using Chi-square statistics for general associations for  $r \times c$  tables. Logistic regression was used to evaluate the impact of rurality on mode of arrival to EDs. Interactions were considered and managed by stratification. Multivariate models were assessed for goodness of fit. Data is presented as odds ratio (99% confidence intervals). Differences were considered significant where  $p < 0.01$ .

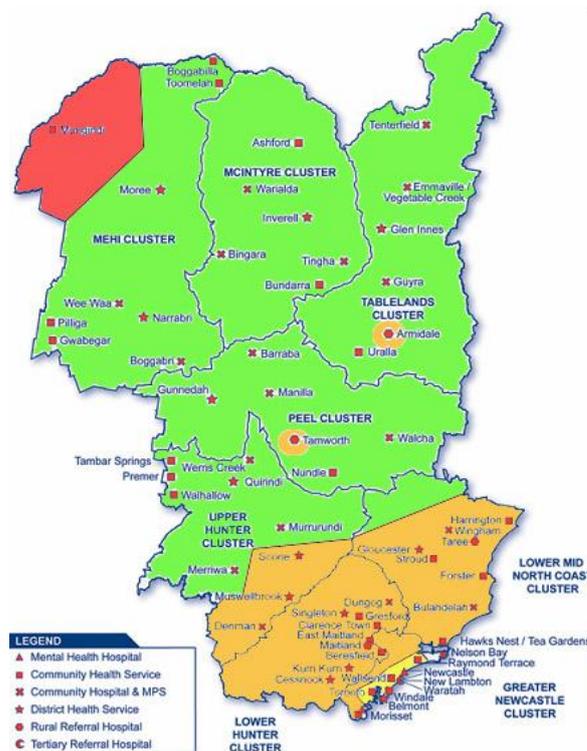


Figure 1. Hunter New England AHS by ASGC Category<sup>1</sup>

## Results

### LITERATURE REVIEW

Abstracts of over 1000 results were reviewed to create a final reference list of 157. The full text resource list comprised 141 journal articles, ten government documents, four reports and a PhD thesis. In total, over 500 pages of text were reviewed in detail.

#### Definition of a Health Emergency

Ambulances have traditionally been seen as a resource for emergency care. Despite the amount of literature on ambulance use, the concept of a health emergency is poorly defined yet underpins any discourse about ambulance use being “appropriate” or “inappropriate”. Morgans advances a definition of “health emergency” in her thesis which has been adopted for the purposes of this report.<sup>6</sup>

*A ‘Health Emergency’ is any condition that is a threat to physiological or psychological status, may result in death, permanent disability or is potentially life threatening, causing severe physiological discomfort and distress or any condition at any time causing distress to the patient.*

#### Incidence of Non-Use

Ambulance workload analysis has traditionally been viewed from the perspective of quantifying and managing inappropriate use.<sup>12-21</sup> Several studies have looked broadly at ambulance demand in different geographic locations with some consideration of rurality.<sup>22-26</sup>

Within the papers focused on inappropriate use, there is a predominant view of “inappropriateness” as a clinician defined parameter.<sup>25,26</sup> Those papers which included comparison between rural and urban ambulance workload tended to find that clinicians (both medical and paramedical) considered rural patients to be more appropriate users and call for more serious emergencies.<sup>25</sup>

Unmet need is poorly covered in the literature, with the few papers on the subject being dated.<sup>13,16</sup> However, these papers do establish broad definitions of unmet need and do examine the phenomenon from an urban perspective.

#### Theoretical Models of Patient Decision-Making

A wide range of theoretical models for patient decision making have been advanced to understand how patients make decisions about their health. Theories based on cognitive approaches to decision making include the Expected Utility Model and Theory of Rational Choice. The cognitivist models rely on logical assessment of options to provide solutions to problems. Within emergency decision making, these models are limited by both the health literacy of the patient and the situational factors which may disrupt logical analysis. Previous studies testing these theories indicate that patients often fail to effectively make health decisions based on logical analysis due to poor understanding of clinical risk.<sup>6</sup>

Socio-emotional models consider that decisions about health are made based on a complex series of social, situational and emotional factors. Each person’s decisions are coloured by their experience, value system, social expectation and situational variables at the time at which decisions need to be made. Examples of socio-emotional models include the Normative-Affective Model, the Health Beliefs Model, Social Cognitive Theory, the Interactionist Model, Theory of Planned Behaviour, and Leventhal’s Self-Regulatory Model of Illness Behaviour.<sup>6,27</sup>

The Normative-Affective Model states that decisions are often made independently of factual information. The Normative-Affective model outlines four ways in which logical decisions can be influenced by normative and affective factors. The first is “inertia” where poor decisions are often continued to be adhered to despite being illogical due to a belief by the decision maker, for example, a person who does not call an ambulance because they do not like being in hospital or delays calling and as a result it is now the middle of the night and symptoms have increased prompting them they not want to be seen as an inconvenience. The second is when there is a lapse to a less-preferred option. In this case a second option is taken without logical appraisal of its risks – for example someone who does not call an ambulance because of influence of a partner or spouse, despite it being the logical course of action. Thirdly are situations where interpretation of the facts is clouded by societal factors or personal beliefs – for example, beliefs that severe pain is normal and does not require medical intervention as it is a sign of weakness. Finally factors can prematurely effect decision makings, known colloquially as “jumping to conclusions”, for example, not calling an ambulance because you saw one drive through town thus creating a belief that there is

no ambulance, regardless of the fact that it may not have been the ambulance for the town or that other paramedics may be on duty or on call.<sup>6</sup>

The Health Beliefs Model is a cost-benefit model of decision making where decision makers are faced with choices and perceived threats. The evaluation of these threats and potential outcomes is coloured by a range of external factors such as social norms, external cues to action, and self-efficacy. This model considers four key elements in health decision making:

- Perceived susceptibility (an individual's assessment of their risk of getting the condition)
- Perceived severity (an individual's assessment of the seriousness of the condition, and its potential consequences)
- Perceived barriers (an individual's assessment of the influences that facilitate or discourage adoption of the promoted behaviour)
- Perceived benefits (an individual's assessment of the positive consequences of adopting the behaviour).

While it is a cognitive model it allows for a wide range of socio-emotional factors to influence the logical process. For example, patients need to believe that a set of symptoms is actually a threat to them to rationally include them as a factor in decision making. This model has been applied to ambulance and ED usage but is limited in the ambulance context by the influence of bystanders, who often create significant confusion or distraction to the decision making process during health emergencies.<sup>6,28,29</sup>

Leventhal's Self-Regulatory Model of Illness Behaviour has promising application to emergency health. Leventhal discusses a three stage model which is summarised as:

- 1) recognition of a health threat – that is, noticing the symptoms,
- 2) implementation of coping mechanisms – that is, forming a plan of action, and
- 3) assessment of the efficacy of coping mechanisms – that is, evaluating the success of the plan and actions.<sup>30</sup>

The model takes into account the risk/benefit decisions made in the first stage as well as having the capacity to be cyclical as the plan is reassessed. The model does imply that plans will involve action, whereas some coping styles result in a plan of inaction.<sup>6</sup>

It is important to note that in many ways access to emergency health services and ambulance services may not perfectly fit into traditional models of health decision making which are more related to utilisation of primary care and preventative health care services. Emergencies often operate in much shorter time frames than other health decisions and are influenced by more situational variables.<sup>31</sup>

Using a review of existing models, Morgans advances a model which is specifically designed for health emergency situations. It combines elements of both Leventhal, the Normative-Affective Model and the Health Belief Model as well as influence from bystander action models. Morgans outlines a four step processes as follows:

- 1) The patient must decide that the symptoms they are experiencing are not normal.
- 2) The patient must determine that the abnormal experience constitutes an emergency, incorporating assessments of risk and vulnerability.
- 3) The patient must decide to seek help either by determining that they are unwell and that they need assistance or by seeking the approval of others to access assistance (ensuring it is congruous with the social expectation of the situation).
- 4) Finally, there is a decision to seek medical assistance – which is a decision in itself about what type of assistance (given the range of services or just consulting family and friends) which results in accessing some type of emergency health care.<sup>6</sup>

This model incorporates the complexities of both the recognition of a health emergency and the choices about what, if any, resources to access to help mitigate the effects of the health emergency.



## Key Decisions

### Morgan's Model of Emergency Health Decision Making

- Are my symptoms abnormal?
- Is this an emergency?
- Do I need help?
- Is the help that I need an ambulance?

## Patient Decision-Making in Practice

Patient decision making models are covered in a range of literature from various disciplines. Many explore the complexities of making decisions in emergencies or perceived emergency situations. The process of seeking ambulance assistance during emergencies involves a number of factors, both clinical and existential.

The All Wales Alliance for Research and Development in Health and Social Care (AWARD) report into unscheduled care found that patients listed up to nine different situational variables when deciding on their choice of service for unscheduled care. In a survey of 1576 Welsh residents, 81% of respondents reported that they felt that the appropriateness of the service was a very important criteria for their choice of health care provider in acute health situations. Additionally, 83% of respondents believe that they chose the correct service for their unscheduled care need. Within the focus group and interview component of this study, participants indicated a fear of being branded as inappropriate users of ambulance services as a factor in service choice. Rural respondents also sited ambulance response times as a factor in their choice of service in unscheduled care.<sup>32</sup>

In the AWARD study, patients who had recently experienced an unscheduled care episode (within the last three months) were asked to assess the experience through the Brief Illness Questionnaire. This tool examined the impact of the situation on the patient from a variety of perspectives. Increased use of unscheduled care was associated with those who had a high level of concern, a high level of emotional response, were experiencing multiple, severe symptoms, believed the consequences of the health problem were serious and believed the problem would not stop.<sup>32</sup> The Brief Illness Questionnaire was developed by Broadbent based on the work of Leventhal.<sup>33</sup>

Several other papers have highlighted the factors which influence patient decision to call ambulances. Determining whether an ambulance is an appropriate service for a health emergency is highly subjective but patients in most cases believe that they have made an appropriate choice and use criteria different to clinicians when they retrospectively determine appropriateness of ambulance use. In most cases those who do call an ambulance do so because they believe it to be the most appropriate option for their situation – this is often a belief in contrast to retrospective analysis by health professionals on purely clinical grounds. Likewise many papers report that those who did attend EDs by ambulance had the ambulance called for them by someone else who was concerned for their welfare.<sup>31,32,34-37</sup>

Self-assessment of appropriateness by patients can be influenced by perceptions of ambulance service providers. A number of campaigns have been undertaken to encourage ambulance users to consider alternate methods of transport. In a Japanese study, Ohshige reported that in a prospective study of the effect of such a campaign in Japan, the percentage of high acuity patients accessing ambulance fell slightly more than the percentage of low acuity category patients accessing ambulance services.<sup>12</sup>

A number of other papers have also highlighted disparities between the health professional definitions and patient definitions of appropriate use of ambulance. Clinician driven definitions of “inappropriate use”, which underpin most research on the issue, rely on either end diagnosis or experienced clinician perception and are influenced by either pattern recognition or simply hindsight. In contrast, patient decision making relies on a complex series of psychosocial and situational variables. As such any conceptual framework about ambulance usage being “appropriate” or “inappropriate” needs to consider both the clinical benefits of ambulance use and the role ambulance plays in assisting those in crisis to manage situations, independent of the clinical benefit which may be potentially gained by the patient.<sup>34,38,39</sup> Several studies which consider appropriateness of transport from a purely clinical point of view refer to “Medically Unnecessary” transports. This may be a more apt term for measuring the validity of mode of transport decisions by retrospective clinical parameters.<sup>15,40,41</sup> The disparities between logical and socio-emotional models of decision making may help explain the disparities between clinician and patient concepts of “appropriate” and “inappropriate” ambulance usage.

Morgans undertook a study of patients who had recently experienced health emergencies in metropolitan Melbourne utilising qualitative interviews, focus groups and qualitative and quantitative survey tools. Both ambulance users and non-users and high and low acuity patients were included in the study. Within the survey tool participants were assessed using the Multidimensional Health Locus of Control (MHLOC) and the Coping Responses Inventory (CRI). The MHLOC is a measure of a person’s belief of whether their actions control the outcome of a situation or whether the outcome is controlled by external influences. The CRI measures both cognitive and behavioural aspects of coping. Using a Discriminant Function Analysis, Morgans used these two measures, along with other factors to determine characteristics of patients who delay seeking assistance in health emergencies.<sup>6</sup> Such factors will also have a strong bearing on not only when and if patients seek assistance but what assistance is sought.

Morgans found that those who use ambulances and have Resignation (“nothing can be done” or “outcome is fate”) and Positive Reappraisal (“everything will be fine” or “it could be worse”) coping styles have shorter delays in seeking assistance. Those who use Problem Solving (form a plan and work hard to achieve it) and Cognitive Avoidance (deny seriousness of problem or hope it will go away) had a longer delay in seeking assistance. Likewise when help was sought, an ambulance was more likely to be the resource of choice for those who utilised positive reappraisal and cognitive avoidance coping styles and has an MHLOC aligned to “powerful others” that is that their health problem would be best managed by others rather than them taking control of it themselves or leaving it to chance. This exploration of the subject of delay of ambulance use demonstrates the impact of the MHLOC and coping styles on choices regarding the seeking of assistance.<sup>6,42</sup>

Mieschke and colleagues also described in detail the response of patients to chest pain and potential acute myocardial infarction (AMI). Using Leventhal’s model they describe that patients suffering symptoms of AMI rarely access ambulance as an initial coping strategy and that accessing ambulance was strongly linked to having a clear concept of their health problem. Those who had previously experienced symptoms of AMI were more likely to call ambulance. Those experiencing symptoms for the first time or who had not had experience with health services (including ambulance) previously for a similar event had difficulty conceptualising the severity and nature of the emergency and the importance of accessing ambulance.<sup>31</sup>

### **Rurality and Ambulance Use**

The use of ambulances in rural areas is poorly described. However a small number of papers have made comparisons between rural and urban ambulance workloads. In a Swedish study, Beillon and colleagues described in a comparison of urban, rural and remote ambulance patients in Sweden that rural and remote patients had a lower incidence of inappropriate use as assessed by paramedics and a higher level of acuity.<sup>25</sup> Brismar likewise describes a higher utilisation rate in urban areas versus rural areas which calls into account issues of cost-effectiveness of rural ambulance services.<sup>22</sup> Herlitz undertook two studies of ambulance use in AMI patients in Sweden and discovered significant unmet need in both rural and urban patients.<sup>43</sup>

### **Rurality and Decision-Making**

Decision making processes as well as other factors such as distance and access to services affect utilisation in rural areas. Morgans, Farmer and Campbell all described barriers to accessing services which are unique to rural areas and rural thinking which indicate the complexity of decision making in rural people experiencing health emergencies.<sup>9,44,45</sup>

A number of papers explore the dilemmas rural people face in accessing a range of health care services. Papers examining choices regarding the use of general practice and rehabilitation services indicate that distance and access are large factors in decisions to use a service.<sup>46-48</sup> Relationships with service providers are also seen as important to rural people.<sup>47,49,50</sup> Compliance with activities such as accessing ambulance and attending cardiac rehabilitation rely heavily on perceptions of invitation and permission. When trusted health professionals such as doctors make clear instructions to use ambulance or access other services then compliance is likely to be higher. Likewise, studies into access to rehabilitation services indicate that if a clear and explicit invitation is made to access services then utilisation is higher.<sup>48</sup> The focus on relationships may also be a barrier to rural use of ambulances when the severity of the emergency is unclear. Studies around GP access indicate that urban users of primary care are often more aggressive and consumerist in seeking services whereas rural users are more accepting of delay as they do not wish to be branded as “troublesome” or “inappropriate” users in smaller communities where such behaviour is perceived to alter health professional’s willingness to see them or create social stigma.<sup>44</sup> This would support anecdotal evidence around delayed or non-use of ambulance, especially overnight, where rural patients are often “afraid of bothering” paramedics. This fear of being branded as an inappropriate user of primary or emergency health care was also a strong theme in the AWARD report.<sup>32</sup>

Morgans undertook a study of asthma emergencies in rural Australia. In this study she identified a number of barriers in rural people seeking assistance. In many cases these barriers related to misperceptions about ambulance services as well as difficulty in recognising their asthma condition as a health emergency. Morgans found that rural people often viewed ambulance services as purely a transport mechanism and were unaware of their clinical capabilities. Likewise, there was a strong perception (also echoed in the AWARD report) that ambulances took too long to access rural locations. This is a significant factor in the risk-benefit assessment contained in a number of the decision-making models and indicates that rural people who could benefit from ambulance assistance often do not access it based on perceptions of ambulance benefit rather than an effective understanding of how ambulance operates and how it can contribute to the health emergency.<sup>9</sup>

A common perception is that cost is a barrier to ambulance use. Several authors found that there was no relationship between cost or payment for ambulance services and the decision to access ambulance services.<sup>9,51</sup>

### Summary

Ambulance usage and decision-making regarding access are poorly described in the literature. However work that has been done indicates that rural people have complex decision making processes based on social norms, concepts of ambulance service capacity and health literacy which commonly result in lower utilisation and poor understanding of the benefits of ambulance intervention. A range of theoretical models can be used to describe this behaviour which demonstrate the complexities of the decision making process in health emergencies. Rural people view themselves as appropriate ambulance users and are afraid of being identified as otherwise.

## DATABASE REVIEW

### Overall Ambulance Use

Usage of ambulance accounts for nearly one fifth of all ED arrivals in HNEAHS. By triage category the relative levels of ambulance usage across the Area Health Service are shown below in Table 1.

**Table 1: All Emergency Department Presentations in HNEAHS 2008-2009**

ATS Category	Ambulance	Other Transport	Grand Total
1-Immediately Life Threatening	1135 (80.3%)	279 (19.7%)	1414
2-Imminently Life Threatening	9646 (46.5%)	11104 (53.5%)	20750
3-Potentially Life Threatening	24325 (31.6%)	52678 (68.4%)	77003
4-Potentially Serious	29534 (17.2%)	141882 (82.8%)	171416
5-Less Urgent	3755 (4.5%)	80408 (95.5%)	84163
Grand Total	68395 (19.2%)	286351 (80.8%)	354746

Even before analysing for rurality it is apparent that there is a significant number of people having serious health emergencies who were not being serviced by ambulance. This accounts for 11,393 patients in the HNEAHS and would extrapolate to approximately 78,000 high priority ambulance cases across the state.



## Impact of Rurality and Age

Across the entire ED data set, the addition of rurality to the analysis of ambulance usage shows a declining level of ambulance usage in areas outside major cities. These figures are shown in Tables 2-4.

**Table 2. Ambulance use by age for patients resident in ASGC Category “Major Cities”**

	0-15 years	16-39 years	40-64 years	65 + years	Total
Other Transport	28458 (89.7%)	39444 (82.9%)	24476 (73.1%)	11878 (40.7%)	104256 (73.4%)
Ambulance	3283 (10.3%)	8140 (17.1%)	9024 (26.9%)	17329 (59.3%)	37776 (26.6%)
Total	31741	47584	33500	29207	142032

**Table 3. Ambulance use by age for patients resident in ASGC Category “Inner Regional”**

	0-15 years	16-39 years	40-64 years	65 + years	Total
Other Transport	34362 (94.4%)	44303 (90.5%)	28123 (83.7%)	14167 (58.3%)	120955 (84.5%)
Ambulance	2034 (5.6%)	4656 (9.5%)	5481 (16.3%)	10121 (41.7%)	22292 (15.6%)
Total	36396	48959	33604	24288	143247

**Table 4. Ambulance use by age for patients resident in ASGC Category “Outer Regional” and “Remote”**

	0-15 years	16-39 years	40-64 years	65 + years	Total
Other Transport	15029 (95.2%)	17472 (91.9%)	13964 (88.3%)	8120 (71.4%)	54585 (88.1%)
Ambulance	759 (4.8%)	1533 (8.1%)	1858 (11.7%)	3249 (28.6%)	7399 (11.9%)
Total	15788	19005	15822	11369	61984

Use and non-use are relatively consistent across the younger age brackets with a mean variance in the non-use (other transport) of only 2.77% between the different ASGC categories in the 0-15 year age bracket. Conversely, the mean variance between the three ASGC groups in 65+ patients is 15.38%. While ambulance usage increases by age there is a greater increase in usage with age in “Major Cities” compared with “Inner Regional” and “Outer Regional/Remote”.

## Impact of High Acuity

When comparing ambulance usage rates for high acuity patients between ASGC groups, the increased non-use rate between patients in Major Cities and regional areas continues. However unlike the increasing level of difference found in the entire ED population, in high acuity patients the differences in the non-Major Cities groups are diminished providing a more dichotomous phenomenon of behaviour between those in Major Cities and those in other areas. This can be seen in Tables 5-7.



## High Acuity Patients

**In this study we use the same definition of “High Acuity” as Morgans. These are patients with an ATS category of one or two. Such patients would include those in cardiac arrest, respiratory arrest, severe shock, major multi-trauma, severe breathing difficulties or cardiac chest pain.**

**Table 5. Ambulance use by age for patients resident in ASCG Category “Major Cities” with ATS 1&2**

	0-15 years	16-39 years	40-64 years	65 + years	Total
Other Transport	940 (70.4%)	1210 (46.3%)	1590 (47.6)	771 (24.1%)	4511 (43.0%)
Ambulance	395 (29.6%)	1402 (53.7%)	1751 (52.4%)	2425 (75.9%)	5973 (57.0%)
Total	1335	2612	3341	3196	10484

**Table 6. Ambulance use by age for patients resident in ASCG Category “Inner Regional” with ATS 1&2**

	0-15 years	16-39 years	40-64 years	65 + years	Total
Other Transport	712 (75.3%)	1245 (65.9%)	1925 (64.4%)	1137 (41.9%)	5019 (58.8%)
Ambulance	234 (24.7%)	643 (34.1%)	1065 (35.6%)	1575 (58.1%)	3517 (41.2%)
Total	946	1888	2990	2712	8536

**Table 7. Ambulance use by age for patients resident in ASCG Category “Outer Regional” and “Remote” with ATS 1&2**

	0-15 years	16-39 years	40-64 years	65 + years	Total
Other Transport	168 (66.1%)	342 (67.1%)	668 (64.1%)	444 (46.9%)	1622 (58.9%)
Ambulance	86 (33.9%)	168 (32.9%)	375 (35.9%)	502(53.1%)	1131 (41.1%)
Total	254	519	1043	946	2753

Transport by means other than ambulance appears to occur consistently in populations outside Major Cities. When comparing hospital types, there is again a linear increase in ambulance usage with an inversely proportional decrease in other transport occurring as the size of the hospital increases. This is indicated in Figure 2.

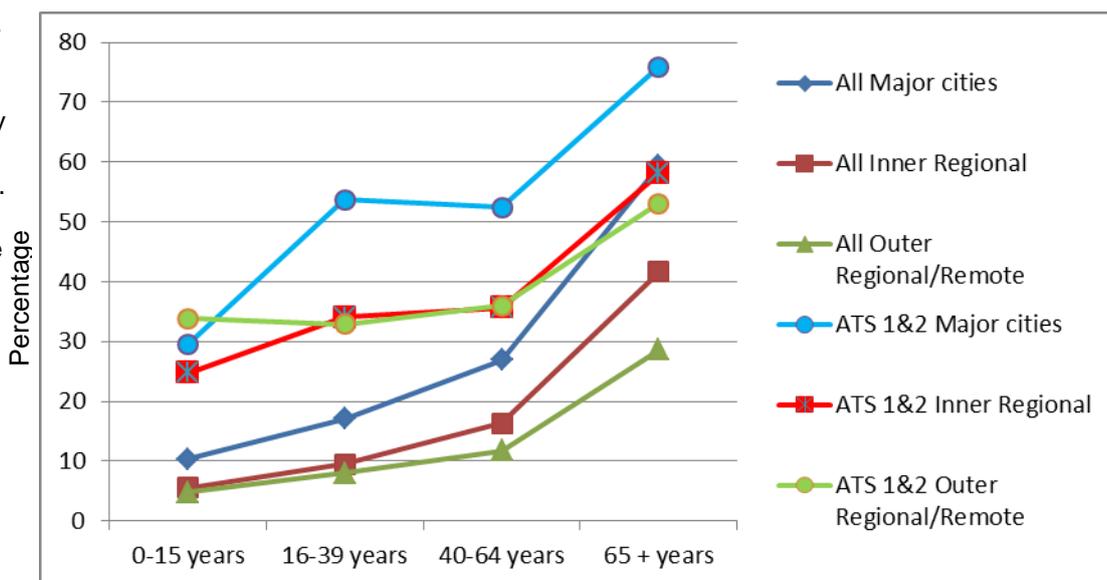


Figure 2. Ambulance utilisation rates (as a percentage of ED presentations) by ASGC for all ED presentations and high triage (ATS category 1&2) presentations.

**Table 8. Ambulance use by destination hospital type for ATS 1&2**

Hospital Type Accessed	Other Transport	Ambulance	Total	Facility location by ASGC		
				Outer Regional	Inner Regional	Major Cities
MPS/Community Hospital	1334 (75.1%)	442 (24.9%)	1776	14	5	
District Hospital	2380 (63.7%)	1355 (36.3%)	3735	6	5	1
Rural Referral Hospital	4679 (57.9%)	3399 (42.1%)	8078		4	
Tertiary Referral Hospital	2960 (34.6%)	5591 (65.4%)	8551			2
Total	11353	10787	22140	20	14	3

## Rurality as a Predictor of Ambulance Use

Logistic regression modelling was performed with the paediatric (0-15 age group) and adult (16 and over) populations stratified. Regression models were controlled for gender. There was a very strong association between rurality and mode of arrival to the ED for both adult and paediatric populations ( $p < 0.0001$ ). The adjusted odds for arriving at ED by ambulance for both populations is shown in Table 9.

**Table 9. Impact of rurality on mode of Emergency Department arrival for patients with ATS category 1 & 2 in Hunter New England Area Health Service**

Effect	Arrived by ambulance		Adjusted Odds Ratio*	99% Wald Confidence Limits	
	NO	YES			
<b>Adults (16-99 years)</b>					
Major Cities	3571 (39.0%)	5578 (61.0%)	1.00	-	-
Inner Regional	4307 (56.8%)	3283 (43.3%)	0.49	0.45	0.53
Outer Regional/Remote	1454 (58.2%)	1045 (41.8%)	0.46	0.41	0.52
<b>Child</b>					
Major cities	940 (70.41%)	395 (29.6%)	1.00	-	-
Inner Regional	712 (75.26%)	234 (24.7%)	0.77	0.60	0.99
Outer Regional/Remote	168 (66.14%)	86 (33.9%)	1.21	0.83	1.75

\*Adjusted for gender

This table indicates that for adults, rurality is a significant indicator of ambulance non-usage. Within the adult population, gender is not an indicator for ambulance use.

For the child population, rurality is a factor for those in Inner Regional areas, however the level of ambulance use for children in Outer Regional and Remote areas is not significantly different than for Major Cities and is actually higher than Major cities.. Gender is also a factor in ambulance use with children; however it is not a strong factor. In examining the child frequency table, smaller numbers in the Outer Regional and Remote group may potentially make it more susceptible to confounders.

## Condition Type as an Indicator of Ambulance Use

Condition presentation patterns have been identified as a predictor of patient assistance-seeking behaviours. Conditions with a slower onset of symptoms have been found to create more confusion in patients about what action to take and make the decision to recognise and act on the change in health status as an emergency.<sup>6</sup> To examine this, a number of presentation types were examined both from the perspective of the ICD-10 diagnostic codes allocated by medical staff on discharge, and the presenting complaint recorded by the triage nurse on presentation.

**Table 10. Chest pain and convulsions presenting with ATS category 1&2 to local and referral hospitals**

Hospital Type	Chest Pain			Convulsions		
	Other Transport	Ambulance	Total	Other Transport	Ambulance	Total
Local Hospitals	1578 (67.6%)	757 (32.4%)	2335	39 (45.9%)	46 (54.1%)	85
Referral Hospitals	2935 (52.6%)	2648 (47.4%)	5583	44 (17.9%)	202 (82.1%)	246
Total	4513	3405	7918	83	248	331

## Summary

People from Inner Regional areas are 41.5% less likely to use ambulances overall and 27.7% less likely to use ambulance in serious health emergencies than people living in Major Cities. People from Outer Regional and Remote areas are 55.1% less likely to use ambulance overall and 27.9% less likely to use ambulances than people living in Major Cities. Regression modelling indicates that rurality is an indicator of lower likelihood of ambulance usage in children living in Inner Regional areas and adults living in all areas outside Major Cities. Age is an increasing indicator for ambulance use; however the rate of increase is markedly less in areas outside Major Cities than it is in Major Cities. The condition with which the patient presents may be an indicator of ambulance usage and that is thought to be linked to the pattern, timeframe and severity in which the symptoms appear.

## Discussion

### LEVELS OF UNMET NEED

The data indicates that there is potentially a significant level of unmet need in high acuity patients in rural areas. It is estimated from this data that across the NSW population (adjusted for ASGC) there are 27,480 patients with serious medical emergencies who are not accessing ambulance. If the assumption is applied that not everyone will call an ambulance in a serious health emergency, then to match the urban usage rates for high acuity patients, there is an unmet need gap of approximately 7,150 patients.

While the percentage of high acuity category patients are small relative to both the population and the overall ED usage, high triage patients are arguably the primary target clientele of ambulance services as they are both clearly within the mandate of the Ambulance Service and most likely to benefit from ambulance intervention. The level of unmet need in high triage patients represents, in consumerist terms, the core target market of ambulance services.

The concept of unmet need is often balanced with the equally important demand phenomenon of “inappropriate use” it is probably poignant to consider the current discussions around definitions of “inappropriate use” which explore the multi-factorial nature of ambulance use and the potential discrepancies between clinician and patient views if “inappropriate”.<sup>18,34,39,52</sup> Likewise, to assume that all patients who attend ED, even those in high triage categories constitute unmet need may be a one dimensional view of the issue.

### RURAL AMBULANCE USAGE BEHAVIOURS

The information from the review of decision making models suggests that there is a relationship between problem solving paradigm and coping skills and ambulance usage. Rural people tend to be more isolated, self-sufficient and utilitarian. As a result, they are more likely to feel compelled to manage health emergencies predominantly using their own resources. Equally, rural people are likely to be aware of scant resources in rural communities and be hesitant to use ambulances believing they are leaving the ambulance resource available for others who are less able to self-manage or are more critically unwell to use. Relationships, local status and identity in the community are more likely to be of value to rural people. As a result, it would be important to them to be seen to be using ambulance services “appropriately” as there is likely to be either actual or perceived censure for “inappropriate use” which will have lasting implications on the person’s standing in the community.

Combined with the data from the review of ED presentations, rural underutilisation is a real phenomenon which occurs not only in remote locations but in populated district and regional centres. The researchers originally expected a gradual increase in non-use of ambulance as rurality increased – which did appear to be the case in the entire ambulance use cohort. However the data would suggest that ambulance calling phenomena in high acuity cases can be categorised into “urban” and “non-urban” phenomena.

The implication from the data is that the level of low acuity use of ambulance declines in line with an increase in rurality. High acuity health emergencies, examined in more detail in this study, represent a dichotomous phenomenon where urban ambulance users are more likely to adopt coping mechanisms which rely on “powerful others” and transference of responsibility of their health problem to more accessible government services. Likewise, non-urban users are likely more likely to use a problem-solving coping paradigm which focuses on self-management and self-transport.

Ambulance use is also linked to existential crisis in patients.<sup>39</sup> It is feasible that the increased community connections found in rural areas make patients less likely to seek a third party (eg ambulance) to assist them as their existential needs (eg comfort, reassurance) as well as physical needs (eg transport).

The specific conditions which form the basis of each patient's health emergency may be a significant factor in the process of both recognising a health emergency and determining the correct course of action. Of the two patient complaint types provided as examples, chest pain tends to occur as an increasing level of pain over a period of time (regardless of aetiology – with the exception of trauma) compared with convulsions which universally have a sudden onset. In these cases patients have been categorised as a triage category one or two which suggests that they are serious iterations of these complaints and may be accompanied by other symptoms of concern such as breathing problems, circulatory compromise or an altered conscious state. In both cases, the emerging pattern of lower ambulance usage to smaller, more rural hospitals is seen, however it is suggested that the more dramatic presentation of convulsions is easier to recognise as a health emergency and thus the decision to utilise ambulance is higher. Despite this, barely half of patients who are complaining of severe, potentially life threatening convulsions, are presenting by ambulance to local hospitals.

### **IMPLICATIONS FOR AMBULANCE SERVICE DEMAND AND RESOURCING**

Ambulance services are providers in a health services market. As such they can be considered to have a "market share" which in this case is people experiencing health emergencies. Due to the capabilities and focus of ambulance, the market share best matched when the services provided are to people experiencing serious health emergencies.

Any increase in ambulance workload, especially in the area of serious health emergencies needs to be viewed in the context of the availability of resources. While many small rural locations have a significant amount of spare capacity, their capacity to manage multiple calls for assistance are limited. Likewise larger regional centres may currently be reaching their levels of capacity as populations, especially aged populations, grow in regional centres. Significant increases in workload involving high acuity cases may create resource gaps.

One of the assumptions on which this report is based is that ambulance services provide benefit to patients with high triage category complaints. We know that this is true for a range of medical conditions, and trauma, however the universal applicability of this assumption is unknown. If an active attempt is made to increase ambulance utilisation (ie "market share") then some thought should be applied to targeting the high acuity patients who will gain most benefit from ambulance utilisation.

The lower rates of ambulance usage in rural areas, as discussed in the literature review, may stem to some part from a lack of engagement between ambulance and the community. Several papers indicate that rural populations do not fully understand the role or capacity of ambulance and hold potentially inaccurate views of the capacity of ambulance to assist in a health emergency.<sup>9,44</sup> Every situation requiring a potential deployment of ambulance resources via the 000 system begins with the potential caller making a cost-benefit decision about what, if any, assistance they will seek to address the health emergency.<sup>6</sup> In its core role as a response-based agency operating in a request-deployment paradigm, ambulance services may not have effectively marketed their capacity to the community. This limits the capacity of the community to make that risk-benefit decision in an informed way.

### **IMPLICATIONS FOR AMBULANCE SERVICE WORKFORCE**

Ambulance services in all jurisdictions have a mandate to manage serious health emergencies in the community. Many paramedics consider this the "core work" of ambulance services and ostensibly what they joined an ambulance service to do. Ambulance workload is tied with paramedic perceptions of their role in the community and their identity as paramedics.

Changes in workload are likely to have corresponding impacts on the paramedic workforce. Increased workload may reduce the risk of skills loss due to underutilisation. Increased value in the community and increased workload may also have a positive impact on paramedic recruitment and retention into small rural areas.

### **FUTURE RESEARCH**

This study explores both the theoretical basis for patient decision making and a statistical analysis of rural ambulance usage. Understanding the phenomenon of unmet need and under-utilisation will require an in-depth exploration of the perceptions, beliefs, decision making paradigms, and coping strategies of rural people faced with health emergencies. Such exploration would lend itself to several qualitative studies. Such an approach would also

provide triangulation with quantitative data from this study and the review of the literature to provide a more complete picture of the phenomenon or rural ambulance utilisation.

This exploration of rural decision making in health emergencies would allow a more effective comparison of rural and urban ambulance usage behaviours. Likewise, it would also allow better understanding of the issue of unmet need.

An effective understanding of the beliefs and values around ambulances services in rural communities may assist with designing effective interventions to address unmet need and service access. Likewise, a clear understanding of the barrier to ambulance use and the decision making process will help inform public education campaigns and engagement strategies.

Research would also be valuable in establishing the benefit of ambulance in rural health emergencies. This could include outcomes measures to determine if there are differences in health outcomes between ambulance users and non-users in high acuity cases. Such research would both help establish the clinical benefit of ambulance to assist decision-making and provide more effective targeting of people with conditions which would benefit by a change their ambulance use behaviours in health emergencies.

## **LIMITATIONS AND STRENGTHS**

### **Generalisability**

This study was undertaken in a specific area health service. It included a unique combination of urban, rural and remote locations. The sample area has only a small number of area classified as “Remote” and no area considered “Very Remote” under the ASGC classifications. In this area health service catchment, most patients who would reside in “Remote” areas would actually be serviced by hospitals over the border in Queensland.

However the data set was large and included a wide range of patients in both the urban and rural settings. This large cohort increases the generalisability of the findings. The data found in this study represented around an eighth of the ED activity in the state. A future data analysis of all NSW Health ED data is planned to confirm the generalisability of the findings in this region. Given the close matches between different levels of rurality found in the study, it is expected that rural ambulance use behaviour would be similar across the state.

### **Triage score**

Classification of severity was based on the triage category given by the triage nurse at the ED. While this is based on clear triage guidelines provided by NSW Health, in practice the process is open to subjective interpretation. Interrater reliability of the triage process in small rural locations has been called into question and is considered to be lower than in sites where emergency triage is a common activity such as a base hospital or major tertiary facility.<sup>53</sup> A variety of subjective factors can potentially influence triage outcomes including personal biases, nurse experience, and other situational factors in the ED.<sup>54,55</sup>

### **Data Set**

The data set was limited to the data fields outlined above. This provides only a general demographic overview of ED patients. Factors not measured include characteristics such as ethnicity (other than indigenous status), occupation, socio economic status and other social factors which may improve insight to the cultural or social context of transport decisions. Additionally, not all addresses were within the HNEAHS as patients could be visitors or tourists but postcode was still analysed as it is a likely indicator of patient behaviour when referenced against the ASGC of the postcode.

The data set also relied on effective data entry by Area Health Service staff. In all 163 (0.04%) records were excluded from analysis for being incomplete in either triage score or method of arrival. This, however, had a negligible effect on data analysis.

### **Examining Confounders**

Several confounders were tested for and found to have minimal effect on the independent variables in most cases.

Presentation rates to EDs by ASGC group were very closely matched to population distribution indicating an even per capita ED usage across all ASGC categories. As a result variability in ambulance usage was not linked to per capita ED usage thus making comparisons of ambulance usage versus ED usage more significant.

Within the data set it was not possible to separate whether the ambulance attendance at the ED was the result of an interhospital transfer or primary (000) response. To assess the impact, the total interhospital transfers to and from hospitals in the HNEAHS was compared to the ED data. In total there were 7402 transfers to hospitals in the

HNEAHS during the time of the study. However the Computer Assisted dispatch data was unable to ascertain if transfers to hospitals were to the ED or to other areas. Of the transfers, 1186 transfers were priority coded as “routine” and would be unlikely to be to an ED. Assuming the remaining higher priority transfers were to an ED (although in reality higher priority transfers can also occur to ICU, CCU, maternity and cardiac catheter lab units), transfers would account for around than 9% of all ambulance movements into EDs. In reality this percentage would be lower. Areas where transfers may have an impact are when looking at specific conditions or demographics. For example, high triage priority children from a rural postcode who use ambulances would likely be transfers as smaller local hospitals would be highly likely to transfer such a patient for specialist care. Transfers would virtually never happen into small hospital EDs so would not affect ambulance cases in those locations.

## Conclusion

The core purpose of providing ambulance services is to provide support and services to those in that community during challenging times in their health. Health emergencies are confusing, stressful, unpleasant, and mostly unforeseen. The capacity for those in the community to cope in those situations varies.

The results of this study found that in the rural areas of the HNEAHS, people were not taking the opportunity to make the Ambulance Service part of the plan to address these crises when they occurred. Nearly 6 out of 10 people living outside of an urban area were choosing to face potentially life-threatening health emergencies alone or with the support of lay bystanders.

Paramedics choose their profession to have the opportunity to provide that type of support for the community. Non-usage of ambulance services in serious health emergencies not only potentially robs the patient of resources which can contribute to their survival or improve their health outcome but impacts on the capacity of paramedics to perform through skills loss and sometimes failure to feel valued in the community.

Each person who faces a serious health emergency has a series of decisions to make which will potentially lead them to seeking ambulance assistance. Not only do they have to recognise a potentially dangerous health state (often subjectively in themselves) they have to determine that they are experiencing an emergency, formulate a plan to address the emergency and determine that ambulance will be part of that plan. For those in rural areas, the decision making is further complicated by issues of distance, access to services, and often a high level of self-reliance. Rural people may perceive “waiting” for an ambulance to be inaction rather than action in which case it would come into philosophical conflict with their normal approach to managing crisis.

Rural people often have a lower level of health literacy and may have had very little contact with ambulance throughout their life. As a result they may be unaware of the capacity or even function of ambulance. As a result each time they are faced with the risk-benefit decisions which could potentially add ambulance resources to the management of their serious health emergency.

The concept of unmet need is more complex than simply counting how many ambulances are not being called. While this is an effective measure of “market share”, it does not fully grasp the complexities of the relationship between ambulance services and patients in achieving improved outcomes – however it is an effective indicator of the potential cohort of patients who may experience improved outcomes from engaging with ambulance services during health emergencies. Understanding unmet need requires an effective assessment of the needs of those experiencing health emergencies. Transport and treatment, the cornerstones of emergency ambulance practice in high acuity patients, are major components, but the role of the paramedic in supporting patients in crisis regardless of their clinical acuity should also be considered. Health emergencies affect much more than the patient and ambulance services have a role in rural communities of not only providing the clinical care to improve health outcomes for the individual but providing a stabilising presence during emergencies in rural areas where the whole community can potentially feel effects from an adverse health event.

Increasing the appropriate use of ambulance services in rural areas will require a range of strategies. It will require increased engagement with rural communities where relationships are key to decision making. Health literacy both generally and in respect to understanding the role and capacity of ambulance services is critical so that informed decisions can be made. Rural populations must not only recognise but fundamentally believe that in a serious health emergency, Ambulance is “the most trusted profession.”

## Recommendations

The findings of this study provide the basis for a range of strategies which may warrant further investigation to determine their effectiveness in addressing rural unmet need.

### TARGETED AMBULANCE COMMUNITY EDUCATION CAMPAIGNS

Having an effective understanding of the benefits of utilising ambulance services during health emergencies is key to patients and bystanders making informed decisions about what resources to utilise in health emergencies. Much of the decision making around health emergencies is coloured by socio-emotive factors such as fear, discomfort, uncertainty and isolation. Campaigns addressing ambulance use need to recognise the role socio-emotive factors involved in the decision making process.

Positive campaigns are more likely to produce positive action in health emergencies. Although literature is scarce, there is some evidence that negative campaigns (those which outline what ambulance use is NOT appropriate) have as strong an effect in reducing high acuity ambulance use as low acuity ambulance use.<sup>12</sup> General media campaigns have shown benefits in ambulance utilisation but not in reducing delay time of indecision about accessing ambulance service.<sup>56,57</sup> The effectiveness of such campaigns is potentially tied to health literacy and may have diminished effect without a more comprehensive understanding of the issues of health emergencies by potential campaign targets.<sup>58</sup> Other literature indicates that knowledge retention from education campaigns can be poor and that those who engage with education campaigns often have pre-existing knowledge of medical conditions or higher health literacy.<sup>6</sup> Strategies which involve analysis and specifically target information gaps and manage perceptions are likely to have an increased effect.<sup>59</sup>

Potential components in education programs designed for increasing high acuity ambulance use in rural areas would include:

- Information about the capacity of ambulance to provide benefit in health emergencies (for example stating how ambulance services can provide care from the point of contact and transport patients to the best facilities or outlining the capacity of paramedics). It is important that the benefits outweigh perceived risks such as response time.
- Clear indicators for calling ambulances which will be memorable even under duress. Indicators should be outlines in clear, simple and concise language. This assists with the determination by the patient or bystanders that a health emergency is occurring. (e.g. if you have pain in your chest for more than ten minutes and you feel scared or uncomfortable – call 000 immediately and ask for ambulance)
- Provide permission to call ambulance in health emergencies (e.g. paramedics are available 24 hours a day in your community and are there to help you in an emergency)
- Show how calling an ambulance is action rather than inaction. Calling an ambulance should be the first part of a list of activities designed to improve patient outcomes or alternatively outline the role of calltakers in providing a plan of action. (eg in a health emergency call 000 and ask for ambulance. While the ambulance is responding to you, specialist calltakers will outline the critical steps you can take to help manage the emergency.)
- Provide information which can be easily accessed during health emergencies and is likely to be displayed.

### INCREASED COMMUNITY ENGAGEMENT BY AMBULANCE SERVICES

Relationships are important to rural people. Relationships are the basis for their choices of services ranging from grocery store to hairdresser to GP and chemist. By having a pre-existing relationship with ambulance in their area, rural residents may be more likely to consider ambulance services during health emergencies. Community engagement activities may include (but are not limited to)

- Primary care, community care, or chronic disease management activities in the community
- Station open days, displays and information stalls at major events
- Health checks and monitoring activities
- Defined community education initiatives such as (in NSW) the Life – Live it. Save it. program, Aboriginal Cardiac Care Program, Emergency Helpers program, Be an Ambulance Hero program and Access to Life program.<sup>60</sup>

- Presentations at community groups
- Engagement with other local health professionals
- Undertaking targeted ambulance planning and education with community members, such as through a GP Management Plan for chronic disease

The benefits of increased engagement are numerous and will support the primary activities of ambulance services in providing emergency response to health emergencies by:

- Addressing the issue of permission. Many people may feel they need “permission” to access ambulance, especially after hours. By providing “permission” to people to access ambulance, especially after hours, it clarifies decision making confusion about “appropriate” use which creates barriers for rural people in calling ambulances.
- Opportunities to collect local intelligence, such as locating difficult to find properties, creating access plans for residences, identifying members of the community who may have complex needs (eg home dialysis patients, bariatric patients, patients with language barriers, patients with complex medical histories).
- Opportunities to address individual concerns and provide factual information which reduces the impact of potentially negative influences on the decision to access ambulance services in health emergencies (eg response times to rural and remote locations, local crewing capacity, etc.)
- Opportunities to display and explain the technological and clinical capacity of ambulance services to support the concept that paramedics provide benefit in managing health emergencies.
- Opportunities to develop contingencies with local community members to address specific logistical issues they may have which can create barriers to utilising ambulance services.
- Creating relationships which underpin community trust in paramedics and identify paramedics as competent and capable health professionals who specialise in providing emergency prehospital care in the community.

## MEDICAL EMERGENCY PLANS

A number of emergency services have introduced pre-planning strategies for managing a range of emergencies which occur in the community.<sup>61-65</sup> Emergency plans can aid in decision making for addressing a range of emergencies.<sup>66,67</sup> Emergency plans designed for specific medical emergencies in high risk patients, plans have also been found to have value in improving the response to health emergencies.<sup>68,69</sup> Medical emergency plans can be either generalised instructions for managing health emergencies in the home or other environments. Likewise they can be specific plans targets at high risk individuals.

One of the key concerns amongst rural people is delay in ambulance attendance, especially in those who largely consider ambulance to be a transport service rather than a clinical care service. This perception often creates barriers to ambulance use where rural residents, especially those on properties, consider that self-transport is a faster option than calling an ambulance – a perception that discounts the clinical value of ambulance attendance during health emergencies.<sup>9,32</sup> For those in remote locations and with poor access to services, specific emergency plans which take into account such factors may increase ambulance use, even if it involves some period of self-transport. A medical emergency plan in this situation would establish effective communication between the patient or bystanders and ambulance control centres, ensure predetermined access information and meeting points for responding ambulance resources and reassure rural and remote residents that ambulance services can be part of a management plan which involves minimal transport times and the benefit of ambulance clinical care.

More generalised plans and guides will assist decision making. Effective planning is useful for assisting patients and bystanders through the decision making processes required to make informed choices in what services to access in unscheduled health care and health emergencies. However to be effective, planning need to incorporate the socio-emotional components of decision making

Medical emergency plans can be combined with community engagement strategies to create relationships during the planning process and provide support to community members to assist them in understanding plan components and functions. To ensure planning efficacy, medical emergency plans should be rehearsed and reviewed like home fire emergency plans. Any system for establishing medical emergency plans should consider ways of ensuring their currency and familiarity for potential users.

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## Appendix One – Australasian Triage Scale

The Australasian Triage Scale is a standardised system for determining the clinical priority of patients who present to ED. The ATS is based on a five level scale ranging from the most to the least clinically serious conditions. The ATS category is tied to treatment time benchmarks.<sup>70</sup>

ATS Category	Response	Description of Category	Example Conditions (not exclusive)
Category 1	Immediate assessment and treatment	<b>Immediately Life Threatening</b> Conditions which are a threat to life and need immediate aggressive treatment	<ul style="list-style-type: none"> <li>• Cardiac Arrest</li> <li>• Respiratory Arrest</li> <li>• Glasgow Coma Score less than 9</li> <li>• Severe shock in child</li> </ul>
Category 2	Assessment and treatment within ten minutes	<p><b>Imminently Life Threatening</b></p> <p>The patient's condition is serious enough or are deteriorating fast enough that there is a potential risk to life or organ failure if not treated in ten minutes OR</p> <p><b>Important Time Critical Condition</b></p> <p>Potential time-critical treatment to make significant effect on clinical outcome must begin within a few minutes of the patient's arrival at the ED OR</p> <p>Very Severe Pain – humane practice requires management of pain within ten minutes</p>	<ul style="list-style-type: none"> <li>• Airway Risk</li> <li>• Circulatory Compromise</li> <li>• Severe Respiratory Distress</li> <li>• Chest pain of likely cardiac nature</li> <li>• Fever with lethargy</li> <li>• Major multi-trauma</li> <li>• High Risk History</li> <li>• Hypoglycaemia</li> </ul>
Category 3	Assessment and treatment within thirty minutes	<p><b>Potentially Life Threatening</b></p> <p>Patient's condition may progress to life and limb threatening if treatment not commenced within thirty minutes OR</p> <p><b>Situational Urgency</b></p> <p>There is a potential for adverse outcomes if treatment not commenced within thirty minutes</p>	<ul style="list-style-type: none"> <li>• Severe Hypertension</li> <li>• Moderate Blood Loss</li> <li>• Hyperglycaemia</li> <li>• Dehydration</li> <li>• Head Injury with short loss of consciousness</li> <li>• Moderate-Severe Pain</li> </ul>
Category 4	Assessment and treatment within sixty minutes	<p><b>Potentially Serious</b></p> <p>Patient's condition may deteriorate or adverse outcomes may occur if treatment is not started within one hour OR</p> <p><b>Situational Urgency</b></p> <p>There is a potential for adverse outcomes if treatment not commenced within an hour OR</p> <p><b>Complex Presentation</b></p> <p>Likely to require complex workup or inpatient management</p>	<ul style="list-style-type: none"> <li>• Mild Blood Loss</li> <li>• Vomiting</li> <li>• Moderate Pain</li> <li>• Minor Limb injury</li> <li>• Non-specific Abdominal Pain</li> </ul>
Category 5	Assessment and treatment within 120 minutes	<p><b>Less Urgent</b></p> <p>Patient's condition is chronic or sufficiently minor that symptoms or clinical outcome will not be significantly affected if treatment is delayed up to two hours OR</p> <p><b>Clinico-Administrative</b></p> <p>Test results, medical certificates, prescriptions</p>	<ul style="list-style-type: none"> <li>• Minor Blood Loss</li> <li>• Mild pain with no risk</li> <li>• Minor wounds</li> <li>• Minor symptoms of low-risk conditions</li> </ul>