

An Exploratory Study to Examine the Phenomenon and Practice of Ambulance Ramping at Hospitals within the Queensland Health Southern Districts and the Queensland Ambulance Service

Research Report



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Notes:

This reports includes that names of organisational units that reflect the structure of the respective areas at the time the study was undertaken. For example, the Southern Emergency Department Network (SEDN) reflects the Southern Districts Emergency Department Clinical Network (SDEDCN).

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List of Acronyms

Acronym	Definition
AEHRC	Australian E-Health Research Centre
ACEM	Australasian College for Emergency Medicine
AR	Ambulance Ramping
ATS	Australasian Triage Scale
CHIPS	Community Hospital Interface Program
eARF	electronic Ambulance Reporting Form
ED	Emergency Department
EDIS	Emergency Department Information System
HDI	Health Data Integration
HIH	Hospital in the Home
HINH	Hospital in the Nursing Home
QAS	Queensland Ambulance Service
SARS	Severe Acute Respiratory Syndrome
SDEDCN	Southern Districts Emergency Department Clinical Network
SWEDN	Statewide Emergency Department Network

Executive Summary

Background

Ambulance Ramping, defined anecdotally as a practice where patients brought to emergency departments (EDs) by ambulance experience delays to admission, has become more frequent in Australian EDs over the last few years. Previous research has shown a link between emergency department overcrowding, ambulance diversion, and adverse outcomes for patients. However, there is very little research about Ambulance Ramping. The literature has no consistent definition of Ambulance Ramping, no description of how it is managed, and limited research on the effects it has on patient and service delivery outcomes.

Aims

This study aimed to develop a consistent definition of Ambulance Ramping for use throughout the Queensland Health Southern Districts in both health and ambulance services. It also aimed to identify how Ambulance Ramping is practised and documented, and the effects it has on how emergency health services function.

Methods

A mixed methods descriptive study using qualitative and quantitative methods examined the phenomenon and practice of Ambulance Ramping. The qualitative component involved focus groups and interviews, with 98 staff from ten EDs and four ambulance stations participating. This data enabled the investigators to identify how Ambulance Ramping was practised and documented across the Southern Districts, and to identify the primary issues associated with ramping from the perspective of staff. The quantitative component of the study involved collecting data over a one-month period (May 2008), from both the Queensland Ambulance Service's electronic Ambulance Reporting Form (eARF) and the Queensland Health Emergency Department Information Systems (EDIS) databases. Data were linked using the Australian e-Health Research Centre's Health Data Integration software. Qualitative data was analysed, using manual thematic analysis for implicit themes (definitions, causes of Ambulance Ramping, consequences of Ambulance Ramping and solutions). Quantitative data was analysed descriptively to identify age, gender, triage category, presenting complaint, length-of-stay, access block and ramp times.

Results

Ambulance Ramping was defined differently by hospital and ambulance service participants. A distinct difference was found between Ambulance Ramping and delays to hospital admission by other processes. Ambulance Ramping was found to occur when no suitable ED bed was available or imminently available for the patient and the patient was forced to remain under the care of ambulance personnel. Delays to usual process included overwhelmed resources at the point of triage and delays while patients in the EDs were moved to accommodate incoming patients, leading to delays in off-stretcher times.

Ambulance Ramping was found to be a manifestation of ED overcrowding, the cause of which was overwhelmingly reported as access block. Participants also described issues such as poor skill mix among medical and nursing staff, lack of support or knowledge of inpatient staff (particularly medical and surgical registrars and ward nursing staff), lack in overall numbers of staff, attendance by patients not requiring emergency care, and the perceived inability of paramedics to refuse ambulance transport. These issues were perceived to contribute to a slowing of ED throughput, impacting on the ability of the department to see new patients.

Major consequences identified by this research included stress and burnout for staff, diminished quality of patient care for ramped patients, slowed ambulance response times to emergencies in the community, physical and verbal violence by ramped patients and relatives directed towards staff, and legal implications for all staff involved. There was significant concern over the personal

legal responsibility of individual staff members when caring for ramped patients (defined as patients who arrived to the emergency department by ambulance and experienced a delay of ≥ 15 minutes from arrival to stretcher offload).

Solutions to Ambulance Ramping identified by staff primarily addressed the consequences described above. The majority of participants believed a sizeable increase in inpatient beds would have a major effect in reducing the frequency of Ambulance Ramping; however, most agreed that increasing ED beds would only have minimal effect. In addition, an increase in ED and inpatient staffing levels and skill mix, and improved communication between and within services to use ED beds most appropriately were identified as potentially beneficial.

Of the 31,163 ED presentations to the EDs in the study group in May 2008, 10,043 (32%) arrived by ambulance. Health Data Integration software linked a majority of the ambulance records of these patients to the EDIS records ($n=8397$, 83%). Ramped patients were found to have longer ED lengths of stay (330 minutes vs 277 mins, $p= <0.01$) than non-ramped patients, comprised a higher proportion of admissions (39% vs 35%, $p= <0.01$), and were affected by higher proportions of ED access block (47% vs 39%, $p= <0.01$), when compared to non-ramped patients. This was not accounted for by the time they spent on the ramp.

Recommendations

Taking into account the results from this study, it is recommended that the definitions of Ambulance Ramping and Off-stretcher Delayed comprise the following criteria:

1. Time:
 - (a) Off-stretcher interval exceeds established benchmark (minutes).
2. Process:
 - (a) The patient must arrive by ambulance.
 - (b) The patient must have been triaged.
 - (c) There must be no appropriate treatment space available for the patient in the ED.
 - (d) There must be no ability to make an appropriate treatment space.
 - (e) Paramedics must remain with the patient no matter where the patient is physically situated, within or outside the ED.

If the patient meets the Time criterion (as determined by Queensland Health or QAS) but not the Process criterion, the patient should be termed 'Off-stretcher Delayed'.

If the patient meets both the Time and Process criteria (as determined by Queensland Health), the patient should be termed 'Off-stretcher Delayed due to Ambulance Ramping'.

In addition to the recommended definition of Ambulance Ramping, the following key recommendations from this study are:

1. Improvements are required in data entry processes within and across organisations, including synchronisation of eARF and EDIS clocks.
2. An easily identified box within EDIS at all hospitals is needed to enable data gathering of Ambulance Ramping.
3. Future research should identify an off-stretcher time stamp for use as a surrogate marker of Ambulance Ramping for ambulance services.
4. Ramped patients' outcomes, particularly surrounding the relationship between Ambulance Ramping and access block should be examined.
5. Ambulance Ramping from the patients' perspective should be examined.
6. Research into the impact of Ambulance Ramping on ambulance community response times should be undertaken.
7. The legal responsibility of individual staff should be examined.

8. The QAS policy for refusal of transport should be reviewed.
9. Inpatient staff should be trained on how to improve flow throughout hospital.
10. Education and support should be provided for triage staff to move patients from QAS stretchers into waiting rooms.
11. The number of staff at triage should be increased to alleviate pre-triage waits.
12. Inpatient staff should not be rostered to admit through the ED on the same days as they have theatre and clinic duties.
13. The workforce should be increased, particularly medical registrars.
14. Management staff should be alert to the possibility of staff burnout and implement strategies for its prevention and management.

Chapter 1 – Introduction

Background

The Southern Districts Emergency Department Clinical Network (SDEDCN) within Queensland Health is comprised of ten Emergency Departments (EDs). Because of high demand for ED services, hospitals within this network, anecdotally, *ramp* ambulance patients who cannot be safely admitted due to a lack of physical space, or a lack of nurses or medical staff. Ambulance Ramping involves the patient remaining on the ambulance stretcher and in the care of paramedics. The ramp may be physical or virtual, located either within or outside the ED. There is little research available on the issue of Ambulance Ramping, although overcrowding in EDs and ambulance diversion from EDs has been documented.

Anecdotal accounts from ED staff in the SDEDCN were that Ambulance Ramping is increasing. Ambulance Ramping is a new phenomenon caused by ED overcrowding. Overcrowding has developed into a significant problem over the last 20 years.¹⁻⁵ Originally attributed to 'inappropriate attendees', that is those patients whose conditions could more appropriately be managed by their general practitioner (GP),⁶⁻⁸ overcrowding is now acknowledged to stem predominantly from hospital access blocks,^{4, 9-30} which occur as a result of reductions in, or insufficient, hospital bed numbers.^{2, 10, 16, 31-35} For the purposes of this study, the Australasian College for Emergency Medicine's (ACEM) definition of access block was used, that is 'those patients in the ED who require inpatient care but are unable to gain access to appropriate hospital beds within a reasonable time frame, often reported as eight hours'.³⁶ While hospital bed numbers across Australia have been reduced, both the acuity and complexity of patients' conditions have increased, leading to increased patient length-of-stay in EDs, and a heavier overall burden on health services.^{13, 32, 33, 37}

Overcrowding and access block have a major effect on EDs and emergency services. The detrimental effects they have on the quality of patient care are well documented.^{11, 24, 30, 38-41} Overcrowding makes infection control and prevention more difficult,^{42, 43} leads to more frequent medical errors,⁴²⁻⁴⁵ decreases patient satisfaction, increases violent behaviour by patients, their family and friends,⁴³⁻⁴⁹ and increases staff workload. For EDs, this causes staff stress, burnout and higher staff turnover rates.^{47, 50}

A primary strategy used by hospitals to cope with ED overcrowding is ambulance bypass or diversion^{20, 51-67} where hospitals close to some, or all, ambulance admissions, and emergency services personnel are forced to take patients to the next open or undiverted ED. Negative effects with this practice include poorer patient outcomes due to increased transport times,^{56, 68, 69} treatment delays and longer ambulance turnaround times.^{56, 59} Although hospitals have sought to address ED overcrowding by improving throughput⁹ and output,^{9, 12, 17, 21, 27, 29} Ambulance Ramping is occurring with increasing frequency in hospitals within the SDEDCN. Ambulance Ramping is thought to increase patient time to definitive treatment, for which ambulance bypass has been widely criticised.^{32, 50, 51} It is essential that paramedics promptly hand over patients to hospital staff to ensure optimal community response times.^{32, 50, 51, 70} Targets for complete ambulance turnaround time have been set at 25 minutes in Victoria⁷⁰ and 15–30 minutes in Queensland.

While several authors have suggested long waiting times for paramedics to offload patients at EDs,⁷¹⁻⁷⁴ only three articles dealt with this issue directly.⁷⁵⁻⁷⁷ Ambulance Ramping has been associated with increased risk of access block in the ED.⁷⁷ There have been reports of deaths associated with diversion,⁶⁹ and media reports of deaths among ramped patients.⁷⁸ The practice requires research to establish its safety and efficacy for patients, staff, and the wider community.

Research problem and aim of the study

The aim of this study was to examine the phenomenon and practice of Ambulance Ramping at hospitals within the SDEDCN. The objectives of this study were to:

1. describe and develop a definition of Ambulance Ramping
2. determine the frequency and practices of Ambulance Ramping at SDEDCN hospitals
3. identify the nature of the delays incurred by patients who are subject to Ambulance Ramping
4. identify mechanisms currently employed to manage Ambulance Ramping
5. determine the extent to which Ambulance Ramping and its effects are documented by hospital and ambulance services
6. identify the effect of Ambulance Ramping on ED functioning
7. identify the effect of Ambulance Ramping on ambulance services
8. identify the effect of Ambulance Ramping on the delivery of emergency health services.

Significance and justification of the research

Congestion and overcrowding of EDs and emergency medical systems are well documented globally.^{3, 10, 11, 14, 24, 30, 40–42, 57, 68, 79–83} These situations lead to access block, with patients remaining on ambulance stretchers for prolonged periods awaiting ED admission, assessment and treatment. Studies that have looked at overcrowding in other settings have shown that ramping adversely affects long-term patient outcomes.^{11, 13, 44, 84} Despite being a well-recognised issue, there is little research investigating overcrowding in the Australian context. Existing research has examined the effects of overcrowding on ambulance services,^{75, 76} particularly the issues surrounding ambulance bypass or diversion.^{20, 54–56, 58–62, 85, 86} Research has demonstrated that patients who had been diverted experienced adverse outcomes related to increased transport times.^{41, 59, 60, 69} These adverse outcomes included delays to definitive treatment for those patients being transported, and a reduction in resources available to respond to other ambulance calls.⁷⁶

Few studies have been conducted into Ambulance Ramping, particularly within Australia. One study found Ambulance Ramping to be a predictor of access block.⁷⁷ To date, the media have reported two deaths in ramped patients in Queensland.^{78, 87} Although it was not established that Ambulance Ramping contributed to these deaths, they attracted intense political and public attention, which was directed at both the hospital and the ambulance service. With the current focus on quality and safety in health care particularly from authorities such as the Health Quality and Complaints Commission, similar events in the future are likely to attract further media, political and public attention

The phenomenon of Ambulance Ramping is relatively new in the SDEDCN, and hospitals are increasingly being forced to use it as a temporary measure to cope with ED overcrowding. The cost to the ambulance service is significant and the effects on response times and patient outcomes are unknown. This study aims to provide evidence for organisational change and improvement across the SDEDCN and the Queensland Ambulance Service (QAS). It is anticipated the findings will inform future research, enable best practice for Ambulance Ramping, and improve both ED and ambulance care.

Chapter 2 – Literature Review

Introduction

The SDEDCN is comprised of ten Queensland EDs, serving a population of approximately two million people.⁸⁸ During the 2008/09 financial year, 411,926 patient presentations were made to EDs in SCEDCN.⁸⁹ As a result of increasing attendances, and subsequent access block of EDs, hospitals within the network adopted a practice of ramping ambulance patients when they could not safely be accepted into EDs due to a lack of physical space, or a lack of nursing or medical staff. Ambulance Ramping occurs when patients brought to an ED by ambulance in times of high departmental activity remain in the care of paramedics and on ambulance stretchers or on the ambulance ramp, which may be either a physical or a virtual ramp.

The practice of Ambulance Ramping is relatively new within the SCEDCN. Ramping means that one or more of the following events may occur:

- the patient remains in the parked ambulance vehicle outside the ED, awaiting a bed in the ED and hospital assessment
- the patient remains on the ambulance stretcher in the care of paramedics inside the ED while awaiting triage and assessment
- the patient has been triaged, but remains on an ambulance stretcher inside the ED in the care of paramedics while waiting for an available bed within the ED treatment area
- the patient has been triaged and allocated a space within the department, but hospital staff may initiate some form of treatment or investigation, but the patient remains under the care of paramedics.

Currently, there is no consistent policy throughout Queensland for managing ramped patients, and the safety of the practice has not been established. The intention of this review was to examine the evidence surrounding Ambulance Ramping, and form a basis for further study on the subject.

Search strategy

Various electronic databases, including MEDLINE, CINAHL and PubMed, were searched throughout the study. More than 30 search terms were used, including 'ED overcrowding', 'capacity alert', 'patient flow', 'emergenc*', 'Ambulance Ramping', 'ramping', 'ambulance', and 'ambulance turnaround'. The terminology used in identified articles was used as a basis for further searches, reducing the risk of regional bias in the searches and ensuring the literature was searched thoroughly. The reference lists of relevant articles were also searched manually.

All articles were evaluated for relevance to Ambulance Ramping and ED overcrowding, and reviewed independently by two of the authors (EH and KH). Some personal communications and unpublished reports have been included to provide a broader local picture of the problems surrounding Ambulance Ramping within the area.

ED overcrowding

To investigate the issue of Ambulance Ramping, its underlying cause, ED overcrowding, must first be examined. ED overcrowding is not new, and has been documented in the lay and medical press for almost 20 years.¹⁻⁵ The Australasian College for Emergency Medicine defines 'overcrowding' as a situation where the functioning of the ED is impeded due to large numbers of patients awaiting assessment, treatment or departure, which exceeds the physical or staffing resources.³⁶ The American College of Emergency Physicians uses the term 'crowding', defined as a situation in which demand for emergency services outstrips resources within the ED.⁹⁰ When comparing definitions, it appears that the terms are interchangeable. For the purposes of this review, the term 'overcrowding' will be used for consistency.

Site visits to EDs within the SDEDCN undertaken by the researchers (JCr and KH)⁹¹ found that the identifying criteria for determining times of saturations and overcrowding were inconsistent within and across the EDs and their parent hospitals. Decisions were made based on a variety

of issues, such as the number of patients in the ED, the number of patients waiting to be triaged and the level of resources available to manage the patients. Identifying when a department became overcrowded was subjective, and inconsistencies of definitions existed between staff and between departments. This observation is supported by the literature.^{58, 92} Hospitals currently initiate Ambulance Ramping procedures when they feel their ED is overcapacity; however, there is no uniform definition of ED 'capacity' within the SDEDCN.

The word capacity can be used in two different contexts in EDs.⁹³ Firstly, capacity can refer to the ability of EDs to accommodate patients. Secondly, capacity can refer to an ED's ability to respond to certain situations. Throughout the literature, capacity appears to have primarily been used to describe the physical limitations of EDs. The researchers of this study found no uniform definition of ED capacity in either the literature or the departments.

While no standard definition applies, the causes of overcrowding can be attributed to issues relating to: input, throughput, and output.⁹⁴

Input

Internationally, it is recognised that overall patient numbers presenting to EDs are increasing.^{16, 31, 33, 34, 95, 96} In the US, while presentations have increased, the number of EDs and hospital beds has actually decreased^{31, 33, 34} resulting in increased pressure on the health services and ED overcrowding. Within Queensland, the population increased 9% from 3,585,639 in 2001 to 3,904,532 in 2006^{97, 98} and hospitals have reported corresponding increases in ED presentations.⁸⁹

For many years ED overcrowding was attributed to high volumes of patients with minor or chronic health conditions presenting to the ED and slowing the process for patients in genuine need of emergency care.⁶⁻⁸ 'Inappropriate ED attendees' have been described as those patients whose conditions are not emergencies and do not require ED input.⁷ Internationally, findings vary regarding the proportion of 'inappropriate ED attendees'. A report by the Portuguese Government estimated the rate of 'inappropriate' ED attendances to be as high as 80 per cent.⁷ However, other researchers found the actual rate to be much lower at 31.3 per cent via a cross-sectional prospective study design using triage records, reviews, and explicit criteria.⁷ The Hospital Urgencies Appropriateness Protocol was used to evaluate ED visits in Spain.⁸ The researchers found the rate of inappropriate ED visits to be 29.6 per cent at their facility. Anecdotally, in Australia patients allocated a Category 4 or 5 (semi-urgent or non-urgent) on the Australasian Triage Scale (ATS) are often considered by ED staff most likely to be more appropriate for a general practitioner (GP) than an ED. This notion is not, however, supported by the ACEM¹⁰ because a considerable portion of these Category 4 or 5 patients require hospital-related services. The name 'casualty department' was changed to 'accident and emergency department' and finally to 'emergency department' in an effort to define its function and enable the public to more appropriately determine their need to visit.⁶ However, the term 'emergency' will always be subjective, and patients will continue to attend EDs for minor conditions for a variety of reasons. It is now acknowledged that attendances by patients with semi-urgent and non-urgent conditions are not the major cause of ED overcrowding.⁹⁹ Furthermore, it has also been acknowledged that, as the lay person cannot always be expected to be able to judge when a condition is serious or not, discouraging ED attendance for minor conditions can be dangerous.³⁰

Throughput

Throughput issues relating to ED overcrowding include reduced access to GP services, increased patient complexity, an increased range of available diagnostic procedures, and staff shortages. It has been suggested that reduced access to GPs and community services encourages patients to attend EDs as their only healthcare option and contributes to ED overcrowding.⁵⁰ The rate of bulk billing among GPs in Australia has been steadily falling since 1996.¹⁰⁰ Lack of access to primary care due to cost may be forcing some patients to avoid visiting GPs until their problem is more complicated and requires hospital care.

Another throughput issue stems from the increasing complexity of patients' conditions when they present to EDs.^{13, 32, 33, 37} This may be related to social issues, including increased recreational drug use,² rising levels of obesity,¹⁰¹ and an aging population.¹⁰² Patients with more complex conditions inevitably take more time to process through the ED, contributing to overcrowding.

EDs are conducting more extensive diagnostic procedures than ever before in an attempt to avoid unnecessary admissions, and to facilitate use of outpatient care.⁸³ Shortages of physical and human resources to perform these extensive diagnostic procedures can increase patients' ED length-of-stay, and subsequently contribute to overcrowding as new patients continue to arrive while others remain in EDs for prolonged periods of time. Global nursing shortages have been widely documented,⁵⁰ and highlighted in the Queensland local press.⁴⁸ Shortages of inpatient speciality staff and difficulties contacting them for patient assessment can also lead to delays in processing patients through the EDs.^{16, 37}

Output

Hospital access block is the most commonly cited output issue relating to ED overcrowding.^{4, 9, 12–30, 95, 103} Access block occurs when patients in the ED require inpatient care but are unable to gain access to appropriate hospital beds within a reasonable timeframe of eight hours.³⁶ In the late 1980s and early 1990s, as a result of improved technology and an emphasis on the provision of outpatient services, there was a decline in the number of inpatient hospital beds^{2, 16, 31–34, 95} and shorter inpatient lengths of stay. During this same period, however, ED presentations increased due to the factors outlined earlier in this chapter.

To function efficiently, an organisation must operate at 85 per cent capacity.⁹⁵ Australian hospitals have been cited as operating at 90–95 per cent capacity, leaving little room for contingency situations.⁹⁵ The impact of this is seen in EDs, with inpatients being held there because there is nowhere else for them to go. As a result, EDs may frequently operate at more than 100 per cent capacity.¹⁸ Although operating at over 100 per cent capacity, EDs in many western countries are still legally obliged to provide timely and appropriate emergency care to those who request it.^{68, 69} Decisions about managing resources and acute healthcare delivery should be derived from policy and procedures that are, in turn, derived from evidence-based research.

Given that overload issues such as ED overcrowding, access block and Ambulance Ramping are currently experienced within existing EDs, there is a mismatch between population growth, and the demand and resource allocation for emergency health care. The impact of overcrowding on EDs has received considerable attention within the literature.

Impact of overcrowding on the ED

Overcrowding has an impact on almost every aspect of ED operation. It affects the quality of care delivery, infection control, patient safety, patient satisfaction, staff safety and satisfaction, and the ability to respond to disasters. Overcrowding has financial implications. Quality of patient care is impacted by ED overcrowding.^{11, 24, 25, 30, 38–41, 44, 45, 103–107} Associations have been made between ED overcrowding and increased mortality,^{105, 107} although cause and effect has not been conclusively established.¹⁰³ An increased inpatient length-of-stay has been associated with patients spending extended periods of time in the ED.^{26, 84} During ED overcrowding, longer door-to-needle thrombolysis times have been reported for suspected myocardial infarction (MI) patients.⁴¹ Care of critically ill patients may be compromised due to a lower staff:patient ratio than on traditional critical care units, and delays in investigations have also been noted.³⁸

In an overcrowded environment, infection control becomes an issue. This was evident in the spread of Severe Acute Respiratory Syndrome (SARS) in Toronto.^{42, 43} Poutanen⁴³ reports that a patient subsequently diagnosed with SARS was placed in close proximity to a patient who was boarded overnight in an overcrowded ED due to hospital access block. Both patients died of the disease.⁴³

Patient and staff safety may be compromised in other ways in overcrowded EDs. Medical errors may increase due to pressure on staff.⁴⁴ There have been documented cases of patient deaths partially attributable to ED overcrowding and subsequent overstretching of staff.^{44, 45} Litigation due to cases such as this may place a further financial burden on individuals and institutions. The physical aspect of having too many people within a finite space may also compromise patient and staff safety.¹⁰⁸ Patients may be placed in inappropriate areas for their care, and they may not be immediately visible to staff or may have to be treated in a chair or waiting area. Staff may not be visible to security staff or cameras, compromising their safety when caring for potentially violent patients.

With increased numbers of patients and finite resources, waiting times for medical treatment inevitably increase, leading to patient dissatisfaction.⁵⁰ Frustration among patients and relatives may lead to verbal and physical aggression directed towards staff.^{46–48} Violence towards staff is increasing in frequency and intensity, and may have a significant impact on job satisfaction. One study has found that 67 per cent of ex-ED staff members surveyed left the job, at least in part, due to aggression directed towards them by patients and families.⁴⁷

As well as coping with aggression and violence, ED staff are also expected to take on larger and heavier workloads due to greater patient numbers with higher acuity in overcrowded EDs.^{13, 37} This increasingly stressful environment contributes to higher staff burnout and turnover rates.^{47, 50} EDs, therefore, often have a higher ratio of inexperienced staff, particularly nurses, resulting in a higher burden on more experienced staff and compromised patient safety.

ED overcrowding can negatively affect patients, staff, and the health care organisation. Frequently operating at over 100 per cent, ED capacity leaves little contingency for disaster response. With an ED crowded with patients as a result of access block, a hospital may already be operating at the level of an internal disaster. In this era of heightened alertness to the threat of terrorism, the capacity of hospitals to deal with mass casualties is more important than ever. A major disaster occurring during a period of severe ED overcrowding could be catastrophic.^{30, 51}

Overcrowding may also have a financial impact on EDs. Anomalies in funding arrangements may mean that reimbursement for boarding admitted patients in the ED due to access block elsewhere may be less than the reimbursement given to an inpatient unit for caring for the same patient. The financial impact to EDs in the US is different to public hospitals Australia, which are funded by government (or in some instances insurance). In the US, and in private hospitals generally, if the ED is overcrowded with access blocked patients, the hospital's ability to see additional fee-paying patients is limited.^{85, 86, 109, 110}

Strategies used by hospitals to manage ED overcrowding

Input

EDs have a limited ability to alter the numbers of patients presenting; however, one of the most commonly documented practices is ambulance diversion or bypass. This practice has also been adopted to some extent by EDs internationally.^{20, 51–67} In this situation, hospitals close to ambulance presentations (with the exception of life-threatening situations), and paramedics are forced to take patients to the nearest open hospital. Ambulance bypass has numerous effects on hospitals, ambulance services and patients. Three major consequences attributed to the practice of ambulance bypass are; increased transport time for patients, increased risk of patients suffering from adverse events,^{56, 68, 69} and delays in emergency service community response as a result of increased ambulance turnaround time.^{56, 59}

A 'network effect' regarding ambulance bypass has also been described in the literature.¹¹¹ As one ED closes due to overcrowding, another receives all patients destined for the first ED as well as their own. This results in the second ED quickly becoming overwhelmed, needing to close to new admissions as well. Patients are then diverted to a third hospital and this continues until all hospitals in the area are on bypass and all are forced to reopen.⁶⁴

Another effect of diversion is that patients may end up far from their 'home' hospitals. As well as causing inconvenience to patients and families, this can also cause delays in treatment and investigations while patient notes are sourced from their usual treating facility.⁵⁶ The patient may also need to be transferred back to this facility, placing more pressure on the already overstretched ambulance service.

Throughput

Increasing ED clinical and ancillary staffing has been recommended as an interim measure to cope with overcrowding.⁴ However, with the nursing shortage in Australia, which was estimated at 33,000 in 2006,⁹⁵ facilities may have difficulty sourcing appropriately qualified staff. If areas such as corridor space are adopted for patient care, then they should be staffed accordingly. However, using this corridor space can impinge on health and safety protocols if fire exit pathways are blocked.

Patient flow initiatives aimed at streamlining the entire ED process from door-to-admission or discharge, have been introduced in some SDEDCN hospitals. Tracking and managing delays may help speed patient flow. Some facilities have opened dedicated ED radiology and pathology services to expedite results,⁹ as well as nurse-initiated procedures (such as X-ray, pathology, and analgesia) and expanded roles (such as ED nurse practitioners).

Output

As ED overcrowding has been acknowledged to be caused primarily by hospital access block, many facilities have initiated procedures to free up inpatient beds. These include opening additional observation unit beds and short stay wards,^{9, 12, 17, 21, 27, 29} and placing patients in corridors on wards rather than in the ED while they are waiting for their bed to be ready.^{4, 112} This practice is known as 'over census' or 'sharing the risk'.⁴ Freeing up beds by implementing early inpatient discharge has proved to be somewhat successful in some hospitals, as has changed admission practices, reducing the number of patients admitted the day before procedures and using a 'day of surgery' admission model.²¹ Some hospitals have opened offsite accommodation for patients travelling from remote areas needing day procedures, reducing inpatient admissions and, in some areas, additional low-level care beds have been opened.^{17, 21, 27}

Selectively cancelling elective surgery during short crisis periods is another way of managing access block and has occurred in at least one of the hospitals in the SDEDCN. This is not viewed as a popular solution for patient, financial and political reasons. Other hospitals have increased day of surgery admissions and day only procedures to both maintain elective surgery and ease hospital access block.^{9, 21} Better bed management practices have been suggested as a solution to reducing the numbers of patients transferred between inpatient units, reducing the labour involved in these transfers.⁴ Initiatives that can reduce the need for hospital admissions and ED re-presentations targeted at populations such as the elderly include Hospital in the Home (HIH), Hospital in the Nursing Home (HINH) and Community Hospital Interface Program (CHIP) Services. These services have been initiated to allow some procedures (such as intravenous antibiotics and wound care) to be delivered to patients in the community, preventing hospital admission. Research regarding the effectiveness of these services is slowly emerging within Australia.

Lessons from the literature

There is little documented evidence of Ambulance Ramping as an established practice. At the time of writing, only one recent article was found that specifically examined Ambulance Ramping and its effects.⁷⁷ Other studies focused on ambulance turnaround and subsequent response times.^{75, 76, 112} Research covering the patient safety aspect of ramping is limited but, anecdotal reports and incidental mention of long ambulance turnaround times suggest it is a practice that is more widespread than formal evidence shows.^{73, 74}

Ambulance Ramping has evolved in hospitals within the SDEDCN as EDs experience increasing overcrowding. This practice occurred through necessity, and no official decision was made to initiate the practice. It happened because there was no other option available. Recently it

has been recognised that the ED overcrowding problem within the SDEDCN has no short-term solution, and Ambulance Ramping needs to be officially recognised because it will continue, at least in the short term. In some hospitals, Ambulance Ramping policies have been developed, and staff follow specific guidelines. At other hospitals, ramping remains a practice that simply occurs through necessity. There is inconsistency within and between departments in the way Ambulance Ramping is implemented.

There is limited published research about Ambulance Ramping; however, one study found ramped patients had a longer ED length-of-stay and comprised higher proportions of access block when compared to non-ramped patients, although no effect was found on subsequent in-patient mortality.⁷⁷ Ramping increases patient time to definitive treatment, something ambulance bypass has been widely criticised for.^{32, 50, 51} Although patients are at hospitals when they are ramped, they remain in the care of paramedics, who do not have the resources to perform more than basic investigations. Therefore, investigations such as blood and urine tests and x-rays may be delayed.

It has been suggested that practices akin to Ambulance Ramping may be illegal in the US under the *Emergency Medical Treatment and Active Labor Act* (EMTALA).^{113–115} Under this act, hospitals must provide timely treatment to all patients presenting and requesting medical care. Medicare funding may be withdrawn if hospitals are found to be in contravention of the act.¹¹³ This may be one reason for the scarcity of literature on the subject.

The literature stated it is essential that paramedics hand over patients promptly to hospital staff to ensure appropriate community response times.⁷⁰ In the US, Haugh¹¹⁴ noted that hospital violations occur 'if a hospital's staff don't transfer a patient in 15 minutes'. One hospital in the US aims to 'move patients off ambulances in 30 minutes or less'. Within Queensland, the QAS report off-stretcher time as 'time exceeding 15 minutes from arrival to ED to stretcher offload'. In Victoria, targets for complete ambulance turnaround times have been set at 25 minutes.⁷⁰ It is not difficult to see how ambulance response times may be affected by Ambulance Ramping times.

The legal issues surrounding Ambulance Ramping have not been fully established within Queensland, and are currently under investigation. However, it could be interpreted that the hospital owes a non-delegable duty-of-care to the patient due to the proximity of the patient to the hospital.¹¹⁶ The legal obligation of individual clinicians varies according to the practices and policies in place at individual hospitals.

The safety of Ambulance Ramping for individual patients has not been established. Although there have been reports of deaths associated with diversion,⁶⁹ there have also been reports of possible mortality in ramped patients.^{78, 87} Therefore, the safety of this practice for patients, staff, and the wider community needs to be formally established.

The minimal literature on Ambulance Ramping illustrates a need for further investigation into this subject. Access block and a longer ED length-of-stay have been found to be more prevalent among ramped patients. Ambulance diversion and ramping increase the time to definitive treatment, so it is possible that Ambulance Ramping could also lead to poorer outcomes as has been documented for patients who have been diverted. Ambulance turnaround times are inevitably affected by ramping,⁷⁵ although there is minimal Australian literature on the subject. Therefore, patient outcomes and ambulance response times as a result of Ambulance Ramping are areas requiring further urgent research.

Conclusions

ED overcrowding is a global problem that has many detrimental effects on patients and staff, including diminished safety, staff burnout, medical errors, and reduced capacity for mass casualties. EDs have struggled for many years to cope with this situation by using strategies such as ambulance diversion. Recently, Ambulance Ramping has increasingly been used within the SDEDCN. Little is known about this practice, perhaps, in part, because it has financial implications for some hospitals in the US and Australia. The safety of ramped patients is largely unknown, although it can be expected that the impact on the community would be the same as, if not worse than, that imposed by ambulance diversion.

Chapter 3 – Methodology

Introduction

The aim of this study was to examine the practice of Ambulance Ramping at hospitals within the SDEDCN. The objectives of the study were to:

1. describe and develop a definition of Ambulance Ramping
2. determine the frequency and practices of Ambulance Ramping at SDEDCN hospitals
3. identify the nature of the delays incurred by patients who are subject to Ambulance Ramping
4. identify mechanisms currently employed to manage Ambulance Ramping
5. determine the extent to which Ambulance Ramping and its effects are documented by hospital and ambulance services
6. identify the effect of Ambulance Ramping on ED functioning
7. identify the effect of Ambulance Ramping on ambulance services
8. identify the effect of Ambulance Ramping on the delivery of emergency health services.

To do this, the researchers employed a mixed methods study, which is described in the following section.

Research design

A mixed-method qualitative and quantitative study was used to explore and describe Ambulance Ramping.

The primary objective of the first part of the study was to understand Ambulance Ramping as perceived by those who experience it. Accordingly, phenomenological principles were adopted for the qualitative aspect of the study. This approach allows the researcher to explore the lived experience of those involved in the phenomenon.¹¹⁷ As some of the researchers had personal experience with Ambulance Ramping from a clinical perspective, bracketing¹¹⁸ was used to enable a more objective approach. This allows the researchers to identify what they already know about the subject and set it aside to reduce the influence of this knowledge on data collection and analysis. Data was collected using focus groups and individual interviews with ED medical, nursing and ambulance staff involved in Ambulance Ramping. The data was transcribed and analysed using manual thematic analysis.

The second part of this study involved quantifying the extent of the problem. This involved retrospective examination of Queensland Health Emergency Department Information Systems (EDIS) and QAS electronic Ambulance Reporting Form (eARF) databases linked by the Australian e-Health Research Centre (AEHRC) using Health Data Integration (HDI)* software enabling detailed analysis to:

- identify the frequency and extent of delays in entry to EDs
- examine consistency in documentation of Ambulance Ramping between QAS and hospitals
- determine the types of presenting complaints likely to be suffered by patients experiencing Ambulance Ramping.

* Hansen D & Maeder A. HDI: Integrating Health Data and Tools. *Journal of Soft Computing* 2007: 11: 361–367.

Sample and setting

This study involved ten Queensland EDs that service a population of over 2 million. One was a tertiary referral hospital, two EDs treated adults only, one treated children only, and seven treated both adults and children. During 2007–2008, these ten EDs had more than 450,000 patient presentations.

The qualitative study involved interviews and focus groups with medical, nursing and ambulance staff working at the study sites. Recruitment for the study started following an initial site visit to all hospitals by one of the researchers (EH). ED staff were informed of the study at staff meetings. An email providing further details of the study was then sent via the ED Nurse Unit Managers, Directors of Emergency Medicine and QAS station officers to all ED nursing and medical staff, and QAS paramedics at the participating sites. Appointments were then arranged for interviews for data collection. At least one week before the data collection, the participant information sheet and consent form were emailed to potential participants. Written informed consent was obtained from each participant. Tape-recorded interviews were conducted at each site in a private room. In total, 95 staff participated in the study, with a further three volunteering information, but who were unable to attend on the interview day.

The inclusion criteria for participants were:

- that they were a nurse, doctor or paramedic working at a participating site, with regular personal experience of Ambulance Ramping
- that they were at least 18 years of age
- that they had fluent English language skills.

The quantitative study analysed 8397 records of patients presenting via ambulance to eight of the ten participating sites during May 2008. Two sites were excluded from the quantitative analysis as data was not available in the required format. Data obtained from the QAS eARF and the EDIS database are shown in Table 1. Linkage of eARF and EDIS data was undertaken using the AEHRC Health Data Integration (HDI) software.

Inclusion criteria were limited to:

- patients who had presented to a participating hospital ED via ambulance during the data collection period
- patients for whom EDIS data was available in the required format for data linkage.

Table 1. Data collected

eARF DATA	EDIS DATA
Name	Name
Date of Birth	Date of birth
Gender	Gender
eARF number	UR number
Date of case	eARF number
Age	Date and time of arrival
Receiving hospital	Date and time of triage
Date and time at scene	Date and time of allocation to first area
Date and time at destination hospital	First area of allocation
Date and time of triage	Discharge date and time
Date and time off-stretcher	Discharge destination
QAS final assessment	Triage complaint code
	Final diagnosis

Ethical considerations

Researchers obtained full ethical approval for the study from the Human Research Ethics Committees of all 10 participating sites and QAS. All participants in the qualitative section of the study were emailed a Participant Information Sheet, a Consent Form, and a Withdrawal Form at least one week before the focus groups or interviews, and informed consent was obtained from all participating subjects. At the start of the focus groups and interviews, it was explained that all participants would remain anonymous, and no individuals or institutions would be identified within the study. It was also explained that participants were able to withdraw from the study and, should they chose to do so, any information they had provided would be deleted at any time up until data analysis. A de-identified transcript of each focus group and interview was emailed to each participant, and a two-week window was provided for them to withdraw their information before data analysis. Only one participant asked for information to be removed due to identification concerns.

During one of the early focus groups, researchers noted that many participants were exhibiting physical signs and symptoms consistent with emotional and psychological distress relating to their experience with excessive workloads. Although the researchers did not believe this was caused by the focus group, staff were referred to staff counselling services and relevant managers were informed. All staff participating in further focus groups and interviews were provided with details of the staff counselling services before the groups started and reports were submitted to the Human Research Ethics Committees, while preserving the anonymity of the participants. No further participants were observed to exhibit this degree of distress.

Data collection and analysis

Qualitative data was collected in focus groups and via individual interviews that used a semi-structured approach. Interview questions were based on the aims of the study. The researchers allowed the participants to stray from the initial question to allow in depth exploration of the subject and surrounding themes, while guiding them back to the subject when necessary. Data collection occurred at the participants' workplaces at pre-agreed times via focus groups. Interviews were recorded with permission of the participants, and field notes were also taken. Data analysis was completed using manual thematic analysis.¹¹⁹ The transcribed interviews and focus groups were analysed by two of the researchers (EH and RS) for implicit themes (definitions, causes of Ambulance Ramping, consequences of Ambulance Ramping and solutions) using colour-coding techniques. Ambulance and hospital data was analysed separately.

QAS eARF data was provided in spreadsheet format by the QAS researcher (VT). EDIS data was sourced in spreadsheet format from the decision support departments at the participating hospitals. Data was analysed using the SPSS data analysis package for descriptive and inferential statistics.

Chapter 4 – Findings and Results

This chapter presents the findings arising from the analysis of the focus groups and interviews, and the results from the analysis of QAS and EDIS data.

Data Set 1: Focus groups and interviews

In total, 95 staff from SDEDCN hospitals and adjunct QAS stations participated in the focus groups and interviews. Findings from these interviews and focus groups included a definition of Ambulance Ramping and how it is managed, as well as the problems, causes, consequences and potential solutions surrounding Ambulance Ramping from the perspective of the SDEDCN and QAS staff.

Definitions – SDEDCN Participants

The researchers adopted the QAS off-stretcher time interval of ≥ 15 minutes as the working definition of Ambulance Ramping for this study. Off-stretcher time can be defined as the time elapsing between the ambulance arriving at the hospital, and the time that ED staff take over the care of the patient. A preliminary review of the data obtained from the QAS during the preparatory phase of this project indicated a large proportion of patients meeting this criteria for all study sites, even the sites that indicated they did not experience Ambulance Ramping problems. Participants from hospitals indicated that the definition needed qualification, and drew a line between delays caused by normal process and Ambulance Ramping.

Ambulance Ramping was defined by hospital staff as:

Definition 1: Patient kept under the care of QAS paramedics until they could be handed over to hospital staff.

'Ambulance Ramping is that the unit or the department is at its capacity, that it's unsafe to take any more patients into the department and that ramping is for the ambulance to be responsible for that patient to a degree.' (Participant 2, Hospital B2)

Hospital staff also defined Ambulance Ramping as when the:

Definition 2: Patient may have been inside the department or outside in the ambulance, but the QAS paramedics remained with them at all times.

'Yes and ramping the patients, usually they're not on the ramp, they're in the corridor within the department, waiting for a bed allocation. They've usually been triaged straight away, as soon as possible.' (Participant 2, Hospital Q)

'They're supposed to wait in the back of the ambulance.' (Participant 3, Hospital B2)

Definition 3: There was no cubicle available for the patient and they required a cubicle i.e. their condition did not allow them to wait in the waiting room.

'So, when you are unable to offload patients from the ambulance, they are unable to either go to the waiting room or go into a bed and you're tying up an ambulance crew in the corridor.' (Participant 1, Hospital D)

All ramped patients were usually triaged. At some sites the patient may have been seen by a doctor and treatment commenced. They may also have had some nursing care while ramped.

'If there is a staff member that can do an assessment and start treatment we try to do that. It doesn't always happen.' (Participant 2, Hospital N)

Usual processes included patients awaiting triage. If triage resources were temporarily overwhelmed, delays may have occurred.

'I'm going to see the three patients or four patients that have been here first, then I'm going to deal with the ambos.... So is that classified as ramping? I don't think so 'cause

they're going to wait for five or seven minutes for me to get to them.' (Participant 1, Hospital P)

After a patient was triaged, ED staff looked for a space for the patient. If no space could be found or made for the patient, Ambulance Ramping occurred.

'What we do is just hold them there for a minute, we'll just have a look around so it's not an official ramping, it's just, let's look and see what we've got available.' (Participant 4, Hospital B2).

As expected, the way individual hospital participants defined Ambulance Ramping differed, largely depending on the ED in which they worked. However, disagreement between participants at the same site was also noted. This was particularly noticeable at hospitals where Ambulance Ramping happened less frequently.

'Never on a shift that I've done in here, have we ever said to the ambulance crew, "Can't take this patient, you are caring for this patient until we decide where their destination's going to be".' (Participant 1, Hospital P)

However, during the same focus group:

'We do have ambulances having them on a bed until we get that process done.' (Participant 2, Hospital P)

'Yes, for me it's never been more than an hour, but it's been pushed up to that at times.' (Participant 3, Hospital P)

Hospital staff also expressed concerns that inaccurate data entry by paramedics negated the effectiveness of the QAS definition as a benchmark, and may have given a false impression of Ambulance Ramping.

'They take five minutes to hand over, they go and have a cup of coffee, they go and change their beds, they wash their van out.' (Participant 1, Hospital P).

However, the majority of hospital participants agreed that Ambulance Ramping occurred when the hospital was unable to take handover of the patient, and the ambulance crew needed to stay with and care for the patient. Where the patient was situated when ramped varied depending on the ED, as did the degree of nursing and medical input.

Definitions – Ambulance Service Participants

The views expressed by paramedics were similar to those of hospital participants. Paramedics felt that Ambulance Ramping definitions varied considerably depending on the receiving facility and the staff involved, from both hospitals and the QAS. They also described varying terminology and the terms 'staged', 'delayed' and 'holding' were used by some to describe ramping:

'We had a cardiac arrest come in and another patient so all I did was manoeuvre the crew down to the holding area, knowing that they were going to be staged for a while anyway.' (Participant 4, Station G)

Although the QAS has a clear definition of Ambulance Ramping that was reported by their staff, ambulance participants appeared confused about the definition accepted by hospitals:

'At the [anonymised hospital], once you've got two or three people waiting inside around the triage area, then we end up having our patients in the vehicle outside, so to me that's ramping. We're outside, we're ramping. Yet you go to the [anonymised hospital], and we'll end up with a long line of people down the corridor, whereas at [anonymised hospital], there is no corridor to put them in. So to me [anonymised hospital], for ramping, ok we can't get inside we have to stay outside, sort of contradicts the [anonymised hospital], because you can still go inside. But it is nearly like you're still outside. It's just because they have a long hallway and we can just line up one after another.' (Participant 2, Station E)

'Some (QAS) units at the (hospital) will say they are delayed if they are in the little triage area and they won't classify it as ramping until they actually get back out to their cars.'
(Participant 3, Station E)

Although this confusion about what happened in practice was evident, it was also clear that the ambulance participants had clear views on how Ambulance Ramping should be defined, and they did not discriminate between usual process and ramping. Participants defined ramping as:

Definition 1: The inability of the hospital to accept the patient on arrival

'I think overall ramping as a sort of inclusive term describes the inability to place a patient on a hospital bed and really start the proper assessment.' (Participant 1, Station J)

Definition 2: Patient remained in the care of paramedics

'Whilst they are on our stretcher we don't actually give over to them, we still own it.'
(Participant 2, Station R)

Definition 3: An off-stretcher time of greater than 15 minutes, no matter where the patient was in the hospital admission process, or where they were situated physically

'From hospital to hospital you could probably define (it) differently, but in reality it's not. Once you get two or three people in there, the rest of them are really ramping... After 15 minutes of standing at the triage, anything after that is ramping.' (Participant 2, Station E)

Causes of Ambulance Ramping

Hospital and ambulance participants nominated multiple factors as causing Ambulance Ramping. These factors were grouped into five areas: (i) staff factors; (ii) service and system factors; (iii) time or seasonal factors; and (iv) patient factors and community factors.

Staff factors

Both ED and hospital inpatient staffing factors were identified by participants as causing ED overcrowding and subsequent Ambulance Ramping. Among the ED staff factors, a lack of experience and a poor skill mix among medical, nursing and logistical staff, as well as a lack of total staff numbers were cited as factors in slowing patient flow throughout EDs. Skills mix appeared to be a major issue, with some hospitals operating with high proportions of junior, overseas trained medical staff who had limited experience of the Australian healthcare context. Some participants felt this affected the decision-making skills of these medical staff, further slowing the ED process.

'It would be over 50 % of our doctors are overseas trained. Nothing wrong with them, beautiful people, but their experience is definitely not strong enough when they start to make decisions. Everyone gets seen two or three times by a doctor and that really is very time consuming on every presentation.' (Participant 2, Hospital C).

In addition, it was noted that regional hospitals were losing medical and nursing staff to inter-hospital transfers with sick patients, sometimes for three or four hours. In most cases, relatively experienced staff were needed for these transfers, further affecting the remaining skill mix in the EDs.

'That's how come I didn't have an assistant last night in triage. So triage was left short of someone, on the floor was left short, and then a doctor goes, quite often, if they are sick.'
(Participant 4, Hospital H)

A lack of ED medical staff seemed to be a particular problem for many sites, and some participants described the reluctance or inability of management staff to replace staff on sick leave, instead relying on nurse practitioners (if staffed) to fill the void.

'When there is a doctor short they'll say, 'Oh great, we've got a nurse practitioner on', rather than replacing the doctor.' (Participant 3, Hospital C)

Limited availability of specialist mental health and security staff within EDs was also cited by some participants as contributing to Ambulance Ramping. When no qualified staff were available to take over the care of mental health patients, the patients were sometimes left in the care of paramedics until experienced staff became available.

'My experience is that it's a mental health reason that we would need QAS. Or that's all I've ever seen, is when we've got no nurses to sit with a patient in that area, so we either get them to sit around in triage with them or sit in the corridor with them.' (Participant 4, Hospital P)

The attitude of staff in dealing with Ambulance Ramping was seen as a key finding. At one site in particular, nursing staff described Ambulance Ramping as a nursing, rather than whole of department problem. Participants felt that medical staff had no ownership of the issue, and left it to the nursing staff to manage. In this case, support for nursing staff was limited, and medical staff were seen as having no sense of urgency in processing patients.

'When I came in the other day there were four (patients) ramped and then I was told by a senior doctor that he did not know they were ramping all morning. I was on for the afternoon, (anonymised) had been on all morning and had been ramping almost constantly and they had no idea.' (Participant 3, Hospital C1)

'It has no impact on them [medical staff], that's the thing. The perception is that it's a nursing problem.' (Participant 1, Hospital C1)

Other sites described a sense of acceptance that Ambulance Ramping is the 'norm'. Although a relatively new phenomenon, it has been occurring long enough that staff no longer to feel any sense of urgency in dealing with or preventing the problem.

'It's been a chronic problem and I think any time there is a chronic problem, that becomes normal. So now it's normal, so it has been accepted as normal, so you can't stay having that panic response or urgent response every day.' (Participant 4, Hospital N)

Most participants saw Ambulance Ramping as a whole-of-hospital issue, rather than simply an ED problem. Most sites reported significant issues with inpatient medical and nursing staff, particularly medical registrars. At most sites, medical patients could not leave the ED and be admitted to the hospital wards without review by the inpatient registrar. Any delay in this process had significant effects on the functioning of the ED. Most sites identified medical registrar review as a significant factor in delays in moving patients out of the ED, due to low numbers of staff with a high workload in this role.

'And if they've got, you know six deep to see, we could have a patient waiting there for several hours just waiting for the reg[istrar] to get them upstairs.' (Participant 2, Hospital Q)

Medical registrars and some ED staff were also considered to lack a sense of urgency.

Most sites reported significant hospital access block. Reasons for this included inexperience and attitudes displayed by some inpatient nursing staff, as well as the processes they had to follow. Some participants described a poor skill mix on the wards, where junior nursing staff were unable to care for some higher acuity patients, resulting in those patients remaining in the ED for longer.

'And that is another problem, because they have diluted the nursing staff in the medical wards because they are all very young and junior and they're not capable of recognising a sick person until it's too late.' (Participant 2, Hospital C1)

Most participants felt that ward staff had very limited knowledge of ED processes and function, and that they lacked understanding of concepts such as 'capacity alert' and 'ramping'.

'I called a ward and explained, "Can I get a patient up please?" (The response was) "No, sorry. I've got to do my pill round in half an hour so you'll have to wait until I've done that to bring them up". I explained that we were ramping and we were very busy and I needed to bring the patient up now and I was told that, "We've been ramping too you know".' (Participant 4, Hospital B1)

This lack of a sense of urgency was seen by hospital participants as a reason why patient transfers out of EDs to appropriate ward care were delayed. They cited inpatient nursing staff using meal breaks or patient handovers as reasons for delay.

'They'll delay accepting patients because people are on meal breaks. Things like that.' (Participant 4, Hospital D)

Service and system factors

Overwhelmingly, the major cause of Ambulance Ramping reported by hospital participants was a lack of ED and inpatient beds.

'I think space for us is the biggest issue and that's why we're ramping...Anything that they bring in, if we just don't have room for them, they get ramped.' (Participant 1, Hospital A)

Most participants felt that their ED was too small to handle the numbers of patients it was expected to see. This included participants from hospitals that had recently been redeveloped. Some hospitals had dramatically reduced or ceased using corridor space a short time before the study due to safety concerns. They had seen a correlating increase in Ambulance Ramping. In some cases, hospital redevelopment had reduced the amount of available space within the department due to reduced corridor space.

'So now we have no corridor we have a finite space.' (Participant 1, Hospital C2)

Although participants were vocal about the significance of a lack of ED space as a cause of Ambulance Ramping, most felt that a lack of inpatient beds was also a major cause. Participants at most sites reported a lack of inpatient beds.

'The emergency department becomes a choke point within the hospital. There aren't inpatient beds to move patients that have been assessed, written up, sorted and they're just sitting in emergency waiting for a bed. That is all they're waiting for. They are from all points ready to go to a ward bed. It's just the bed isn't there.' (Participant 2, Hospital B1)

Lengthy inpatient stays were identified as a factor contributing to access block.

'We've got patients that have been on the ward for six, twelve months nearly sometimes, waiting placement and the reason is they are just not getting stuff done at the other end.' (Participant 2, Hospital C2)

Lengthy processes performed in the ED were identified as factors contributing to Ambulance Ramping, with patients requiring extensive investigations and treatment before discharge from the ED.

'Well, a 12-hour troponin, that's one person in a bed for 12 hours.' (Participant 1, Hospital A)

'We can have seven of them.' (Participant 2, Hospital A)

Participants at most hospitals stated how EDs at other hospitals functioned had an impact on Ambulance Ramping at their hospital. Many participants felt that when other hospitals within the area spent a significant time on ambulance diversion, this caused increased ambulance presentations at their site.

'We had a patient come from (hospital) because all the hospitals all the way through were on bypass and they turned up at (Hospital H). That is just ridiculous.' (Participant 3, Hospital H)

Hospital processes affected Ambulance Ramping at most sites, with ward bed turnaround times being mentioned by many participants as a cause.

'And then there is the terminal clean...A wardsman comes and takes the curtains down before the next person comes and cleans the ward and the floor and that person can't make the bed and those individuals all call each other and the net turnaround time for a terminal clean can be two hours.' (Participant 1, Hospital D)

At one site, participants stated that their hospital's policy for patients whose condition deteriorated on the wards was that those patients were transferred to the ED for stabilisation. Participants stated that this increased ED staff workload and slowed processes for patients already within the department.

'The other thing that impacts on us. . . .is the number of sick patients in the rest of the hospital that actually come to ED. Because we are such a small hospital, anyone that is unwell, and I mean anywhere...gets raced over as quick as they can to ED.' (Participant 2, Hospital C1)

The political aspects of Ambulance Ramping cannot be ignored. Many participants described reluctance by their hospitals to divert ambulances because of financial and political penalties. They also stated they believed ambulance diversion was avoided due to fear of receiving adverse publicity. One participant described Ambulance Ramping as a political tool.

'I think ramping is a political tool. It was developed to highlight the problem. I'm not sure it's worked...Well I think that the hope was that if we ramped we would be a visible problem and, therefore, the real problem would be addressed and resolved but that hasn't happened.' (Participant 1, Hospital B1)

QAS processes were identified as contributing to Ambulance Ramping. Some participants felt that paramedics did not take the receiving hospital's activity or capability into account when transporting patients.

'There are times when we've been ramping here for most of the day and then you find out that [the other hospital – anonymised] just up the road has had multiple empty cubicles all day and it's an ambo that finally says, "Oh I've just rung my mate who's just taken a patient to (other hospital) and they're empty".' (Participant 5, Hospital B2)

Patients waiting for QAS transport home or to other facilities were described by participants as having a lower priority for transport than emergency cases yet to be transferred to hospital. Many hospital participants described an increase in the number of patients presenting via private transport. At most sites these patients took priority over ramped patients for cubicles when they became available as, unlike ramped patients, they had no one caring for them.

'Those ones sitting in chairs aren't with anyone, there is no medical personnel of any type that are seeing them at that stage, so in the back of your mind you always have I would prefer to get them onto a bed first for their patient safety than offload the QAS.' (Participant 1, Hospital N)

Time and seasonal factors

The majority of hospital participants felt that ED activity and consequent Ambulance Ramping increased during winter due to seasonal illnesses such as asthma and influenza.

'Winter is disgusting, then really bad heat, then we get the elderly.' (Participant 2, Hospital N)

On a weekly basis, Ambulance Ramping was described as being more frequent on Thursdays to Mondays, with Mondays mentioned most frequently. Afternoon and evening shifts were mentioned as the busiest times of the day.

'Weekends, Monday nights, Monday evenings, Friday nights, Saturday nights, Sunday nights.' (Participant 2, Hospital H)

'Mondays are horrendous. Generally it is your GP referrals that start at eight o'clock in the morning and they generally set the day.' (Participant 1, Hospital H)

Patient and community factors

The population in South East Queensland has increased rapidly in recent years. Many participants reported a large increase in patient attendances with either no or limited increase in both ED and inpatient beds. Participants felt that supply was simply not matching demand.

'I have only been here seven years, but in that time we have exactly the same beds and now have a look at the population statistics in the past seven years — it does not equate.' (Participant 4, Hospital H)

In addition to patient numbers, participants described increased complexity in the condition of the presenting patients. Complex patients take longer to process through the ED and this contributes to overcrowding and Ambulance Ramping.

'And more co-morbidities as well. There are difficult patients we all have a bit of a laugh about, you know, you get the phone call from triage. It's like, "I've got a chest pain with a potassium of 6.7, oh, by the way, they're a transplant patient". They've got bugs, they'll have MRSA, probably diabetic, so there are lots of co-morbidities as well.' (Participant 4, Hospital B1)

Many patients who have co-morbidities are too unwell to wait in the ED waiting room on arrival. Some participants felt that the administration of narcotic analgesics by paramedics en route may contribute to the complexity of the patients' clinical problem and the care required.

'Especially if they don't come with any relative in tow and they're on their own and they may have dementia or orientation problems. We can't put them in the waiting room and also then, depending on their injuries. Some assaults come in on their own and (may be) under the influence of alcohol.' (Participant 2, Hospital H)

'Sometimes, depending on how much morphine has been given by the ambulance service.' (Participant 3, Hospital H)

Participants identified the lack of community services as a contributing factor in ED overcrowding and Ambulance Ramping. The limited availability of bulk billing GPs was reported to contribute to an increase in the number of patients presenting to EDs.

'I think the trouble is the bulk billing has gone down, (and) the amount of GP surgeries that are open after hours has gone down.' (Participant 1, Hospital A)

Participants also stated that a lack of skill among community health staff including those in general practice and nursing homes, contribute to Ambulance Ramping through inappropriate patient referral.

'...because we're getting people here that should never be here in a million years. Or they're sending private patients here that could be sent directly to a private hospital and there are people here that shouldn't be here. The GP should have forethought something out. We are just a drop-off zone so that we can just sort everybody's problem out there, including the GP's problem.' (Participant 4, Hospital C1)

Some participants felt that members of the public take little personal responsibility for their own health and have a lack of knowledge of the function of EDs and ambulance services. Participants

described a prevailing belief held by some patients that those arriving at the ED by ambulance would be seen before other patients.

'There's a lack of responsibility for those who care for themselves and others – they want someone else to take responsibility for it.' (Participant 2, Hospital H)

Participants from hospitals cited the ambulance service as having a policy of compulsory transport for patients insisting on it. They believed this contributed to ED overcrowding.

'I can only speak for...but they are not allowed to turn down a patient, even if they have a toothache.' (Participant 2, Hospital H)

'The ambos I have spoken to have said that if it is something minor, they will do their best to dissuade them, but if they insist they have to transport them.' (Participant 5, Hospital H)

QAS staff factors

Paramedics reiterated many of the issues reported by hospital participants, but had particular concerns regarding the skills and experience of triage nurses. Some ambulance participants perceived that some triage nurses were reluctant to transfer patients off QAS stretchers and into waiting rooms due to either a lack of experience and confidence in the individual nurse concerned or a workplace culture issue regarding ownership of the patient. They felt this delayed the release of the QAS crew.

'Or it will be someone new to triage and they'll still go, 'Oh I don't know what to do so we'll just leave them in your care.' (Participant 1, Station M)

Service and system factors

Ambulance participants agreed with hospital participants that the major cause of Ambulance Ramping is a lack of hospital and ED beds. They demonstrated considerable understanding of the issues faced by EDs relating to access block and limited resources.

'At the end of the day the reason we can't get our patients (in) is because there is bed block at department or in wards, so unless we start to get significant numbers of beds in hospitals or more large hospitals...' (Participant 2, Station E)

Ambulance participants also voiced frustration at the reluctance of hospitals to initiate ambulance diversion or use the capacity alert system appropriately. Without clear direction from the hospitals, paramedics are required by QAS policy to transport patients to the nearest appropriate facility.

'We have had four or five cars up there for a number of hours and I have rung up and said, "Are you going to go on capacity alert or something so we can do something about it officially?", "Oh no, we haven't got enough ambulances on the ramp." ...But how many do you need to do this?' (Participant 3, Station R)

Ambulance participants stated that, in some cases, ramping was in progress on their arrival, and once at the hospital they became stuck within this holding pattern.

Ambulance participants reported instances of poorly organised inter-hospital transfer, and described situations where communication channels had failed, and appropriate resources were not available for patients on arrival.

'We had an inter-hospital transfer from one of the stations and when the crew got to the hospital they said, "We haven't got any psych staff", so we had to sit with this patient for the next two hours until we called them in and they knew we were coming as it was an arranged inter-hospital.' (Participant 2, Station R)

Ambulance participants also reported that private hospitals offer limited support. Even patients with private health insurance were sometimes unable to access private care due to the limited

services available. Participants reported that these patients often had to be transported to overcrowded public hospitals.

'I caught [from anonymised hospital] out lying, flat out lying so many times, and they've said, "We're so full, we can't take any more patients" and I went in there and the doctor was sound asleep and there wasn't a single patient in the ED. But it was because they didn't have any beds upstairs.' (Participant 4, Station E)

Time and seasonal factors

Ambulance participants agreed with hospital participants that Ambulance Ramping was more frequent in winter as a result of influenza and other similar season-related illnesses. Weekends and Mondays were also identified as peak times for ramping.

'It certainly does get worse in the winter — when workload demand goes up for both ambulance and hospitals, so there is an impact there.' (Participant 2, Station R)

'Monday mornings would probably be about the worst. Yep, it seems to be about the worst.' (Participant 1, Station R)

Patient and community factors

Many issues identified by hospital participants were reiterated by ambulance participants, including the population increase in South East Queensland, the rise in complexity of presenting patients, a lack of bulk billing GPs, and inexperienced staff in nursing homes.

'You've got the population ageing, you've got the lack of bulk billing doctors.' (Participant 3, Station M)

Ambulance participants also felt that the Community Ambulance Cover, coupled with a general lack of health knowledge within the community, had increased their workload significantly and caused abuse of the ambulance system, further affecting ED activity and Ambulance Ramping.

'I think there has been a fundamental shift in the community's responsibility for their own medical conditions and stuff like that...They think that, "If I ring for an ambulance I will go to a facility where I am not going to pay anything and because I'm in an ambulance I will get seen quicker".' (Participant 5, Station R)

Ambulance participants also felt that they were unable to refuse transport to patients whose conditions they did not feel warranted it, for fear of litigation.

'If they say they want to go to hospital we have to take them to hospital; we're not allowed to say, "No you don't need to go to hospital".' (Participant 3, Station E)

Ambulance participants also identified issues with walk-in patients taking priority for ED cubicles over ambulance patients who were already ramped. Patients arriving at EDs via private transport and who were unable to wait in the waiting room were given priority for available cubicles, as they had no one available to care for them, unlike the ramped patients. This further increased the delays faced by ambulance patients.

'Plus there's been situations where if we have a staged Cat. 3 on a stretcher and a Cat. 3 in the waiting room that arrived at the same time, they would take the Cat. 3 in the waiting room first.' (Participant 3, Station G)

Consequences of Ambulance Ramping

A number of consequences arising from Ambulance Ramping were noted by hospital and ambulance participants. These consequences were threefold: (i) staffing consequences; (ii) service and system consequences; and (iii) patient consequences.

Staffing consequences: hospital

Hospital participants described Ambulance Ramping as having a huge impact on ED staff. Workload issues were raised, with staff missing meal breaks and working overtime to complete patient care.

'But in saying that, like any ED, often at times none of us are taking breaks, let alone going to use the toilet. We just work right through until it clears up and if we are having to ramp, then people are generally not taking breaks because it is just too busy.'
(Participant 3, Hospital H)

Most sites described Ambulance Ramping as an increasingly stressful situation, with most impact felt by the triage nurses and nursing shift coordinators. Other staff working within EDs were also affected by the need to move patients quickly.

'It's on top of the normal stress. The stress of trying to find a bed for this patient that's been sitting there for hours. It's just an extra stress on top of the normal stress.'
(Participant 6, Hospital B1)

Many hospital participants described a sense of personal responsibility for the failure of the health system to care for ramped patients adequately. They felt that it reflected a degree of personal failure in their role.

'I get the feeling myself that it's ultimately me saying, "I'm sorry, but I can't do my job properly"... It's not that I'm bad at my job; it's not because I'm incompetent.' (Participant 2, Hospital B1)

Hospital participants described feelings of not wanting to come to work due to the increased workload and stress of Ambulance Ramping. Participants at some sites reported an increase in sick leave since ramping began. They also stated some long-term staff had reduced their working hours in the ED and taken on less stressful second jobs. Staff shortages resulted in some participants reporting of being unable to take annual leave at some times.

'I am actually going home every day and I think, "Oh my god" you know, anxious about it and when I look at the paper and (it) says somebody died in the ED and I just hope it isn't (Hospital A) ED. Absolutely, it's a nightmare and I think all the clinicians are absolutely petrified of that.' (Participant 3, Hospital A)

'Most of my level twos are very mature, experienced clinicians, and I think it's the workload that's actually made them drop from full to part-time... Sick leave has increased. Normally it sits around four to five %. Lately it's eight %. So it has doubled.'
(Participant 3, Hospital A)

Fear of litigation was a source of stress for participants. They reported being particularly concerned about the blurring of lines of responsibility for the ramped patient. Although some felt comforted by the presence of paramedics, participants were divided on this issue.

'I feel more secure about the patients on the ramp than what I do about my Cat 3s in the waiting room.' (Participant 2, Hospital H)

'It gives me absolutely no sense of security or satisfaction to know that they are in that corridor with an ambulance officer because, in my opinion, anecdotally, my perception is that the care stops once they walk through that door. Very little ambulance care goes on once they get in.' (Participant 1, Hospital N)

Participants reported that Ambulance Ramping had caused significant strain on relationships between hospital staff and paramedics. However, many identified that, as ramping has become more frequent, QAS and hospital staff have begun to work more collaboratively.

'I have actually been hassled by the QAS with ramping and they have actually put in a complaint about why their patient didn't come off ramping when they saw a bed

available. But the reason for that was that there were Cat. 3s out in the waiting room.'
(Participant 1, Hospital H)

'They'll send in those, you know, the intensivist paramedics, I think, who drive around on their own, to come in and assess the situation and communicate with us and that's really good because they come in and ask, "What can we do to help you?".' (Participant 3, Hospital A)

Hospital participants demonstrated considerable understanding of issues faced by paramedics, including the expectation that they take on roles outside their scope of practice, for example transporting patients to x-ray and performing 12-lead ECGs.

'Sometimes I found the ambulance really good at...like they will happily help you because they know...like do an ECG because they can see that you're busy and stuff like just helping if you need.' (Participant 1, Hospital Q)

They also felt that Ambulance Ramping was stressful for paramedics, as it meant they were unable to perform their job in responding to community call-outs.

'I think it is a huge issue, because if my family are out there wanting an ambulance and they can't get an ambulance because they are stuck at some hospital, then that is a huge problem. A huge problem for the community that we're putting so many people at risk.' (Participant 2, Hospital C1)

Service and system consequences: hospital

Hospital staff highlighted service and system consequences of Ambulance Ramping that arose from practices performed outside the norm. For example, ramped patients can block fire exits causing a safety risk for everyone at the hospital. Some participants also reported that their hospitals were using resuscitation areas for less acute patients, blocking these areas for high acuity presentations.

'And that did happen, where a patient came in we got a phone call that they were in cardiac arrest that was coming and they had to move a patient out that didn't really need resus into the corridor then to get that patient in.' (Participant 2, Hospital C2)

Some participants described Ambulance Ramping delays that were so long that internal batteries on ambulance monitoring equipment were flat.

'And yesterday a monitor. They ran out of lifepak because they had been here (so long).'
(Participant 4, Hospital B2)

Hospital processes were also identified as being affected by Ambulance Ramping. Many participants reported that triage was becoming a three-step process. First, an initial quick assessment of patients presenting simultaneously was carried out to determine who needed to be fully assessed first. Standard triage was then carried out. A final triage was then done to determine which of several ramped patients should be transferred to ED beds as they became available.

'Alternatively, you get four ambulances turn up, you essentially have to triage them to find out who needs to be triaged first, so you're triaging, then triaging.' (Participant 1, Hospital H)

'They (the paramedics) had a patient who, I think he was something like a back pain that didn't warrant too much care and attention from an acute point of view, but you couldn't sit him in the waiting room. More and more chest pains and respiratory [cases] were coming in, so they (the patient) just sat around.' (Participant 2, Hospital C2)

Some participants felt that Ambulance Ramping had become a form of unofficial ambulance diversion. Once ambulance crews were ramped at a hospital, they would inform other crews who would then avoid that hospital. This meant that hospitals avoided the penalties associated with diversion.

'It's a lie, because what we're saying to the ambulance men, "Unofficially go somewhere else and do that because we're not going to tell you officially to go somewhere else".' (Participant 1, Hospital B1)

Hospital participants reported concerns that, as a result of a reluctance to wait with ramped patients, QAS crews were offloading inappropriate patients to the waiting room and then leaving before their assessment by triage staff. They felt this also added to the unsafe nature of Ambulance Ramping.

'Speaking from a triage perspective, I have also noticed that they are bringing more acute patients out there so that they can actually offload them in the waiting room rather than stay with them.' (Participant 4, Hospital H)

Patient consequences: hospital

Consequences to patients of Ambulance Ramping centred on safety issues. Many felt that patients could potentially suffer harm through waiting outside EDs in hot ambulances.

'They're supposed to wait in the back of the ambulance...but that's fine to say except that for if it's 40 degrees outside; you can't leave the patient in the back of a hot car in summer.' (Participant 3, Hospital B2)

Concerns were also expressed about delays to investigations and treatment caused by Ambulance Ramping.

'You have got a female patient with an infarct and you can't do a 12-lead ECG in the corridor.' (Participant 2, Hospital D)

At some sites participants had concerns that patients were being treated in inappropriate areas such as dental chairs and offices in an effort to avoid Ambulance Ramping. They felt this was unsafe due to the decreased visibility of the patient.

'We even use the bed manager's office sometimes. There's a chair in there. I've seen a patient being examined, say a sore throat or something...because there's nowhere else to go.' (Participant 4, Hospital A)

Some hospital participants reported noticing an increase in the number of patients self-discharging from ambulance stretchers, which they felt was a risk to patient safety.

'They can walk out. If they've been on a trolley for a couple of hours, a lot of them go, "Stuff this". Not a lot of them, but there have been cases where they have walked out mid-treatment.' (Participant 2, Hospital N)

In addition to the safety risk to ramped patients, some hospital participants identified that ramping compromised the safety of patients who were already in EDs. To accommodate patients arriving by ambulance, some participants felt that patients were moved out of cubicles within the department, and out of the department itself, too quickly. This increases the risk of deterioration of patients' conditions and they may need further intervention. These patients were also identified as being at risk due to nursing staff being called away from their allocated patients to care for ramped patients at some sites.

'I think I get a move on both sides of it, so, "Can you just do an ECG on the patient that is on the ambulance trolley?" Well, I have six other patients that I am responsible for... and then now you're asking me to take on (ramped patients)...So I think one thing is that you can do intervention, but if you find something, as a nurse, you can't just say, "I'm going to ignore it".' (Participant 3, Hospital N)

At one site, it was reported that inter-hospital transfers from outlying hospitals were sometimes delayed when the ED was unable to accept them due to overcrowding and Ambulance Ramping. Participants felt that, in these cases, the patients often arrived later and more unwell than they would have if they were transported at the original time. More resources were ultimately required for their care.

'The rural hospitals really just keep them another day and send them the next day.'
(Participant 1, Hospital L1)

'And they do...they actually come sicker.' (Participant 3, Hospital L1)

The emotional and psycho-social needs of patients were reported to suffer as a consequence of Ambulance Ramping. Some hospital participants felt that ramped patients may feel less valued by hospital staff. There were also reports of patients and relatives becoming angry and agitated as a result of Ambulance Ramping, with frontline hospital and paramedics required to deal with this aggression.

'The patients themselves, if they're really sick they don't. They're too sick to care. It's their families or friends that get agitated.' (Participant 3, Hospital A)

At some sites, participants reported patients showed understanding and acceptance of Ambulance Ramping. These participants expressed concern about this situation, as they felt that if ramping was considered acceptable by consumers, it was less likely to be resolved.

'I generally find that the patients that are ramped are quite understanding...They do understand the system, which is positive.' (Participant 3, Hospital B1)

'I think that's really scary. The fact that they're accepting it means that it's never going to get better.' (Participant 1, Hospital B1)

Staffing consequences: ambulance service

Although ambulance participants also experienced increased stress also described by hospital staff, they had unique workforce issues. Many crews were expected to work involuntary overtime due to Ambulance Ramping, and many crews reporting missed meal breaks while delayed at hospitals.

'Staff welfare. I mean it's impacting on staff being able to be fed in their meal breaks, which also impacts on (participant) and his financial side of having to pay penalties.'
(Participant 2, Station M)

Ambulance participants reported that service workplace agreements require crews to be stood down, on full pay, until a minimum break between shifts has elapsed. Therefore, Ambulance Ramping at one hospital can affect QAS staffing levels across the whole station, which impairs QAS's ability to respond to the community.

'There is a real compounding issue. Like we said before, about the number of times we can actually use some of these people too, because they can go into mandatory stand-down. Because if you work 36 hours, that's it, you're out. They can't work any longer than that.' (Participant 4, Station G)

Like hospital participants, ambulance participants reported experiencing frustration and anger from patients and relatives. At times, this manifested in physical and verbal aggression directed towards paramedics, putting their safety at risk.

'I've seen patients get violent. I saw one incident (with a patient) punching the wall inside an ambulance and screaming at the top of his lungs.' (Participant 2, Station E)

Increased workplace stress, poor morale and resignations were described by ambulance participants as noteworthy consequences of Ambulance Ramping.

'He was sitting on the floor of the hospital with his patient. I said, "How long are you here for?" He said, "Three or four hours". That was about two in the morning and he said, "This is only one example. I've had a gutful of this." I said, "What do you mean?" He goes, "I didn't sign up to sit in the hallway of a hospital" and he resigned two weeks later.' (Participant 2, Station M)

Frustration at being unable to perform the job for which they were trained, and embarrassment and guilt caused by being unable to provide a quality service to patients were also described by ambulance participants.

'They can hear jobs (being called on the radio) and they're getting pressured, 'What are you doing?' They feel like they're not doing much. They're just standing around and you could say well hang on, these patients probably wouldn't be having much done for them anyway. But you wouldn't have a nurse standing beside them the entire time.' (Participant 1, Station J)

Like hospital participants, ambulance participants expressed concerned about the confusion of professional boundaries and the responsibility for ramped patients. They described being asked to perform roles outside their scope of practice, and concerns about litigation.

'We had a case the other day where we had a car that was at a hospital. It was a rule-out acute coronary syndrome. They asked our people to put a patient in a wheelchair, push them in to have their chest x-ray and come back out onto our stretcher.' (Participant 1, Station J)

Ambulance participants described increased stress placed on their communications centre staff as a result of Ambulance Ramping. These staff are responsible for dispatching ambulances to community calls. Participants felt that the diminution of resources imposed on the QAS by ramping would have a significant impact on their workload.

'I think a lot of stress is at the comms centre, who are trying to find the next resource to send out to a case. That is a lot of stress on those guys in there; they're counting every minute.' (Participant 2, Station R)

Some participants described the practice of 'doubling-up' patients when ramping. This occurred when a crew already ramped at a hospital took over the care of a second patient in addition to their own, releasing the second crew back onto the road. As well as increasing the workload on the first crew, it created difficulties in recording the care the second patient received because a new eARF must be created. Participants felt that this practice caused problems with data capture.

'So I've gone, you know, off-stretcher, print and have the copy of the ARF, which is going to give you inaccurate data. Your CAD data is going to be saying, "I've got a clear time of this", when really the case hasn't been cleared; it's just been put into another car.' (Participant 1, Station M)

Ambulance participants reported that ramping affected those crews who were not ramped, as there are fewer crews available to respond to calls. Workload and subsequent stress for these staff was, therefore, increased.

'That's the other thing. While you've got guys sitting on the ramp that aren't getting fed, people that aren't on the ramp are then doing higher volumes of work, because they're having to cover the workload of the cars that are sitting on the ramp.' (Participant 2, Station E)

Service and system consequences: ambulance service

Ambulance participants highlighted the effects of ramping on ambulance community response times.

'From a manager's point of view, that impacts on our response times and the ability to be able to send...you know to have a work-ready vehicle to send to the next patient.' (Participant 1, Station M)

They also described how certain areas may be left under-staffed when Ambulance Ramping has occurred. When a crew is ramped, a second crew from a different area may be dispatched to a community call because it is the closest available vehicle. It is then extremely difficult to return

the second crew to their original area, as they may also be ramped or dispatched to incoming emergencies. This leaves the second crew's area under-serviced.

'The moment you get out across the imaginary boundary line, Brisbane will pick you up because you are now the next closest unit to go to a case. Particularly as an ICP, you just get smashed all the time.' (Participant 4, Station G)

Ambulance Ramping has forced the QAS to purchase extra resources including stretchers and oxygen cylinders, so that staff can care for ramped patients.

'We've had, at times, to put on extra crews to cope when the hospital's ramped. We've had to purchase extra stretchers to put up at the hospital, so when patients are ramped and we have another crew come up, they can swap stretchers and provide another work-ready vehicle.' (Participant 1, Station M)

Some EDs have been adapted to accommodate ramped patients, but with a loss of some patient seating areas. The QAS has adapted rosters to account for crews lost to ramping.

'We've added extra staff, (and) we've changed our rosters around to meet the demand profile and things like that.' (Participant 1, Station M)

Patient consequences: ambulance service

Ambulance participants were acutely aware of the impact of Ambulance Ramping on the quality of patient care. They stated patients were aware of ramping issues, and some were reluctant to go to hospitals where delays were known to be frequent. Participants felt that Ambulance Ramping was a significant source of stress for patients as well as staff.

'Yeah, the main complaint we hear from patients who go to hospital is that they don't want to go to [anonymised hospital] because of the delays there.' (Participant 2, Station M)

A lack of privacy was noted, with ambulance participants describing situations in which patients were kept in confined spaces and overhearing arguments between QAS and hospital staff. Some patients were also in locations where they could overhear the details about other patients and their clinical condition.

'I think some of the other embarrassing things that happen is there's the odd argument over all this and it happens in front of the patient and it's bloody hard to sit there.' (Participant 1, Station J)

Ambulance participants felt that lower acuity patients were subjected to longer delays than those with more acute conditions.

'It's the low acuity cases of course; the high acuity cases get taken in straight away.' (Participant 1, Station R)

Ambulance participants voiced significant concerns that they were unable to provide appropriate treatment for ramped patients.

'We have a certain amount of protocols of how much drugs and things we can give. Sometimes we run out and we are sort of at a loss and trying to track down a doctor in a busy hospital to get permission to give more or get them (the drugs), because they then have to assess the patient before they'll give their drugs... Pain relief is just one example because we only have a limited amount that we can give. Whereas there are more appropriate medications out there, but we have to just keep giving them the same stuff over and over again because it's all we can do for them... Even though they're sitting at a hospital, they're not necessarily getting the best treatment or the most appropriate treatment for their particular condition. It's just because that's all we can do.' (Participant 2, Station M)

Solutions

A number of potential solutions to manage Ambulance Ramping were suggested by hospital and ambulance participants. These solutions relate to staffing, system and service provision, and the patient and community.

Staffing solutions: hospital

Solutions proposed by hospital participants included an increase in overall medical and nursing staff numbers in both EDs and wards. Participants were keen to see an increase in inpatient medical admitting staff, such as medical and surgical registrars to improve patient flow within the department.

'Back up resources in med registrars to help admit the patients through, because if we can get them seen and sorted faster, we can get them up.' (Participant 2, Hospital Q)

Many hospital participants reported that their sites were using innovative staffing initiatives to expedite patient flow. These included employing a highly motivated and efficient bed manager, emergency nurse practitioners and a streaming nurse to facilitate transfers to the wards. These were described as having had a positive effect on Ambulance Ramping.

'The other thing is having a really good bed manager, a scary one.' (Participant 2, Hospital D)

As well as increasing total staff numbers, many participants described the use of excellent teamwork and communication to expedite patient flow and to deal with Ambulance Ramping. Effective and frequent communication between the triage nurse and nursing and medical shift coordinators was felt to be essential to coordinate ramping and patient flow.

'The staff specialist who is in charge of the area will talk to the flow nurse and the process will be to try and free an acute bed somewhere.' (Participant 4, Hospital N)

Some participants also mentioned the need for appropriate staffing skills mix. They felt that this could be facilitated by improved rostering practices.

'I think that there are rostering things that we could do to improve (the) skills mix so that it doesn't contribute (to issues) at times, particularly when we're more likely to ramp.' (Participant 7, Hospital B2)

Some hospital participants reported that their sites were using an on-call nursing staff system, so extra staff could be contacted when the department became busy. However, it was noted that some staff were, at times, reluctant to contact the on-call staff, and that the system had only been used once, when the situation was extreme.

'We have an on-call person as well that we call in if we get busy like that.' (Participant 2, Hospital L1)

Hospital participants at one site felt that some other hospitals were, at times, unable to provide the level of care required by more specialised groups of patients. They felt that these patients were reluctant to attend those hospitals and would rather travel further to their preferred hospital. They suggested an up-skilling program for staff at other sites to improve their knowledge and skills, enabling them to provide better services and spread the patient load.

'If we can put some resources into up skilling those whole areas so that they are more available...then that should also help.' (Participant 3, Hospital P)

Staffing within community health services was recognised by some participants as an area in need of improvement to help prevent Ambulance Ramping. Hospital participants at some sites stated they experienced high numbers of inappropriate GP referrals, and felt that better education of GPs could help to address this problem.

'On the other end, before they even come to hospital, if the GP and (the general) population are educated, because we're getting people here that should never be here in a million years.' (Participant 4, Hospital C1)

Similarly, participants were concerned about the lack of services within nursing homes, and felt that the use of nurse practitioners and Hospital in the Nursing Home Programs could help to reduce ED presentations by nursing home patients.

'Whereas, you think that if there was a nurse practitioner out there that was assigned a certain amount of nursing homes that they could call first to see the patient that is constipated or has pain management issues.' (Participant 1, Hospital C1)

The use of the QAS Hospital Liaison Officer (HLO) was described as having a positive effect on Ambulance Ramping at sites where it had been initiated. Hospital participants at some sites had concerns over the accuracy of ED data entry. They believed that efficient triage and the provision of administration staff to assist with data entry would help give a clearer picture of the extent of Ambulance Ramping.

'I think one of the aids to that is the clerical staff and also having a second triage person during our busy time and that's only through adequate staffing and seeing that there was a need there.' (Participant 1, Hospital L1)

'They'll work with us. If I'm putting information in they're just copying mine at the same time or vice versa so it works really quickly. We can have somebody on the computer and triaged in a minute probably.' (Participant 2, Hospital L1)

Service and system solutions: hospital

Overwhelmingly, the major solution to Ambulance Ramping proposed by hospital participants was an increase in both ED and inpatient bed numbers. Hospital participants pointed out that increasing ED bed numbers in isolation would not resolve the problem of ramping as it was a hospital-wide issue.

'If you don't increase the bed stock with the population sitting up around half a million, you will have access block.' (Participant 2, Hospital D)

However, hospital participants were acutely aware that providing more beds is not a simple solution, and that other avenues should be explored to address Ambulance Ramping in the short term. Some participants felt that redesigning current ED space for them to be more efficient would be a feasible and cost-effective solution.

'I'm sure in the space we've got we could redesign it and get ten more beds in.' (Participant 1, Hospital A)

Redesign suggestions included provision of fast track areas, GP examination rooms, and short stay or observation wards.

'Another big solution would be an obs[ervation] unit, observations or short stay units for patients waiting troponin.' (Participant 2, Hospital A)

Although all participating EDs were physically different and Ambulance Ramping was managed differently in each, some participants felt it was important that ramped patients should be visible to all staff in the ED to prevent an 'out of sight, out of mind' situation.

'The other thing is my personal philosophy. If you leave someone in the back of an ambulance you are not going to (be) prompted to fix (the problem) as the same as if you take them out and put them visible in front of everybody. It is an obvious problem and you have got to sort.' (Participant 2, Hospital D)

Communication processes within EDs, and between EDs and the wards and bed management were thought to be key to improving and maintaining patient flow and reducing Ambulance Ramping. Regular clinical rounds by ED nursing and medical staff to identify patients who could

be moved out of cubicles into ward beds, short-stay beds or discharge areas was identified by many hospital participants as an effective means of promoting patient flow.

'We have a very good rounding system with the SMO and the senior nurse on duty will either sit down on the computer and do a physical round or they do a walk around and from that the SMO will go off to chase doctors... We're pretty good with that; we actually round quite frequently, at least every two hours.' (Participant 1, Hospital H)

Some hospital participants identified executive physical bed management rounds as being an effective tool for identifying available beds within wards. At one hospital the ED consultant participated in bed management rounds.

'The biggest thing to change is you do an executive ward round, don't listen to anyone, just walk the wards, which I did at 12.30 with the Director of Medicine and the bed manager and found 18 beds.' (Participant 1, Hospital D)

Hospital participants identified a need for good communication with ward staff to aid the development of a 'pulling' culture among ward staff, whereby the sections of the hospital actively draw patients from the ED rather than the ED having to push them through. This would encourage them to accept patients, as opposed to the traditional 'pushing' culture, when EDs try to push patients to the wards with resistance from ward staff.

'Trying to work on getting the wards to pull the people rather than us pushing them a little bit more.' (Participant 1, Hospital K)

Hospital participants at one site described a policy where the bed manager was informed when only two available cubicles remained within the ED. This enabled the bed manager to expedite movement of patients to ward beds and avoid Ambulance Ramping.

'We call when we're down to two cubes; it used to be four. But we generally call them if we're down to two cubes.' (Participant 2, Hospital K)

Most hospital participants identified the need for a whole-of-hospital response to Ambulance Ramping, with the acceptance that it is a whole-of-hospital problem, rather than simply an ED problem.

'If you want to have a high quality, high class, functional emergency department, the rest of the hospital has to support us.' (Participant 2, Hospital B1)

Many hospital participants felt that they needed increased executive support to initiate procedures such as ambulance redirecting or capacity alert to help temporarily ease pressure within EDs.

'They need to sometimes see it and when we get to the point where the nurse managers can't do anything with the wards, it's just completely blocked, get executive down to be able to see and make that decision. We have to go on bypass, we have no choice.' (Participant 1, Hospital A)

The use of an over-census system to cope with access block was suggested by some hospital participants. In an over-census system, situation wards take a specified number of patients over their bed numbers. Patients then wait in the ward corridor rather than the ED corridor for their bed to become available.

'So I've called capacity alert and the response was quite quick and rapid. A flood of all the nurse managers came downstairs. Each was allocated to at least one patient that was due to go to their ward. They assessed it and they facilitated for someone to come down and then moved on to the next one. So they ended up ramping in their wards.' (Participant 2, Hospital P)

Some hospital participants stated their sites continued to use a 'rubber wall' method of dealing with excess presentations, squeezing patients into every available area and at times placing more than one patient into a space only meant for one. This was particularly noted at sites that treated children. The smaller a patient was, the less physical space they took up. However, participants

were keen to note that this did not make them easier to manage, and in many cases it made them a great deal more difficult and labour intensive.

'We can put kids on laps that you can't do (with adults). We can put three kids where one adult goes...by having three chairs lined up.' (Participant 3, Hospital P)

'But they're complicated in that you're dealing with a whole family, so you've got parental concern and stress plus the children. Also, children can decline so rapidly, quicker, so you've got less of a window.' (Participant 2, Hospital P)

Some hospital participants suggested that there should be a dedicated ED admissions team to deal with the assessment processes involved in admitting patients to the hospital.

'But you have the specialities, designated speciality just for clerking and admitting. So you wouldn't have to rely on one doctor team to come down. You'd have a number of house officers and regs clerking patients in...And they are just based in ED. All they do is ED patients.' (Participant 3, Hospital Q)

Other hospital participants felt that the ability to transfer patients directly to ward beds before inpatient medical assessment would, in some cases, expedite flow.

'So if there's a bed available there, the patient goes up with a two-hour plan from us and then they get seen and sorted in MAPU [Medical Assessment and Planning Unit].' (Participant 3, Hospital L1)

Hospital avoidance programs such as Hospital in the Nursing Home and Home IV Service were in place in some areas. Hospital participants felt these programs were effective. By using these programs, patients could avoid transfer to hospital in the first place, or be discharged to these services from the ED, avoiding the need for inpatient admission.

'The other thing is a very active hospital avoidance program through hospital and nursing homes... The ED now has a physio, pharmacist, OT and they will improve the quality of discharge. The second thing is the home team, all the IV antibiotics and all that stuff.' (Participant 1, Hospital D)

Some hospital participants described hospital discharge planning programs, such as the expected date of discharge program, which aims to identify date of discharge on admission to allow for future bed management.

'The expected date of discharge program has already started to get the traction started in some wards.' (Participant 1, Hospital D)

At one site, a 'two out by 10' system was in place where participants stated wards aimed to discharge at least two patients by 10 am to free beds for elective and emergency admissions. The appropriate use of the discharge or transit lounge was also suggested by hospital participants as being effective in freeing ward and ED beds.

'We have a strategy that we try to get two out by 10 am and also to transit lounge.' (Participant 4, Hospital B1)

Hospital participants felt the QAS had a part to play in providing solutions to Ambulance Ramping. At one site, paramedics telephoned the ED to advise them of every patient they were bringing. Hospital participants felt this was extremely effective in assisting them manage their ED space, as they could plan for every ambulance presentation and clear cubicles early, if necessary.

'I do think we could actually streamline that process by adopting a similar process to some other places where every ambulance that is coming to your hospital rings through that they are arriving and that will give you a 15 or 20 minute leading, on occasion.' (Participant 7, Hospital B2)

Some hospital participants suggested that ambulance crews 'double up' their patients once ramped, to enable one crew to return to the road.

'Providing we maintain communication with comms, they will send the duty up, whoever is in charge for the shift, and usually someone else. There are two ambulance trolleys always kept here. We mobilise those, we find somewhere safe for that ambulance person to manage a couple of patients still on ambulance trolleys, and that will then free up the crews to get out. So they are still ramped, but the cars are not.' (Participant 1, Hospital D)

Patient and community solutions: hospital

Hospital participants at most sites described significant numbers of patients presenting with conditions they did not feel warranted emergency treatment. For this reason it was suggested that there needed to be a significant investment in public health education to enable people to better manage their own health and to use health services appropriately. One medium suggested was television advertisements on the use of EDs.

'I've always said, an ad on the television (to) explain what emergency departments are for and the triage system and what to expect (would be useful). The patient education would be huge, because they come in and they don't have a clue.' (Participant 3, Hospital A)

However, not all hospital participants agreed that this would be effective, as they felt that this would only apply to lower acuity patients and these patients would be unlikely to be among those ramped.

'They are not generally the ones that come in on the ambulances. We wouldn't put those ambulance patients out where those other patients go, so I don't think that would make a huge difference.' (Participant 1, Hospital Q)

Hospital participants also mentioned the inappropriate use of ambulance services. They felt that this could be addressed through the reintroduction of an ambulance charge.

'We often talk amongst ourselves (about) how things might change if there was just a simple \$5.00 fee to take an ambulance. Just something to make it so that it wasn't just a free taxi ride.' (Participant 1, Hospital K)

Many hospital participants wanted the opportunity to triage patients out of the ED to more appropriate health services such as GPs or dentists.

'I think I say it in so many words, but try to say it in the right way sometimes. You know, "This is what you can expect while you are here. There are other facilities that can deal with this but if you want to wait you can. Here is a flyer of a bulk billing practice down the road if you are keen". And most of them are.' (Participant 4, Hospital A)

Staffing solutions: ambulance service

Ambulance participants highlighted many of the same solutions as hospital participants. They did, however, suggest that at some hospitals the triage system was extremely slow due to large numbers of patients presenting simultaneously. It was suggested extra staff placed at this point would improve delays prior to triage.

'They need to invest in triage. If you're going to be making some of these critical decisions, you don't want people pressured beyond normal pressures because you'll make a mistake.' (Participant 1, Station J)

From a QAS perspective, participants felt that there needed to be a general increase in ambulance and crew numbers. However, participants also stated that this would only temporarily alleviate the problem and that it was not a simple solution.

'It will fix one side of the problem because it will fix the side of crews tied up in hospitals.' (Participant 4, Station E)

'It will make the hospitals worse.' (Participant 2, Station E)

Ambulance participants suggested roster reform to take into account the issues of ramping and the numbers of staff held at hospitals.

'Some of the strategies that started in the area to try and negate this are looking at roster reform. (This) all because of, you know, the workload is ok to match but if we have delays with ramping we have to redo our roster because we don't have enough coverage at nights. We don't have enough coverage in peak hours.' (Participant 2, Station G)

The use of a hospital liaison officer and having an intensive care paramedic within the communications centre was also suggested.

'So what we've put in is our HLO (hospital liaison officer) to do a number of things. To shift those people on who are truly free and to assist the other people who are truly ramped...into optimising and working with the triage nurse and the control nurse...in the hospital to get those people in so we free the car up.' (Participant 1, Station J)

'We have the expertise in our comms centre. We've got an intensive care paramedic there 24-hours a day in Brisbane. They can make a decision on what patient can go to what hospital.' (Participant 1, Station J)

The hospital liaison officer was also described by some ambulance participants as having a role in ensuring accurate data capture.

'One of the primary functions of the Hospital Liaison Officer will be to capture the data accurately, because we look at the data from the eARF program and we look at our CAD data when our crews actually hit clear from the MDTs and there is a disparity.' (Participant 2, Station M)

System and service solutions: ambulance service

While many of the system solutions suggested by hospital participants were echoed by paramedics, they also suggested some unique solutions. Ambulance participants saw system solutions from a broader perspective, and suggested that the space within EDs should be managed centrally to enable the most appropriate allocation of available space.

'I said, "Look if QHealth aren't going to manage their inter-zonal stuff, well let's do it ourselves," because it's not worth it to us to keep inundating the (hospital) with cars to the point that we have to. You know, why keep going there and then suddenly find out we've got five there and they say, "Well now we're on bypass." Let's do it early.' (Participant 1, Station J)

They also felt that hospitals should form links to share the patient load, and that paramedics should be taking patients to hospitals that they know are not as busy.

'I think with some hospitals there's an advantage in that they can load share and that is something we put in place between ourselves and the hospitals.' (Participant 3, Station R)

Continually open channels of communication between the QAS and hospitals were suggested by participants as being vital to the efficient functioning of the system and to pre-empting Ambulance Ramping. Using channels of communications included appropriate use of the capacity alert and escalation policies by hospitals, as well as the use of the Emergency Capacity for Hospitals (ECHO) screen to provide information to the wider area on the capacity status of the EDs.

'It works really well. Especially being on the road and if you get a page saying [anonymised hospital] isn't at capacity, because you might go to someone and they can either come into an area or go down to the other area. You can say to the patient, 'Look, this hospital is quite busy, how about we go down to the other hospital?' You know, you are not trying to change their minds, but most patients say, 'Yeah, I'd rather go to the other hospital then if that is the case.' And then it takes the workload off, whereas if you

keep heading into the same place you are just going to make that ramping even worse.' (Participant 2, Station R)

In agreement with hospital participants, ambulance participants believe it is vital that the hospital inpatient teams took ownership of the ramping issue.

'Unless there's ownership from the inpatient teams about the problem you won't drive efficiencies in the rest of the hospital.' (Participant 1, Station J)

Facilitating patient discharge was suggested by ambulance participants. They felt they needed greater freedom to take patients home, and also to allow aged-care facility patients with simple problems, such as requiring a catheter change to be treated on the ambulance trolley and returned to the nursing home.

'If it's a catheter change or minor medical that can be done immediately on the stretcher to return to the nursing home, that has occurred. Simply to have quick turnaround and not for it to hit the beds.' (Participant 3, Station G)

Poorly organised inter-hospital transfers were mentioned by ambulance participants as a cause of delays. They felt that inter-hospital transfers should be reviewed, with patients only transferred if absolutely necessary.

'I think a little bit more attention needs to be placed on the authorisation of MAT [medically authorised transport] forms for transfers to hospitals, because if we are transferring from one facility to another where the initial facility could have adequately treated it I think it is a waste of resources for QH and QAS.' (Participant 2, Station G)

Ambulance participants described the practice of 'doubling up' ramped patients, and the use of 'hot tag' crews (crews dispatched to take over the care of ramped patients) as effective in immediately releasing services back to the road.

'Some of the other things we do is, say, well if you are a crew that is finishing at 7 am, and we get a hot tag crew to come up. So we get a crew that starts at 7am here, they go to the hospital, they take over from that particular person or number of people (and) look after a number of patients.' (Participant 4, Station G)

Finally, ambulance participants suggested that hospitals should be financially penalised for periods during which patients were ramped as an incentive to avoid ramping.

'The only true way to get movement through the Emergency Department is to have financial penalties for the people upstairs.' (Participant 1, Station J)

Patient and community solutions: ambulance service

Ambulance participants agreed with hospital participants about the need for improved public health education, particularly the use of health services. Participants felt that the culture needs to be changed so that the community avoid calling an ambulance if it is not necessary.

'So what you're doing is moulding the mind of the people in the community to say, "Well I've got a cut finger, I really don't need the ambulance. I'll put a Bandaid on, I'll go to my local doctor, make an appointment for three days time because that doesn't really matter." "I've got central chest pain. What does that mean? I'm starting to sweat. I think that's an ambulance." And then anything in between that is then based around what is important to that person. That's really hard to change.' (Participant 4, Station G)

They also felt that greater access to community health services is necessary, including the development of GP super clinics.

'A lot of people would go to those so called super clinics if they're out in the right areas and they know they're going to get seen quicker and it is going to be bulk billed or whatever because (for) a lot of these people, that's the reason why they go to the hospital anyway, because the GP down the road will charge them \$50.' (Participant 2, Station E)

Data Set 2: Statistical data from the QAS and EDs

A retrospective cohort study of patients presenting by ambulance to eight of the ten participating EDs during May 2008 was conducted following the deterministic linkage of Queensland Health EDIS and QAS eARF data. Two of the participating sites were excluded due to inconsistencies in output from the EDIS database. Collectively, the eight EDs had approximately 340,000 patient presentations in the 2008/09 financial year, servicing both adult and paediatric populations. The QAS off-stretcher time benchmark of ≥ 15 minutes was used as a working definition of ambulance Ramping for this study.

During May 2008, a total of 31,163 patient presentations to the eight ED sites were recorded on the EDIS. Of those presentations, 10,043 (32%) presented via QAS as determined by EDIS and eARF. Most QAS arrivals, 8567 (85%) were successfully linked to the EDIS data using AEHRC HDI software based on name, sex, date of birth (\pm five years), and date and time of arrival to the ED. A total of 170 patient presentations were excluded because the triage complaint code was unknown, the presentation was entered twice, or the off-stretcher time was calculated as zero minutes. The research team considered an off-stretcher time of zero minutes as unfeasible and most likely to be the result of a data entry error. Figure 1 shows the sampling process.

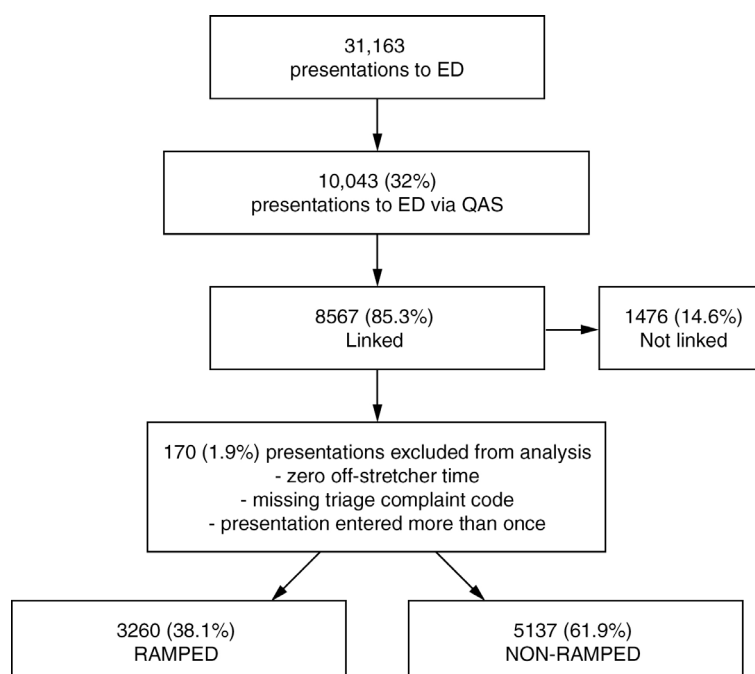


Figure 1. Sampling process (1–31 May 2008)

From the linked, cleaned dataset, of the 8397 patient presentations to the EDs via ambulance, 3260 (38.1%) were found to have an off-stretcher time of greater than or equal to 15 minutes and were therefore classed as ramped. Those with an off-stretcher time of less than 15 minutes were described as non-ramped.

Patient demographics

For patients arriving to EDs via ambulance, the median age of all QAS presentations was 49 years (IQR: 26–71). The age of ramped and non-ramped groups differed significantly (ramped: Md 53 years, IQR 31–73 vs. non-ramped: Md 46 years, IQR 24–69, $p < 0.001$). Ramped and non-ramped groups did not differ significantly regarding gender (ramped males: $n=1,611$, 49% vs. non-ramped males: $n=2,625$, 51%, $p = 0.128$).

ED characteristics examined for those arriving to the ED by ambulance included ATS category, day of arrival, shift of arrival, and presenting complaint (see Table 2). For the shift of arrival, each 24-hour period was divided into AM, PM and night shift periods, based on the usual hospital nursing roster of 0700–1459, 1500–2259, and 2300–0659. The presenting complaint was grouped into the top five complaints plus a group for all other complaints.

For all patients arriving to the ED by ambulance, higher proportions were noted in: ATS Category 3 (55.1%), Saturdays (17.1%); evening shifts (37.0%); and presenting complaint of injury (after all others combined) (21.5%). Ramped and non-ramped groups differed significantly for ATS, shift of arrival, presenting complaint, and day of the week. Compared to non-ramped patients, higher proportions of ramped patients were noted in the ATS Category 3; on the early and late shifts; presenting with cardiac/vascular and neurological complaints; and on Tuesday, Thursday, and Friday.

Table 2. ED characteristics of presenting patients

ED characteristics	Non-ramped (OS < 15 minutes)	Ramped (OS ≥ 15 minutes)	P value
ATS category			<0.001
1	19 (3.5%)	16 (0.5%)	
2	946 (18.4%)	493 (15.1%)	
3	2502 (48.7%)	2127 (65.2%)	
4	1422 (27.7%)	596 (18.3%)	
5	88 (1.7%)	28 (0.9%)	
Shift of arrival			<0.001
AM (0700–1459)	2152 (41.9%)	1461 (44.8%)	
PM (100–2259)	1776 (34.6%)	1331 (40.8%)	
Night 2300–0659)	1209 (23.5%)	468 (14.4%)	
Top 5 triage presenting complaints			<0.001
Injury	1138 (22.2%)	666 (20.4%)	
Cardiac/vascular	776 (15.1%)	569 (17.5%)	
Pain	644 (12.5%)	393 (12.1%)	
Neurological	441 (8.6%)	350 (10.7%)	
Respiratory	387 (7.5%)	223 (7.1%)	
All other	1751 (34.1%)	1049 (32.2%)	
Day of Week			<0.010
Monday	656 (12.8 %)	417 (12.8%)	
Tuesday	650 (12.7%)	423 (13.0%)	
Wednesday	647 (12.6%)	401 (12.3%)	
Thursday	763 (14.9%)	575 (17.6%)	
Friday	803 (15.6%)	521 (16.0%)	
Saturday	926 (18.0%)	514 (15.8%)	
Sunday	692 (13.5%)	409 (12.5%)	

QAS and ED outcomes

QAS and ED outcomes examined included ramp time, ED length-of-stay, discharge destination, and the percentage of access block at eight hours.

Off-stretcher times (median and range) and ED lengths-of-stay were calculated for all patients arriving to the ED by ambulance (see Table 3). Those in the ramped group had an off-stretcher time of approximately 14 minutes longer than those in the non-ramped group. This difference was significant ($p = <0.001$). The median length-of-stay in EDs for all patients was 298 mins (IQR: 179–487). Those in the ramped group had an ED length-of-stay almost one hour longer than those in the non-ramped group. This difference was significant ($p = <0.001$).

Table 3. Off-stretcher time and ED length-of-stay

	Non-ramped	Ramped	P value
Off-stretcher time			<0.001
Median off-stretcher time (IQR), mins	8 (5–11)	22 (18–33)	
Minimum	1	15	
Maximum	14	215	
ED length-of-stay			<0.001
Median ED length-of-stay (IQR), mins	277 (166–455)	330 (205–540)	

Most patients (63.4%) presenting to the ED by ambulance were discharged. For those patients requiring hospital admission, a higher proportion of admissions were noted in the ramped group (38.6%) compared to the non-ramped group (35.3%). This difference for admission was significant ($p = 0.003$). For the 3073 patients requiring hospital admission, 42.7% were access blocked (i.e. waiting in the ED for 8 hours or more). A higher proportion of those in the ramped group (47.4%) were access blocked, compared to those in the non-ramped group (39.4%). This difference was significant ($p = <0.001$).

Table 4. ED outcomes

	Non-ramped	Ramped	P value
Discharge destination			0.003
Not Admitted	3322 (64.7%)	2002 (61.4%)	
Admitted	1815 (35.3%)	1258 (38.6%)	
Access blocked at 8 hours			<0.001
Not Access blocked	1099 (60.6%)	662 (52.6%)	
Access blocked	716 (39.4%)	596 (47.4%)	

Data was examined to determine if ramped patients, as determined by the QAS definition of ≥ 15 minutes off-stretcher time, were also identified as ramped by the hospitals. Of the 3260 ramped patients only 943 (28.9%) were nominated on the EDIS as ramped patients (AMB, AMBUL, QAS, RAMP). However, 404 (7.9%) of the 5137 non-ramped patients were also allocated to these areas. A large number of all patients (452) were allocated to 'overflow' on EDIS; however, although some sites use this area for ramped patients, it may also be used for other patients.

Table 5. Identified as ramped on EDIS by through area allocation

Allocated to AR area on EDIS	Non-ramped (OS < 15 minutes)	Ramped (OS ≥ 15 minutes)	P value
Not allocated	4733 (92.1%)	2317 (71.1%)	<0.001
Allocated	404 (7.9%)	943 (28.9%)	

In summary, ambulance presentations represent almost one third of ED presentations. Ambulance presentations are in need of urgent care, with three quarters of ambulance arrivals being allocated an ATS of 1, 2, or 3. Just over one third (36.6%) of ambulance arrivals require hospital admission. Those arriving to the ED and waiting more than 15 minutes to be offloaded have a longer wait, of almost an hour, in the ED than those offloaded within 15 minutes and comprise higher proportions of hospital admissions and access blocks.

Chapter 5 – Discussion

Definitions

Individual participants defined Ambulance Ramping differently, largely depending on the hospital where they worked. However, disagreement between participants at the same site was also noted. This was particularly noticeable at hospitals where Ambulance Ramping happens less frequently. Hospital participants were also keen to distinguish between ramping and usual process. In most cases, hospital participants described Ambulance Ramping as only occurring after triage. Ambulance participants did not make this distinction. They described long waits for triage as Ambulance Ramping. This is perhaps because the QAS used a benchmark of ≥ 15 minutes off-stretcher interval as an indicator of off-stretcher delay, whereas hospitals used process and environmental factors. This conclusion is supported by the statistical data in which hospitals only identified 29 per cent of QAS defined ramping patients as ramped. However, interestingly, they had also allocated 8 per cent of QAS non-ramped patients to ramping areas.

Hospitals had no consistent way of documenting Ambulance Ramping. Various terminologies were used to identify categories for ramped patients on the EDIS screen, including 'ramp', 'amb' and 'QAS'. However, some sites used a generic ED 'overflow' to categorise ramped patients in the EDIS. According to participants, these categories were not used exclusively for ramped patients. Therefore, examining the statistical data, it was not always possible to identify which patients the hospital considered to be ramped.

The only available literature on ramping⁷⁷ uses the QAS benchmark for off-stretcher delay and states, 'For the purposes of this study, Ambulance Ramping is defined as time exceeding 15 minutes from ambulance arrival at the ED to the handover and transfer of the patient from ambulance stretcher into an ED bed or chair'.⁷⁷ However, the Council of Ambulance Authorities defines Ambulance Ramping as, 'the situation when an ambulance crew has arrived at the ED and the patient is unable to be transferred from the ambulance stretcher to the hospital ED, which results in the paramedics being required to continue caring for the patient until the ED has the capacity to accept the patient'.¹²⁰

There are two distinct issues surrounding the definition of Ambulance Ramping. The first issue is off-stretcher delays. The second issue is lack of space within the ED. Both issues may occur simultaneously, but they may also occur independently. As hospital participants stated, a patient may be subject to an off-stretcher delay, but this may be due to a number of factors, not only because the hospital cannot accept them. However, variations in the definition of ramping may mean that although a hospital defines a patient as ramped, the delay is not long enough to be defined as an off-stretcher delay. It is clear that off-stretcher delays and Ambulance Ramping are not the same.

This study revealed significant inconsistencies in data entry within ambulance services and EDs, largely due to the absence of a universal definition of Ambulance Ramping. It is important that off-stretcher delays and a lack of space in EDs that contribute to Ambulance Ramping are recorded in data systems accurately and consistently. It is suggested that patients who are subjected to actual Ambulance Ramping are likely to have considerably longer delays to definitive treatment.

Causes

Ambulance Ramping is a symptom of ED overcrowding, and many of the causes described by participants are well documented in the literature. However, it is important to note that causes appear to differ depending on where delays occur.

Both ambulance and hospital staff identified pre-triage delays as a result of temporary overwhelming of triage resources, with multiple patients presenting concurrently. Although the literature indicates that ED overcrowding is not caused by large numbers of non-emergency presentations, many hospital participants disagreed and described considerable numbers of

patients they felt could have been treated through non-emergency health services. Many of the participating sites operated a single-point triage system, where all presenting patients were triaged by the same nurse. If the hospital is experiencing a surge in non-emergency patients it is easy to see how triage resources can be overwhelmed and result in delays to ambulance off-stretcher times.

ED patient presentation numbers are increasing worldwide, at the same time as hospital bed numbers are decreasing.^{2, 10, 16, 31–35} Most participants cited this situation as a problem and a contributing factor in Ambulance Ramping and ED overcrowding. Some sites had experienced large increases in patient presentations over the last few years as the population in South East Queensland continues to expand. Some hospital participants felt that their site had no issues with Ambulance Ramping, but acknowledged that at times, they were overwhelmed by sheer numbers of patients awaiting triage, leading to delays. Ambulance participants highlighted the issue of lack of resources at triage.

Ambulance participants described an inability to refuse transport to patients who insisted on transport. Hospital participants supported this position and it appeared a widespread belief among both hospital and ambulance participants that it is QAS policy not to refuse transport. The QAS has no policy dictating that transport cannot be refused; however, according to the Clinical Practice Manual, QAS staff are advised to transport patients to definitive care without delay.¹²¹ It seems, therefore, this manual may be the source of this widely held belief. From participants' comments it could be concluded that paramedics are afraid of the consequences of not transporting patients. They have a fear of litigation and of dealing with subsequent patient complaints; therefore, paramedics are potentially, by their own admission, bringing patients into hospital who may not require emergency care and add to congestion of the system.

In addition, disagreement between hospital and ambulance participants over the allocation of patients in the waiting room was evident. Hospital participants largely did not believe that low acuity patients were often subjected to Ambulance Ramping. Hospital participants stated that, if able, these patients were usually taken off the ambulance stretcher and asked to wait in the waiting room. Ambulance participants, however, believed that there were many occasions where they felt a patient could be placed in the waiting room, but they were asked to keep them on the stretcher and wait with them. They attributed this to a lack of knowledge and experience on the part of the triage nurse, but also an unwillingness to take responsibility for the patient.

Delays that occurred after the patient was triaged appeared to be more likely related to a lack of space within EDs, and to be acknowledged as Ambulance Ramping by hospital participants. Although most participants were quick to describe lack of space as the initial cause of Ambulance Ramping, the causes of lack of space mirrored many of the acknowledged causes of ED overcrowding.

Most hospital sites described significant hospital access block and the inability to process patients through EDs in a timely manner, both of which were acknowledged in the literature to be major causes of ED overcrowding.^{9, 10, 12, 17–19, 21, 22, 25, 26, 28, 29, 81, 82, 122}

One of the major issues cited by participants as slowing patient flow through EDs, was difficulty in accessing inpatient medical staff to admit patients to the hospital. This issue has been highlighted in the literature on ED overcrowding. Many participants described a perceived lack of understanding on the part of these staff about the issues of ED overcrowding and Ambulance Ramping, and a subsequent lack of urgency on their part in dealing with patients. This perhaps reveals an interdepartmental divide within the hospital. This view is supported by hospital participants' experiences in communicating with inpatient ward nursing staff and also, a perceived lack of urgency in accepting patients onto the wards.

Consequences

The consequences of Ambulance Ramping as described by participants are widespread and variable. Of particular note is the pressure experienced by staff. ED overcrowding has been found to contribute to higher staff turnover and burnout,^{42, 50} and this was reflected in this study. As Ambulance Ramping can be seen as a symptom of ED overcrowding, it is difficult to attribute the stress exhibited by participants specifically to Ambulance Ramping rather than the overarching problem of overcrowding. However, at sites where Ambulance Ramping occurs most frequently, participants did describe it as a new source of stress on top of usual stresses. Although some felt comforted by the presence of the ambulance staff, others felt this was no comfort at all.

Both hospital and ambulance participants demonstrated significant concern about who is responsible for ramped patients, with some specifically asking researchers for advice. To date, there have been two deaths of ramped patients reported in the lay media.^{78, 87} Yet the issue of responsibility for patients has not been clarified for the staff working with ramped patients. Paramedics, in particular, described significant fear of litigation.

The failure of the system to accommodate ramped patients was seen as a personal responsibility by some staff, and both hospital and ambulance participants described the care these patients received as suboptimal.

The issue of verbal and physical violence within EDs by patients and visitors has been a problem for some time.^{46, 47} Ambulance participants described Ambulance Ramping as an additional trigger for this aggression and, therefore, an additional source of stress.

For paramedics, Ambulance Ramping means they are unable to perform the role for which they have been trained. Although the examined patient presentation data for May 2008 shows a maximum off-stretcher time of 215 minutes, many interviewed participants described much greater off-stretcher intervals at other times. This means that, at times, paramedics may spend the majority of their shift waiting at a hospital with a ramped patient, often causing significant frustration. This study also found that occupational stress was more far-reaching than expected. Paramedics described the stress experienced by ambulance dispatchers, as well as other ambulance staff, as a consequence of Ambulance Ramping.

As well as concern about the legal responsibility for ramped patients, participants described being asked to use hospital equipment with which they were unfamiliar or perform procedures outside their scope of practice. Both ambulance and hospital participants were aware of this issue with paramedics demonstrating particular concern. The legal aspects of this situation are concerning and it is easy to see how this adds to the stress experienced by staff.

Access block was one of the major causes of Ambulance Ramping as described by participants; however, as well as being a cause, access block may also be a consequence of Ambulance Ramping. Although patients may be ramped because another patient already within the department is access blocked, the ramped patient is at greater risk of becoming access blocked. Forty-seven per cent of ramped patients were access blocked for eight hours compared to 37% of non-ramped patients. Ramped patients also comprised higher proportions of hospital admissions compared to non-ramped patients. Ramped patients had a median ED length-of-stay 53 minutes longer than non-ramped patients, which is not necessarily explained by the time they spent on the ramp (median ramp time 22 minutes). This finding is consistent with previous research that found ramped patients were significantly more likely to have an ED length-of-stay of greater than eight hours. Detrimental effects of access block on patient outcomes have been established in the literature.^{26, 123} Among these effects are reports of delay to surgery for patients suffering from fractured neck or femur and an increase in recurrent myocardial infarction.^{124–125} It is therefore concerning that ramped patients may be at higher risk of these outcomes.

ED overcrowding has long been linked with the delivery of sub-optimal patient care in areas including the effective and timely administration of analgesia.^{126, 127} Ambulance Ramping perhaps adds another level to this. Participants described significant concern that Ambulance Ramping directly impacts on the quality of care received by patients. Ambulance service participants were very aware that they are not trained or equipped to provide ongoing care for patients. Pain was the third most frequent reason for patients' ED attendance. The most frequent reason for attendance was 'injury', which is usually associated with pain. Pain has been established as a leading reason for ED attendance and is now considered the fifth vital sign.¹²⁸ Ambulance participants described concern that they were unable to provide adequate and appropriate analgesia for ramped patients. With several of the EDs within this study participating in the National Institute of Clinical Studies pain initiative, it is of concern that a significant cohort of ambulance-attending patients may not be receiving optimal analgesia appropriate for their condition.

In addressing quality of patient care, it must also be noted that 65 per cent of ramped patients were classified on the ATS as a Category 3,¹²⁹ compared to only 49 per cent of non-ramped patients. According to the ATS, Category 3 patients are described as potentially life-threatening or important time-critical treatment or severe pain and meaningful treatment should commence within 30 minutes of arrival. The ACEM performance indicator measures state that 75 per cent of ATS Category 3 patients should be seen within this time.¹³⁰ With median off-stretcher times for ramped patients at 22 minutes, Ambulance Ramping may impact on the ability of the ED to achieve these benchmarks.

Fifteen per cent of ramped patients were classified as ATS Category 2 patients. These patients should be seen within 10 minutes of arrival at hospital, with a performance indicator threshold of 80 per cent.¹³⁰ Furthermore, the second most frequent presenting complaint amongst ramped patients was 'cardiac/vascular'. According to the ATS, patients presenting with cardiac suspicious chest pain should be allocated a Category 2. It is therefore possible that a sizeable number of ATS Category 2 ramped patients will have a cardiac or vascular reason for attending. ED overcrowding has been found to have a detrimental effect on time to thrombolysis for patients suffering from acute myocardial infarction.⁴¹ Therefore, Ambulance Ramping may have a significant impact on patients with time-sensitive outcomes.

Sixteen ATS Category 1 patients were also among the ramped group. Participants stated that Category 1 patients, who should be seen immediately according to the ATS, were never ramped and most stated that Category 2 patients were also not ramped. Data input errors were cited by staff as the reason for statistics relating to off-stretcher delays appearing in these circumstances. However, some participants did describe situations in which paramedics stayed to assist with patient care, leading to a delay in freeing the paramedics (and subsequently their entering of data), but not in the patient receiving definitive care.

The effects of Ambulance Ramping are wider than the direct impacts on the staff and patients directly concerned. Participants demonstrated concern that ambulance community response times are affected. Ambulance services throughout Australia and the rest of the world describe prompt ambulance turnaround times as essential to the delivery of a timely and effective service to the public.^{70, 120, 131} Most services aim for an off-stretcher time of 15–20 minutes, with total ambulance turnaround time at 25 minutes within Australia. In recent years there has been increased publicity concerning poor ambulance response times^{132, 133} and ambulance services have (anecdotally) directly linked Ambulance Ramping to their ability to respond to the community. The QAS has introduced Clinical Deployment Supervisors to communication centres to provide emergency calltakers and dispatchers with clinical advice and guidance to determine effective and efficient ambulance coverage and deployment.

Solutions

Even though low acuity or ‘inappropriate’ ED attendees do not reportedly affect ED overcrowding due to the limited ED resources they require, many participants felt that provision of alternative community health resources would help to prevent Ambulance Ramping through empowering the public to take responsibility for their own health. As described in the literature, it has been found that some patients may delay visiting their GP due to the costs involved.¹⁰⁰ Illness may then become more severe, necessitating ED treatment and hospital admission. By providing better community health services, health promotion, and increased bulk billing in particular, participants felt this issue could be addressed, reducing ED overcrowding and thus Ambulance Ramping. Participants were supportive of the GP super clinic model and saw it as a way of achieving this.

Increasing ED and inpatient staff has been suggested in the literature as a solution to ED overcrowding.^{81, 134} Participants in this study agreed that this would help to address Ambulance Ramping, but also felt that staffing was not just an issue of quantity. Skill mix was described as poor, both in EDs and inpatient units. Participants felt that increasing education and improving skill mix at all points in the patient journey would improve patient flow. In addition, communication between all existing team members at all stages of the process was described as essential to effective functioning of the system. Some participants felt that if hospitals were informed before the arrival of all ambulances they would be able to plan in advance to accommodate patients, maximising their ability to prevent Ambulance Ramping. Hospital participants indicated that inpatient staff had little understanding of the issues faced by EDs, and little understanding of commonly used terminology. Participants felt that education of inpatient staff was necessary to enable them to understand and support the ED.

ED overcrowding is not simply an ED problem, and that its causes are complex.^{13, 14, 42, 82, 134} For this reason participants believed that Ambulance Ramping requires a whole-of-hospital response, and that executive support for EDs to use systems such as capacity alert and ambulance redirect (or load sharing) is essential for effective system functioning.

Worldwide, hospital bed shortages have been well documented^{2, 10, 16, 31–35} and it appears that South East Queensland is no exception. The major solution suggested to address ED overcrowding is to improve the number of available hospital beds. Participants in this study agreed with this proposal; however, all were aware that this is not a quick solution and that processes must also be examined to enable the system to run more efficiently. Ambulance participants suggested centrally managing hospital ED beds within an area, and allocating patients to hospitals with available appropriate beds well before arrival. This solution may be more feasible once electronic medical records become commonplace within Queensland hospitals. Participants were keen to point out that merely increasing ED beds will not solve the Ambulance Ramping issue in the long term, as the ED is dependent on the availability of inpatient beds to clear its own beds. This is supported by the literature.^{17, 18, 26–28, 122}

Limitations

As noted in Chapter 2, the qualitative component of the project does not offer a singular objective view, as is the case with all qualitative research. In addition, some of the researchers conducting the focus groups and interviews had personal experience of Ambulance Ramping. To minimise the risk of introducing bias, the researchers used bracketing¹¹⁹, where the researcher acknowledges what they already know about a subject and sets it to one side.

Qualitative research also runs a risk of response bias. Anecdotally, few medical staff participated in the hospital focus groups and interviews; most participants were nursing staff. Therefore, responses may not be entirely reflective of all ED staff. In addition, EDIS data were not available from two of the ten sites. Therefore, these two hospitals were excluded from the quantitative aspect of this study. In addition, the data collection period was short (one month). The data is now more than two years old and may contain some inaccuracies. Despite these limitations, this was a multi-site study and the analysis of one month of data has been used to inform a more comprehensive examination of Ambulance Ramping.

Chapter 6 – Recommendations and Conclusions

Recounting the aims of the study

The aims of the study were to:

1. describe and develop a definition of Ambulance Ramping
2. determine the frequency and practices of Ambulance Ramping at SDEDCN hospitals
3. identify the nature of the delays incurred by patients who are subject to Ambulance Ramping
4. identify mechanisms currently employed to manage Ambulance Ramping
5. determine the extent to which Ambulance Ramping and its effects are documented by hospital and ambulance services
6. identify the effect of Ambulance Ramping on ED functioning
7. identify the effect of Ambulance Ramping on ambulance services
8. identify the effect Ambulance Ramping has on the delivery of emergency health services.

Findings

Definitions of Ambulance Ramping varied depending on the hospital, service and sometimes the individuals involved. However, it is important to distinguish ramping from delays to usual process.

The aetiology of Ambulance Ramping is complex and multi-factorial, but it appears to be a further manifestation of ED overcrowding, with well-documented issues such as access block, increases in emergency presentations and increasing complexity of patient conditions as key causes. However, the impact of Ambulance Ramping is much more wide-reaching than ED overcrowding. There are distinct issues surrounding the legal responsibility for patients and blurring of professional boundaries that impact on the workload and occupational stress of both hospital and ambulance staff. Patient care is affected, with staff concerned they are unable to provide optimal treatment for patients and fulfil their roles as health professionals.

Ramped patients were found to be access blocked in high proportions compared to non-ramped patients, and this cannot necessarily be explained by the time they spent on the ramp.

Recommendations

For standard definitions of Ambulance Ramping and Off-stretcher Delayed

Taking into account the results from this study, it is recommended that the definitions of Ambulance Ramping and Off-stretcher Delayed comprise the following criteria:

1. Time:
 - (a) Off-stretcher interval exceeds established benchmark (minutes).
2. Process:
 - (a) The patient must arrive by ambulance.
 - (b) The patient must have been triaged.
 - (c) There must be no appropriate treatment space available for the patient in the ED.
 - (d) There must be no ability to make an appropriate treatment space.
 - (e) Paramedics must remain with the patient no matter where the patient is physically situated, within or outside the ED.

If the patient meets the Time criterion (as determined by Queensland Health or QAS) but not the Process criterion, the patient should be termed 'Off-stretcher Delayed'.

If the patient meets both the Time and Process criteria (as determined by Queensland Health), the patient should be termed 'Off-stretcher Delayed due to Ambulance Ramping'.

For clinical practice

The true extent of Ambulance Ramping is difficult to estimate. For this study, the QAS off-stretcher time benchmark of ≥ 15 minutes was used as a working definition of Ambulance Ramping for this study. However, this definition does not reflect delays to usual process. A significant number of presentations were excluded from this study due to the arrival, triage and off-stretcher times being identical, giving an off-stretcher time of zero. The researchers viewed it as unfeasible that full handover of care could be achieved within one minute and that this was most likely a result of data entry error. In addition, the researchers initially wanted to identify whether delays occurred before or after triage by examining the difference between ambulance arrival time, EDIS triage time and QAS off-stretcher time. This was not possible because in many cases, the off-stretcher time occurred before the triage time, or triage time occurred before the arrival time. For accurate research and quality assurance on this issue it is important that data entry quality be addressed through: education of staff, possible synchronisation of clocks used by the eARF and EDIS systems, and data sharing using information technology such as bluetooth.

In addition to data entry issues, it was noted that not all hospitals had a suitable area on their EDIS screen in which to place ramped patients. Currently ramped patients are identified using QAS statistics, although not all sites agreed this was actually undertaken. For hospitals to be able to monitor their own Ambulance Ramping issues, it is important that they are able to identify which patients have been ramped. It is recommended that all hospitals use a clearly marked box on the EDIS map in which to place ramped patients. This should be for the exclusive use of QAS or other ambulance service (for example New South Wales and Careflight) ramped patients only and not for walk-in patients requiring an acute ED bed, and should be clearly identifiable using terminology such as 'Ambulance Ramp'. This will have the benefit of enabling hospitals to conduct quality projects on Ambulance Ramping as well as facilitate further research.

Information provided by the hospital participants indicated that all participating sites performed a full triage on patients before determining if they were to be ramped. It is recommended that this is endorsed as standard clinical practice during Ambulance Ramping times both for patient safety and for auditing and quality purposes. It is likely that delays occurring prior to triage are of a different aetiology than those after triage.

For policy

A significant source of stress and concern for all staff involved is the legal issue surrounding Ambulance Ramping and, in particular, the legal responsibility taken by individuals for the care and welfare of ramped patients. Although participants appeared to be aware that the hospital takes some responsibility for the care of these patients, there was significant concern surrounding the personal responsibility that individual practitioners take under these circumstances.

Queensland Nurses Union secretary has been quoted as stating that nurses have a responsibility for ramped patients once they become involved in any aspect of their care.¹³⁵ For this reason it is recommended that this issue is addressed urgently and communicated to frontline staff. Institutional policies and official guidelines for staff to work within may need to be developed.

There appears to be no documentation or policy specifically enabling paramedics to refuse transport when it is clearly not warranted. While this may not alleviate Ambulance Ramping, the unnecessary transport of non-acute patients may contribute to off-stretcher delays and extended community response times. Some participants believed that they had no scope to refuse transport, and others felt that dealing with patient complaints as a result of refusal to transport negated the benefits of refusing transport in the first place. There was also significant concern that patients may be sicker than at first thought, and that a wrong decision could impact negatively on the individual officer. This matter should be subject to further research.

For education and training

Many hospital participants described a lack in sense of urgency among staff that were not directly involved in Ambulance Ramping, in particular among inpatient medical and nursing staff. Education on patient flow processes targeted at staff may help to improve this issue.

There appeared to be disagreement among nursing and ambulance staff regarding the appropriateness of taking patients off ambulance stretchers and asking them to wait in the waiting room. Ambulance participants believed that many patients were kept on stretchers when they did not need to be, perhaps as a result of lack of knowledge on the part of triage staff or an unwillingness to take responsibility. Hospital participants described ambulance staff as inappropriately placing patients in the waiting room before triage. Refresher education for both ambulance and hospital triage staff may be warranted to help alleviate this problem.

For workforce planning

Many ambulance participants described long waits prior to triage at some facilities due to the simultaneous arrival of both ambulance and private transport patients. It is recommended that hospitals examine triage waiting times and use these as a basis for increasing staffing at this point if necessary.

Skill mix within the ED was described as having a significant impact on patient flow and, subsequently, Ambulance Ramping due to the slower pace at which inexperienced staff work. Attention should be paid to skill mix when planning rosters and allocations within the ED. Education should be available to improve staff skills and therefore expedite flow.

A lack of inpatient medical staff was identified as a source of delays. Participants at some sites described inpatient medical staff as having to conduct clinics or operating sessions at the same time as admitting patients through ED. It is suggested that quarantining these staff for ED admissions would reduce delays for patients being admitted to the hospital and reduce hospital access block. In addition, participants at many sites felt that medical registrars were a particular cause of delays as their workload was too high. Rostering to address this concern is recommended.

Many hospital participants described significant levels of occupational stress as a result of high workload, ED overcrowding, and Ambulance Ramping. ED staff are well known to suffer burnout, with participants at many sites in this study describing increasing levels of sick leave and the loss of experienced staff. With appropriate skills mix essential to the effective functioning of EDs, full support must be given to staff to retain highly skilled and experienced staff across all levels and professions. Management should be alert to the possibility of burnout among staff, and critical incident debriefing and psychological support should be available and offered when issues are identified.

For future research

The examination of the effects of Ambulance Ramping on patient outcomes is important. As previously reported, ambulance diversion, ED overcrowding and access block have all been shown to result in poor outcomes for patients. Of particular note is the finding from this study that ramped patients had a longer ED length-of-stay and comprised higher proportions of hospital admissions and hospital access block compared to non-ramped patients. This study used a small data collection period of one month that is now more than two years old. Therefore, it is important that this issue is investigated further, and any relationship between Ambulance Ramping and hospital access block formally established.

Many participants expressed concern at the quality of care ramped patients receive. Paramedics in particular described situations where patients had become violent and distressed while ramped. Therefore, examination of this phenomenon from the patients' perspective is warranted. From the staff perspective, further research is required about the differing views surrounding responsibility of care for the ramped patient.

Both hospital and ambulance staff described concern over the impact of Ambulance Ramping on ambulance community response times. Further research is warranted to examine the true extent of this issue.

Conclusions

This study aimed to develop a common definition of Ambulance Ramping that would be accepted for use across the SDEDCN and, ultimately, Queensland Health and QAS. In addition, the study aimed to identify how Ambulance Ramping is practised and documented by hospitals, how it impacts on the functioning of EDs, and to identify the effect Ambulance Ramping has on the delivery of emergency health services.

Using qualitative and quantitative research, Ambulance Ramping was found to be a manifestation of ED overcrowding with many of the same causes as overcrowding. However, the consequences of Ambulance Ramping are unique and concerning. Ambulance Ramping was found to have a significant impact on staff, patients and the community. Particular concerns included findings that ramped patients experienced access block in higher proportions, there is confusion about the level of responsibility taken by individual staff members, stress is experienced by both paramedics and hospital staff, and there is potential impact on ambulance community response times.

Key recommendations from this study are:

1. Improvements are required in data entry processes within and across organisations, including synchronisation of eARF and EDIS clocks.
2. An easily identified box within EDIS at all hospitals is needed to enable data gathering of Ambulance Ramping.
3. Future research should identify an off-stretcher time stamp for use as a surrogate marker of Ambulance Ramping for ambulance services.
4. Ramped patients' outcomes, particularly surrounding the relationship between Ambulance Ramping and access block should be examined.
5. Ambulance Ramping from the patients' perspective should be examined.
6. Research into the impact of Ambulance Ramping on ambulance community response times should be undertaken.
7. The legal responsibility of individual staff should be examined.
8. The QAS policy for refusal of transport should be reviewed.
9. Inpatient staff should be trained on how to improve flow throughout hospital.
10. Education and support should be provided for triage staff to remove patients from QAS stretchers and place them in waiting rooms.
11. The number of staff at triage should be increased to alleviate pre-triage waits.
12. Inpatient staff should not be rostered to admit through the ED on the same days as they have theatre and clinic duties.
13. The workforce should be increased, particularly medical registrars.
14. Management staff should be alert to the possibility of staff burnout and implement strategies for its prevention and management.

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