Future Roles and Design Concepts for Emergency Departments in Queensland

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Abstract

Background and significance

Emergency Departments (EDs) play a unique role in every healthcare system as patients, in the event of an unexpected or urgent need, seek medical care through the services of these departments. In recent years however, the utilisation of EDs has been growing rapidly around the world and in Australia. This trend appears to occur irrespective of the healthcare system settings existing in the particular country, population size or its characteristics. The consequences of such a situation affect the safety of patients, their satisfaction and the quality of care. These effects are not limited to the individuals but impact also on healthcare resources including human, financial and organisational resources. The consequences are also observed on stakeholders and can impact negatively on the community. A number of initiatives have been undertaken to date to manage these issues, but these have not met with as much success as expected.

Researchers around the world have undertaken comprehensive studies to examine this situation and a number of factors have been found to contribute to the rising utilisation of emergency health services. Their impact however remains unknown and differs from one system to another. There also remain limited models for use to better understand and rectify this situation.

Aim

The overall objective of this discussion paper is to identify factors associated with increased demand for EDs in order to provide information for policy proposals that can lead to improved service delivery.

The aims were further subdivided into two studies with the following research objectives.

Study one identifies a profile of the design and use of existing EDs throughout Queensland and the consideration of the future planning and implications for EDs from the perspective of their potential expansion and re-development.

Study two aims to produce a profile of ED users, analyse and evaluate factors that influence the demand for emergency services and identify any patterns with respect to provision of services. Additionally, workload or case-mix patterns were delineated using Urgency Related Groups (URGs)

The results of both studies were used to develop future models of care and design features for two EDs with similar demand but differing age and socio-economic mixes who will undergo redevelopment within the next five years.

Methods

The project involved two separate studies.

Study one utilised a prediction formula to forecast future demand over the next decade based on the number of presentations from 2008-09 and 2015-16. A cross-sectional design was employed for study one, utilising a self-completed questionnaire collected from Directors of Emergency Medicine and Directors of Nursing in EDs. Two versions of the survey were used: one for identification of existing provision of emergency services and one to identify future needs. There was no previously developed or used questionnaire that could have been adapted for the current project. The exiting standard measures of the key constructs, or questions from prior studies were used where applicable. Additional scales and questions were developed and added to the questionnaire to measure all identified aspects of demand for ED services including reasons for use or general opinions about these services.

Study two used the HAT ED Analysis Dashboard (Dashboard), created using Australian Bureau of Statistics socio-economic data (SEIFA and SA2), Queensland Health ED data and from a patient administration system known as the ED Information System (EDIS) for the period 2009-2016 for all 27 EDs that report performance data across Queensland to the Healthcare Improvement Unit (HIU). Descriptive statistics were used to show the distribution, trends, patterns and prevalence in use of ED services as well as user characteristics.

Results

For study one, it was suggested that, based on the number of presentations from 2008-09 and 2015-16 and the utilisation of the predictive formula, the predicted number of patients expected to present to EDs in Queensland by 2026 is expected to be 2,009,643; 2,234,993 and 2,483,086 for annualised growth rates of three, four and five per cent respectively. Questionnaires surveying medical directors and nursing unit managers of the reporting EDs were collected during the data collection process. The response rate achieved was satisfactory with 100 per cent with all of the entire cohort providing a response. Analysis of data for study three established some important findings. Firstly, there is a good accordance of views that the present ED designs are inadequate to manage present demand. Secondly, the present models of care are not matched to ED designs and thirdly, there is a need for the development of new models of care to manage future demand and workload.

The findings of study two suggested that an increase in demand for emergency services had been observed in all age groups with the oldest and the youngest patients recording the highest utilisation rates. The majority of presentations were men who had higher utilisation for ED services except the 20-29 age group where women exceeded men. An increase was also observed among more urgent triage categories and among patients who decided to seek care of their own initiative. Patients from lower socio economic backgrounds had higher utilisation than patients from other groups. The impact of other users such as cultural backgrounds remains unclear. No differences were found between patients who were presenting during and outside of working hours. Also, little variation was observed with presentations according to months of the year.

There was an increase in attendance during weekends and during daytime hours.

Conclusions

There are some major conclusions that can be drawn from this work. Firstly, EDs are providing acute care to the community with up to date models of care despite shortfalls in resources and design adequacy. Secondly, this study recognised that a growing and ageing population cannot be exclusively blamed for growing utilisation of EDs, as demand is rising with all age groups and is high among paediatric patients. Whilst no single group of patients was found to contribute singularly to the use of ED services, the findings strongly assert that lower socio-economic groups and age groups less than four and 20-24 years are consistent predictors of ED utilisation.

The study findings indicate that no single solution or strategy will effectively assist in the management of utilisation and demand of services by the ED networks throughout Queensland. Any proposed management policy ideas should bear in mind the complex and multi-factorial issues that are causing the current situation. As a result, the study suggests a possible multifaceted strategy for future ED roles, models of care and design concepts that are not used presently.

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List of Abbreviations

A&E	accident and emergency
ABS	Australian Bureau of Statistics
ACEM	Australian College of Emergency Medicine
ACS	acute coronary syndromes
ADL	activities of daily living
AHR	after-hours referrals
AIHW	Australian Institute of Health and Welfare
AMAU	acute medical admissions unit
AMU	assessment medical unit
AMU	acute medical unit
ATS	Australasian triage scale
BA study	before and after study
CCT	clinical controlled trial
CGA	comprehensive geriatric assessment
CHO	Chief Health Officer (Qld)
CI	confidence interval
CIN	clinical initiatives nurse
CT	computed tomography
CTAS	Canadian ED triage and acuity scale
DALY	Daily Adjusted Life Year
DDR	direct discharge rates
DFT	discharge facilitation team
DNA	did not arrive
DNW	did not wait
DR	doctor
ECG	electrocardiogram
ED	Emergency Department
ED NPC	Emergency Department Nurse Practitioner Candidate
ED(s)	Emergency Department (s)
EDC	Queensland Health Emergency Data Collection
EDIS	Emergency Department Information System
EDTU	Emergency Department treatment units
EHR	electronic health record
EMS	emergency medical service
EMW	emergency medicine ward
ENT	Ear Nose Throat
EP	emergency physician
EPAS	Early Pregnancy Assessment Service
EPIX	emergency physician-initiated x-ray

Term	Description
ES	emergency services
Firstnet	Cerner Firstnet
FT	Fast Track
HBCIS	Hospital Based Computer Information System
HHS	Hospital and Health Services
HITH	hospital in the home
Hr/s	hour/s
ICD	International Classification of Disease
ICU	intensive care unit
IHPA	Independent Hospital Pricing Authority
KPI	key performance indicators
LOE	level of evidence
LOS	length of stay
LWBS	left without being seen
LWCA	left without complete assessment
MAPU	medical assessment and planning units
MATS	minor accident treatment service
MAU	medical assessment unit
MIN	minute
MIU	minor injury unit
MO	medical officer
NHSD	NHS direct
NHSDW	NHS direct wales
NI	nurse initiated
NIPP	nurse initiated pain protocol intervention
NP	nurse practitioner
OC	office care
OR	odds ratio
OT	occupational therapist
OW	observation ward
PACS	patient acuity score
PAT	physician assisted triage
PED	paediatric Emergency Department
PHIL	paediatric health information line
PIT	physician at triage
PIT	physician initiated
POCT	point of care testing
POST	patient off stretcher times
QAS	Queensland Ambulance Service
QED-SAG	Queensland Emergency Department Strategic Advisory Group

Term	Description
QGSO	Queensland Government Statistics Office
QH	Queensland Health
RAP	rapid assessment program
RCT	randomised controlled trial
REACT	rapid entry and accelerated care at triage
RITZ	rapid intervention and treatment zone
RITZ	rapid intervention and treatment zone
RMA	rapid medical assessment program
RN	registered nurse
RR	readmission rates
RTT	rapid triage and treatment
SA2	Statistical Area 2 Code
SAW	surgical admission ward
SC	self-care
SEIFA	Socio-Economic Index for Australia
SHD	Swedish health care direct
SNOMED-CT	Systemised Nomenclature of Medicine - Clinical Terms
SSU	Short Stay Unit
SSU	short stay unit
SWAT	senior work up assessment and treatment
TAS	telephone advice system
TENP	transitional emergency nurse practitioners
TLP	triage liaison physicians
TLP	triage liaison physicians
TLP	triage liaison physicians
TRIAD	triage rapid initial assessment by doctor
TTA	time to analgesia
UAP	unlicensed assistive personnel
URGs	Urgency Related Groups
WAU	Weighted Activity Unit
YLL	Years of Life Lost
PPH	Potentially Preventable Hospitalisations
IPV	Intimate Partner Violence
NNAPEDCD	National Non –Admitted Patient Emergency Department Care Database
NPHED	National Public Hospital Establishment Database
CSCF	Clinical Service Capability Framework

Chapter 1: Introduction

This chapter provides background information in relation to ED services and an overview of the research aims and objectives.

Overview

While emergency health, particularly trauma, has always been a principal focus of healthcare, it has only been in the last century that a more organised approach to the delivery of emergency care has occurred - the majority of these developments have been in the last 40 years in most developed countries.

The developments have been underpinned through the modernisation and reformation of 'Casualty Departments' to 'Accident and EDs' and then as now known 'EDs', ambulance services and patient transfer retrieval services[2, 3]. This reformation has been underpinned professionally by the development of a new specialisation of Emergency Medicine, a specialisation in nursing of emergency nursing and the introduction of paramedics. Each of these has been associated with the development of professional support strategies, particularly education programs.

The positive impact of these reforms on health outcomes is unquestioned by experts in the area. However, despite this positive impact and considerable investments in personnel and structures, the delivery of emergency care is still the focus of frequently negative political and media attention. Delays in treatment of hospital admissions are the most frequent causes of news reports, but there are also more serious reasons for reporting in the media such as issues surrounding treatment quality and compromised patient outcomes.[2, 3]

This public attention has led to research into effective interventions, however, there is no common cohesive evidence based guidance for practitioners and policy makers. The research to date focuses on particular aspects of the issue including best practice for delivery of pre-hospital emergency care,[2, 3] strategies to reduce attendance and the time patients wait, throughput factors such as the implementation of triage and fast track,[2, 3] or on output factors aimed at reducing access block and patient admissions.[2, 3] However, the current public discourse often does not reflect an in-depth understanding of the factors that are contributing to this congestion or the evidence based strategies required to address it.

Internationally

Irrespective of country and healthcare system, EDs around the world are overwhelmed by increasing presentations. For example, in 2016 there were 23.57 million attendances at England's EDs, of which 65 per cent were at major EDs ('type 1') which operate a consultant-led 24 hour service.[4] The remainder were at minor injury units, walk-in centres, and single speciality facilities.[4, 5] Total attendance increased by 5.2 per cent compared with 2015 – equivalent to an average of 3,216 more people attending A&E each day.[4] Attendance at ED appears to be increasing at a faster rate than population growth. In 2016 at major ED departments, the increase in attendance was 5.5 per cent – an average of 2,210 more attendances each day. There were 4.26 million emergency admissions to hospital via ED in 2015-16 – up 4.5 per cent on the previous year and up 17 per cent on five years ago.[4] Presentations continue to rise in the US with the Agency for Healthcare Research and Quality calculating there were 137.8 million ED visits in 2014 with a rate of 432 per 1,000 population. The number of ED visits increased 14.8 per cent

from 2006-2014. Comparing the two years, the US population grew 6.9 per cent. A similar climb in utilisation rates have been reported in countries across the globe: Canada, Denmark, Finland, France, Germany, India, Iran, Italy, Netherlands, Saudi Arabia, Spain (Catalonia), Sweden and Switzerland.

Queensland and other states and territories

Australia is no exception to the situation. EDs have experienced considerable growth in the occasion of services over the past few years and is discussed in detail in the following chapters.

Population growth and demand for ED Services

Population growth is one of the most important factors identified in the rising demand for ED services, as the number of people changes the demand for goods and services. Population growth in Australia has an undeniable impact for EDs, with Queensland having one of the fastest growing populations over the past decade. The impact of population growth on the utilisation is ED services are discussed in the following chapters below.

Clinical urgency and demand for ED services

EDs use the Australian Triage Scale in order to identify the clinical urgency of presenting patients and to provide them with time critical intervention.[6] In Queensland, the growth of demand has been more prominent amongst the more urgent than non-urgent categories of patients. As such the increasing demand, utilisation rates and acuity of patients presenting over the last years is further investigated below in order to understand the causes and better predict trends with respect to population and social change.

Effects of rising ED use

The increasing use of EDs combined with limited healthcare resources affects delivery of care for patients and impacts on resource utilisation and the proper functioning of an ED. The high volume of patients accessing hospital care through an ED contributes to congestion and crowding. In turn overcrowded EDs contribute to longer waiting times to be seen and result in delay for essential treatment for patients. It is well documented[7] that delays occurring in pain treatment and timely administration of medication including antibiotics. Longer waiting times also contribute to patients leaving EDs before receiving appropriate care. The safety of patients is also compromised and patient mortality is one of the most commonly studied adverse outcomes of congestion in the ED. Reduced quality in medical care leads to patients' dissatisfaction with health services.[7] The more congested the ED, the more dissatisfied the patient. Longer waiting times consequently contribute also to patients leaving without being seen by a doctor, which may have a negative impact on their health.

Increasing demand for emergency health services also impact negatively on staff and their work conditions. Overcrowded EDs contribute to a naturally stressful and frenetic environment and impairs the occupational health of staff. Decreased job satisfaction may lead to increased absenteeism.[2, 8, 3]

In addition to all the other activities of an ED, an ED provides educational environment for junior staff. Studies have found that overcrowded floors and the pressure to fast-track patients do not permit quality teaching and proper education.[2, 3, 9, 10] This combined with introduction of performance target instruments such as the four-hour rule,[2, 3, 11] contributes to junior staff concerns and raises further questions relating to the quality of care to patients.[2, 3, 10, 11]

The increasing use of EDs also can impact on financial resources and places strain on other stakeholders. EDs operate 24/7 and naturally cost 2-3 times more than costs for visits to other settings.[12, 13] The investigation of the impact on costs from the extended length of stay (LOS) of patients in EDs has been intimately researched with studies concluding that by decreasing or eliminating ED boarding and improving inpatient access has a potential to significantly decrease cost.

Finally, overcrowded EDs impact also on pre-hospital services. If an overcrowded ED is unable to receive more patients, ambulance services are not able to transfer them which can cause ramping. The diversion of ambulances to less busy facilities is a well-known issue.[2, 10, 11] Both of these impact community confidence for ambulance services to respond to people requiring urgent medical help.

Aims

The overall object of this study is to identify factors associated with increased utilisation of ED services in order to provide information for policy proposals that can lead to improved future service delivery and planning of EDs. The aims are further subdivided into two studies specified below.

Objectives

Study 1

a. Produce a profile of future ED demand using a predictive calculation tool and with the assistance of a survey, to understand and determine the models, resources and design concepts for Queensland EDs in the future

b. Analyse and evaluate the models, resources and design that would meet future ED demand

c. Identify the changes in the scope of future roles and design concepts for EDs in Queensland.

Study 2

a. Produce a profile of current and predicted ED users' utilisation

b. Analyse and evaluate the factors that influence the utilisation of ED services

c. Identify the predicted scope and purpose of services provided in Queensland EDs.

Structure

Chapter 1: Introduction: This chapter provides background information in relation to ED services, and an overview of the research aims and objectives.

Chapter 2: Overview: This chapter provides an explanation of the structure and role of EDs in

current healthcare systems.

Chapter 3: Context, Trends and Characteristics: The aim of this chapter is to identify the characteristics of users and through comparison with the population, determine those characteristics which appear to contribute to the future impact and growth of utilisation of EDs.

Chapter 4: Concepts and Literature Review: This chapter addressed the background and scope of the literature of the interventions and patient streaming models of care to address ED overcrowding.

Chapter 5: Methodology: This chapter outlines the study design, study population, sample selection and the research instrument used for data collection from EDs. It provides a detailed account of the data collection procedure and describes the study methods, statistical methods and analytical plans for that data analyses.

Chapter 6: Results - Study 1: Characteristics of ED users: This chapter presents the results from study one and examines the objectives of study one, which identified the characteristics of users and factors contributing to the increased use of ED services.

Chapter 7: Results - Study 2: Study sample and results of descriptive analysis: This chapter presents the results from study two and includes presentation of data collection, results, response rate, and representation of the study sample and discusses the profile of those surveyed. It also presents results from descriptive analysis performed for all variables.

Chapter 8: Discussion, Reflections and Implications: This chapter discusses the present study findings, strengths and limitations, study implications, and recommendations for policy and future research.

Chapter 2: Overview

The chapter provides background information in relation to ED services and an overview of the research aims and objectives.

History of Emergency Services

The organisation and structure of emergency medical services involves multiple agencies and people working together to create a comprehensive system ready to respond rapidly to unpredictable events and deliver an advanced level of care.

It is a system with a long history beginning with early hunters and warriors who provided care for the injured. Although their methods were primitive, the basic idea of response to injury remains current to the present day for all emergency health systems.[14] Many of the earliest developments in emergency care were appropriated from military environments, having the greatest need for methods of care for the injured and ill outside a hospital setting.[14] Modern EDs as part of emergency health services are a recent development.[14] Prior to the 1960s many hospitals did not have designated departments, just a single room, often poorly equipped and under-staffed with unqualified personnel.[14] In Australia, the first Director of a Casualty Department was appointed in Geelong in 1967.[14] Other hospitals followed and in 1981 the Australasian Society for Emergency Medicine was established. From the 1980s hospital casualty departments were to be transformed into EDs with better educated staff.[14] This was largely facilitated and engendered through the formation of the Australasian College for Emergency Medicine (ACEM) in 1983[14] and the establishment of the College of Emergency Nursing[15] in recognition of emergency medicine specialisation as separate medical professions.

Accordingly, the ED has been greater defined with its designation as a hospital department that specialises in the immediate medical care for patients who choose to seek urgent treatment, are delivered by ambulance, or are referred by their doctor.

Organisation of emergency departments in Australia

ED structure

The core business of EDs has changed significantly over the last 20 years due to factors such as changing demographics and changes in hospital and community healthcare provision and service delivery.

As such, EDs require highly specialised staff, access to services of allied health staff, 24 hour access to pathology, radiology and surgery.[16] ACEM requires EDs to be part of a recognised hospital and be licenced by the appropriate authority. To receive a licence they must be purpose designed, include a dedicated area for advanced life support, used for the reception and stabilisation of critically ill patients, operated with a registered nurse on duty at all times, and have access to a senior emergency physician at all times for clinical support.[16]

There are now 104 accredited EDs in Australia, including 21 EDs in Queensland.[17]

EDs are classified according to their role and level of function, and are grouped into three major categories: major referral, urban district and major regional/rural base ED.[18] There are two other

categories: rural emergency service and primary care/remote emergency service that relate to hospital base services, although these are too small and/or under-equipped to be considered EDs for accreditation purposes.[18]

Another classicisation is used by the Australian Institute of Health and Welfare (AIHW) which groups all emergency hospitals into four geographical locations: major cities, inner regional, outer regional, and remote.

More than 50 per cent of specialist EDs are located in major referral hospitals.[19] Major referral EDs manage and provide comprehensive initial care for all emergencies with a wide range of subspecialties onsite. These facilities have experienced staff on site 24 hours a day (although consultant coverage is likely to be 24 hours on-call rather than on site). In some states, EDs also form part of a crucial care network.

Outer metropolitan hospitals vary from basic EDs with designated nursing and on-call medical staff to those that provide a full range of services. Major trauma is generally transferred to the tertiary referral hospitals.

Regional/base hospitals in rural areas play a role that falls between tertiary referral hospitals and other metropolitan hospitals. Base hospitals typically provide high level emergency services with trained staff on site. Other rural hospitals provide basic emergency care for resuscitation and limited stabilisation from nursing staff and a medical officer on call. These facilities do not have capacity to provide definitive care in cases of major trauma. Often the doctor providing emergency care is the local GP. In small rural communities and remote areas emergency services are provided by the local GP, the local hospital or the Royal Flying Doctor Service.[19]

In addition to the EDs in public hospitals, there are also EDs in private hospitals that have been operating mainly in capital cities in Australia since 1988.[20, 21]

ED patient pathway

There are a number of pathways into an ED requiring the department to be available for patients seeking care regardless of time of day or number of patients.[22] EDs must remain open and prepare for any eventuality. This makes resource management within EDs complex and uncertain.[23]

Patients using an ED may initially deal with **reception**, and are then **triaged or assessed** for their level of urgency. Triage describes the assessment of a patient's medical condition by a practitioner (commonly by an experienced nurse) and assignment based on requirement of medical attention.[24]

ACEM's[6] five categories of triage and outlines the maximum waiting times for patients before they receive treatment by a doctor for each of these categories as listed below:

Triage Category 1: Critically ill patients who require urgent attention. Typically arrive by ambulance, require resuscitation and need to be seen immediately.

Triage Category 2: May also be critically ill and/or in severe pain, and need to be seen within 10 minutes. Patients with breathing difficulties, serious bone fractures and/or severe chest pain (likely to be related as a heart attack).

Triage Category 3: Conscious patients but have serious illness, serious bleeding from wounds, fractures, dehydration, persistent vomiting or head injuries and need to be seen within 30 minutes.

Triage Category 4: Patients presenting with conditions which could be potentially serious but with non-severe injuries or symptoms such as mild head injuries, sprains, fractures, migraine, mild bleeding, abdominal pain or ear ache and should be seen within 60 mins.

Triage Category 5: Patients with minor conditions or symptoms who are considered non-urgent in terms of the requirement for medical attention, such as minor relapse with a chronic illness requiring stabilisation or may present with a condition developed and persisted for more than one week. Are to be seen within 120 minutes.

Once the triage nurse has assigned the patient, the task of collecting data pertaining to the medical history and provide instruction for their treatment begins (in a cubicle). This is immediately followed by **registration** to record the personal details of the patient including previous medical records. Should the patient require urgent medical attention registration is deferred.

Once the patient is stabilised, the risk of injury or deterioration is minimised and an action plan for further treatment or follow-up (if required) is established, **discharge** may be initiated. Patients presenting to EDs are typically discharged home as soon as treatment is completed. In these cases, patients leave the ED quickly and largely unaided.

EDs also function as a zone to hold patients awaiting admission to a ward and also provide services for patients returning back to hospital.

ED reform

More recently, issues surrounding the functioning of EDs have become a significant part of the National Health Reform introduced in 2010. As part of the five year National Health and Hospital Network Agreement, states and territories receive 50 per cent of efficient price for inpatient and outpatient services (including EDs) provided to public hospitals.[25]

National Emergency Access Target (NEAT)

More commonly known as the four-hour rule, NEAT stipulates that a pre-determined proportion on patients should be admitted, discharged or transferred from EDs within four hours of presentation. This reform has resulted in changes at a whole-of-hospital level to meet stipulated targets. No Australian jurisdiction has achieved an overall 90 per cent NEAT compliance for any significant reporting period.[26] Another proposal in the Agreement committed additional funding for EDs as a reward for meeting targets (upfront and capital development). However there was a lack of clarity as to how these funds would be allocated and if it would address functional and operational issues surrounding EDs.[27] As the implemented process improvements help hospitals to improve their NEAT performance, they are faced with the potential situation of requiring increasingly expensive interventions for decreasing returns for increased levels of NEAT compliance.[26]

Activity Based Funding (ABF) and the Emergency Department Performance Framework

Two other recommendations included the development of ABF and a performance framework for EDs. Activity based funding in EDs commenced in July 2010 and uses the Urgency-Related Groups (URG) classification to describe ED activities and is currently under review.[28] In July 2011, all states and territories signed the *National Health Reform Agreement – National Partnership Agreement on Improving Public Hospitals,*[25] establishing the financial incentives for public hospitals to meet targets including NEAT. Whilst there is no formal framework, Queensland EDs use NEAT, EDLOS (emergency LOS) and Patient Off Stretcher Time (POST) as time-based performance indicators which are reported both nationally and by Queensland Health.[29] These data are reported monthly and annually. Additionally, these performance data are reviewed by the Queensland Emergency Department Strategic Advisory Panel (QEDSAP) which is developing quality performance indicators as well.

[1] Since 1989 the Commonwealth Government has commissioned a number of studies with the goal of development a case-mix classification system for 'non-inpatients' to predict the power or urgency and outcome of ED costs in Australia. In 1992, the National Ambulatory Case-Mix Project (see: Lagaida). In 1995, (see: Jelenik) a single case-mix system able to encompass all patients presenting to EDs based on variables was developed. 'Cost –drivers' (cost, outcome and diagnosis) established Urgency and Disposition Groups (UDGs), and URGs. (see: Bond, Erwich-Nijhout, Phillips and Baggoley) URGs are derived from the urgency disposition group (UDG) which classifies patients into 12 groups based on disposition (admitted or discharged) and urgency (triage category 1-5), including a category for patients who did not wait for treatment as well as a category for patients who died. In 2013-14 IHA undertook an investigative review of national and international classification systems, recommending a staged development of a new classification to replace URGs and UDS using the ICD 10AM principal diagnosis short list as a key component of the new emergency care classification system to better account for patient complexity, the impact of drivers of cost in providing emergency care (activity based funding).

Chapter 3: Context, Trends and Characteristics

The aim of this chapter is to identify the characteristics of users and though comparison with the population, determine those characteristics which appear to contribute to the future impact and growth of utilisation in EDs.

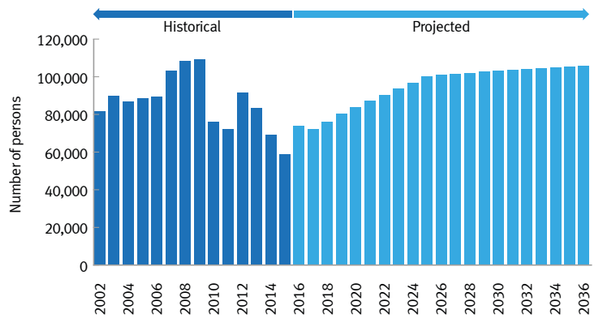
The future

Demographic factors have a large impact on health and on the demand for and delivery of health services. Population growth and ageing will have a significant impact on the health needs of Queensland over the coming decades. The key demographic factors likely to influence the health needs of the population now and in the future are discussed below.

Profile

There were an estimated 4.853 million Queensland residents in June 2015, comprising 20 per cent of the Australian population of 23.781 million.[31] The Queensland population has grown at the rate of about 86,000 persons a year over the past decade and is projected to increase by about 94,000 a year for the next 20 years,[31] when the total Queensland population is estimated to be about 6.8 million.[31]

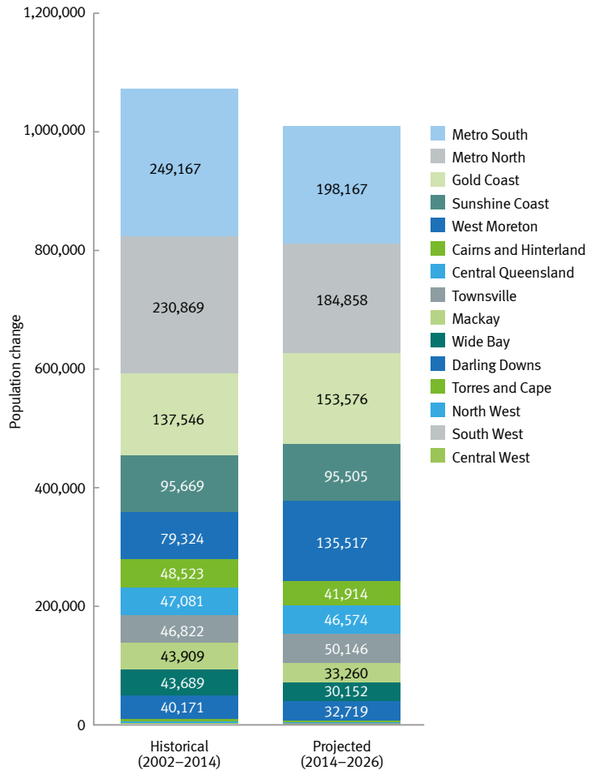
Figure 1: Population change (Queensland): Annual increase 2002-2036[1]



Two-thirds of the two million projected increase in the state population over the next 20 years is likely to occur in four Hospital and Health Services (HHSs): Metro South, Metro North, West Moreton and Gold Coast.[31]

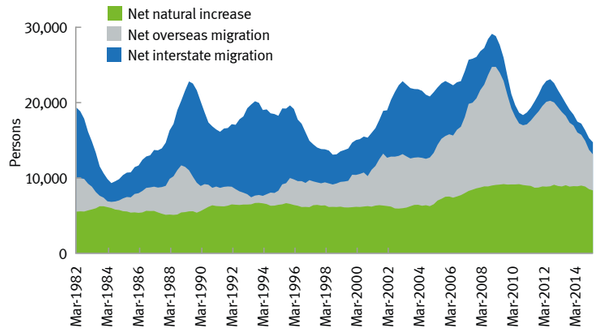
In 2015 there were 686,237 Queenslanders aged 65 years and older, 14 per cent of the total population (~1 in 8 Queenslanders), and is forecast to increase to 1 in 5 by 2036.[31] This will be a considerable driver of future health needs. The HHS with the largest populations of older people are Metro South (~20 per cent of the state population), Metro North (~19 per cent), Gold Coast (~13 per cent) and Sunshine Cost (~11 per cent). HHSs with the greatest relative increase in the number of older people between 2014 to 2026 are Torres and Cape (projected to double), West Moreton (~81 per cent growth), Central Queensland and North West (~66 per cent) with the remaining HHSs growing by at least 50 per cent.[1, 31]

Figure 2: Population change (Queensland): Change in total population by HHS 2002-2026[1]



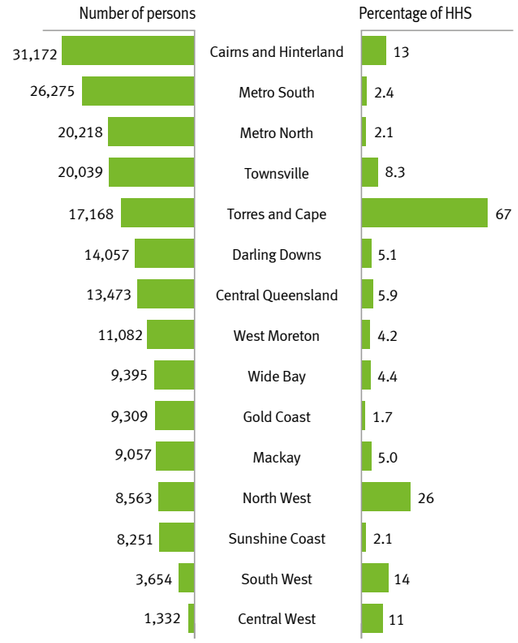
Overseas migrants currently make up about 32 per cent of the most recent annual increase in Queensland population. While this has declined in recent years it remains a major contributor to population growth.[1] Natural increase made the largest contribution to population (52.2 per cent) followed by (net) overseas migration (31.4 per cent) and interstate migration (16.4 per cent).[30]

Figure 3: Population diversity Queensland: Components of growth 1981-2015[1]



Queensland had the second largest proportion of the Australian indigenous population after New South Wales.[32] The estimated resident population of Indigenous Queenslanders in 2014 was 203,045 (4.3 per cent of the state population).[33] One-quarter of the Indigenous Queenslander population live in two HHSs: Cairns and Hinterland and Metro South.[32]

Figure 4: Population diversity Queensland: Indigenous Queenslanders by HHS (2014)[1]



Life expectancy

Within Queensland's population there are substantial differences in health status and life expectancy. The life expectancy at birth was 79.9 for men and 84.2 for women in 2014.[34] Although annual gains are slowing, life expectancy continues to increase. Queenslanders' life expectancy was a little lower than the national: 0.4 years less for men and 0.2 years less for women in 2014.[34] The gap between Indigenous and non-Indigenous Queenslanders has diminished slightly. The latest estimate is a gap of about 10 years.[34]

Thirty per cent of the life expectancy gains in Australia in the past 23 years were for years lived in ill health (health disability).[35]

The majority of adult Queenslanders experienced good health and wellbeing. Despite self-assessing their health to be good, many Queenslanders experience some level of disability or ill health, and even relatively minor conditions add to health system pressures.[36]

Australia's high life expectancy ranking among the OECD carries with it a relatively high disability burden, resulting in social and economic impacts including growing health system demands.

Burden of disease[2]

In a global study, Australia was within the top 188 countries worldwide for life expectancy, a leader in all cause death rates having improved over the past 23 years, and fourth among OECD centres for average YLL rate ranking for top 10 causes. However, based on the global assessment, Australia did not rank so highly on disability burden compared with the 34 OECD countries. In particular, Australia was lower in health adjusted life expectancy ranking due to the relatively high loss of healthy years and had slipped in ranking since 1990.

A national study showed that the total disease burden (DALYs) for the Queensland population was fairly evenly split between fatal outcomes (51 per cent YLL) and disability burden (49 per cent YLD).[37] Cancer (17 per cent), heart disease (14 per cent), mental disorders (12 per cent) and musculoskeletal conditions (12 per cent) caused the most DALYs.[37] Cancers (Lung 6.4 per cent), injuries (6.4 per cent) and heart disease (12 per cent) caused the greatest years of life lost.[37] Mental disorders, musculoskeletal disorders and respiratory conditions caused the greatest loss in healthy life.[37]

An estimated 44 per cent of deaths and 31 per cent of the total burden of disease and injury in Australia in 2011 was associated with 13 modifiable risk factors categorised as behavioural, metabolic and environmental risk factors.[37] Data for Queensland is not currently available. The leading risks were tobacco smoking (9.0 per cent of DALYs),[1, 37, 38] dietary factors combined (7.2 per cent).[1, 37, 39] Socioeconomic disadvantage accounted for 21 per cent of the total burden in Australia in 2011.[37] The age adjusted DALY rate in disadvantaged areas was 50 per cent higher than the rate in advantaged areas with the greatest relative difference between socio economic groups was endocrine diseases (diabetes), mental and substance use disorders.[37]

Remoteness accounted for 4.2 per cent of the burden in Australia in 2011.[1, 37] The disease group with the greatest relative difference in DALY rates between remote areas and cities was kidney and urinary disease, although the largest contributors to the absolute difference were heart disease and injuries.[1, 37]

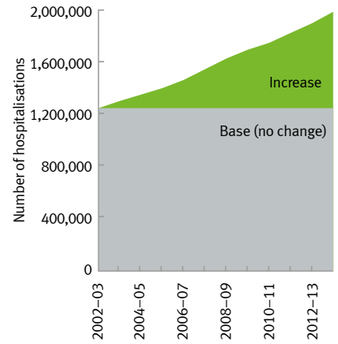
Hospital burden

In 2014 there were 169 hospitals (165 acute and 4 psychiatric) and 108 private hospitals (52 free standing day hospitals and 56 others) in Queensland which provided 10,450,560 occasions of care for non-admitted services with 2,071,130 admitted patient episodes (52 per cent in public hospitals).[41]

In 2013-14, 1.8 million occasions of emergency services were provided in public hospitals in Queensland. The number of occasions of service has increased by an average of 3.8 per cent per year since 2009-10, higher than the national increase of 2.6 per cent a year.[40, 40] In 2014-15, there were 1.4 million presentations to EDs in Queensland, having increased by 50,000 per year since 2008. If the current upward trend prevails, there will be about 0.6 million more presentations in 2026 than 2014-15, reaching a total of two million.[1]

In respect to admissions to hospital, in 2013-14, there were about 750,000 more admissions in Queensland than in 2002-03, an average increase of 68,000 each year[42] with the three major drivers of the increase of these hospitalisations identified as: population growth, population aging and changing rates of admission.[1,1]

Figure 5: All-cause hospitalisation trends by age group (Queensland): Total increase[1]



By analysing the increasing number of hospitalisations, these factors provide insight into how future change can be managed and modified.[1, 43, 44]

- *Population growth*. Of the 750,000 increase in hospitalisations in Queensland in 2013-14, the total number of hospitalisations has increased 70 per cent each year since 2002-03 with 46 per cent due to population growth. The number of hospitalisations per admitted person has increased by nine per cent in seven years from 2.1 per person in 2007-08 to 2.5 in 2014-15
- *Population aging*. Of the 750,000 increase in hospitalisations in Queensland in 2013-14, eight per cent were due to ageing. Hospitalisations for people aged 75 years and older have increased dramatically. In 2005-06 it was calculated that there was one hospitalisation for every older person in Queensland. This has now increased to about 1.5 hospitalisations for every older person. However almost half (47 per cent) of the state increases in hospitalisations are for the age group 50-74 years.
- *Changing rates of admission*. Of the 750,000 increase in hospitalisations in Queensland in 2013-14, 32 per cent were due to higher admission rates, while demographic factors are important drivers of the growth in health system pressures, independent of demographic change, the increasing rates of admission accounted for one-third of the average yearly increase in hospitalisations – the most modifiable factor for constraining pressures. Achieving constraint will require a focus on population groups that are contributing to the most change (50-74 year olds) and those for whom admission rates are increasing the most (75 years and older).

The remaining 14 per cent is a cause of an interaction between these factors.

[2]Burden of disease = Years of Life Lost + Years Lost to Disability. [DALYs = YLL + YLD]

Figure 6: All-cause hospitalisation trends by age group (Queensland): Age group contribution change[1]

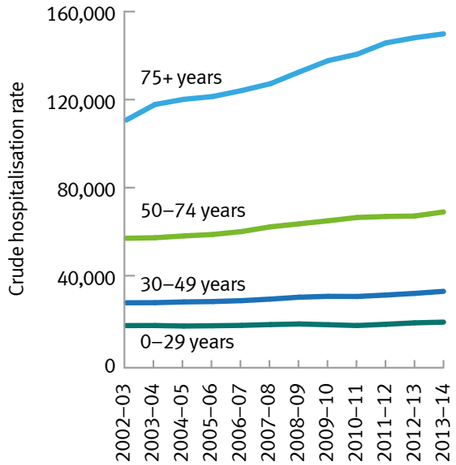


Figure 7: Change in all-cause hospitalisation rates between 2002-03 and 2013-14 by HHS and age group (Queensland)[1]

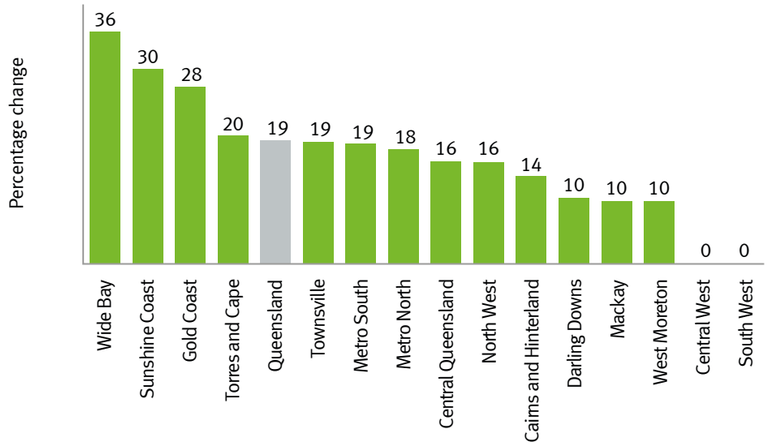
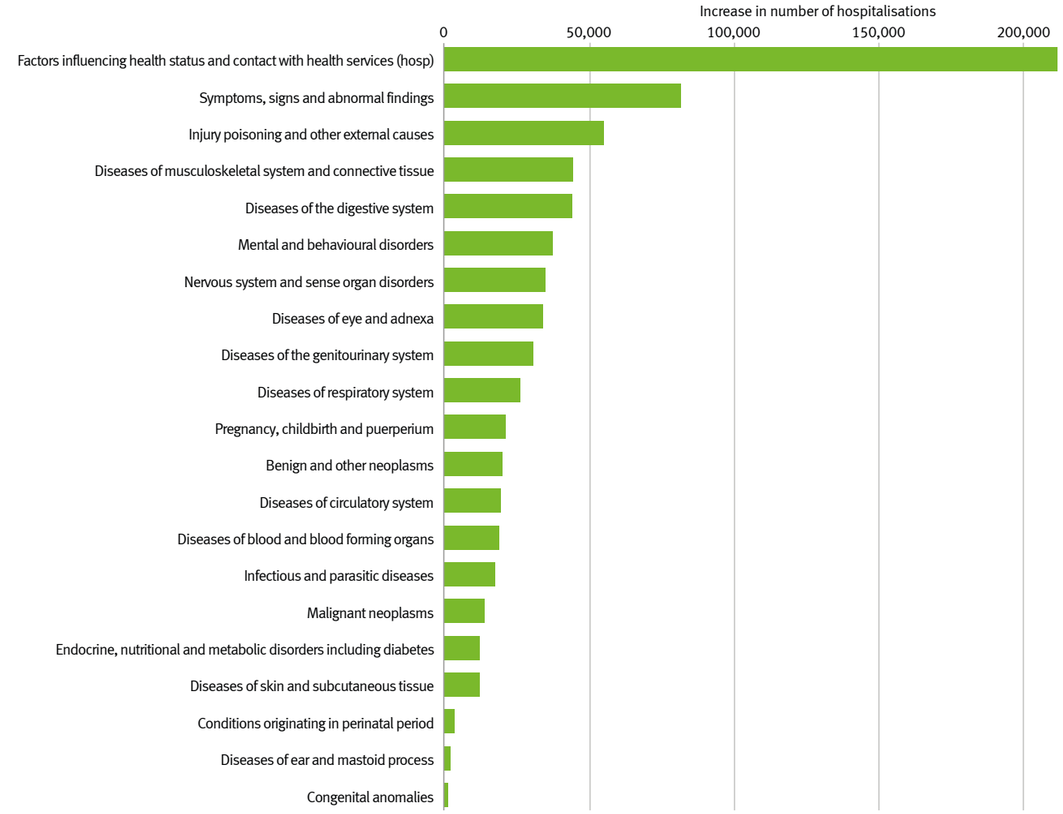


Figure 8: Increase in number of hospitalisations per year between 2002-03 and 2013-14 by ICD (Queensland)[1]



Potentially preventable hospitalisations[3]

A substantial number of hospitalisations are avoidable. In Queensland, the proportion of potentially preventable hospitalisations (PPH)s has not changed over the last four years, nor has the aged standardised rate.[1, 40-42, 45]

In contrast, the all cause hospitalisation rate increased by six per cent in this time.[1, 40-42, 45] There was a small peak in PPHs in early childhood with about 13 per cent for young children.[1, 40-42, 45] With age, there was a dramatic increase with about 42 per cent of PPHs for those aged 65 years and older over two years (2012-2014).[1, 40-42, 45] The PPH rate increased with increasing disadvantage. Disadvantaged areas were 90 per cent higher than advantaged areas over the last two years [1, 40-42, 45] The PPH was the lowest in major cities.[1, 40-42, 45] The rate in remote and very remote areas was higher

[3] Queensland defines potentially preventable hospitalisations (PPHs) as conditions where hospitalisation could have been avoided if timely and adequate non-hospital care had been provided. They do not include those hospitalisations that could have been avoided if the disease or condition had not been included in the first place such as heart disease or lung cancer. The use and calculation of this definition is based on the nationally defined indicators used to monitor health system progress (COAG (2010), AIHW (2012) Productivity Commission (2014))

outside major cities: 12 per cent higher in regional areas, 17 per cent higher in remote areas and 76 per cent higher in very remote areas. For Indigenous Queenslanders the rate was 2.6 times the non-Indigenous rate.[1, 40-42, 45] The proportion of PPHs in Queensland was 14 per cent higher than the national in 2013-14 and second after the Northern Territory.[1, 40-42, 45] There were many HHSs (9 of 16) with higher PPH rates than the Queensland average.[1, 40-42, 45]

Unlike demographic factors which are challenging to modify, changes due to admission rates are an opportunity to manage future pressures. International studies show that the availability of non-hospital care explains a significant proportion of the variation between geographic areas in hospitalisation rates for specified conditions.[46] While potentially avoidable hospitalisations will never be entirely eliminated, the variation between geographic areas demonstrates potential for strengthening the impact on non-hospital care.

Socio-economic demographics

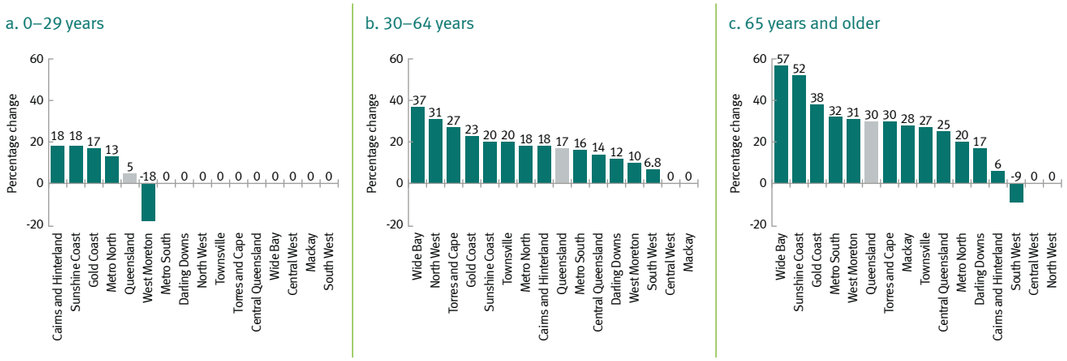
The Chief Health Officer's (CHO) 2016 Report (p.38)[1] identified that in 2013-14, of the estimated two million admitted patient episodes:[1, 42]

- 53 per cent were for women, 47 per cent were for men;
- 95 per cent were for non-Indigenous Queenslanders, five per cent for Indigenous Queenslanders;
- 18 per cent were for infants, children and young people aged 0-29 years;
- 44 per cent were for adults aged 30-64 years;
- 38 per cent were for people aged 65 years and older;
- 62 per cent were for people living in major cities, 36 per cent for inner and outer regional areas and 2.5 per cent for people living in remote and very remote areas; and
- 22 per cent were for people living in the most disadvantaged and areas and 18 per cent for most advantaged areas.

Over the past 11 years, trends in age adjusted hospitalisation rates did not differ by sex, Indigenous status or socio-economic status. The trends were greater for older people than younger and were higher in major cities than in remote and very remote areas.

Across most HHSs, hospitalisations are increasing more rapidly for older people than younger, with higher admission rates the most significant cause.

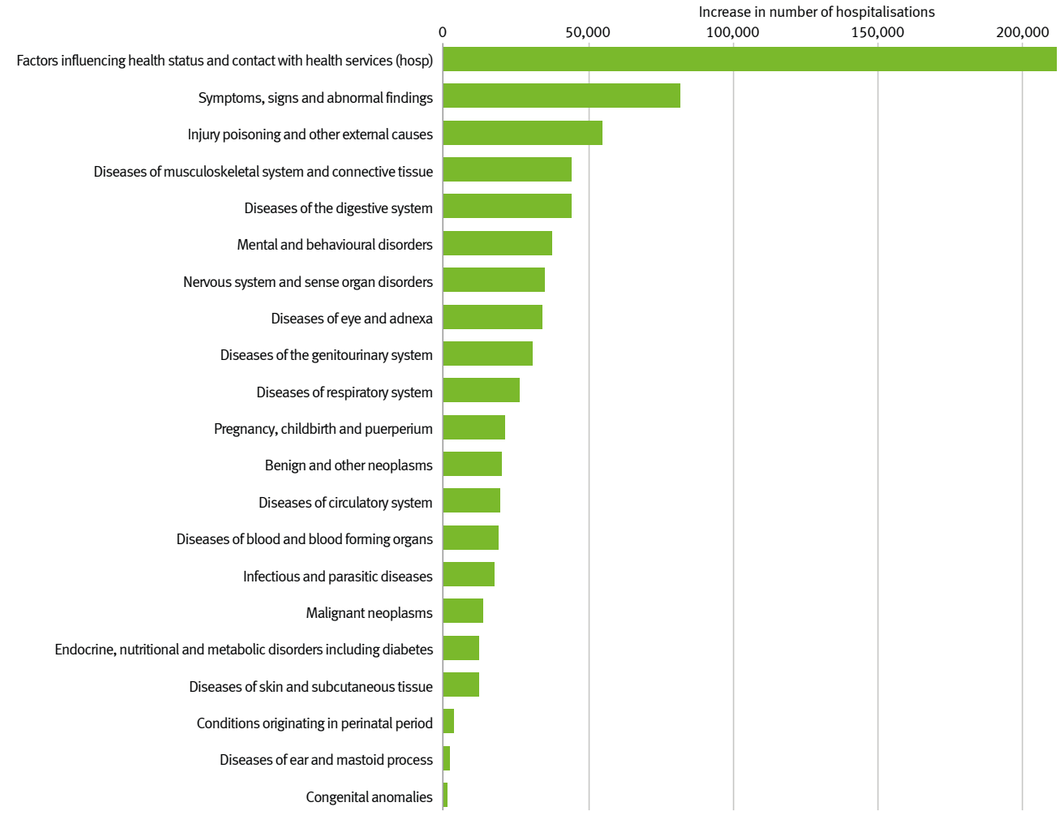
Figure 9: Increase in number of hospitalisations per year between 2002-03 and 2013-14 by Age Groups (Queensland)[1]



Changing patterns

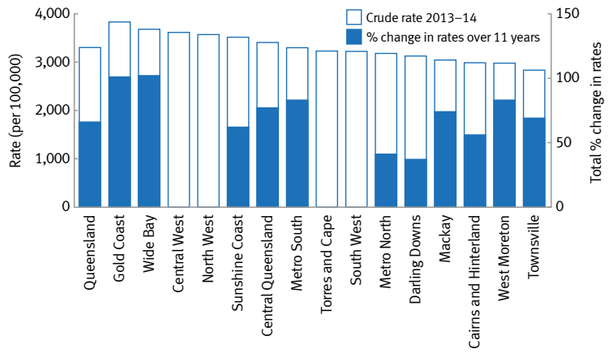
The 2016 CHO Report[1] calculates that there were 2,008,341 (public and private) hospitalisations (for 909,124 unique patients) in Queensland,[1] and that the largest causes[4] for the increase of the ~68,000 hospitalisations a year were for a wide range of reasons not principally associated with disease diagnosis. Treatments, investigations, specific procedures, symptoms and signs, together accounting for one-third of total hospitalisations and more than one-third of the annual increase in admissions and patient days over the past 11 years.[1, 42] The rate of hospitalisation for symptoms and signs and abnormal findings was reported evident in all but four HHSs with the greatest increase in Wide Bay and Gold Coast.

Figure 10: Increase in number of hospitalisations per year between 2002-03 and 2013-14 by ICD (Queensland)[1]



[4] Based on ICD chapters

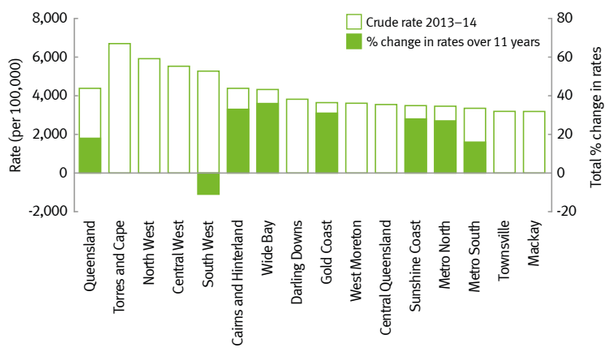
Figure 11: Hospitalisations for selected conditions - crude rates and trend 2002-03 and 2013-14, by HHS (Queensland): symptoms, signs and abnormal findings of hospitalisations[1]



The *underlying causes*[40-42] and the extent of the change in hospitalisations in 2013-14 from 11 years earlier:

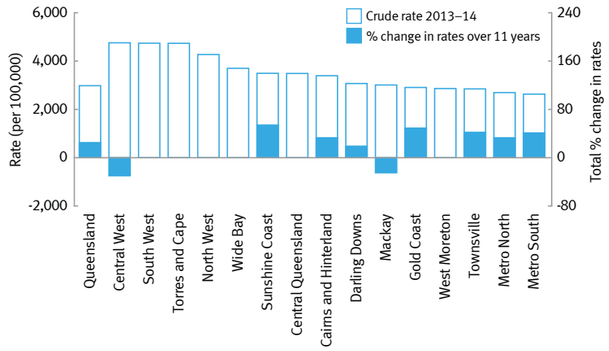
- Variations occurred by *selected specific cause*. In particular there were 13 per cent more hospitalisations for renal dialysis, seven per cent increase in hospitalisations for injuries and eight per cent increase in hospitalisations for infectious diseases in Queensland.
  - Across the state the relative change was evident in seven HHSs for infectious disease hospitalisations, with the greatest increase in Wide Bay, followed by Cairns and Hinterland, Gold Coast, Sunshine Coast and Metro North. However, the highest rates were in remote HHSs (Torres and Cape, North West, Central West and South West).

Figure 12: Hospitalisations for selected conditions - crude rates and trend 2002-03 and 2013-14, by HHS (Queensland): infectious disease hospitalisations[1]



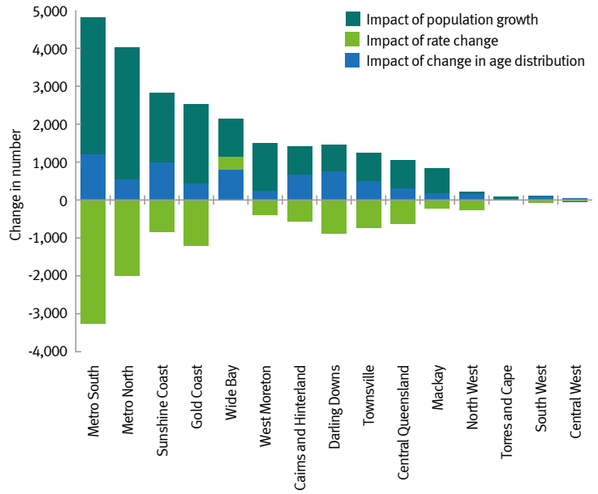
  - Hospitalisation rate for injuries increased by 25 per cent between 2003-04 to 2013-14. The rate change was most evident in nine HHSs with the greatest increase in Sunshine Coast, followed by Gold Coast, Townsville, Metro South, Metro North and Cairns and Hinterland. While the highest rates for infectious disease hospitalisations were in the remote HHSs, in the past 11 years the rates either did not change or they declined in these areas.

Figure 13: Hospitalisations for selected conditions - crude rates and trend 2002-03 and 2013-14, by HHS (Queensland): injury hospitalisations[1]



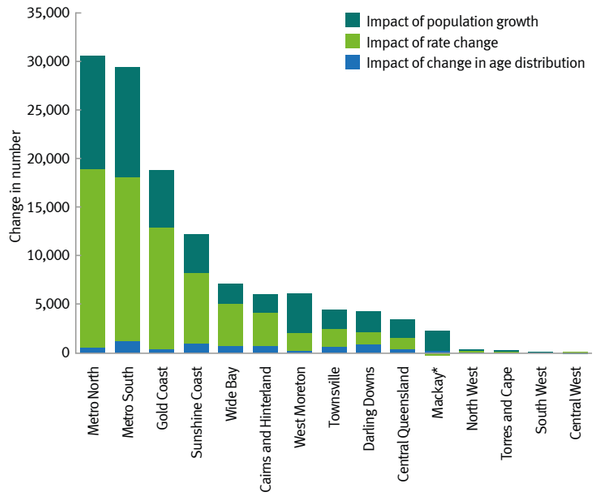
- Declined by rate of admission for *lifestyle related chronic conditions* and shorter days which resulted in 46,000 fewer patient days. Improved lifestyles have the power to reduce the demand for hospital services and the data. Although population growth has caused the number of hospitalisations to increase in 11 of 15 HHSs, the data indicates that the pressure on hospitals has substantially reduced by falling admission rates. Three HHSs (South West, Central West and Torres and Cape) reported no statistical differences. Wide Bay reversed the state trend, with the admission rate driving the hospital burden combined with growing and an ageing population.[1, 40-42, 45]

Figure 14: Hospitalisations for selected conditions - crude rates and trend 2002-03 and 2013-14, by HHS (Queensland): injury hospitalisations[1]



- Increased by 21 per cent for *chronic conditions related to age and disability*. Chronic conditions associated with ageing (and increasing disability burden) were a major contributor to the steady increase in hospitalisations in Queensland over the past 11 years. Hospitalisations for these conditions increased in all HHSs with two-thirds of the state increase in the high population HHSs (Metro South, Metro North, Gold Coast and Sunshine Coast). In six HHSs (Metro North, Metro South, Gold Coast, Sunshine Coast, Wide Bay and Cairns and Hinterland) increasing admission rates for chronic conditions were the dominant driver.

Figure 15: Underlying causes of change in hospitalisations for chronic conditions between 2002-03 and 2013-14, by HHS: chronic conditions of ageing and disability[1]



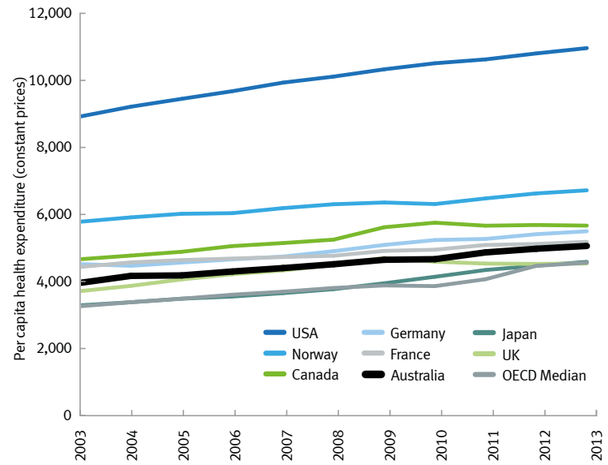
- Increased by ~5000 more hospitalisations for *tooth decay*. Rate increase was evident in North West HHS which increased by 81 per cent. Rates decreased in five HHSs: West Moreton, Mackay, Metro South, Townsville and Cairns and Hinterland, with no change in the remaining HHSs.

Cost

Health system expenditure

The AIHW estimated that in Australia in the 2014-15 financial year, about 9.7 per cent ($161.6 billion) of GDP was expended on health.[47] This represents AU$6,846 per person in Australia.[47] Compared with other OECD countries; the USA spends about 16.4 per cent of GDP (US$8,713) per person on health, while the UK spends about 8.5per cent (US$3,235 per person).[48] Australian health spending (9.3 per cent) is close to the OECD median (per capita and proportion of GDP), and has remained in similar position over the past decade.

Figure 16: Trend in per capita spending on health (constant prices), selected OECD countries[1]



Total healthcare spending increased by five per cent per year nationally between 2003-04 and 2013-14.[47] Health (including hospitals, primary and community care) is the largest component of Queensland Government expenditure, accounting for 29 per cent of the 2016-17 state budget.[49, 50] About with two-thirds (69 per cent) was funded by the Federal Government (40 per cent) and 30 per cent by the State Government.[49, 50] In Queensland, $32.1 billion[49, 50] was spent on health in Queensland in 2013-14, an average of $6,319 per person. This is similar to the national spending in 2013-14.[47] The spending of health in Queensland has increased 51 per cent in a decade: about $200 more per year per person.[47]

Hospital expenditure

The largest component of health spending in Queensland was for hospital services (40 per cent or 11.8 billion in 2013-14, with 30 per cent of this on public hospitals).[47] The average cost of providing hospital services was $12,516 for every person who had been hospitalised that year. Spending on hospitals in Queensland has increased about 88 per cent over 10 years, more than triple the rate of population increase (in this period, Queensland population grew by 26 per cent).[51]

Seventy-five per cent of total health spending is for people under the age of 75 years, although per capita spending increases with age.[58] About 10 per cent of public hospital costs are associated with treating people in the last year of life.[58, 59]

Unhealthy lifestyles are a bigger cost to the wider community than to the health sector. Risk factors affect the individual directly through disease development resulting in costs associated with heathcare delivery and treatment. However, a person diagnosed with a condition may have a diminished ability to participate in the workforce resulting in productivity losses and other intangible costs of loss of wellbeing.[60]

Figure 17: Recurrent spending on health goods and services 2013-14: Queensland

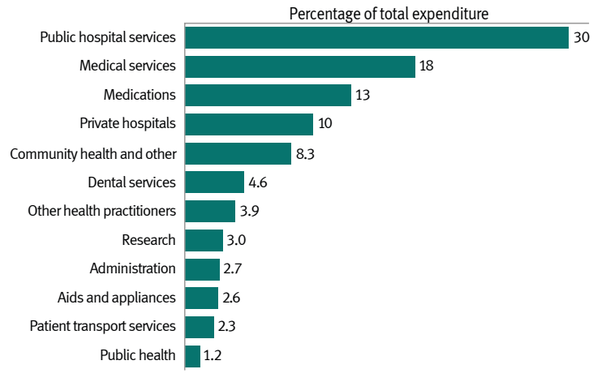


Figure 18: Estimates of hospital expenditure by disease group 2012-13: Queensland[1]

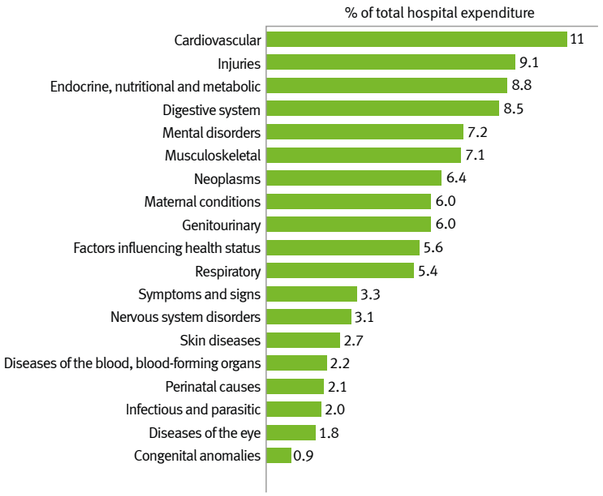
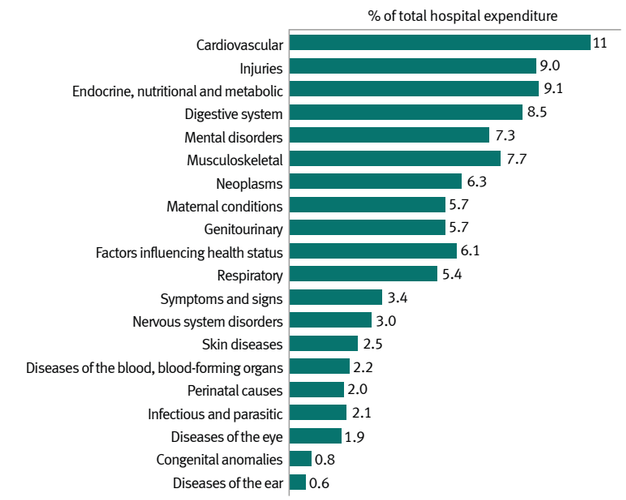


Figure 19: Estimates of hospital expenditure by disease group 2012-13: Australia[1]



Hospital construction costs

Three new hospitals have been built in Queensland in the past three years:[51] Lady Cilento Children's Hospital (LCCH), Gold Coast University Hospital (GCUH), and Sunshine Coast University Hospital (SCUH), with a combined expenditure of $5.08 billion dollars.[52] The cost per acute bed at GCUH (824 acute beds) is $2,184,466.52 The third most expensive building in the world is Royal Adelaide Hospital which cost $2.3 billion[53] representing a cost of $2,625,000 per acute in-patient bed.

For comparison, the cost of the University of Texas South-West Hospital (532 acute beds) was A$1.08 billion or A$2,030,07554 and Parkland Hospital (862 beds) in Dallas was A$1,809,744 per acute bed.[54]

According to a report by Townsend and Turner[55] international construction management experts, the cost per square meter for Australian hospital construction in 2016 was A$5,800. Table 1 displays comparative international construction costs.

Table 1: Comparison of estimated hospital construction USA, Norway and UK to Australia

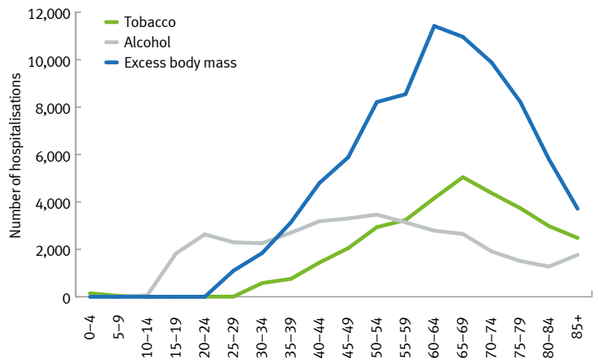
Australia	USA	Norway	UK
$AU 5,800	$AU 4,008	$AU 5,877	$AU 4,933

Risk Factors and determinants of disease

Smoking

Of the risk factors, smoking was the largest cause of unhealthy years in 2011, causing 4.3 per cent of YLD burden.[61] Data for Queensland is not currently available.[61] In 2013-14 there were about 34,000 hospitalisations due to smoking in Queensland: 1.6 per cent of the two million hospitalisations for all causes in that year.[44] The most recent national assessment of the cost of tobacco smoking was in 2004-05.[62] Expenditure data for Queensland is not currently available. However, based on Queensland's share of the Australian population, the CHO 2016 report[1,44] estimates that in 2004-05, the financial cost of smoking to the Queensland population was 2.4 billion, with $0.06 billion spent on healthcare and $1.15 billion on lost production in the workplace. That is, tangible cost: three per cent spent on healthcare with 97 per cent associated with lost production and impact on household finances. The intangible losses associated with early deaths were assessed at $3.9 billion, taking the total cost of smoking to Queensland society in 2004-5 to $6.3 billion.

Figure 20: Hospitalisations due to selected risk factors (overweight, tobacco, alcohol) by age: Queensland[1]

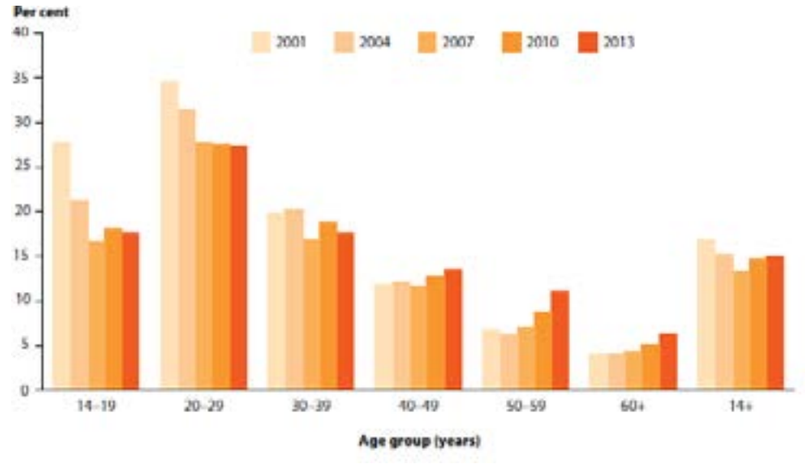


Illicit drug use

In 2011, of the risk factors, illicit drug use was the tenth largest cause of disease burden in Australia, accounting for 1.8 per cent of total DALYs.[37] The main outcomes of illicit drug use were attributable to drug use disorder (40 per cent of DALYs), chronic liver disease (31 per cent), liver cancer (20 per cent) and injury including suicide (eight per cent). The remaining 0.5 per cent was attributed to HIV/AIDS, and acute hepatitis B and C.[37] Illicit drug use is estimated to have caused 1.3 per cent of the YLD burden in Australia.[37] Data for Queensland is not available. In 2013-14 there were 6,900 hospitalisations, 0.3 per cent of the two million hospitalisations for all causes in that year. Of these, 63 per cent were for drug dependency, 26 per cent chronic liver disease, seven per cent liver cancer, six per cent injury (including suicide) and the remaining 0.6 per cent HIV/AIDs and hepatitis. The most recent national assessment of the costs of drug use was in 2004-05. Based on the Queensland's share of the Australian population, the CHO 2016 report[1] estimates that in 2004-05, the financial cost of illicit drug use to the Queensland economy was $1.4 billion, with $0.04 billion spent on healthcare, $0.4 billion of lost production and $0.89 billion on injury and crime. Health system costs were three per cent of the tangible or financial costs. Intangible losses associated with early deaths and loss of wellbeing was assessed at $0.26 billion taking the total cost of illicit drug use to Queensland society in 2004-05 to $1.64 billion.

Patterns of drug use and harms change. While the prevalence of drug used is still relatively low, there has been consistency in the increase of methamphetamine use in the community, in particular: the crystalline form ('ice') which is commonly smoked or injected; damp or oily substance ('speed') which is snorted, injected or swallowed. Among people who use methamphetamine ,crystal meth (ice) use more than double between 2010 and 2013 (from 22 per cent to 50 per cent) while the use of speed has almost halved (51 per cent to 29 per cent).[63] This has resulted in a range of harms experienced by individuals and families and communities and is impacting of ED presentations, hospitalisations and treatment through drug and alcohol services.[63] In 2013, about 1 in 40 Queenslanders aged 14 or older reported to having used methamphetamine in the past 12 months with about 1 in 8 (12 per cent) reporting to be daily users[64]. There were 1,619 methamphetamine related presentations to EDs in Queensland in 2014-15, five times more than in 2009-10.[64]

Figure 21: Percentage of illicit use of any drug, people aged 14 or older, by age (2001-2013)[65]



Alcohol

Of the risk factors in 2011, alcohol was the fourth largest cause of disease burden in Australia, accounting for 5.1 per cent of total DALYs.[37] Data for Queensland is not currently available. The most recent national assessment of the cost of alcohol use was in 2004-05.[62] Based on Queensland's share the Australian population at this time, the financial cost of alcohol consumption to the Queensland economy was $2.17 billion, with $0.4 billion spent on healthcare, $0.72 billion in productivity losses, $0.31 billion in home production losses, $0.32 billion in crime and $0.44 billion in road transport injuries. Health system costs were 18 per cent of the tangible financial costs. Intangible losses were associated with early death and loss of wellbeing and were assessed at $0.9 billion taking the total cost of excess alcohol to Queensland society in 2004-05 to $3.06 billion.

Exercise

Physical inactivity accounted for five per cent of DALYs in Australia in 2011, and was the fifth largest risk factor associated with health loss[37]. Queensland data is currently not available. More than half of the health loss from lack of physical activity was associated with heart disease (51 per cent of DALY burden), 14 per cent with diabetes, 13 per cent with bowel cancer, 11 per cent with stroke and 11 per cent breast cancer.[37] Physical inactivity cased 2.1 per cent of YLD burden in Australia in 2011.[37] Queensland data is not available, however the CHO 2016 report[1] estimates that in 2013-14, there were about 20,000 hospitalisations in Queensland due to physical inactivity, involving about 77,000 patient dates (one per cent of the two million hospitalisations in Queensland that year). Of these hospitalisations 70 per cent were for heart disease and stroke, 17 per cent were for breast and bowel cancer and 13 per cent for diabetes. In 2008, it was estimated that lack of physical activity resulted in $672 million in health sector costs nationally and $1.135 million in production losses.[66] Based on the population share (in 2008), the CHO 2016 Report estimates that this was a total of $361 million in Queensland, where 37 per cent ($134 million) was associated with costs to the health sector and 63 per cent ($227 million) was for production losses.

Obesity

Overweight and obesity caused 2.9 per cent of YLD burden in Australia in 2011.[37] Data for Queensland is not currently available. In 2013-14 there were about 83,500 hospitalisations due to high body mass in Queensland, four per cent of the two million hospitalisations for all causes in that year.[1, 44] More than half (55 per cent) were associated with diabetes-related renal dialysis. The financial cost of obesity is high and was estimated in 2015 at $8.6 billion nationally (about $1.72 billion in Queensland),[67] 40 per cent tax foregone ($0.75 billion) and 12 per cent productivity losses ($0.20 billion). The impact of loss of wellbeing and early death was assessed at $47.4 billion nationally ($9.5 billion in Queensland) taking the total cost of obesity in Queensland in 2015 to $11.2 billion. Food and nutrition caused 2.9 per cent of YLD burden in Australian in 2011.[37] Data for Queensland is not currently available. High body mass contributed a similar proportion. There were about 8,000 hospitalisations for conditions that resulted from low fruit and vegetable consumption in Queensland in 2013-14, 0.08 per cent of all hospitalisations.[1, 44] In 2008, it was estimated that inadequate fruit and vegetable consumption resulted in $206 million in health sector costs nationally, and $63 million in production losses.[66] Based on population share, this was a total $53.8 million in Queensland where 77 per cent or $41.2 million was associated with costs to the health sector.

Violence

Intimate partner, domestic and family violence was responsible for one per cent of the female burden of disease and injury in Australia in 2011.[37] For women aged 25-44 years, IPV was the third leading cause of burden in 2011 accounting for 2.7 per cent of total burden peak for women aged 40-49 years.[37] Almost half of the burden was associated with self-inflicted injury, 40 per cent for depressive disorders and 12 per cent for homicide. The total burden of disease increased by about 14 per cent between 2003 and 2010, being attributed to population growth and changes in the population structure. In 2014-15 there were 1,895 hospitalisations in Queensland for domestic assault and 69 per cent were females, with the majority of these hospitalisations (1,190) due to assault by a partner and of these 83 per cent were women.[68] This is an increase of 73 per cent between 2005-06 and 2014-15.[69] Domestic assault is also associated with a higher rate of discharge against medical advice (5.7 per cent in women aged 16-64 years compared with six per cent of all-cause hospitalisations).[68] Partner violence against women was estimated to cost the Australian economy $12.5 billion in 2014-15.[67]

Socio Economic Status

Socioeconomic levels influence disease and wellness. The is an inverse relationship between the socioeconomic status and the frequency of disease as well as perception of wellness.

Future costs

Almost half the projected increase in health spending over the next 30 years is for more frequent treatments, with the remainder due to population increase and ageing.[70] The projected increase in volume of services per treated case is indicative of increasing rates of presentations, hospital admissions and treatments (see: PPH section).

The costs for ED attendances and acute hospital admissions are determined by the Independent Hospital Pricing Authority and are estimated as follows.[71] For admitted patients, Queensland ranks in the middle of the list and close to the national average.[71] New South Wales, Tasmania and Australian Capital Territory are the most expensive per presentation.[71] In the non-admitted group, Queensland is ranked in the middle of the list and is close to the national average.[71] This can be interpreted to indicate Queensland's hospital system is relatively efficient and cost effective.

Table 2: Cost for admitted patients by jurisdiction[71]

		Total		Average
Jurisdiction	**No. Hospitals**	**No. Presentations**	**Expenditure ($M)**	**Cost per presentation ($)**
NSW	59	565,851	636	1,123
Vic	37	458,830	407	887
Qld	82	412,989	379	917
SA	13	134,491	116	863
WA	29	193,389	139	719
Tas	4	36,052	42	1,163
NT	5	39,101	24	624
ACT	2	34,191	50	1,456
Admitted ED	**231**	**1,874,894**	**1,793**	**956**

Table 3: Cost for non-admitted patients by jurisdiction[72]

		Total		Average
Jurisdiction	No. Hospitals	No. Presentations	Expenditure ($M)	Cost per presentation ($)
NSW	59	1,477,652	570	385
Vic	37	1,042,220	392	382
Qld	107	1,315,272	656	499
SA	13	311,208	158	507
WA	16	471,703	258	548
Tas	4	112,153	44	396
NT	5	105,982	41	385
ACT	2	91,647	58	634
Non-Admitted ED	**243**	**4,927,837**	**2,183**	**443**

The comparison cost table below displays the admitted costs and emergency presentation costs by jurisdiction for 2014. Compared to cost per bed day for admitted patients, EDs are less expensive with Queensland's cost comparable to the national average. New South Wales is the most expensive for total costs but has 30 per cent of national emergency presentations. Nationally, EDs are a cost-effective service.

Table 4: ED Presentation Cost by Jurisdiction[28]

Jurisdiction	No. of Hospitals	No. of Presentations	Costs ($M)	Average Cost/ Presentation ($)
NSW	59	2,043,503	1,205	590
Victoria	37	1,501,050	805	536
Queensland	107	1,728,261	1,035	599
SA	13	445,699	274	614
WA	29	665,092	397	598
Tasmania	4	148,205	86	582
NT	4	145,083	65	449
ACT	2	125,838	108	857
National	**256**	**6,802,731**	**3,976**	**584**

Table 5: Cost of acute admissions by jurisdiction[40]

		Total		Average			
Jurisdiction	No. Hospital	No. Separations	Cost ($M)	Length of Stay (days)	Cost per day ($)	Cost per separation ($)	Cost per weighted separation ($)
NSW	89	1,482,917	7,779	3.10	1,694	5,249	4,964
Vic	63	1,321,664	5,531	2.47	1,694	4,185	4,268
Qld	138	1,040,374	4,929	2.40	1,974	4,738	4,858
SA	16	339,867	2,077	3.13	1,955	6,111	5,596
WA	35	491,867	2,770	2.55	2,209	5,633	5,879
Tas	4	106,101	551	2.65	1,959	5,197	5,106
NT	5	122,377	548	2.26	1,983	4,481	7,054
ACT	2	93,291	636	2.88	2,363	6,814	6,872
National	**325**	**4,998,408**	**24,822**	**2.70**	**1,839**	**4,966**	**4,966**

Chapter 4: Concepts and Literature Review

This chapter provides a summary of a scoping review undertaken by the project team to identify interventions and patient streaming models of care to address ED overcrowding in published research.

Introduction

The input of patients (ED visits) has increased significantly over the past two decades and because modern EDs can diagnose and treat a much wider range of patients compared to 20 years ago, it is unlikely that the trend in patient visits will decline in the near future. The destination of patient disposition is mostly either home or stay at hospital. The process of ED admission is often difficult and patients need to wait and receive treatment in the ED. However, access block and output of patents is not an issue that can be easily tackled by the ED alone. In order to balance admissions and discharges, a larger scale of planning and coordination is needed. For example, health system administration need to distribute available beds according to patient flow, different specialities, staffing changes and seasonal fluctuations. The report[73] summarises the evidence on the effectiveness of a variety of models and interventions aimed to address congestion in the ED. As ED crowding worsens, it is important for departments to improve operations to promote patient throughput.

Summary of results

The initial search retrieved 5,518 articles and/or abstracts. All duplicates were removed. The title of each article was then screened for relevance. Titles that were not relevant to the key focus areas around ED throughput were excluded from the study. The remaining abstracts and full articles were then screened for potential inclusion in the review, based on inclusion and exclusion criteria. A total of 98 were included. The characteristics and findings are detailed in a previously published report.[73] These comprised a variety of method logical designs ranging from before and after studies (n=28) [74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 97, 98, 99] RCTs (n=13), [100, 101, 102, 103, 104, 105, 106, 107, 108] prospective cohort study/s (n=19) [109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133] and retrospective cohort study/s (n=22) [113, 134, 135, 136, 137, 138, 139, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 91, 149]. The majority of papers (n=36) of the studies included in the review were conducted in Australia [100, 109, 112, 75, 102, 103, 135, 150, 151, 152, 137, 82, 140, 141, 117, 118, 142, 116, 143, 153, 154, 84, 84, 106, 123, 124, 125, 145, 86, 87, 91, 130] the USA (n=28), [155, 156, 157, 101, 77, 77,158, 119, 120, 83, 159, 85, 144, 107, 160, 161, 146, 88, 90, 127, 128, 147, 92, 93, 94, 95, 96, 99] UK (n=16) [115, 78, 138, 162, 163, 164, 165, 122, 166, 126, 89, 129, 131, 108, 167, 133] and then Canada (n=8), [104, 79, 80, 81, 139, 121, 148, 149]. The remaining papers were categorised from other Europe (n=7), [110, 111, 111, 168, 114, 169, 98] Asia,[132] Africa[113] and New Zealand.[74] Most were single site studies (n=52)[74-76, 79-81, 83, 85, 89-92, 94-98, 102, 104, 105, 107, 108, 112, 115, 120, 122, 125-127, 129, 131, 132, 136-138, 141-143, 145, 147, 149, 150, 152, 156, 158, 159, 161, 162, 164, 165, 170].

From the database search the most predominately evaluated model of care is Triage with 30 papers identified [76, 77, 83, 86, 87, 89, 90, 93-95, 99, 104, 105, 108, 109, 113, 120, 121, 127, 131, 132, 134, 146, 160, 161, 163, 164, 166, 167] followed by 23 papers categorised as Fast Track and Rapid Assessment [74, 110, 111, 78-80, 84, 86, 91, 97, 114, 116, 123, 124, 135-137, 143, 147, 152, 168, 170] studies. The database search also identified [21, 81, 82, 103, 112, 115, 138, 141, 150, 151, 156, 162, 118, 122, 125, 129, 142, 145, 153, 154, 169] papers which could be categorised as Nursing Scope of Practice.

All papers (98) reported on EDLOS outcomes. The majority of papers (87) also reported on wait time [74-84, 86-88, 90-95, 97, 99-106, 108-111, 113, 114, 116-121, 123-133, 135-139, 141, 142, 144-149, 151-154, 156-163, 165-170] followed by turnaround time (41)[73-76, 80, 88, 90, 93, 95, 99, 103, 105, 108, 110, 115-117, 121, 122, 124, 125, 127-129, 132, 136, 137, 140, 141, 144, 146-148, 152-154, 157, 158, 166, 168] and (32) left without being seen (LWBS)/left without completing treatment (LWCT). [75, 82, 83, 88, 89, 92-94, 98, 101, 103, 119, 120, 122-124, 129, 131, 132, 135, 144-146, 149, 152, 156, 159, 164, 165, 168, 170] The characteristics and findings of these papers are summarised in a previously published report.[72]

Sample size varied from 107,100 to 180,870.89 Twenty–seven (27) studies[73, 74, 78, 83, 85, 88, 91, 96, 97, 99, 105, 109, 113, 122, 123, 129, 134, 141, 142, 145, 146, 154, 156, 160] were unclear as to the sample size.

Eleven (11) [171, 172, 173, 174, 175, 176, 177, 178, 179, 180] systematic reviews were identified from the database search. The characteristics and findings of these papers are summarised in a previously published report.[72]

Summary of Findings

This scoping review of the academic literature shows that few and often methodologically limited studies have been published concerning front-end operational improvement strategies. Of those published only a handful noted the effects of these strategies on patient outcomes.

Patient streaming

Patient streaming is a way of directing flow so that patients with minor injuries or illnesses can be seen in a separate area of the ED to patients with complex care requirements. The most common example of streaming minor presentations is fast track. Streaming has been reported to benefit all ED patients, not just those in fast track, with a number of studies in this review indicating patients were seen by a doctor more quickly. Following implementation of streaming ED LOS was reduced as well as patients who did not wait for treatment.

Triage

Triage systems have traditionally been used to ensure that the most urgent patients receive timely service. The majority of the studies included in this review have been able to demonstrate that triage systems can also have a positive effect on patient flow, as measured by waiting time and ED LOS. However not all triage systems are the same, and the types of services provided at triage may influence these outcomes. Triage systems may be relatively simple seeking only to put patients in order or priority or allocate appropriate services. Other more complex systems enable simple treatment to take place at the time of triage, which could potentially remove a patient from the queue or increase efficiency of future treatment. The majority of papers that analysed **team triage** concluded that dedicating a senior doctor in triage reduced the wait time for patients to see a doctor, decreased LOS and lowered the proportion of left without being seen/leaving without completing treatment. However, the impact of patient satisfaction was inconsistent across the studies identified. Triage systems may vary along the continuum until at some point the intervention becomes extensive enough that the process becomes assessment and treatment rather than triage.

Fast Track and Rapid Assessment

Apart from triage, **Fast Track and Rapid Assessment** was the most studied intervention method

supported by the strongest scientific evidence. Fast-tracking patients with less severe symptoms results in shorter wait times, ED LOS and fewer patients leaving without completing treatment or being seen. It has been reported that implementation of **computerised tracking systems and whiteboard systems** improves patient flow, shortens patient wait times, reduces left without being seen rates as well as improving patient and staff satisfaction as well as communication. Tracking systems (electronically) may be a useful addition to ED performance improvement initiatives not only to further streamline practices but also capture metrics and data to build on capacity and to continuously improve. Clearly, the use of these technologies together with other communication technologies in the ED setting and their effect on outcomes has yet to be fully explored.

In an attempt to address the growing ED population in the context of limited medical workforce, the adaption to the **scope of practice of nurses** in the ED is being presented as a staffing option. The results for the reviews included in this study suggest that the changing scope of the nurse, especially when dedicated to seeing minor treatment patients have improved wait time and ED LOS as well as improve patient satisfaction, with little to no impact on quality of care. For the low acute patients in congested EDs as well as rural hospitals, the extension of the scope of practice for nurses may represent a viable and effective option allowing optimal use of limited physician resources and improving access to emergency care for the population.

In response to escalating workloads and waiting times and deteriorating patients, an attempt to shorten ED LOS, the scope of practice of nurses has expanded to allow **nurses to initiate investigations** and interventions including **blood tests, analgesia and x-rays**. The studies included in this review found that the majority of papers analysing nurse initiated analgesia, blood tests and x-rays found decrease to pain assessment, reduced length of stay and improved patient satisfaction.

Medical Assessment Units

Medical Assessment Units staffed by multi-disciplinary teams led by acute medical physicians have the potential to improve the quality and safety of care of a significant proportion of acutely ill patients presenting to hospital. Also, **Short Stay Units** have been co-located with many EDs to reduce LOS in the ED. These units accommodate patients requiring more time in the ED. The systematic reviews and the single study included in this scoping report show that short stay units and observation wards have the potential to benefit patients, reduce LOS, and improve efficiency of the ED.

Conclusions

Worldwide, ED congestion is a problem that is demanding hospital administrators and policy makers understand the complexity of front-end hospital services and understand the impact congestion has on a patient journey. The review indicates there is a plethora of literature available indicating the deleterious effects of ED congestion on patient outcomes. Improving access and flow is important with patient safety remaining of paramount importance.
The scoping report has evaluated key initiatives introduced to improve patient flow in EDs. Based on the papers reported, it seems that there is a significant body of literature on models of care and strategies to manage ED congestion. The existing streaming, care processes and analysis of ED crowding is most frequently linked to quality of care measures such as the time spent waiting and their LOS in the ED.

The review identified that strategies are often limited in applicability from one institution to another. However, there do appear to be some overarching alterations in behaviour and management that could serve to better assess, treat and flow patients through the ED. Useful strategies include improvements in triage (and registration), nurse initiated actions, fast track and point of care testing. The result of this review also highlight important gaps in knowledge with respect to the prioritisation of care processes and outcomes and the association between congestion and the quality of care in specific populations and settings. For example, the majority of studies took place in large urban or suburban tertiary EDs. However, the studies that included smaller EDs identified some differences in the link between crowding measures and quality between the ED settings. Also, disparity in ED evaluation and treatment were identified based on factors including sex, ethnicity, and age. Finally, the review highlights the need for the prioritisation of care process and outcomes to drive routine measurement to support quality improvement that is focused on crowding and quality of care.

The results of this review have important implications on future research on the measurement and alleviation of ED congestion. Further research, potentially incorporating a meta-analysis, is needed to investigate the impact of various models of care designed for the admission and discharge components of a patient journey from the ED. Innovations continue to emerge and each must be systematically and rigorously tested and evaluated.

Chapter 5: Methodology

This chapter outlines the study design, study population, sample selection and the research instrument used for data collection from EDs. It provides a detailed account of the data collection procedure and describes the study methods, statistical methods and analytical plans for that data analysis.

Study one

Aim

The aim of this study was to identify what challenges health services face to better understand patient needs and to design and validate models of care and ED design concepts that will meet those future needs.

Method

A compounding formula, $S = P\,x\,(1+\,i)^n$ [key][5] was chosen to predict future demand. Based on the number of presentations 2008-09 and 2015-16, the study further forecasts the number of patients are expected to present to EDs for each site annually over the next 10 years.
Data from the reporting EDs throughout Queensland were used to obtain total numbers of presentations and presentations by age groups for the five-year period 2006-07 to 2015-16 (10 data points). The mean percentage in growth for the eight-year period was 7.7±3.0 per cent with a 95 per cent confidence interval. This figure was applied to the next 10 years up to 2026 using the calculation formula and applying 95 per cent confidence intervals.

With the aid of a survey of ED directors, and nurse unit managers of EDs across Queensland we describe the options in regard to future ED designs, staff workload, roles and functions including patient streaming models of care to meet the future needs of the population, case mix and complexity.

Participants were a purposive sample including medical directors and deputy directors and nurse unit managers. Purposive sampling was used to maximise diversity and to provide the broadest representation. The survey questions were developed based on the literature and refined through consultation with senior staff in the field. The survey sought information about existing models of care used, design and space adequacy, and insight as to whether the current models of care, design and space adequately met present demand and whether it would meet future demand.

The retrospective written survey of all 27 reporting EDs took place on over three month period from April 2017. The survey was conducted using the Survey Monkey tool from 1 March 2017 to 31 May 2017 in order to identify current service delivery and streaming practices across EDs in Queensland public hospitals. The survey sought clarification and identification of possible future design concepts, models of care as well as IT and support services expected to meet future needs. The characteristics and findings of this survey are detailed in Appendix 1.

Descriptive analysis was generated to elucidate the stakeholder's perceptions of the current design and models of care utilised within EDs across Queensland and the capacity of these designs and models of care to meet future patient needs as well as identified suggestions for change.

Descriptive univariate statistics were calculated for all variables. The data were summarised with medians for skewed continuous and ordinal data, means for normally distributed continuous data and proportions for categorical data.

Study two

Aim

The aim of study two was to identify the characteristics of users and through comparison with the population, determine those characteristics of the population which appear to contribute to the demand, growth and workload. This study utilised the HAT Dashboard. The Dashboard is a visualisation tool that allows for easy exploration and analysis of ED performance and activity. The dashboard aggregates information for analysis at population, hospital, and hospital and health service level to identify patterns and trends and evaluate factors that influence the demand and workload for emergency services and identify any patterns with respect to services provided.

The Dashboard

The Dashboard utilised data collected from the Queensland Health Emergency Data Collection (EDC), which is the source of information for statutory reporting around Queensland emergency services. EDC data is used for aggregation in the Commonwealth National Non-Admitted Patient ED Care Database (NNAPEDCD). The NNAPEDCD collects episode level data from all peer group A and B level hospitals (explained next), so not all hospitals that have EDs or used EDIS are included in the collection. On the other hand, the National Public Hospital Establishment Database (NPHED) is the database that records the overall number of presentations to EDs for all public hospitals in Australia without detailed episode level data.

Australian public hospitals are classified by the AIHW into four major peer groups and further subcategories based on their geographic location, number of patients and range of admitted patient activities. The groups are broadly described as: (A1) Principal referral and specialist women's and children's hospitals; (A2) Large hospitals (major city, regional and remote); (B1) Medium hospitals (Group 1 and 2); and (B2) Small acute hospitals (regional and remote). Some hospitals, mainly smaller with separations less than 2,000 in major cities or with less than 200 in other areas are not grouped.[12] Peer grouped hospitals are the main bodies that report their data to the central databases such as Queensland Health Emergency Data Collection (EDC). Non peer grouped hospitals rarely report their data. In this report, our analysis is limited to EDs with the above mentioned peer groupings.

Public hospital EDs in Queensland are categorised in accordance with the Clinical Service Capability Framework (CSCF)[181] which in turn is derived from the Australasian College for Emergency Medicine (ACEM) categorisation.

The EDC receives data from two sources. EDIS and from FirstNet, the Emergency Information System bundled as a part of the Digital Hospital Initiative. Presentation data, where a presentation represents a single attendance of a patient at an emergency service, were linked to information for each presentation to represent the socioeconomic status (SEIFA) and remoteness

[5] S = predicted Number; P = present Number; i = mean annual percentage change for the interval period; n = interval period (years)

(ARIA+) of the patient based on the residential address of the patient at the time of their presentation. Further information was provided to determine the URGs of each presentation, based on the characteristics and outcomes of the presentation.

This, in itself, was a major outcome of the project and will have great utility at state, hospital and health service and individual facility levels to identify cohorts of presentations that will influence future emergency service delivery and planning.

Method

Two sites were selected for comparison to investigate demand and growth and to forecast future workload. The sites were selected based on:

- Non-metropolitan, secondary level EDs delivering emergency care to adults and paediatric patients in a region with forecasted population growth
- An ED that has not been built or refurbished in the last five years and that is earmarked for redevelopment in the next 5-10 years.

For the purposes of this study, Caboolture Hospital and Redland Hospital were identified as sites that met the above criteria. Indicators such as age distribution and SEIFA variables for these sites are different and should allow for comparable analysis of the change and trends between the two reporting periods.

The study utilised the Dashboard to extract the following data and examined the trends between each site for the reporting periods 2008-09 and 2015-16:

a. Presentations: by age group, socio- economic group (SEIFA), triage category, arrival and discharge time, mode of arrival, disposition and URG[6]
b. Utilisation of Short Stay
c. Length of Stay: by age group, socio- economic group (SEIFA), triage category, disposition and URG.

[5] Currently there is no accurate and reliable data on the utilisation of other models of care

Chapter 6: Results Study 1 - Characteristics of EDs

The chapter presents the results from study one and includes presentation of data collection, results, response rate, and representation of the study sample and discusses the profile of the survey. It also presents results from descriptive analysis performed for all variables.
A survey of all of the 27 reporting EDs was developed and circulated (see: Appendix 1) using Survey Monkey. Elements of the survey included data about existing models of care used, design and space adequacy and whether the present models, resources and design would meet future demand. The same survey of EDs was performed to outline possible future models of care as well as information technology and support services needed to meet expected demand and case-mix.

The 27 reporting EDs were categorised into the following:

1. Small (‹40,000 attendances per year);
2. Medium (40,000-75,000 attendances per year);
3. Large (›75,000 attendances per year).

Design and models of care:

Existing design

The survey asked the cohort to describe the present design of their ED in respect to meeting demand with existing models, what models of care were currently used and what support services were utilised. The survey sought the views of directors of the ED and NUMs in relation to future models of care, design concepts and support services (including IT) that would be necessary to meet future demand. Importantly, opinions were sought as to the relationship between design and models of care that would be necessary in the future.

Only 28 per cent of the large EDs reported that the design of the ED met current demand. Forty-five per cent reported that current models of care met the demand needs. In the small ED group nine per cent believed the existing design met present demand and 2.7 per cent met existing models of care requirements. In the medium size EDs, two per cent believed the present design met demand and 40 per cent stated the design met current models of care.

Existing models of care

There was commonality among the design and models of care elements of all EDs. The scope and type of models of care provided in our EDs is adequate. Smaller EDs indicated that 3.6 per cent had models of care adequate for the demand and only 1.8 per cent believed resources were adequate for those models of care. The medium sized EDs indicated 44 per cent and 37 per cent for the same, respectively.

The large ED group indicated 47 per cent had adequate models of care to meet present demand and only 33 per cent indicated adequate resources.

Figure 22: Results from Survey: Models of Care

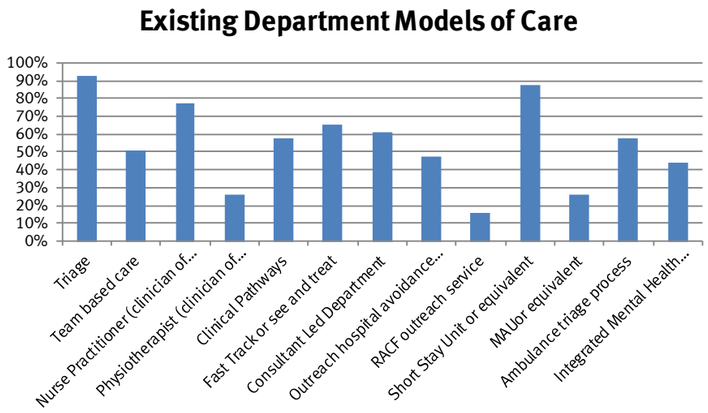
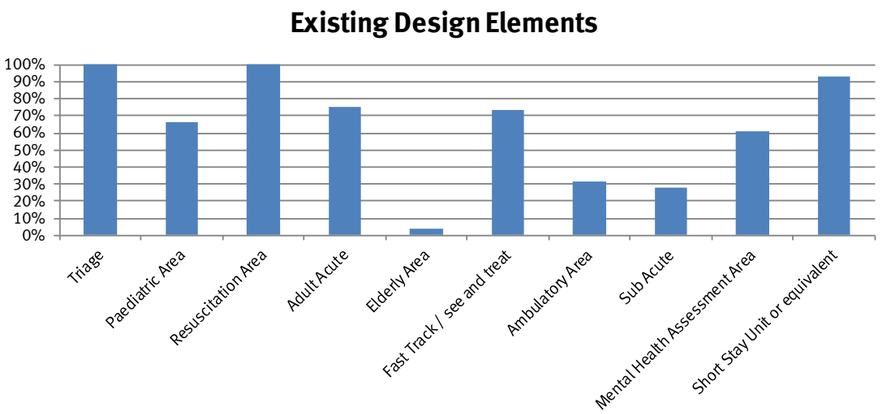


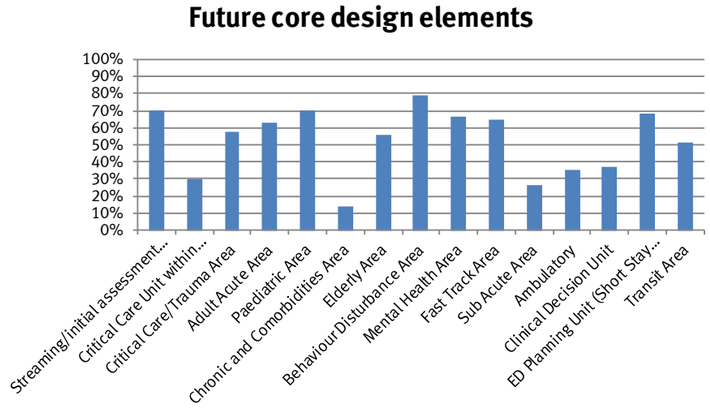
Figure 23: Results from Survey: Existing Designs



Future design

There was a wide variety of elements considered as core requirements for future EDs across all EDs. However, mental health and behaviour management figure highly in all responses, in having dedicated areas (79 per cent and 67 per cent respectively). An additional finding of interest is that 70 per cent indicated an initial assessment area and streaming will be necessary.

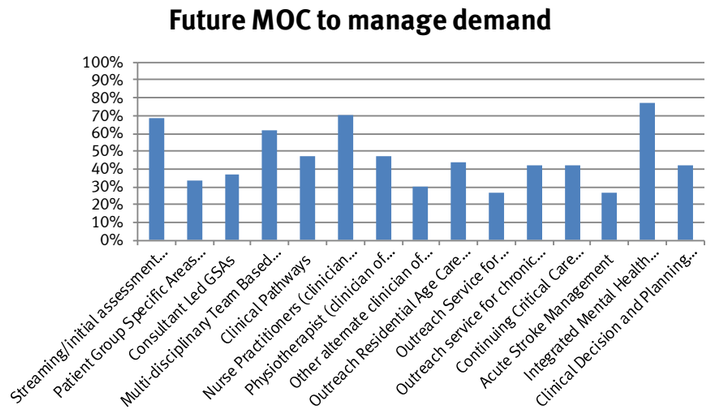
Figure 24: Results from Survey: Future Core Elements



Future models of care

Again, there was a wide variety of models of care thought to be necessary for the operation of future EDs to meet expected demand. This indicates that there will be differing models of care required for the expected demand at individual EDs. This is, most likely, reflective of differing age groups, SEIFA groups and case-mix making up ED workload.

Figure 25: Results from Survey: Future Models of Care

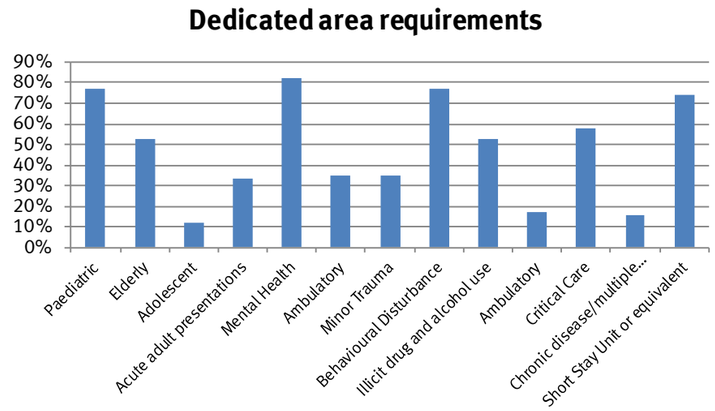


Specific and Dedicated Areas

Views were sought from the respondents about areas within the ED dedicated for specific patient cohorts. These cohorts would be managed by a corresponding model of care within that area.

The results indicated the top four areas for a dedicated area designed for specific patient cohorts were mental health, behaviour management, paediatric and SSU or equivalent respectively. The results are summarised below. Other areas of importance indicated by responses were dedicated areas for the elderly, critical care, and alcohol and drug use services respectively. This is a reflection of changing patterns of disease presentation.

Figure 26: Dedicate Areas – Percentage of respondents by dedicated area requirements

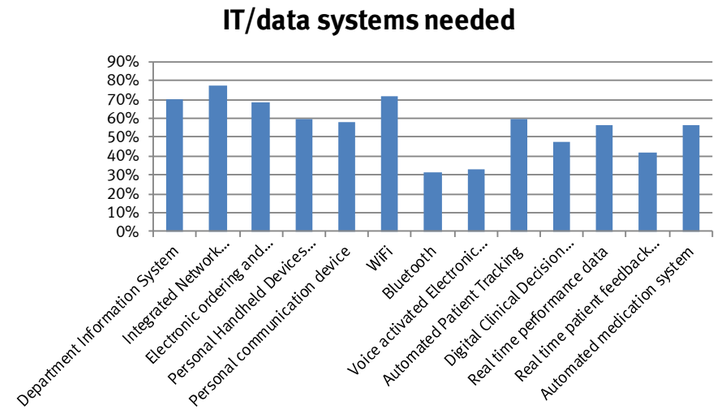


Information technology management and data systems

Respondents were asked for views on present and future requirements for information and data management.

Information technology management and data systems were key issues for all EDs. It is clear that digital disruption and future electronic data management is an essential component in future planning. The rate of growth in new electronic patient data use is exponential. There is already the Digital Hospital Program implementation occurring across the state. The volume of data available for analysis will be enormous.

Figure 27: Results from Survey: Information Technology and Data Systems



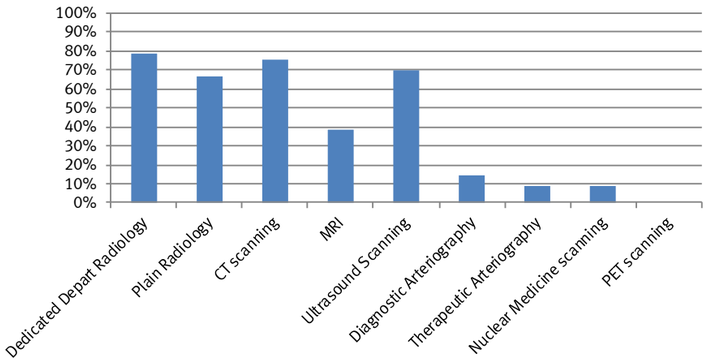
Support Services:

Radiology and pathology services are important support services for clinical decision making. It is for this reason that respondents were surveyed on their views to determine the important elements in each of these support services for existing and future service provision.

Radiology

Radiology was an essential component for ED patient care. There was wide spread support for dedicated ED radiology (77 per cent) which should include plain radiology (67 per cent), CT scanning (75 per cent), ultrasound scanning (70 per cent) and MRI scanning (39 per cent). It was also evident the preference was 24/7 operation of these services.

Figure 28: Results from Survey: Radiology

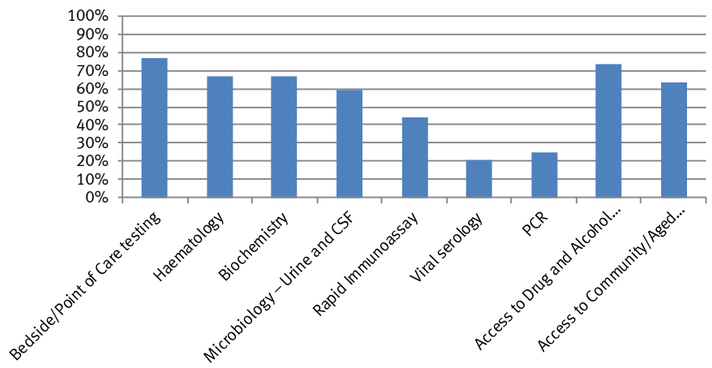


Pathology

Pathology was also considered essential. Of interest was the strong requirement for point of care testing (77 per cent).

Other support services indicated as important were the provision of a dedicated ED alcohol and drug service seven days per week (74 per cent) and access to community services seven days per week (63 per cent).

Figure 29: Results from Survey: Pathology



Based on the results the following is evident:

- Present ED designs are not meeting demand (28 per cent of large EDs)
- Design and models of care do not meet current perception of need or predicted future
- Importance of IT and data management
- Need for enhanced and well-resourced support services.

Chapter 7: Results of Study 2 - Characteristics of ED users

Trends in Demand

This chapter presents the results from study two to examine and identify characteristics of users and factors contributing to the increased demand for ED services. This chapter begins with an investigation of various characteristics related to ED visits of patients presenting to EDs across Queensland. Finally it undertakes an analysis of the demographic profile of the two nominated sites (Caboolture and Redland Hospital) with comparisons to the population data. In Queensland, there are 58[i] EDs or acute care clinics ranging from Level 1-6 according to the Clinical Capability Framework (Queensland Government, 2018 #1039) delineation. Only data from EDs that were at level four and above (27) were analysed. EDs are comprised of two dedicated adult only departments, one specialised paediatric department and the remainder are mixed departments (adult and paediatric patients). The EDs included in the data analysis are listed below by Hospital and Health Service.

All EDs report on activity and performance monthly and annually to the Queensland Emergency Department Strategic Advisory Panel. The panel is the umbrella organisation within HIU which is responsible for planning emergency service requirements as well as advising government on the delivery of emergency health services.

CHHS - Cairns Hospital and Health Service: Cairns Hospital.	**CQHHS** - Central Queensland Hospital and Health Service: Rockhampton and Gladstone Hospitals
CHQ - Children's Health Queensland: Lady Cilento Children's Hospital	**GCHHS** - Gold Coast University Hospital and Health Service: Gold Coast University Hospital
MATER – Mater Hospital	**MHHS** – Mackay Hospital and Health Service: Mackay Hospital.
MNHHS - Metro North Hospital and Health Service: Caboolture, Kilcoy and Redcliffe Hospitals, Royal Brisbane and Women's Hospital, The Prince Charles Hospital	**NWHHS** – North West Hospital and Health Service: Mt Isa Hospital
SCHHS – Sunshine Coast Hospital and Health Service: Caloundra, Gympie, Nambour, Sunshine Coast University Hospital	**THHS** – Townsville Hospital and Health Service: Townsville Hospital
WBHHS – Wide Bay Hospital and Health Service: Bundaberg, Hervey Bay and Maryborough Hospitals	**WBHHS** – Wide Bay Hospital and Health Service: Bundaberg, Hervey Bay and Maryborough Hospitals
WMHHS – West Moreton Hospital and Health Service: Ipswich Hospital	

ACEM determined maximum waiting time to treatment performance indicator threshold for each triage category. The indicator threshold represents the percentage of patients assigned to triage code 1-5 who commence medical assessment and treatment within the relevant waiting time of their arrival (ACEM: PO6 Policy on the ATS. Melbourne. ACEM, 2000).[7]

Triage Category	Max Waiting Time to treatment	Performance indicator Threshold (%)
1	IMMEDIATE	100
2	10	80
3	30	75
4	60	70
5	120	70

Statewide

As shown below, more than 1.4 million patients attended EDs in 2015-16 across Queensland. As discussed above, the national hospital morbidity database for 2014-15[182] categorises public hospitals according to their peer grouping and remoteness into various categories.[8]

Table 6: Queensland ED presentations 2015-16

Type of Hospital	No. of hospitals	No. of patients treated	%
Principal referral and Specialist (A1-A2)[9]	6	429,269	26
Large major- Regional –remote (B1- B2)	7	454,085	27
Medium (C1-C2)	9	380,902	23
Small regional acute- Non Acute (D1-D2)	64	371,056	22
Total	**86**	**1,635,312**	

The percentages of patients attending all levels of EDs are evenly distributed. It is an interesting finding. Combining ED levels B1-B2 and C1-C2, these EDs have 50 per cent of all ED presentations. For the same time period, the two EDs (Caboolture and Redland) which were used in study two had 52,653 and 54,741 presentations respectively. There were 837,328 presentations to the peer group EDs of the EDs in study two, representing 51.2 per cent of total presentations.

A1	Principal referral	A2	Specialist women's and children's
B1	Large Major cities	B2	Large regional and remote
C1	Medium (group 1)	C2	Medium (group 2)
D1	Small regional acute		

[9]Since 1999, public hospitals have been categorised by the AIHW into peer groups to reflect the need to compare hospitals against other hospitals with similar characteristics. The most recent categories (1999-2013) can be summarised as follows: A1 Principal referral, A2 Specialist women's and children's, B1 Large major cities, B2 Large regional and remote, C1 and C2 Medium (group 1 and 2), D1 Small regional acute;,D2 Small non–acute; D3 Small remote acute.

Hospital and Health Services

ED presentation numbers are proportionally similar across all HHSs, taking into account the population serviced by HHSs. However, predictions indicate that the metropolitan and south coast HHSs will have the biggest growth with Sunshine Coast HHS growing significantly. The growth in ED presentations for the top three HHSs represents 59.6 per cent of the predicted presentations for Queensland by 2026.

The figures included below provide evidence of major growth in ED presentations which will be beyond present infrastructure to manage. Coupled with the corresponding increases in admissions, planning for future infrastructure within HHSs is a major priority.

Figure 30: Prediction for ED attendances for Queensland

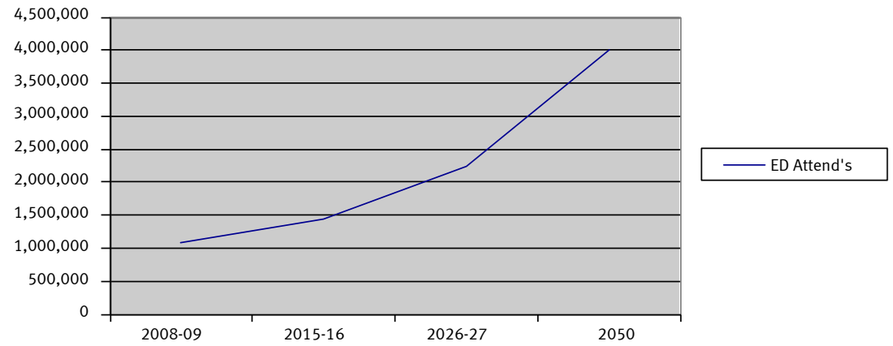


Figure 31: Predictions for ED Attendances by HHS (2026)

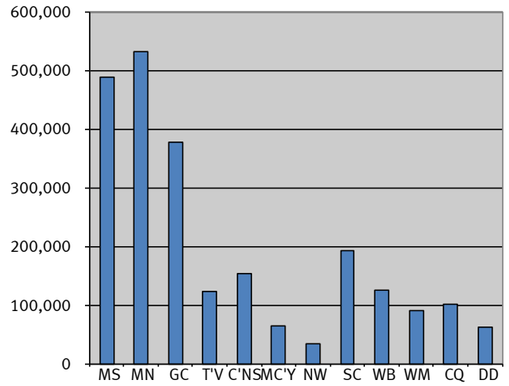
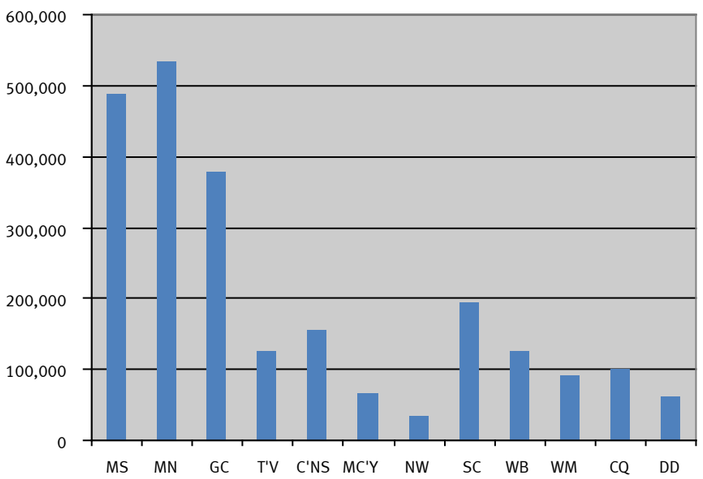


Figure 32: Percentage Change in ED Attendances by HHS (2026)



Age, gender and socio-economic status

Age and gender

For the reporting period, the rate in change across ED attendances was 4.8 per cent. However, the rate change across age groups varied. Changes in attendances for age groups showed specific age clusters were growing at differential rates. These figures were extrapolated using the age group specific growth rates as a basis and projected to 2026-27. This gave a better indication of the changes in the number of presentations that EDs will be seeing in relation to the expected differing types of age related presentations.

As can be seen, the distribution of the age groups remains approximately the same for both time periods. The percentage changes are not uniform in age groups. Variations range from as low as 20 per cent in the age groups 35-39 and 40-44 respectively to significantly higher presentations in the 5-9, 30-34, 50-54, 65-69, 70-74 and the 85+ year age groups respectively. Combing all age groups of 65 years and older the predicted number of presentations to EDs by 2026-27 will be 379,133 representing a change of 45 per cent. This group will form 15 per cent of total ED presentations.

There is a strong negative correlation between age groups and ED presentations when applying the Pearson Correlation Formula to five year age brackets from statewide data on presentations. The correlation "*r*" value was -0.8772 and the "*r2*" was 0.7695 indicating that age is a predictor of ED utilisation. The lower the age group, the higher the utilisation.

Figure 33: Presentations by age-group 2015-16 and 2026-27

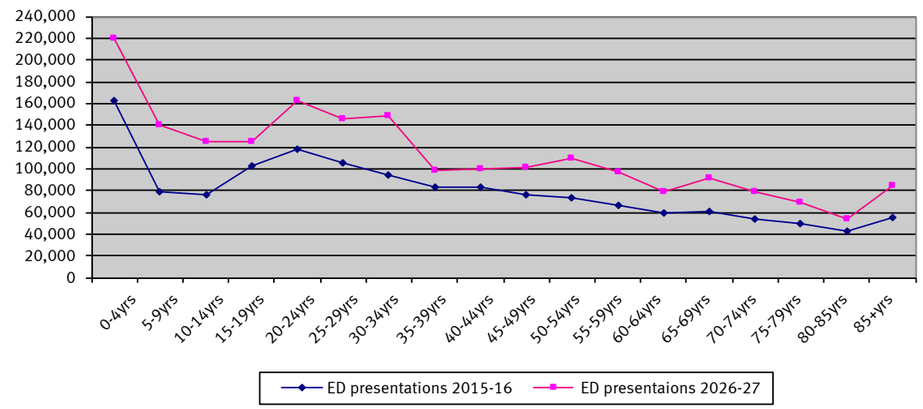
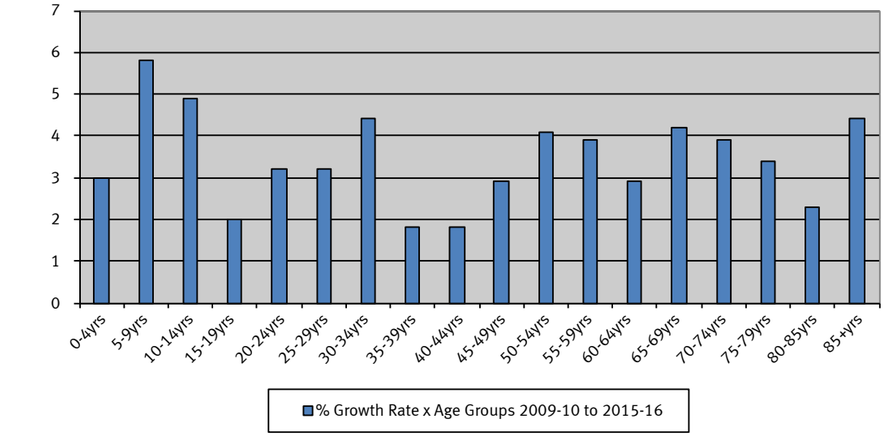


Figure 34: Growth Rate by age-group 2009-10 and 2015-16



Further sub analysis of sex, age group and triage categories shows the shift in use by age and gender. There is a significant rise in the utilisation in the age group >75 years for both groups. There is not the same corresponding rise in the other age groups with females in these groups displaying a higher growth rate compared with males.

Table 7: ED use by aged and gender (2009)

Age	Female		Growth Rate		Male		Growth Rate	
	Reporting period 1	Reporting period 2	Total %	Annual %	Reporting period 1	Reporting period 2	Total %	Annual %
‹16	57,371	168,656	193.9	**24.2**	72,828	207,256	184.6	**23.1**
16-75	166,972	558,000	234.2	**29.3**	173,833	531,219	205.6	**25.7**
›75	23,914	88,098	268.4	**33.5**	20,176	81,980	360.3	**38.3**

There is a definite change in the proportion of males and females utilising ED services. Males are using EDs more in 2016 than in 2009 with a corresponding decline in female usage. There has been a significant growth in overall attendances in the eight year period.

Table 8: Patients average age by gender (2016)

	Reporting period 2009			Reporting period 2016			
	N	Mean	%	N	Mean	%	% Change
Men	201,292		44.8	814,754		49.8	**+11.1**
Women	248,257		55.2	820,455		50.2	**-9.1**
Total	449,549		100.0	1,635,209		100.0	**263.7**

Table 9: Triage Category by Disposition for 2009

Triage Category	All Admissions (%)	Non-Admitted (%)	DNW (%)	Died in Department (%)	Total (N)
1: Resuscitation	76.3	18.5	0.0005	5.2	3,592
2: Emergency	58.7	42.0	0.20	0.23	47,141
3: Urgent	32.3	64.1	3.4	0.0004	199,969
4: Semi-Urgent	10.1	80.3	9.5	0.0001	213,996
5: Non-Urgent	2.9	84.1	13.0	0.0001	39,990

Table 10: Triage Category x Disposition for 2016

Triage Category	All Admissions (%)	Non-Admitted (%)	DNW (%)	Died in Department (%)	Total (N)
1: Resuscitation	84.1	11.9	0.04	3.8	10856
2: Emergency	64.6	35.0	0.2	0.07	202667
3: Urgent	42.5	55.1	2.1	0.001	653013
4: Semi-Urgent	14.6	80.8	4.55	0.001	592010
5: Non-Urgent	3.7	91.5	4.7	0.001	148182

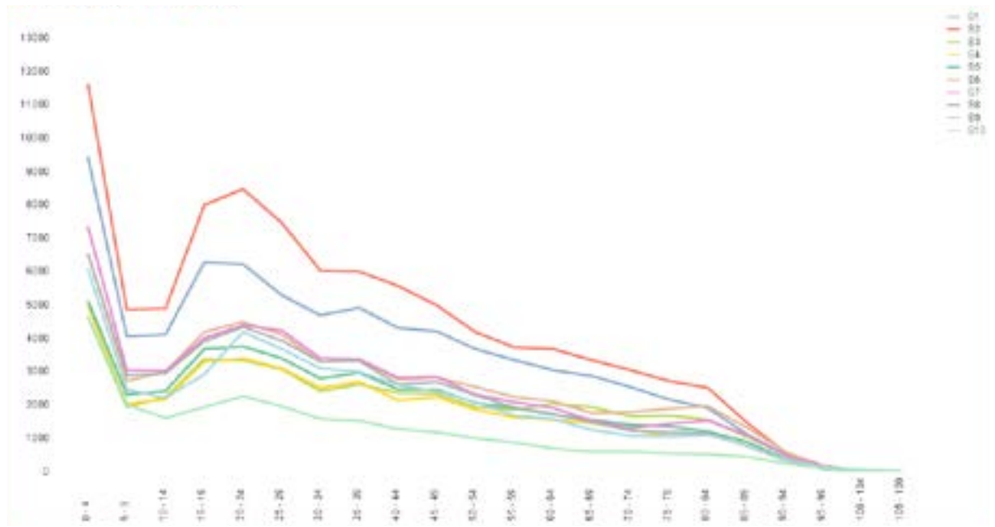
Whilst it is not as high as was expected, this age group consume disproportionate amounts of ED resources due to chronic disease and comorbidities. Therefore, this age group is a significant factor in determining service delivery.

Socio Economic Status

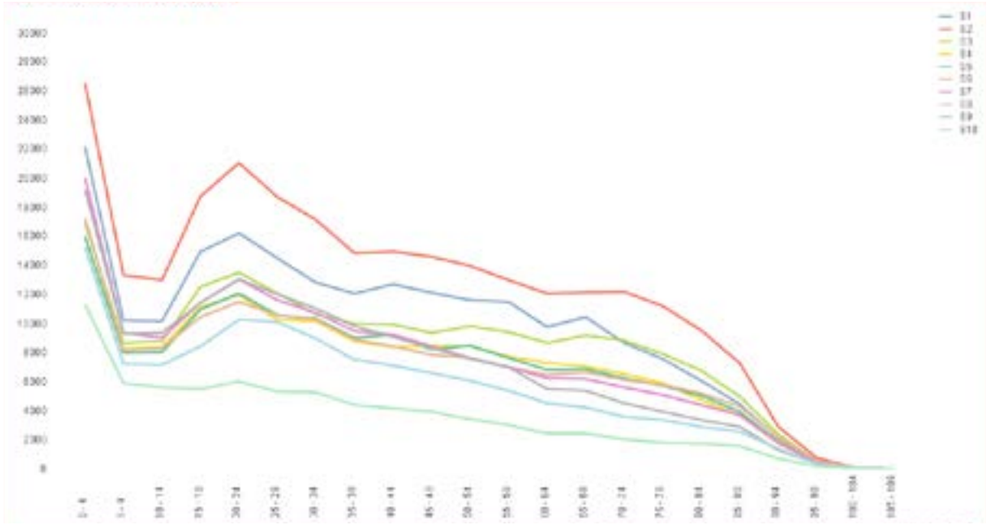
There is significant correlation between lower and other socio economic groups. Presentations for SEIFA are presented below. As a percentage of total presentations, the percentages across SEIFA categories are relatively consistent with little change from 2009-16. Total presentations by SEIFA groups indicate clear differences between the lower groups than the higher groups especially for groups one and two. There is a consistent pattern across triage categories that indicate increased utilisation for the lower socio-economic groups and decreasing presentations for the upper socio-economic groups. Applying the Pearson Correlation Formula to the statewide data on SEIFA, the "*r*" value was -0.8712 and the "*r2*" value 0.7695 with a strong negative correlation. This indicates the lower SEIFA groups utilise ED services more and therefore this has significant implications for EDs servicing areas with growth in these groups.

Figure 35: Presentations by SEIFA by age-group 2008-09 and 2015-16

a) 2009



b) 2016

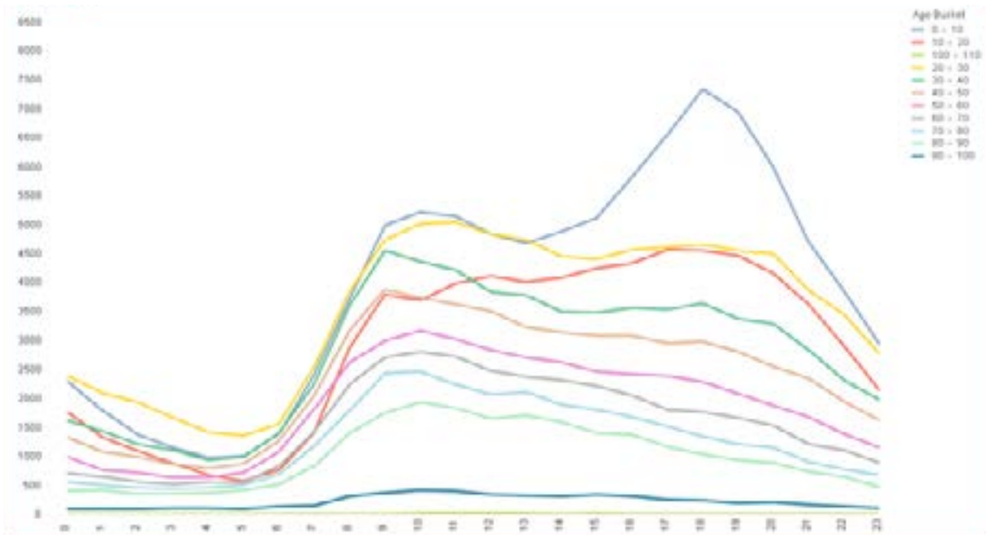


When SEIFA and age groups are analysed, two distinct peaks for presentations are apparent:

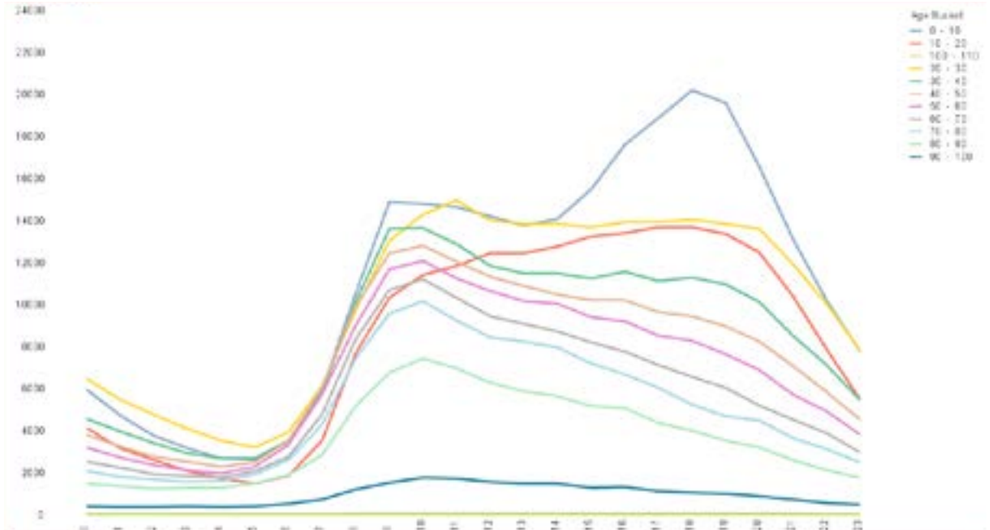
1. The age group ‹5 years and 20-24 years
2. The lower groups of one and two dominate, with larger numbers across the age-groups with the effect and differences declining from age 84 years and older.

Figure 36: Presentations by age-group by hour of day 2008-09 and 2015-16

a) 2009



b) 2016



Triage category

The percentage by triage category for EDs statewide between the two reporting periods is below. The percentage of category 1 presentations has remained static. There has been significant increase in category 2 period and 3 presentations associated with marked growth rates. The percentage of category 4 has declined significantly while category 5 presentations have remained static. There has been growth across all categories reflected by the large growth in total numbers, as expressed elsewhere in the study.

Table 11: Presentations by Triage category 2009 and 2016

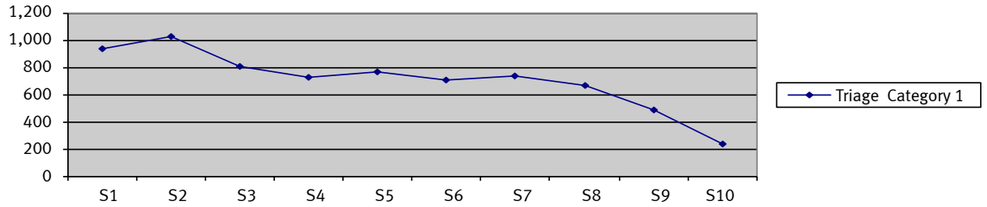
Triage Category	Reporting period 1		Reporting period 2		Total growth	Annual Growth
	N	%	N	%	%	%
1: Resuscitation	3,900	0.7	11,913	0.7	205.4	25.6
2: Emergency	49,607	9.6	211,309	12.9	325.9	40.7
3: Urgent	205,678	39.9	711,733	43.5	254.6	30.7
4: Semi-Urgent	215,865	41.8	596,519	36.4	176.3	22.0
5: Non-Urgent	43,134	8.3	148,511	9.5	256.1	23.0

Triage Category and SEIFA

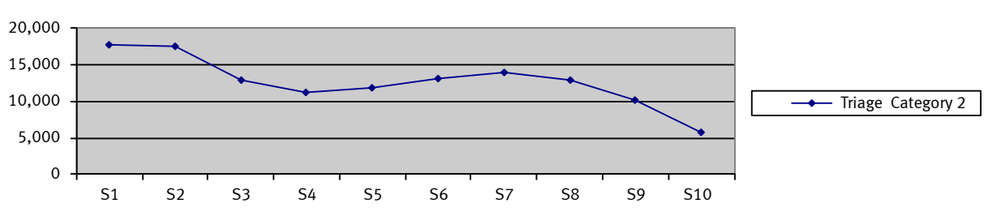
The following charts reveal the pattern of triage category presentation numbers in relation to SEIFA. In 2016, the pattern across all triage categories is consistent. SEIFA groups 1,2 and 3 make up a significant proportion of presentations in each triage category. Whilst there was some wide variation in the years 2009 to 2012, there has been no real change in the proportion of SEIFA presentations since 2012.

Figure 37: Presentations by SEIFA and Triage Category (2016)

a) Triage Category 1



b) Triage Category 2



c) Triage Categories 3, 4 and 5

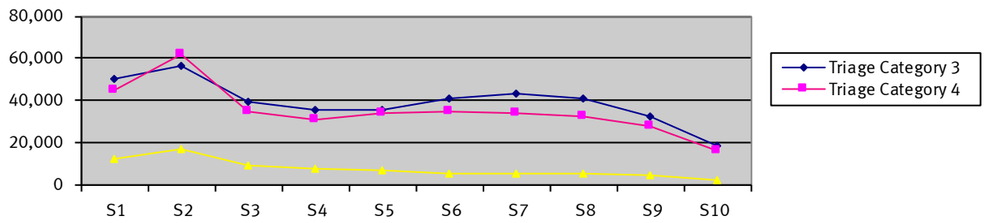
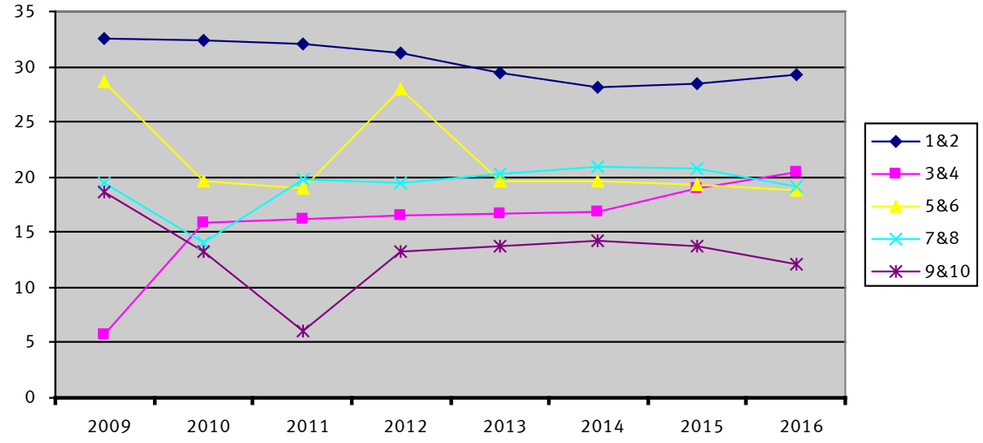


Figure 38: Percentage of presentations by year and SEIFA



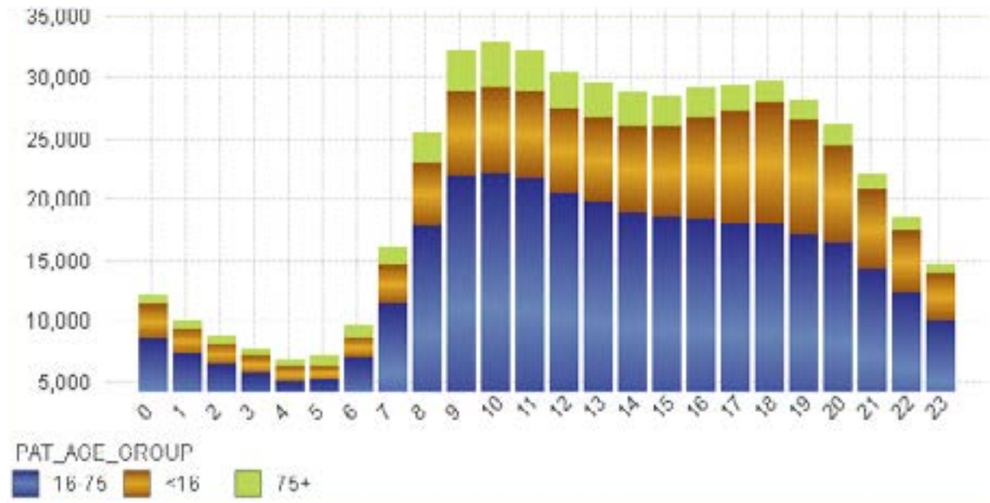
Arrival time variation

The data demonstrates that the time of day patients arrive at hospital EDs and indicates the similarity in majority of attendances occurring between the two reporting periods and the peak presentation times. The pattern is consistent across all years from 2009 to 2016. The pattern of presentations by hour is consistent with national and international data.

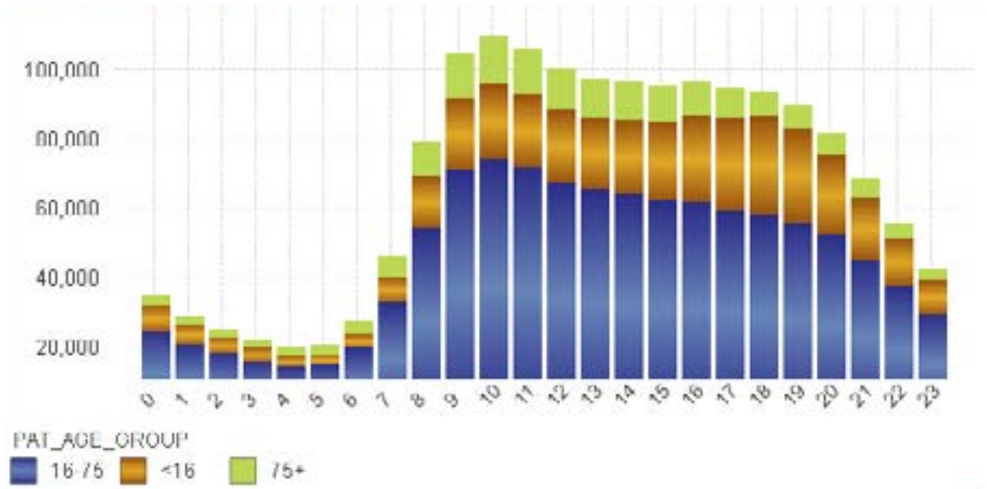
Hour of day

Figure 39: Presentations by Hour of Day 2008-09 and 2015-16

a) 2009



b) 2016



Time of day

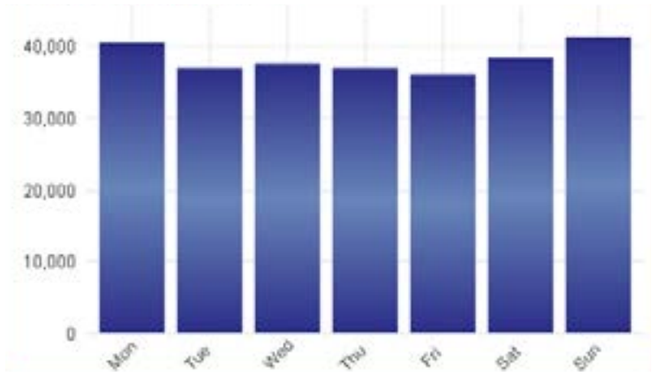
For the two reporting periods, the net differences between presentaions and discharges which include admissions and transfers, remains remarkably similar. This is despite significant structural and flow changes over the reporting period.

Day of week

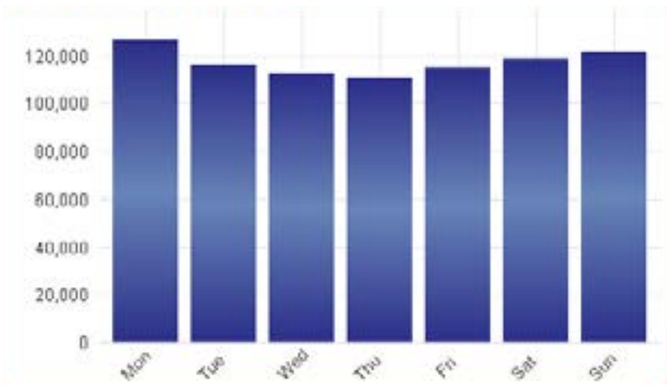
The data shows the day of the week for attendances to determine if there are any changes in patient arrivals. Mondays and Sundays are the busiest days of the week in the ED. The pattern remained relatively unaltered between the two periods which is an interesting finding. There has been little research into this area to determine influencing factors.

Figure 40: Presentations by Day of week 2008-09 and 2015-16

a) 2009



b) 2016

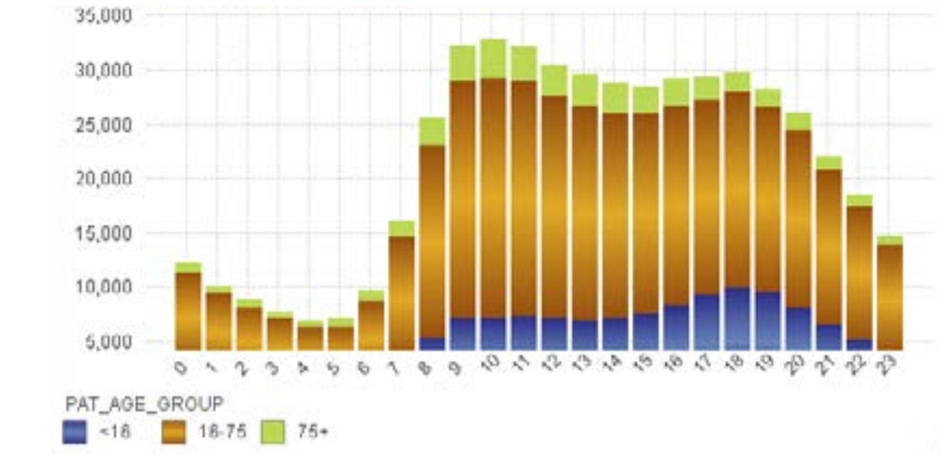


Presentation[10] patterns by hour of day in total and for all age groups follow a graphical curve that is well established and similar across Australasian EDs. Interestingly, all age groups present later in the day. These patterns have not changed from 2009 to 2016.

By Age group by Hour

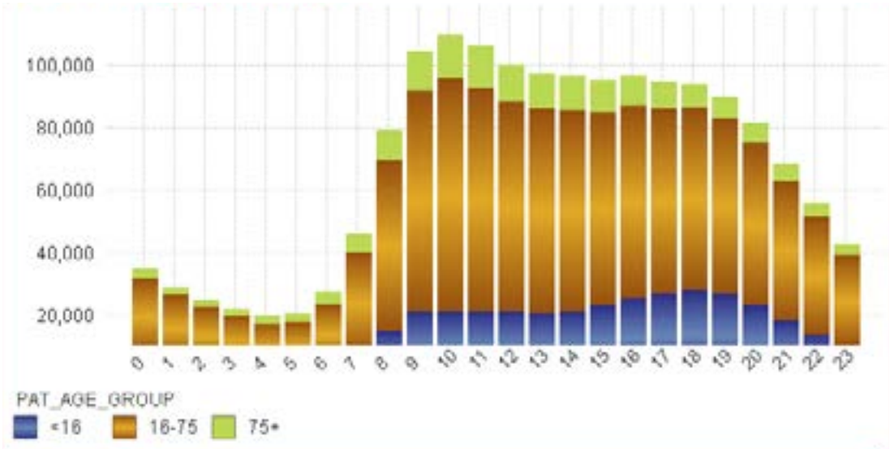
Figure 41: Presentations by age-group by Hour of Day 2008-09 and 2015-16.

a) 2009



[10] Data collected for age groups ›90 revealed wide variations in all analyses due to small numbers and probable data entry errors. Therefore it has been excluded.

b) 2016

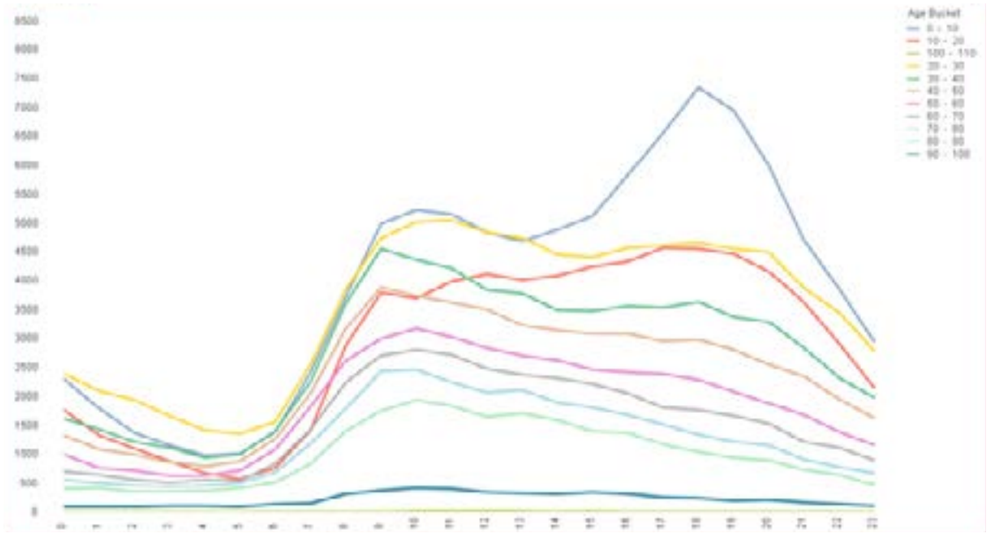


Socioeconomic status and age group

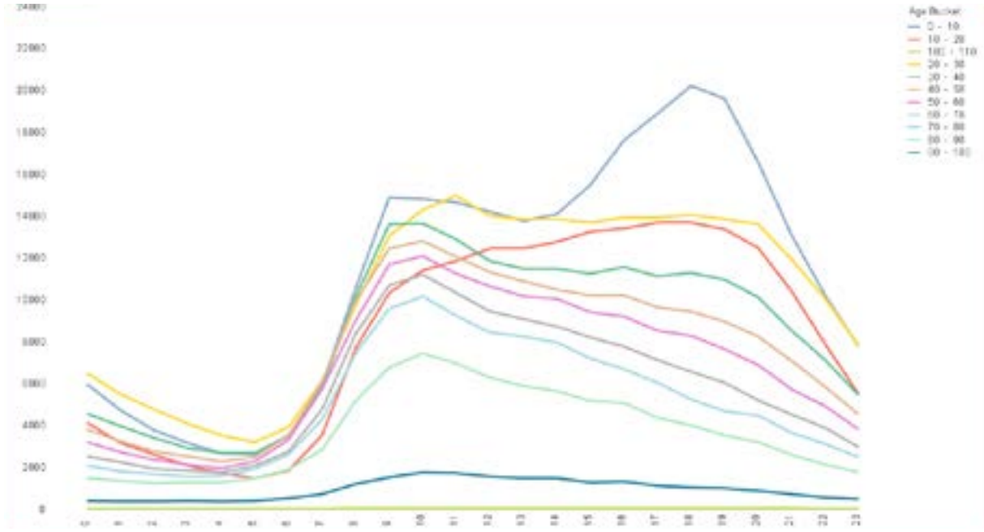
Combining age and SEIFA groups for presentations by hour of day, there is a significant peak in the lowest socioeconomic group for the time period 5-8pm. This will have implications for EDs with large paediatric presentations and an increase in lower socioeconomic populations. These patterns have not changed from 2009. It would be reasonable to assume this pattern will continue and will be the same in 2026-27. Therefore, this analysis can be used to predict the age and socioeconomic mix that will utilise ED services in the future.

Figure 42: Presentations by age-group by hour of day 2008-09 and 2015-16

a) 2009



b) 2016



Arrival Mode

The eight modes of arrival were amalgamated into three broad categories for ease of analysis. Further sub-analysis was done for ambulance arrival with paramedic by age group and SEIFA groupings. It was noted that across all modes of arrival there was no significant change from 2009 to 2016. Patterns and changes by all modes are represented below. It is interesting to note that SEIFA groups one and two represented a significant proportion of ambulance mode of arrival. There was a consistent use of ambulance across age groups 10-14 through to >85 years of age.

Mode of arrival by age group and SEIFA

Modes of arrival were classified according to national criteria which were recorded in EDIS and Firstnet:

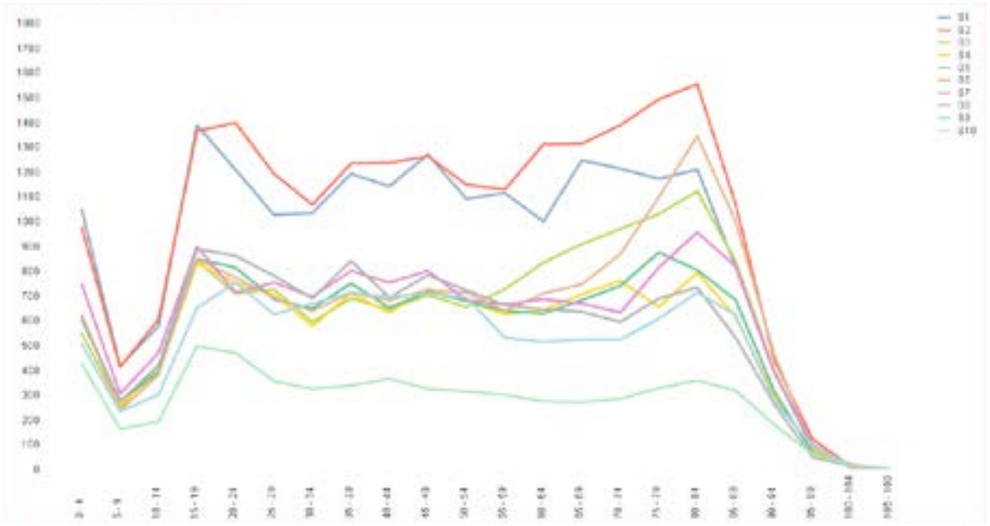
- Ambulance: fixed wing
- Ambulance: rotary wing
- Ambulance: road and paramedic
- Ambulance: road by patient transport
- Community service
- Police or correctional facility
- Walked-in
- Other.

Table 12: Method of arrival by triage category and percentage and totals

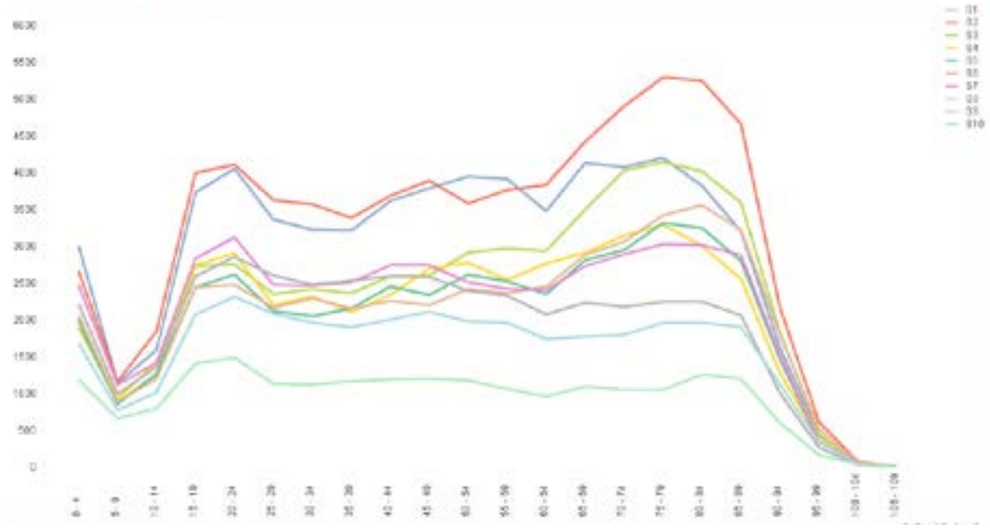
		1	2	3	4	5	Total	%
Ambulance (road +paramedic)	2009	87.7	52.4	37.3	16.9	3.9	138,790	**28.6**
	2016	81.1	49.1	37.8	16.8	3.4	475,595	**29.1**
Walk in	2009	11.4	45.2	62.5	82.9	95.8	342,949	**70.7**
	2016	16.5	49.2	60.9	82.4	94.4	1,140,565	**69.7**
Other(s)	2009	0.9	2.4	0.2	0.2	0.3	33,455	**0.7**
	2016	2.8	1.7	1.3	0.8	1.2	19,152	**0.2**

Figure 43: Arrivals by Ambulance with paramedic by SEIFA and Age Groups 2008-09 and 2015-16

a) 2009



b) 2016

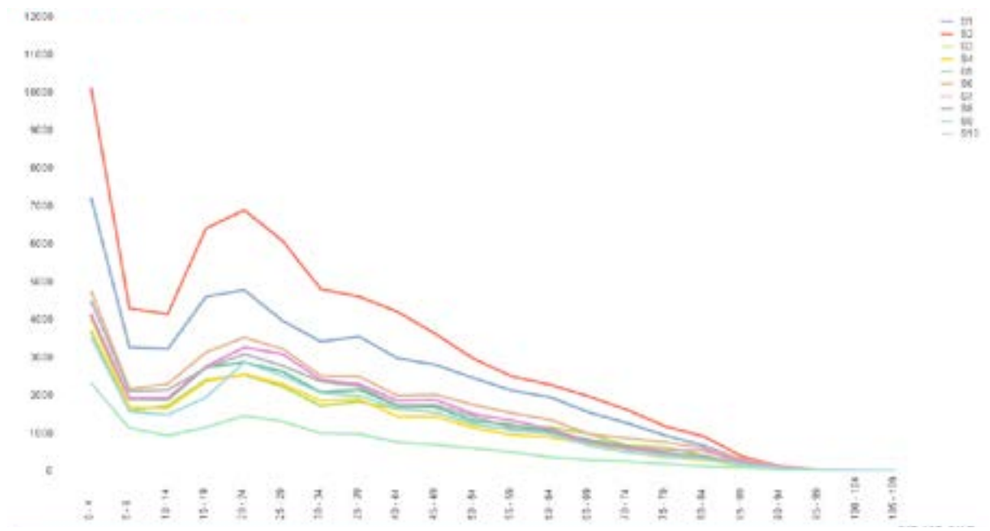


Walk-ins

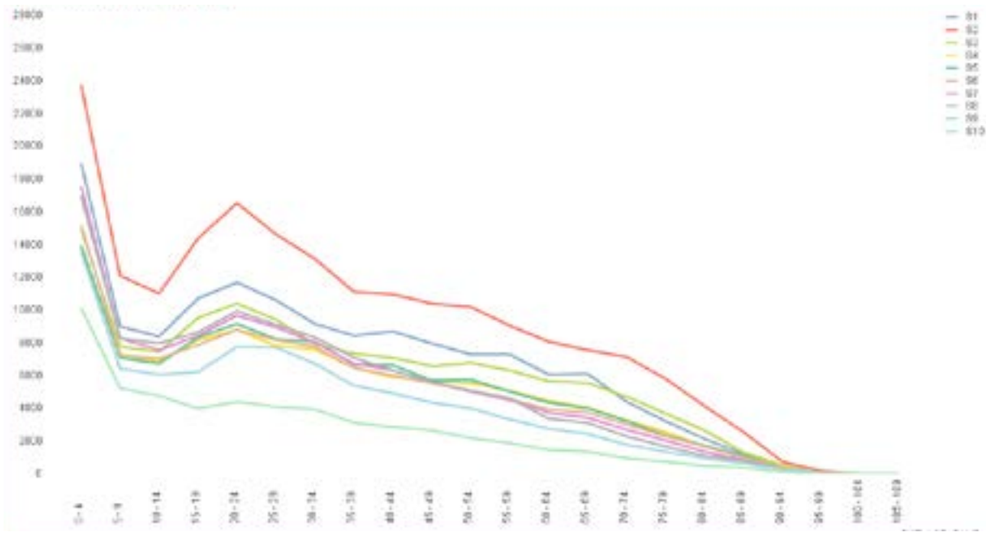
Walk-ins were the most common mode of arrival. Comparisons between 2009 and 2016 reveal no change in patterns over the period. The age group <4 and SEIFA group one represented higher proportions of this mode of arrival.

Figure 44: Walk-in presentations by SEIFA and age-group 2008-09 and 2015-16

a) 2009



b) 2016



Discharge Status

Discharge Status is defined by the Commonwealth Minimum Data Set Definitions and was extracted from the Hospital Based Computer Information System (HBCIS):

1. Admitted
2. Admitted to observation ward
3. Admitted to SSU
4. Admitted to Hospital in the Home
5. Admitted to the ED
6. Dead on Arrival
7. Died in the ED
8. Emergency service completed and discharged
9. Left at own risk after treatment commenced
10. Registered, triaged and referred elsewhere without care
11. Returned to hospital
12. Transferred to another hospital.

This analysis was confined to departure status.

Admissions

Triage Category

Admissions include inpatient, SSU, observation units and emergency admissions. The figures below show the distribution of admission numbers by triage category and compares admission numbers and rates (per cent) by year. It was found that distribution of admissions by triage category is similar for 2009 and 2016. However, there was an increase in the number of admissions, especially in triage category 3.

There is an increase in total admissions across all triage categories from 2009 to 2016. In the interval between the two reporting periods, there was a significant change in the utilisation of short stay units. These units increased in usage from 2010. At present, most EDs have them. In 2009, the percentage of SSU use compared to observation units was one per cent, whereas in 2016 it was 94.5 per cent. There was no real change in other areas of departure status to be noted except in the admitted group where there was a decline. This may reflect increased utilisation of SSUs and alternative models to hospital admission.

Discharge rates remain similar. Death rates likewise remain similar comparing the two years. DNW and Left at Own Risk after Treatment Commenced rates reduced when comparing the two years.

Table 13: Admissions by Triage Category by numbers 2008-09 and 2015-16

a) 2009

Triage Cat	Disposition	Admitted	Admitted to observation ward	Admitted to the emergency department/service
1		2,597	67	81
2		23,172	1,763	2,166
3		54,192	5,479	5,105
4		17,610	2,026	2,151
5		976	142	58

b) 2016

Triage Cat	Disposition	Admitted to Short Stay Unit	Admitted	Admitted to Hospital in the Home service	Admitted to observation wards	Admitted to the emergency department/ service	Hospital in the Home patient transferred to ward	Returned to Hospital in the Home service
1		1,598	7,435	-	37	62	-	-
2		49,203	79,028	20	2,013	711	3	-
3		127,105	142,119	209	7,236	1,493	11	9
4		39,366	43,459	438	2,782	524	12	55
5		1,420	3,868	62	136	33	1	30

Table 14: Departure status of patients 2008-09 and 2015-16

Departure Status	2009		2016	
	N	%	N	%
Admitted	98,464	19.1	275,887	16.8
Transfer	10,435	2.0	28,455	1.7
Did not wait	32,798	6.4	48,711	2.9
Left at own risk after treatment commenced	7,391	1.4	30,688	1.8
Died In ED	349	0.0006	668	0.0008
DOA	71	0.0001	53	0.00003
Admitted to DEM	9,550	1.8	2,823	0.1
Admitted to SSU/ OBS ward	9,437	1.8	230,867	14.1
Emergency service completed and discharged	346,663	67.3	1,016,259	61.9

Table 15: ED patients' triage category by departure status 2008-09 and 2015-16

	Departure status	1	2	3	4	5
2009	Admitted	66.4	46.7	26.3	8.1	2.5
	Discharged	16.1	38.2	60.9	78.0	80.2
	DNW/ Left	0.9	0.2	4.8	11.0	13.9
	Died/ Dead on arrival	5.1	0.2	0.003	0.00002	0.1
2016	Admitted	76.7	61.9	41.7	14.4	3.6
	Discharged	9.9	32.2	52.2	78.1	90.1
	DNW/ Left	0.1	1.6	4.1	6.6	5.9
	Died/ Dead on arrival	3.6	0.0007	0.0001	0.00002	0.00009

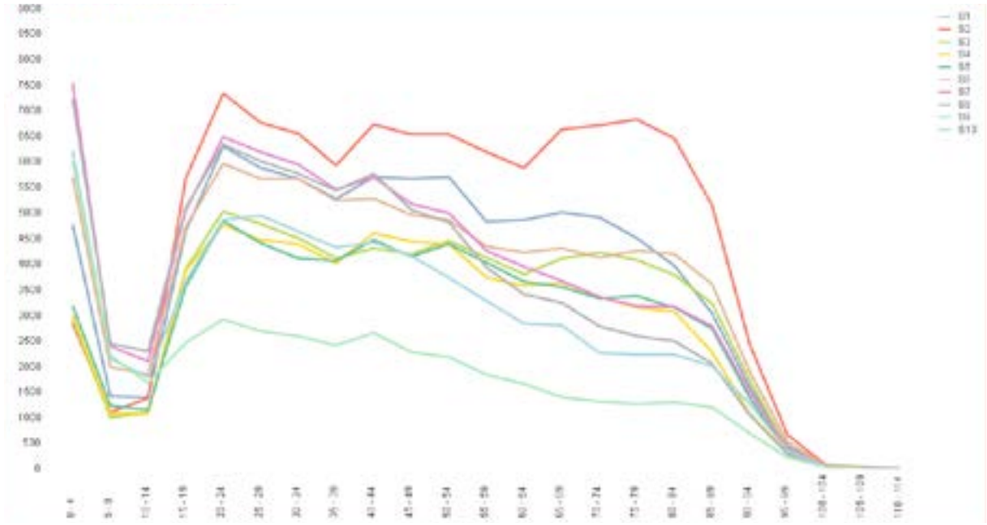
Short Stay and Observation Unit

Age groups and SEIFA

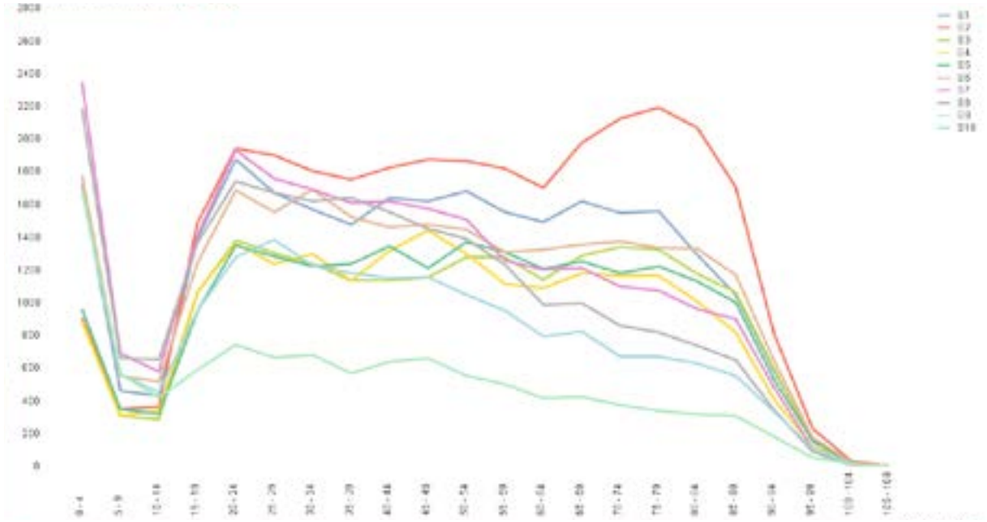
There is a significant use of ED SSU in the age group 0-9 with a peak from 15 years onward, but declines after 85 years of age. There is a low admission rate for the highest (S10) SEIFA group but an increase for the lower group S2. The remaining SEIFA groups are clustered in two groups from age 20 to 54 but merge together after that age. There is no change in pattern across both age and SEIFA groups.

Figure 45: Admitted to SSU by age-group and SEIFA

a) 2009



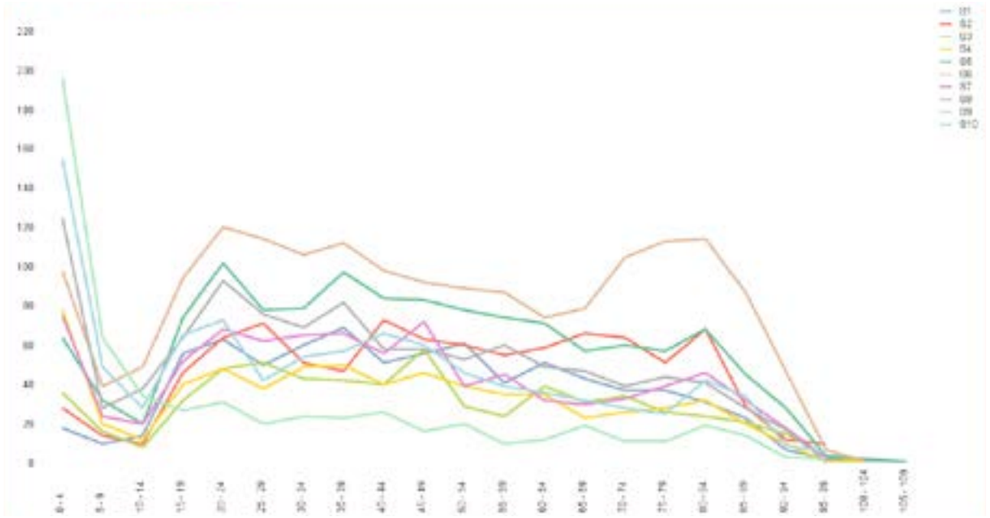
b) 2016



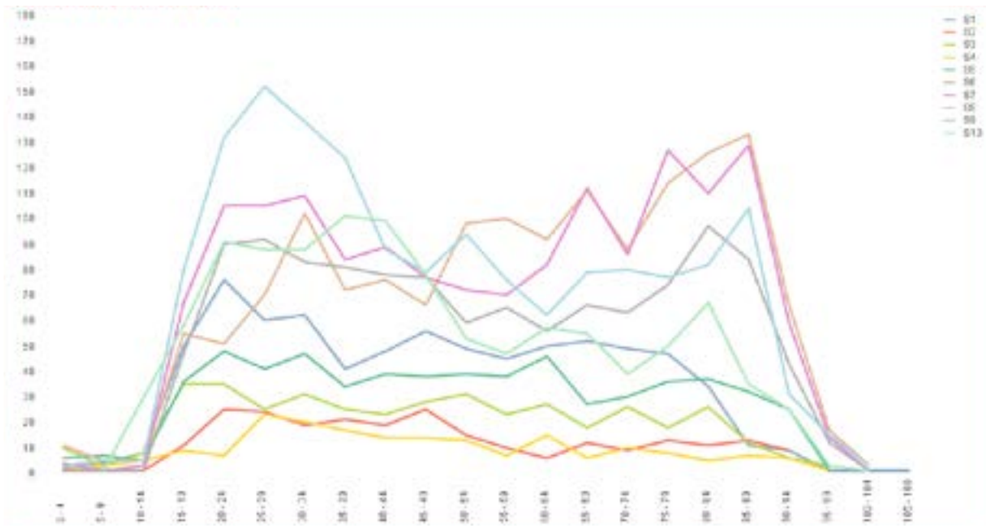
There is no distinct pattern in age groups or SEIFA for admission to observation unit, except for the large numbers admitted in the age group less than nine years of age. This is not consistent by 2016 where it appears the age group 15-34 years of age are more likely to be admitted. The change in patterns may be the result of newer models of care and the increase in ED SSU.

Figure 46: Admissions to Observation Unit by age-group and SEIFA 2008-08 and 2015-16

a) 2009



b) 2016



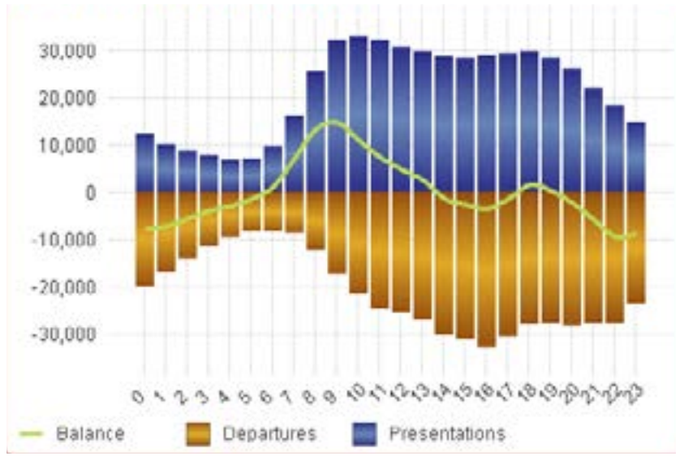
The data in these case studies were used to estimate the predicted demand and workload using calculation methods previously outlined and data analysis of age groups, SEIFA and disposition.

On the basis of this methodology, predictions in design elements and models of care were produced for future ED development. Comparing total presentations and departures (includes all admissions, transfers and discharges from ED), the pattern remains relatively the same for both 2009 and 2016. The net result line demonstrates the start of overcrowding begins at 0800 and

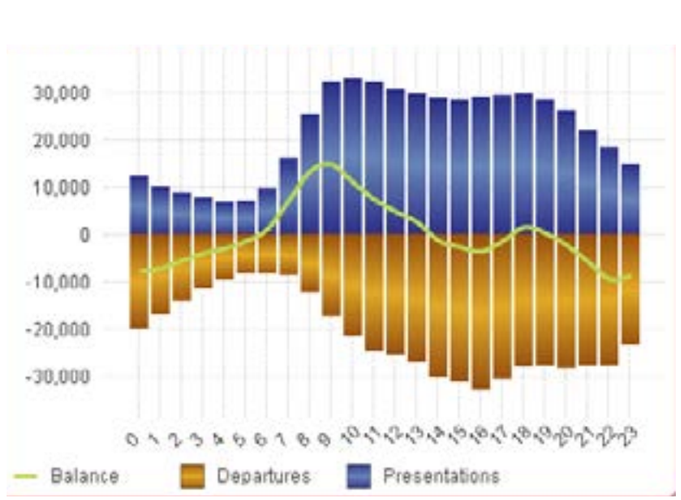
climbs to a peak at 1000 but remains above the zero line until 1700. Despite improvements in ED designs, resources and changes in patient flow, the problem remains.

Figure 47: Presentations vs Discharges by Hour 2008-09 and 2015-16

a) 2009

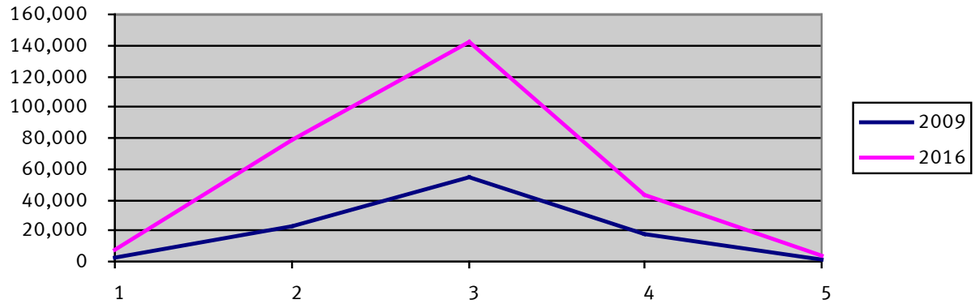


b) 2016



For the year 2009, there were 98,547 admissions to hospitals from EDs. In 2016, the figure was 275,909 reflecting an increase of 22.4 per cent per year.

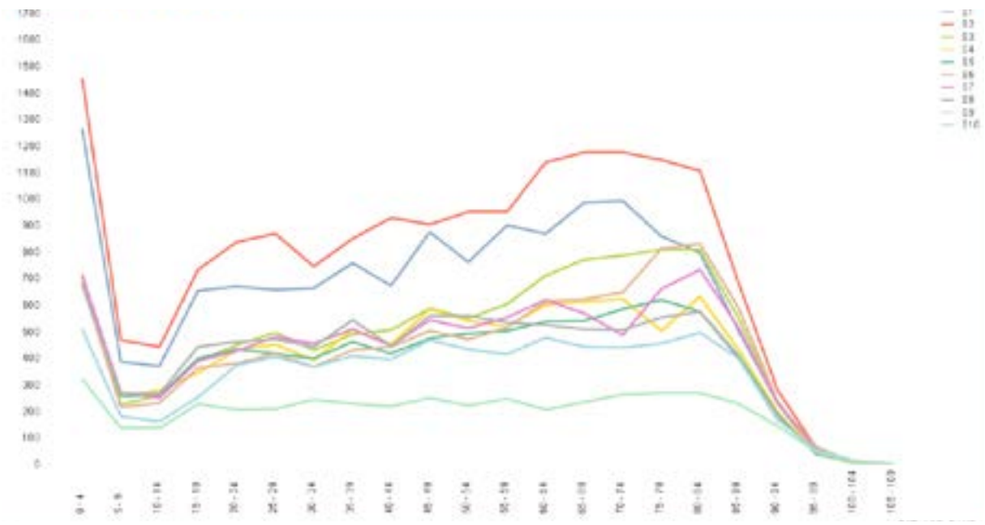
Admissions x Triage Category 2009 and 2016



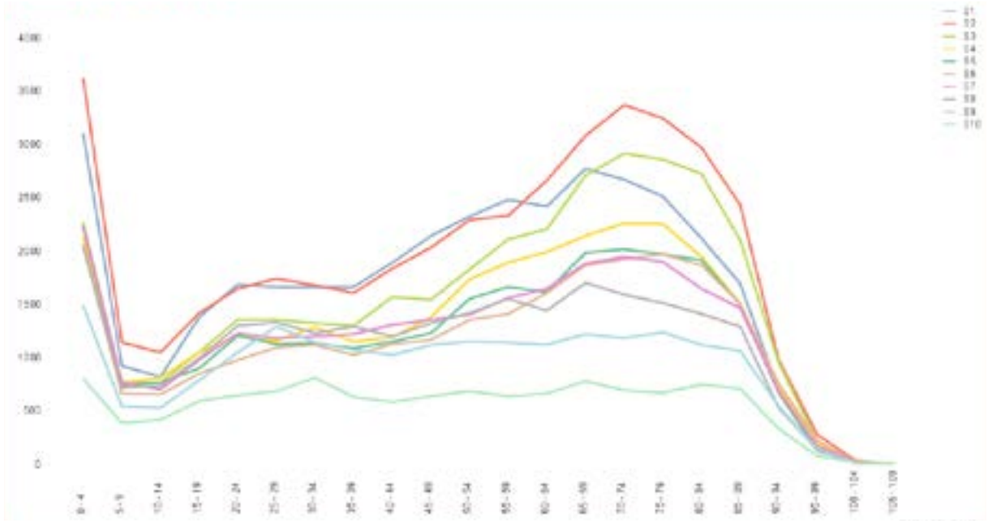
Data for 2009 admissions by age group and SEIFA reveals the most admissions were in the age groups less than nine years of age and greater than 80 years of age. The SEIFA categories with higher admissions were the lower groups one and two across all age groups, but this trend diminished after 85 years of age. It is clear that SEIFA is a marker for the likelihood of increased admission. In 2016, the pattern of age group admissions was the same but admission by SEIFA was less sustained by comparison. However, the lower SEIFA groups of one and two are still more likely to be admitted.

Figure 48: Admissions by SEIFA and age-group 2008-09 and 2015-16

a) 2009



b) 2016

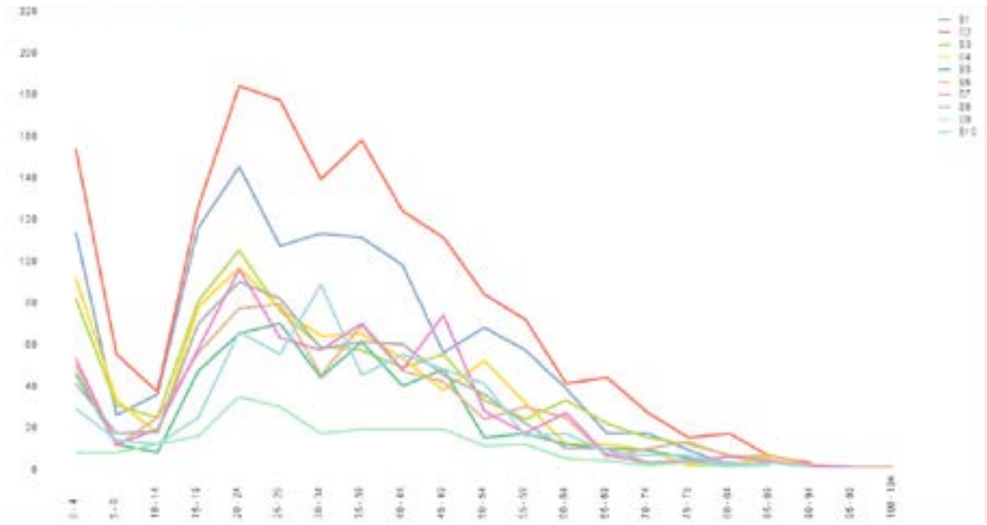


Left at own risk

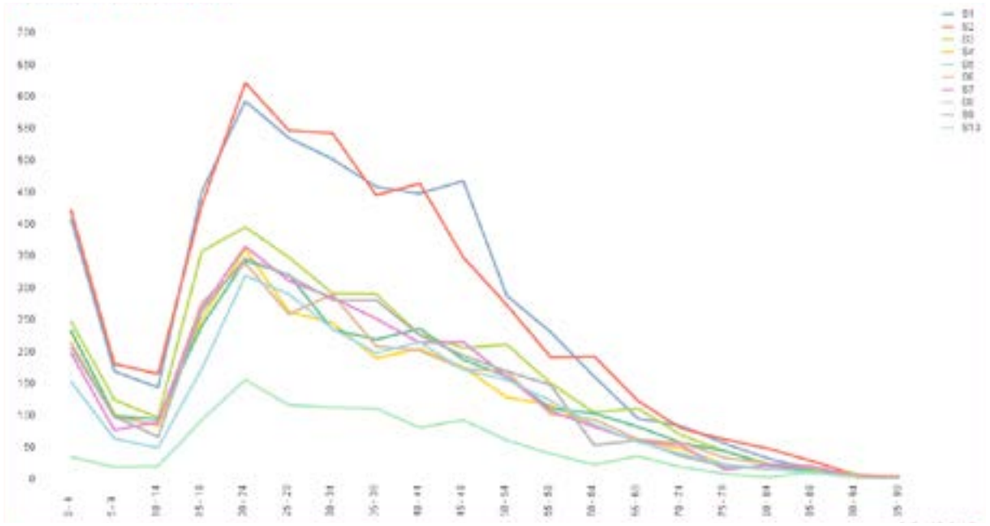
Patients who left at own risk were more prominent in the age groups less than nine years of age and 10-44 years of age. Again SEIFA categories one and two were more likely to leave than other groups. This was a pattern sustained between 2009 and 2016.

Figure 49: Left at Own Risk 2008-09 and 2015-16

a) 2009



b) 2016

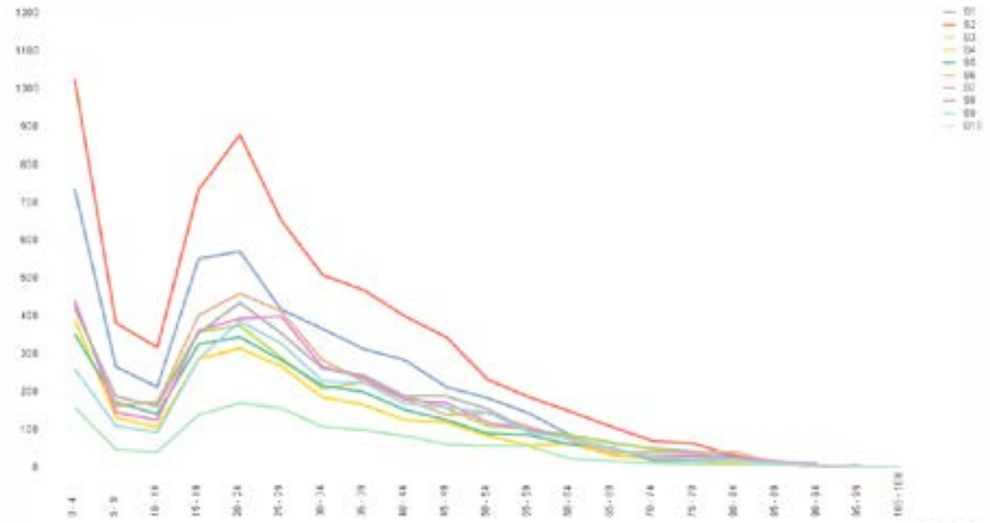


Did not wait

Analysis of DNW presentations for age groups and SEIFA revealed two age group peaks for less than nine years of age and 15 to 34 years of age. The lower SEIFA groups one and two were more likely to leave without waiting.

Figure 50: Did not Wait Figure 49 Left at Own Risk 2008-09 and 2015-16

a) 2009



Length of Stay

Below table presents the average length of time to treatment for each of the triage categories in Queensland hospitals for 2008-09 and 2015-16. Comparison of the results from the two reporting periods demonstrates definite improvement in median wait times across all triage categories.

Table 16: Median waiting time from arrival to treatment (in minutes) 2008 and 2016

Triage Category	1	2	3	4	5
2008-09					
2015-16	0.3	6.6	22.5	30.3	28.0

Below table presents the number of presentations by triage category, the percentage of total presentations and the mean LOS. Results indicate changes in percentages for categories 2 and 3 (increased) and categories 4 and 5 (decreased). LOS data are interesting in that despite a large increase in presentation numbers across all triage categories, LOS has declined considerably. This may represent increased resources, new EDs and new models of care being utilised in present EDs.

Table 17: LOS from arrival to discharge (in minutes) 2008-09 and 2015-16

Triage Category	2008-09			2015-16		
	Mean	Number	Percentage	Mean	Number	Percentage
1	**339.6**	3,900	0.7	**285.3**	11,913	0.7
2	**372.1**	49,607	9.7	**271.1**	211,399	12.9
3	**320.1**	205,678	39.9	**232.2**	667,057	40.8
4	**194.3**	215,865	41.9	**152.8**	596,399	36.6
5	**115.1**	40,144	7.8	**87.3**	148,511	9.0

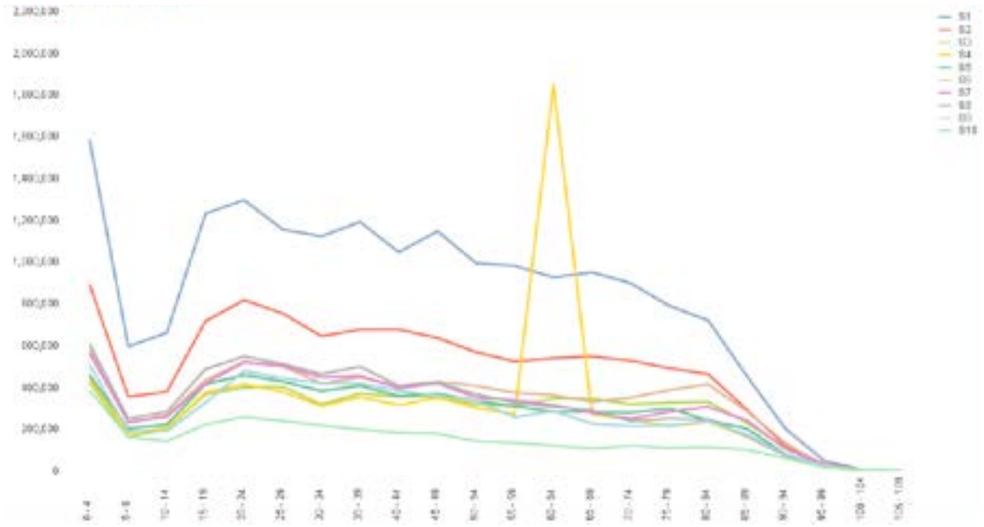
Total ED LOS by age-group and SEIFA

Comparing data for the years 2009 to 2015, the total LOS by age group and SEIFA group show a consistent pattern for all SEIFA groups across all age groups with the exception of unusual spikes in the S4 group in the age groups 60-64 in 2009, 15-19 in 2010, S1 20-24 in 2011 and 2012, 15-19 and 60-64 in 2013 respectively. As there was no consistency in the pattern of age groups in these variations, it is thought to be due to separate factors peculiar to each year or data error.

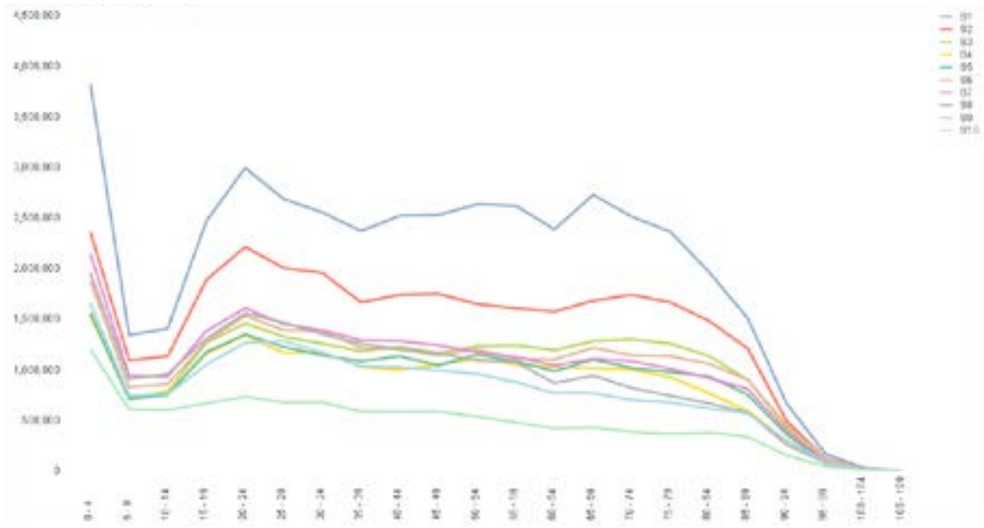
There is a definite difference in total LOS for the lowest SEIFA groups S1 and S2 and other SEIFA groups. Whilst not analysed statistically, these two groups have a longer TLOS which is consistent for all years 2009-2016 and therefore likely to be a definite finding.

Figure 51: Total LOS by age-group and SEIFA 2008-09 and 2015-16

a) 2009



b) 2016



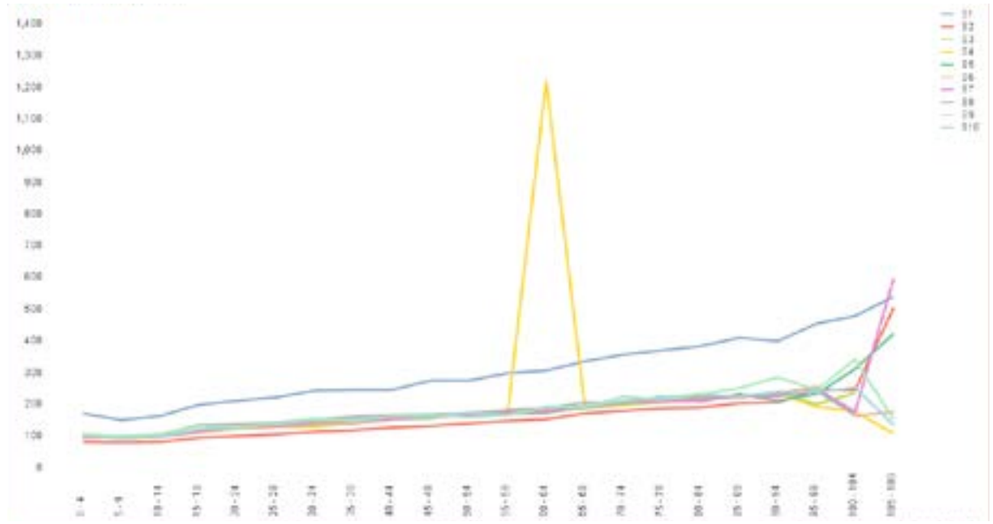
Average length of stay by age group and SEIFA

The average LOS shows a very consistent pattern of SEIFA groups across all ages. Whilst there was no statistical analysis, a definitive difference for S1 group was clearly evident. There are uncharacteristic changes to the pattern in SEIFA groups and the age groups 95+ are thought to be anomalies due to low numbers but may be a reflection of the presentation types in these age groups. It appears that LOS is independent of SEIFA in these very old age groups. However, further analysis is warranted as the very old age groups will represent increasing numbers in the future.

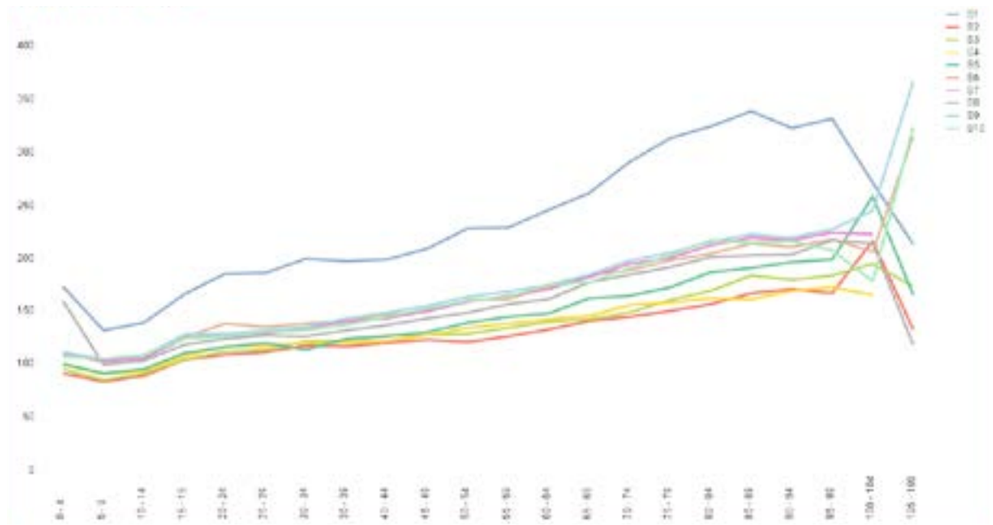
Additionally, the spike in 60-64 age group in 2009 is thought to be an anomaly due to data entry as this was not reflected in any other year.

Figure 52: Average LOS by age-group and SEIFA 2008-09 and 2015-16

(a) 2009



(b) 2016



Discharge Diagnosis

The tables below compare the top 25 ICD 10 discharge diagnostic codes and code description for patients to demonstrate the changes in the mix of patients between 2009 and 2016. ICD data was only available from 2009. There are similar codes and descriptions evident in both years but in differing rank order reflecting changes in the pattern of diseases.

Table 18: ICD Descriptions for 2009 and 2016

2009	1. Procedure not carried out because of patient's decision for other and unspecified reasons
	2. Other chest pain
	3. Acute upper respiratory infection, unspecified
	4. Follow-up examination after unspecified treatment for other conditions
	5. Viral infection, unspecified
	6. Examination and observation for other specified reasons
	7. Asthma, unspecified
	8. Urinary tract infection, site not specified
	9. Viral intestinal infection, unspecified
	10. Open wound of wrist and hand, part unspecified
	11. Pain localised to other parts of lower abdomen
	12. Sprain and strain of ankle, part unspecified
	13. Sprain and strain of other and unspecified parts of lumbar spine and pelvis
	14. Superficial injury of head, part unspecified
	15. Syncope and collapse
	16. Other gastroenteritis and colitis of infectious and unspecified origin
	17. Pneumonia, unspecified
	18. Cellulitis of lower limb
	19. Acute tonsillitis, unspecified
	20. Open wound of other parts of head
	21. Unknown and unspecified causes of morbidity
	22. Nausea and vomiting
	23. Fracture of lower end of radius, unspecified
	24. Pain localised to upper abdomen
	25. Allergy, unspecified
2016	1. Unstable angina
	2. Viral infection, unspecified
	3. Superficial injury of head, part unspecified
	4. Pain localised to other parts of lower abdomen
	5. Other chest pain
	6. Urinary tract infection, site not specified
	7. Syncope and collapse
	8. Acute upper respiratory infection, unspecified
	9. Sprain and strain of other and unspecified parts of lumbar spine and pelvis
	10. Acute abdomen
	11. Open wound of wrist and hand, part unspecified
	12. Other and unspecified abdominal pain
	13. Sprain and strain of ankle, part unspecified
	14. Nausea and vomiting
	15. Pneumonia, unspecified
	16. Procedure not carried out because of patient's decision for other and unspecified reasons
	17. Suicidal ideation
	18. Headache
	19. Other gastroenteritis and colitis of infectious and unspecified origin
	20. Asthma, unspecified
	21. Viral intestinal infection, unspecified
	22. Cellulitis of lower limb
	23. Constipation
	24. Fever, unspecified
	25. Fracture of lower end of radius, unspecified

Table 19: Comparison of the top 25 discharge diagnoses by ICD for ED patients 2009 and 2016

Code 2016	2009	2016
	N	N
I20.0	31,864	35,044
B34.9	25,003	29,286
S00.9	21,245	22,510
R10.3	20,577	21,680
R07.3	15,968	19,548
N39.0	15,549	19,270
R55	15,537	18,500
J06.9	14,730	18,383
S33.7	14,697	16,466
R10.0	14,394	16,212
S61.9	13,722	15,404
R10.4	13,390	15,308
S93.40	12,902	14,986
R11	12,085	14,608
J18.9	11,969	14,321
Z53.2	10,645	13,784
R45.81	9,786	13,313
R51	9,409	13,011
A09	9,182	12,924
J45.9	8,813	11,314
L03.11	8,129	10,812
TOTAL	**72,054**	**94,597**

Urgency Related Groups

URGs are a composite formula of ICD 10 codes, triage categories and disposition. They are surrogate markers of complexity, case-mix and workload. They are the best way of determining these factors at present. As the formula is refined with additional qualifying information, they will become more accurate as markers of complexity and workload for EDs. In July 2018, the new classification system will be introduced by the Independent Hospital Pricing Authority following extensive consultation, modelling and live trials. URGs will be replaced by Emergency Care Diagnostic Groups (ECDG). The new structure can be found in Figure 76.

Age and socio economic status

Comparative URG analysis was made for the years 2009 and 2016. This period represents the continuous use of URGs but the formula was refined in 2012. To establish a true comparison, the 2012 formula was retrospectively applied to data from 2009.

The following tables represent URGs for transferred, admitted and non-admitted ED patients in Queensland for the years 2008-09 and 2015-16.

Admitted Patients by URG

Table 20: Comparison of patients admitted by URG 2009 and 2016

URG	2009	2016	% Change
Injury	32,418	69,759	115.2
Respiratory illness	27,840	55,855	104.7
Circulatory, endocrine, nutritional and metabolic Illness	26,713	92,731	247.1
All MDB groups	14,291	72,625	386.7
Neurological illness	13,002	31,160	139.7
Gastrointestinal and digestive system illness	6,218	78,522	1,162.8
Urological illness	4,059	22,967	465.8
Poisoning/toxic effect of drugs	3,608	24,928	590.9
Blood/immune system/system infection/ parasites	3,548	16,126	354.5
Psychiatric illness	3,130	41,743	1,233.6
Hepatobiliary System Illness	2,131	8,181	283.9
Illness of the eyes, ear, and throat	2,198	11,747	434.4
Obstetric /gynaecological Illness	1,275	5,628	341.4
Social problem or other presentation	1,080	3,835	255.0
Total	**138,694**	**535,846**	**286.4**

Non-Admitted Patients

Table 21: Comparison of patients not admitted (by URG) 2009 and 2016

URG	2009	2016	% Change
Injury	109,879	345,475	217.1
Gastrointestinal and Digestive System Illness	80,917	101,527	25.5
Respiratory Illness	44,768	55,433	23.8
All MDB groups	39,299	137,889	250.8
Did not wait	32,810	48,756	48.6
Circulatory, endocrine, nutritional and metabolic Illness	15,374	36,232	135.6
Blood/immune system/system infection/parasites	13,857	23,820	71.8
Return visit	10,153	40,095	294.9
Musculoskeletal/connective tissue Illness	8,826	31,464	256.5
Genitourinary Illness	8,755	25,712	193.7
Psychiatric Illness	8,399	29,510	251.4
Neurological Illness	6,987	20,483	193.2
Left at own risk	6,986	31,625	352.7
Illness of the eyes, ear, and throat	6,956	55,512	698.0
Toxic effect of drugs and poisoning	6,652	14,997	125.5
Urological Illness	4,585	11,202	164.5
Illness of the skin/subcutaneous tissue/breast	4,022	14,605	263.1
Obstetric /neonate/newborn	2,668	8051	201.8
Musculoskeletal and connective tissue Illness	8,826	31,464	256.5
Died or deceased on arrival	217	34	
Died in ED	342	667	95.0
Total	**412,120**	**1,024337**	**148.5**

Transfers

Table 22: Percentage change patients transferred 2009 and 2016

Triage Category	2009	2016	% Change
1 - 2	2,742	9,771	256.3
3	5,638	14,018	148.6
4	1,839	4,359	137.0
5	111	297	167.6
Total	**10,330**	**28,445**	**175.3**

Admission/transfer rate

Table 23: Admission/ Transfer rate 2009 and 2016

Year	2009	2016	% Change
	36%	55%	52.7

Figure 53: Top 5 Admitted URGs

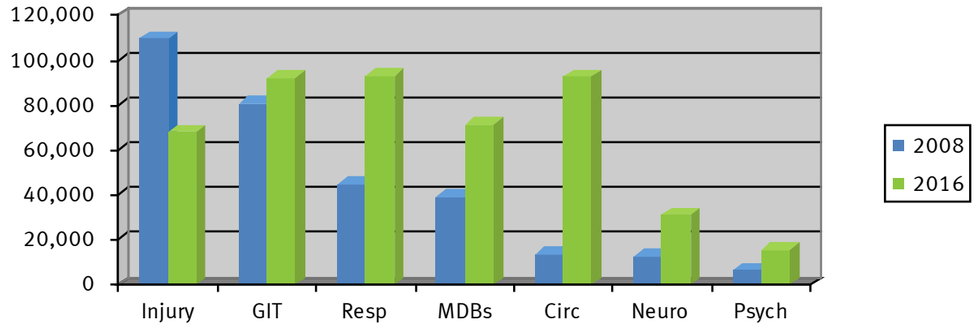
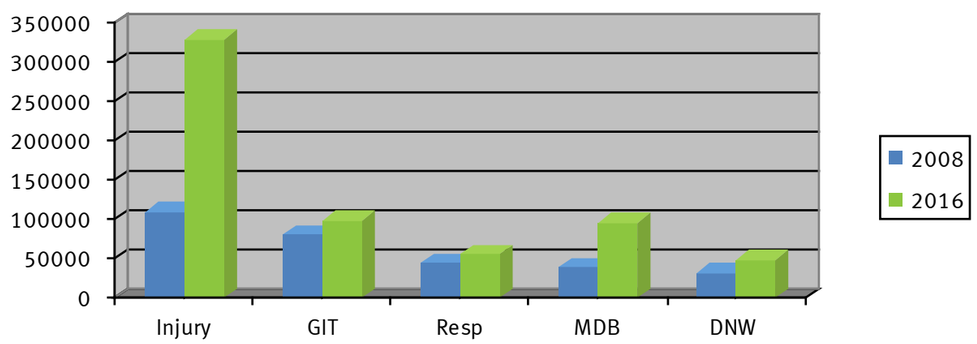


Figure 54: Top 5 Non admitted URGs



Redland Hospital and ED

Redland City

Redland City is located in the southeast of Brisbane. It is spread along the southern coast of Moreton Bay bordering the city of Brisbane and Logan City with its islands situated north of the Gold Coast.

The census in 2016 revealed the resident population of Redland City was 147,010[183] living in 59,817 dwellings in an average household size of 2.62[183]. The 2011 census revealed the resident population was 138,665. Approximately 94 per cent of the population is employed with 81.2

per cent over 15 years of age. In 2016-17 the population was estimated to be 151,987. By 2026 the projected population will be 172,673 (IDcommunity Demographic Services, 2016 #1040). There will be, at least, an additional 9,447 detached and semi-detached dwellings built by 2016, increasing the population by 33,000 people (IDcommunity Demographic Services, 2016 #1040). Redland Hospital is unique in that it has high throughput and acuity in a mixed ED with limited secondary services and no intensive care unit. The application of the data sets is based upon ED service delivery and the implications for future secondary service delivery (Queensland Government, 2018 #1039).

Redland Hospital

Redland hospital a 148-bed hospital and is approximately 25 kilometres east south of Brisbane and is the major health centre for Redland City and Brisbane's southern bayside suburbs.[184] The level four hospital provides emergency, general medical, paediatric, surgical, geriatric, palliative care and obstetric and gynaecological services. The hospital is co-located with the Mater Private Hospital Redland (60 beds), the Redland Health Service Centre[11] and Redland Residential Care.[184,12] Administratively, the hospital is part of the Metro South HHS.

In 2012, Redland Hospital completed a multi-million dollar expansion, which included the creation of a dedicated paediatric emergency and treatment area, expanded emergency short stay unit, and expanded and refurbished paediatric ward and new paediatric ambulatory services centre as part of the Redland Health Service Centre.[184]

The ED is a level four department and has one resuscitation room, three critical care cubicles, 11 acute cubicles, four bed clinical decision unit, five cubicle ambulatory care unit, a fast track area and an 11-bed short stay unit. The department also has a dedicated paediatric unit.

Growth

In 2016-17, there were 54,741[184] presentations to the ED. From 2008-09 to 2015-16 presentations grew by 135 per cent for those aged 0-14, 113 per cent for 20-24 years. There was a 390 per cent growth in presentations for people aged over 70. With a forecast of about 100,000 presentations to the ED by 2026-27, it is predicted that the greatest number of patients will be aged 0-14, 20-24 and greater than 70 years respectively. A third cohort identified to have predicted impact was the 80-84 age group. This cohort will create significant demand even though the total numbers are less by comparison because of their comorbidities and complex disease profile.

Demand

The following table summarises the age group growth and predicted numbers by 2026-27. The peak growth will be in the age group less than 14 years. It should be noted that the older age group has a significant growth rate. This group will have a higher complexity and likely comorbidities. Therefore, this group will have a major impact on ED demand and hospital based services.

[11] Provides a range of community and primary health services including child health, breast screen, chronic disease management, ATSI liaison, palliative care and public dental clinic.

[12] Is a 126-bed high care residential aged care facility. This includes eight residential transition beds.

Demand activity for 2016 across variables for age, SEIFA, triage categories and disposition are indicated in the following figures. SEIFA group analysis indicates S6-9 comprise the majority of presentations reflecting the relative middle to upper class construct of the population. As a growth area with increasingly younger and more affluent families moving to the area it is expected that both the age group demands and SEIFA groups will change little by 2026-27.

Analysis reveals that the highest utilisation is in the mid SEIFA group with peaks in the age groups 0-4, 20-24 and 50-54 years respectively. This pattern is different from the statewide one and reflects the different socioeconomic mix of Redland City compared with Caboolture.

The pattern of presentations by age group by hour of day also reveals the typical peak for 0-10 age group presenting later in the day which is consistent pattern across the state. Presentations by day of week and month of year reveal no consistent pattern different from other equivalent EDs. Disposition patterns are similar to other equivalent EDs. The pattern for net presentations versus departures has a similar pattern to statewide patterns.

Disposition data analysis indicates that the two age groups with a larger admission rate are 0-9 and ›75 years. Most likely to be discharged are the age group 10-70.

Table 24: Summary of growth by age group and predicted presentation demand

Age -Group	Annualised Growth Rate (%) 2009-16	Predicted Demand (presentation numbers) 2026-27
‹14	6.5	22,627
20-24	3.6	49,908
›70	5.1	11,595

Figure 55: Presentations by age groups and SIEFA 2016

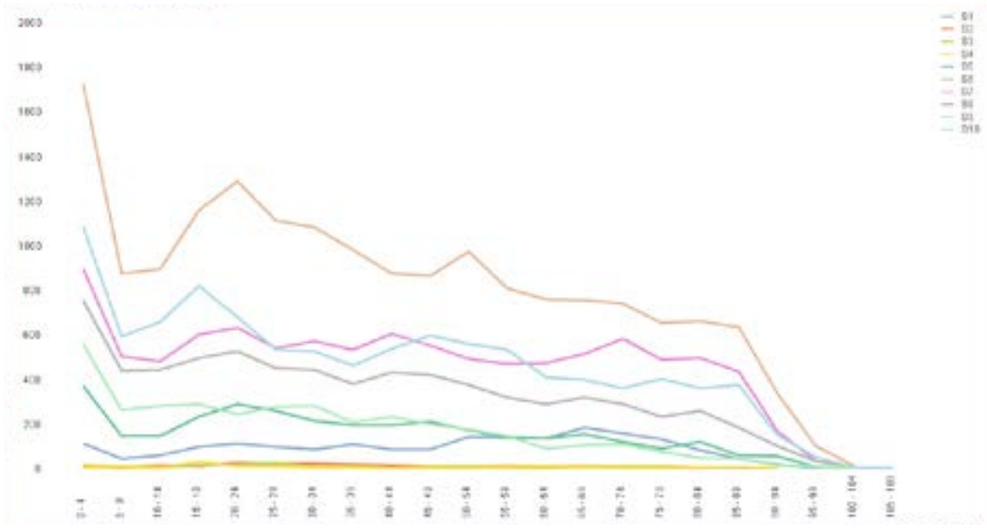


Figure 56: Presentations by age group (10 year groups) and hour of day 2016

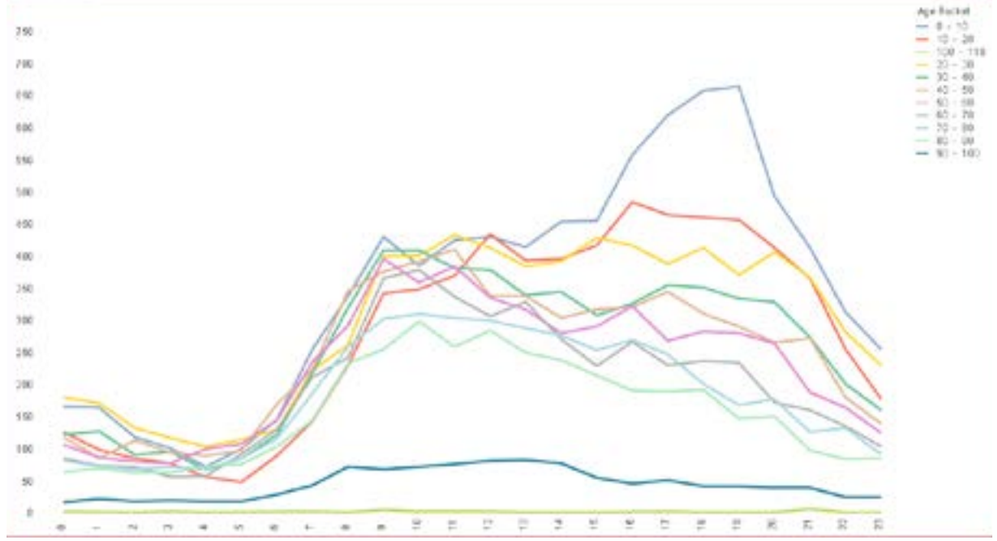


Figure 57: Presentations by age group (‹16, 16-75 and ›75 year groups) and hour of day 2016

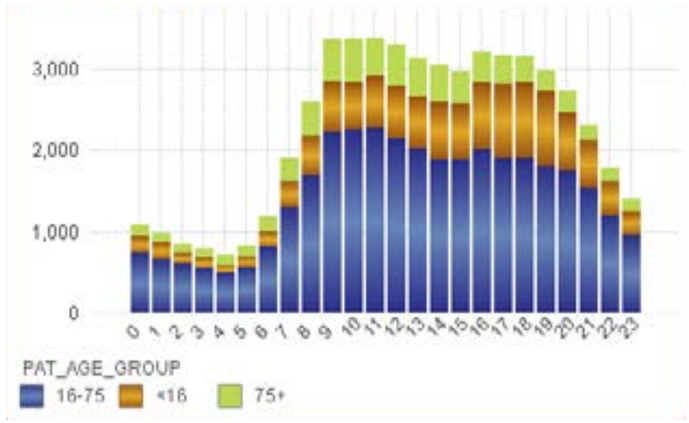


Figure 58: Presentations by day of week and age 2016

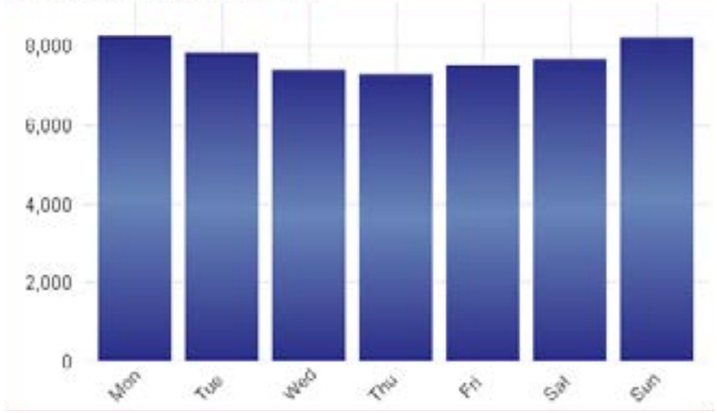


Figure 59: Presentations x by month and age group 2016

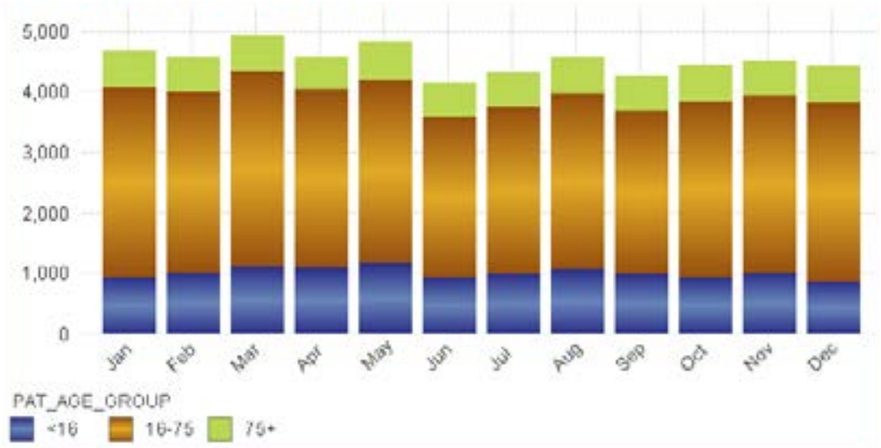


Figure 60: Total LOS by SEIFA and age group 2016

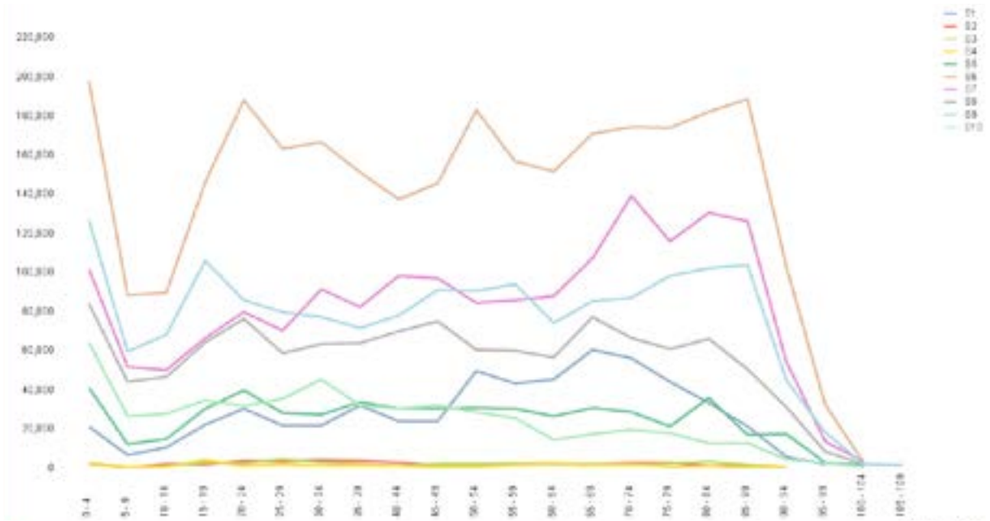
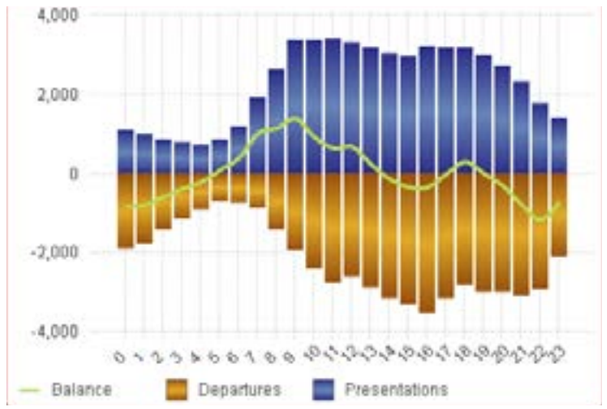


Table 25: Disposition by triage category 2016

Triage Cat	Dis-position	Did not wait	Admitted to Short Stay Unit	Admitted	Emergency service episode completed and discharged	Left at own risk after treatment commenced	Transferred to another hospital	Died in the emergency department/ service	Admitted to Hospital in the Home service	Admitted to observation ward	Admitted to the emergency department/ service	Hospital in the Home patient transferred to ward	Returned to Hospital in the Home service
1		-	11	87	31	2	55	14	-	11	5	-	-
2		19	1,157	1,218	2,895	94	694	2	2	956	63	-	-
3		835	2,947	2,080	15,570	297	1,284	4	34	1,900	112	3	4
4		1,011	870	451	14,900	159	334	-	59	352	31	1	4
5		193	31	26	3,249	36	18	-	22	10	1	1	2

Figure 61: Net Presentations versus departures 2016



Workload

The following tables list the admitted, non-admitted and transfer URGs for 2009 and 2016. There have been significant changes in activity and workload between the two years. For the admitted group, there are marked increases in urological and gastro-intestinal disorders.

In the non-admitted group, a huge change in psychiatric illness is noted. Injuries have also increased.

Transfer numbers have climbed dramatically, reflecting the increasing severity of illnesses presenting. Most of these are required to be transferred because Redland Hospital does not have a coronary care unit or intensive care unit.

Table 26: Admitted URGs for 2009 and 2016

URG	2009	2016	% Change	Annualised % Change
Respiratory Diseases	1,074	1,544	43.7	6.24
Circulatory System/Endocrine and metabolic diseases	604	2,517	316	45.1
Gastrointestinal System and Digestive Diseases	227	1,785	686	98
Neurological Diseases	154	553	259	37
Major Diagnostic Blocks (not classified elsewhere)	146	1,572	976	139
Injury	139	916	558	79.1
Psychiatric Illness	109	206	88	12.6
Urological Illness	109	511	368	52.5
Blood/immune system illness/system infection/ parasites	109	291	166	23.7

Table 27: Non-admitted URGs for 2009 and 2016

URG	2009	2016	% Change	Annualised % Change
Injury	4,352	13,742	215	30.7
Major Diagnostic Blocks (not elsewhere classified)	2,934	3,583	27.1	3.8
Gastrointestinal and Digestive Illness	1,603	4,046	152	21.7
Respiratory System Illness	1,100	1,815	39.9	5.7
Did Not Wait	876	2,054	134	19.1
Circulatory System/Endocrine and metabolic diseases		1,540	52.9	7.55
Genitourinary System	397	1,021	157	22.4
Illness of the ENT	382	703	84.0	12.0
Neurological illness	332	860	159	22.7
Blood/immune system illness/system infection/ parasites	224	1,222	268	38.2
Psychiatric Illness	155	1,247	704	100.5

Table 28: Transfers

Transfers	2009	2016	% Change
	913	2,385	161

Data analysis

Redland Hospital and ED faces an increasing demand and workload. As evidenced by the large growth rates expected in the URGs of gastrointestinal, psychiatric and urological cases, along with significant growth rates in all other URGs from 2009 to 2016. It is therefore likely this profile of URGs will continue to 2026-27. Additionally, the growth rate in the age group most likely to suffer from these URGs and other age-related URGs, the demand and workload will be significant, especially if there is no increase in secondary hospital services. There is potential for a larger than expected population growth as the Redland City Land Supply Review is due for review after 2020.

Transfers showed a significant growth with the absolute number in 2016, being the largest of any ED in the state. Further analysis of this subgroup reveals the large number is due to the lack of secondary in-patient services, coronary care unit and an intensive care unit. Additionally, this sub analysis reveals private hospital transfers make up ten per cent of all transfers. This reflects the higher than average private insurance rate in the Redland City population.

If the rate of transfers continues at the same growth rate as total attendances, by 2026-27 there will be 3,922. This has significance for future hospital development.

The data analysis reveals the following key factors in determining future design concepts and models of care:

- The demand in the three age groups
- Most patients are discharged (78 per cent)
- Predominance of mid-range of SEIFA groups will mean shorter average ED LOS
- Predominance of circulatory and respiratory illnesses for admitted patients
- Huge growth rate in psychiatric illness patients discharged
- Large growth in injury presentations
- Large growth in blood and immune system illnesses.

Based on the demand, age groups and URGs, changes and growth in demand and workload, the following design concepts and models of care should be considered for any future ED developments.

Design concepts

1. A large paediatric area with an integrated short stay unit and dedicated resuscitation area
2. A large acute adult area
3. A specifically designed elderly patient area with extended stay capabilities
4. A critical care area with an integrated intensive care/critical care unit
5. A behavioural management area
6. A dedicated mental health area
7. An ambulatory/rapid treatment area for injuries
8. Emergency planning/short stay unit
9. Acute clinical decision units, especially for circulatory illnesses such as chest pain and neurological illnesses.

Models of care

a. streaming and front loading
b. specific frail elderly care
c. use of allied health as clinician of first contact
d. condition specific clinical decision units with clinical pathways
e. residential aged care outreach/in reach service
f. accelerated paediatric clinical pathways
g. expanded hospital in the home service
h. point of care pathology
i. end of life care and planning

Caboolture Hospital and ED

Caboolture Shire

Caboolture is part of the Moreton Regional Council and located on the northern fringe of Brisbane, south of the Sunshine Coast. The 2016 census revealed the resident population of Caboolture in 2016 was 67,583[183] living in 25,490 dwellings with an average household size of 2.77. The 2011 census showed the resident population was 59,654 (IDcommunity Demographic Services, 2016 #1041). Approximately 89 per cent of the population is employed with 78 per cent over 15 years of age (IDcommunity Demographic Services, 2016 #1041).

The population growth from 2011 to 2026 will be 33.7 per cent as calculated by the Queensland Government Statistics Office. The estimates population will be 167,354 in the drainage area of Caboolture Hospital.

Estimating future demand by the ratio of ED presentations to population reveals a predicted total of 63,612 presentations. Using the prediction formula model of a growth rate of 2.26 per cent per annum +/- 0.39 per cent (95 per cent confidence interval), the total will be 66,650.

Predicted population growth is shown below. Analysis of the land utilisation plan from the Moreton Regional Council indicates housing and other developments will signifcantly increase the population serviced by Caboolture Hospital by 2026.

Figure 62: Moreton Regional Council Population Projection by age groups (QGSO)

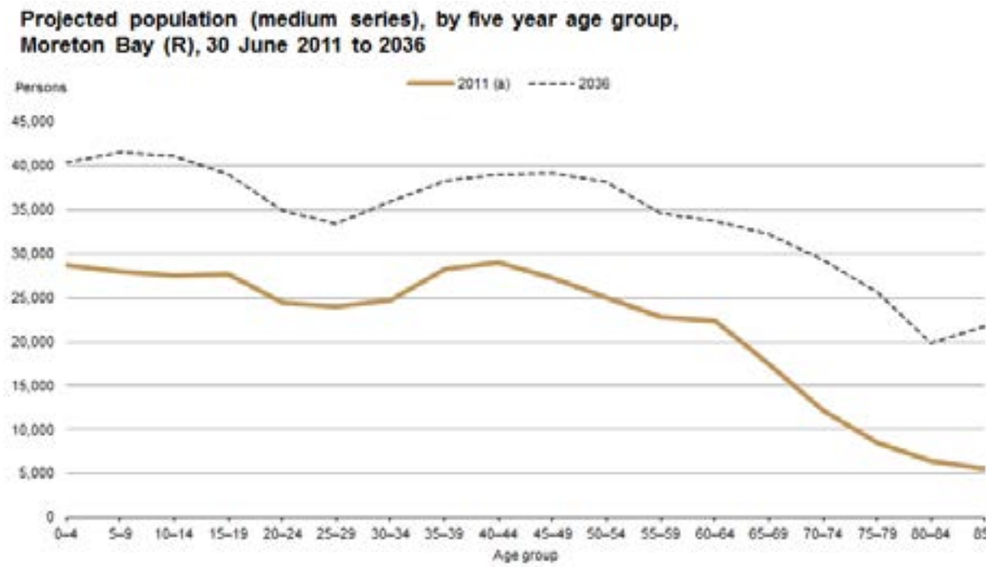
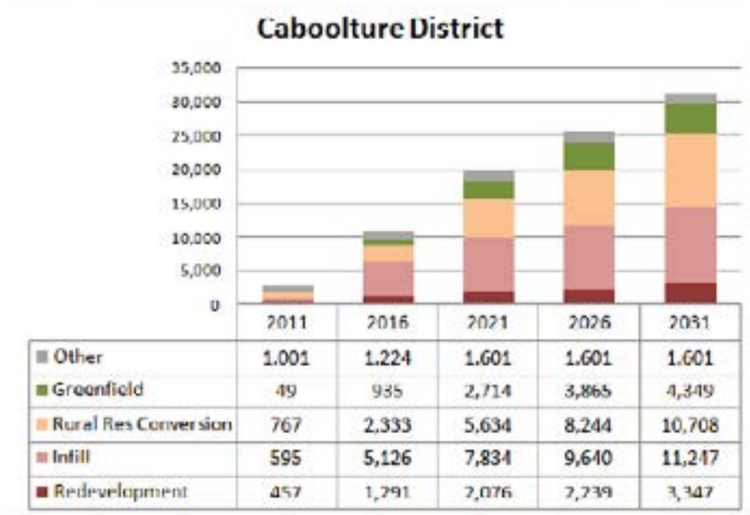


Table 29: Predicted Land Utilisation for Caboolture District x Dwelling Numbers and Type

	Pine Rivers District		Caboolture District		Redcliffe District		MBRC	
Land Supply Type	**Total Dwellings 2011 to 2031**	**%**	**Total Dwellings 2011 to 2031**	**%**	**Total Dwellings 2011 to 2031**	**%**	**Total Dwellings 2011 to 2031**	**%**
Redevelopment	2,036	7	2,890	10	2,824	52	7,750	12
Infill	5,352	18	10,652	38	2,289	42	18,293	29
Rural Res Conversion	3,923	14	9,941	35	0	0	13,864	22
Greenfield	17,675	61	4,300	15	0	0	21,975	35
Other	24	0	600	2	279	5	903	1
Total	**29,010**	**100**	**28,383**	**100**	**5,392**	**100**	**62,785**	**100**

Figure 63: Predicted Land Utilisation for Caboolture District by Land Type



Caboolture Hospital

Caboolture Hospital is a 194 bed facility approximately 50 kilometres north of Brisbane. Administratively the hospital is part of the Metro North HHS. The hospital provides emergency, general medical, cardiology, surgical, geriatric medicine, paediatric, obstetric and gynaecological services. The ED is a level four department with four resuscitation rooms, seven acute cubicles, a fast track area and a seven bed short stay unit.

Demand

The demand for 2016 by age grouping and SEIFA factors is summarised in the following tables and graphs which indicate the impacts of both factors. From 2008-09 to 2015-16 presentations grew by 5.1 per cent across all age groups. Further sub age group analysis reveals there was a 9.3 per cent growth in presentations for people aged over 55-59 years and 7.6 per cent for 70-74 years respectively. This indicates a forecast of about 100,000 presentations to the ED by 2026-27. It is predicted that the greatest number of patients will be aged 0-4 and greater than 70 years respectively. The latter cohort will create significant demand even though the total numbers are less by comparison because of their comorbidities and complex disease profile.

Typical of statewide patterns, the lower SEIFA groups and the age groups 0-4 and 5-29 years, respectively, utilise EDs more than any other group. It is interesting to note that the SEIFA group S3 and the age group 60-84 years are also significant users of ED services.

The pattern of presentations by hour of day, day of week and month of year are similar to statewide patterns. Total LOS is largest in the lowest SEIFA groups, not dissimilar to other equivalent EDs in regions with similar socioeconomic profiles.

The net pattern of presentations versus departures is consistent with all other EDs in Queensland.

This pattern that has not changed significantly over the eight years of data collection and analysis.

The following table summarises the age group growth and predicted numbers by 2026-27.

Table 30: Summary of growth by age group and predicted presentation demand

Age - Group	Annualised Growth Rate 2009-16	Predicted Demand (presentation numbers) 2026-27
‹14	5.1	19,120
20-24	5.1	6,480
›70	5.1	16,802

Table 31: Predicted Annualised Growth Rate in age-group Presentations and Presentations by 2026

0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44
1.0%	2.0%	2.4	1.0%	1.4%	1%	1.9%	1%	3.7%
6,162	3,115	3,308	4,200	4,604	3,792	3,895	3,167	4,379
45-49	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**›80**	
3.2%	4.7%	9.3%	4.7%	4.7%	7.6%	6.9%	6%	
3,720	3,375	6,029	3,633	4,098	5,169	4,574	7,616	

Figure 64: Presentations by SEIFA and age-groups 2016

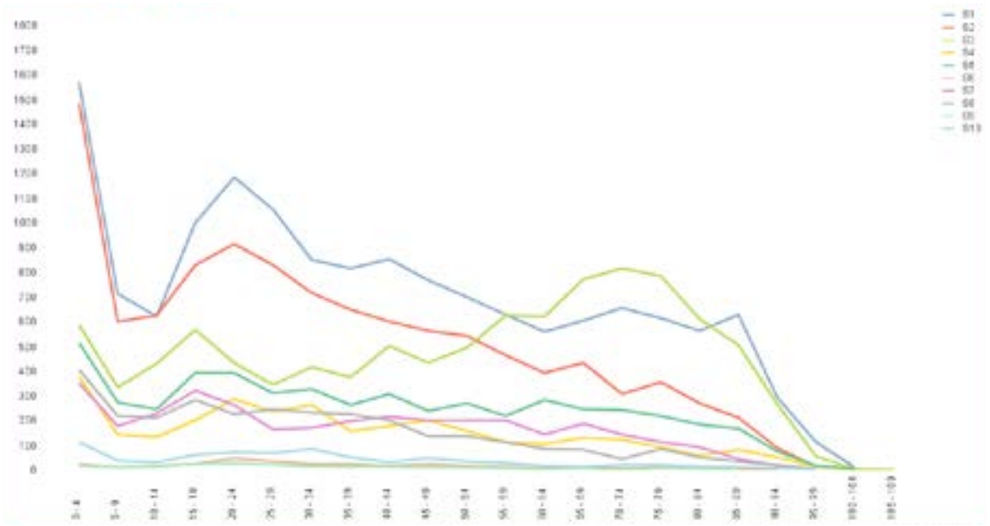


Figure 65: Presentations by Age and Hour 2016

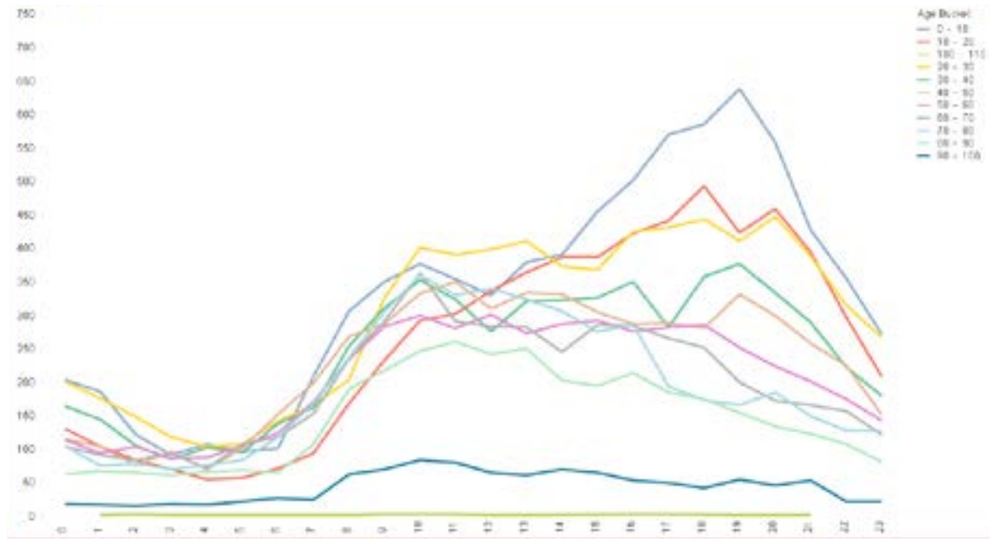


Figure 66: Total LOS by SEIFA and age-groups 2016

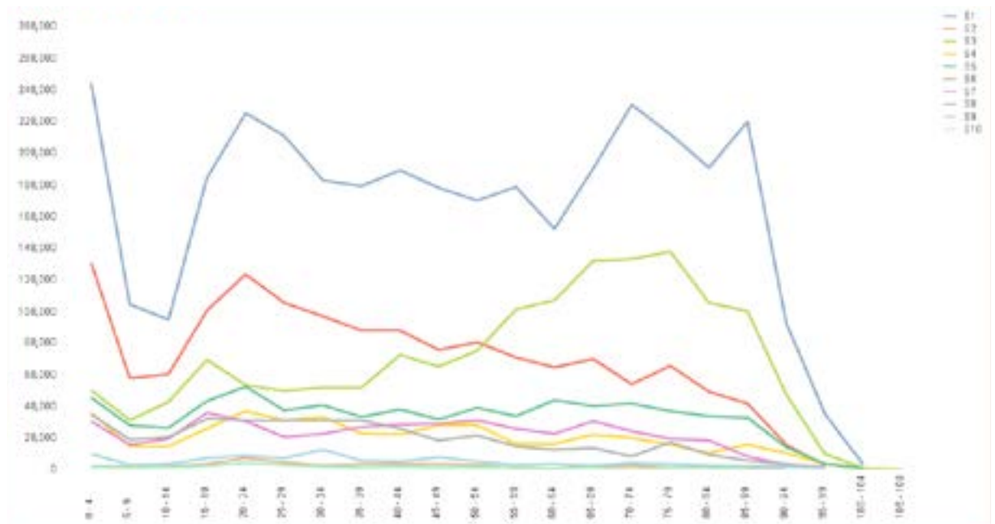


Figure 67: Presentations by Age and Hour 2016

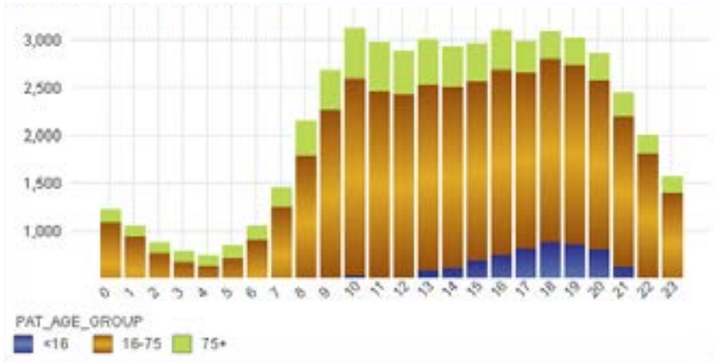


Figure 68: Presentations by age-group and Day of Week

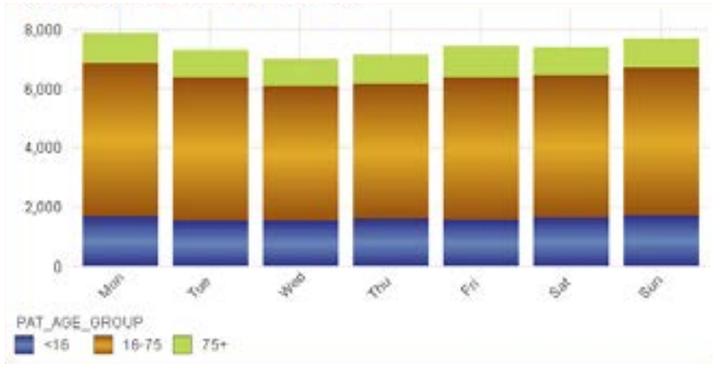


Figure 69: Presentations by age-group and by Month

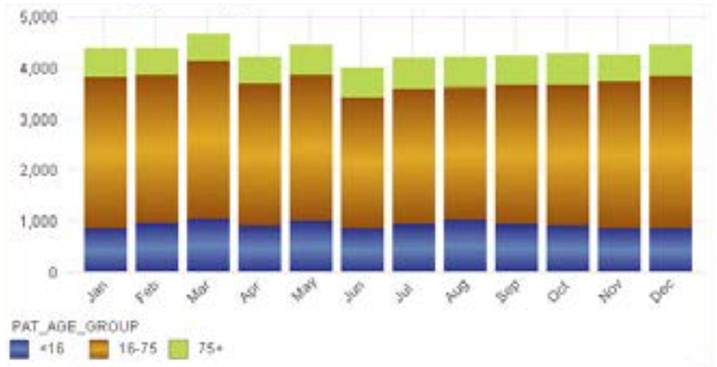


Figure 70: Presentations vs Discharges by Hour

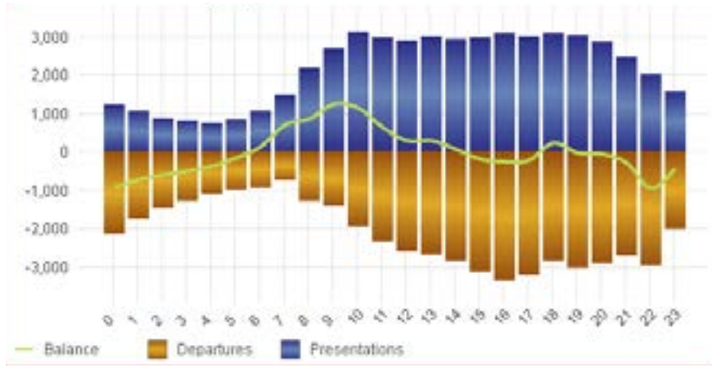


Table 32: Summary of Disposition by Triage Category (2016)

Triage Cat	Dis-position	Did not wait	Admitted to Short Stay Unit	Admitted	Admitted to Short Stay Unit	Left at own risk after treatment commenced	Admitted to observation ward	Transferred to another hospital	Admitted to the ED/ service	Died in the ED/ service	Dead on arrival (no treatment provided in the ED	Admitted to the emergency department/ service	Returned to Hospital in the Home service
1		-	14	122	38	4	-	25	3	17	1	-	-
2		12	2,729	3,483	2,779	200	-	318	28	12	-	1	-
3		583	13,448	6,270	4,172	1,221	1	372	35	4	-	-	1
4		658	11,456	1,081	1,064	699	-	101	8	-	-	3	1
5		60	632	20	14	38	-	5	-	-	1	-	-

Workload

Changes in URG profiles for the top 10 admitted and non-admitted patients are summarised in the following tables. There has been significant growth in all URGs for admitted patients. Large increases are noted for infection, urological and eye/ENT illnesses.

In the non-admitted group of patients, ENT/eye and digestive illnesses stand out as having very large growth rates. Likewise transfers show a large increase indicating the lack of secondary services and expansion of the hospital.

Table 33: Change in Top 12 URGs from 2009 to 2016 for Admitted Patients

URG	2009	2016	% Change	Annualised Growth Rate %
Circulatory	1,226	3,970	216.2	27.4
Digestive	1,071	2,392	123.4	15.1
Respiratory	**737**	**2,425**	**229.1**	**28.6**
Injury	649	2,028	212.4	26.5
MDBs	722	2,468	241.8	30.2
Neurological	324	1,230	279.6	34.9
Urological	187	992	430.4	53.8
Blood/Immune	176	581	230.1	28.7
Psych	172	634	268.9	33.5
Hep-biliary	122	347	184.4	23.0
Eyes/ENT	96	372	287.5	35.9
Infection	44	219	397.7	49.7
Poisoning	155	363	134.1	16.7

Table 34: Changes in Top 12 URGs for 2009 to 2016 for Non-Admitted Patients

URG	2009	2016	% Change	Annualised Growth Rate %
Injury	3922	11073	182.3	22.7
Digestive	1329	3341	515.3	18.9
Circulatory	**640**	**1535**	**139.8**	**17.4**
Respiratory	1035	1492	44.1	5.5
MDBs	2100	1487	-29.2	-0.03
Psych	312	1324	324.2	40.4
Urological	187	826	241.1	42.7
Eyes/ENT	56	786	1303.7	162.9
Poisoning	157	495	215.2	26.9
Genito-ur	166	307	84.9	10.6
O&N	96	188	95.8	11.9
O&G	145	172	18.6	2.3
Poisoning	155	363	134.1	16.7
Genito-ur	166	307	84.9	10.6
O&N	96	188	95.8	11.9
O&G	145	172	18.6	2.3

Table 35: Changes in Transfers 2009 to 2016

Transfers	2009	2016	% Change
	372	921	147.5

Data analysis:

The above data indicate that Caboolture Hospital faces a large growth in population. This will impact on the ED's ability to manage demand and workload/case-mix. The large growth in specific conditions such as eye/ENT, infections and urological conditions will require appropriate clinical pathways to manage these. Growth in utilisation of ED in the lower age groups and SEIFA groups which have increased LOS and admission rates, will require specific models of care and design concepts to manage the demand.

Predicted growth in demand is predominantly in the age groups greater than 50 years of age. Queensland Government Statistics Office (QGSO) demographic data indicates that the age distribution pattern across Moreton Regional Council area will not change significantly by 2036. It is expected that this pattern will also be the same in 2026. Therefore the demand will be within the age groups as mentioned. There will be significant growth in demand by the older population. New models of care and design concepts will be necessary for managing this group.

Whilst the age group less than 10 years of age does not demonstrate significant predicted growth in ED demand, the growth in this age group population will be significant. Therefore, it is expected that demand for emergency services will be high.

The annualised rate of increase in ED presentations from 2009 to 2016 was 8.3 per cent. Applying the prediction formula, the ED attendances by 2026 will be 116,833 +/- 9,258 (95 per cent confidence interval). As stated previously the age and SEIFA groupings should remain similar to those in 2016. Therefore the workload pattern should remain similar.

From these data the following should be considered in future ED developments.

Design concepts

1. Paediatric area and short stay unit
2. Trauma area
3. Fast track/ambulatory area
4. Critical care area with possible extended stay critical care unit
5. Acute adult area with Clinical Decision Units
6. Women's health area, including Early Pregnancy Assessment Service (EPAS)
7. Eye/ENT area
8. Adult emergency planning unit
9. Elderly persons area with extended stay unit
10. Acute mental health and behavioural assessment and management area

Models of care

1. Streaming
2. Geriatric and frail elderly
3. Residential Aged Care Outreach Service (CARE-PACT)
4. Paediatric fast track pathways
5. Extended care/emergency planning pathways
6. Expanded critical care for short term ventilation
7. EPAS fast track
8. Early senior clinical decision making
9. Extended community outreach service
10. Clinical Pathways for specific diseases

Chapter 8: Discussion, Reflections and Conclusions

This chapter discusses the present study findings' strengths limitations and study implications and recommendations for policy and future research.

From the survey results, there is a concern that existing designs and models of care are not meeting present demand. Therefore, on review of the results future design concept models of care and support services including IT will have to be considerably modified and resourced if EDs are to meet the future demand.

The following are derived from all of the data analysed and form the basis of the conclusions.

Design Concepts

The results outlined above and the survey of Queensland EDs indicate there needs to be significant change and investment in the way EDs need to function and are designed. The survey of EDs revealed a variety of possible models of care for future patient management.

This paper outlines possible ways EDs can function with new design concepts and elements which should be incorporated into future ED builds.

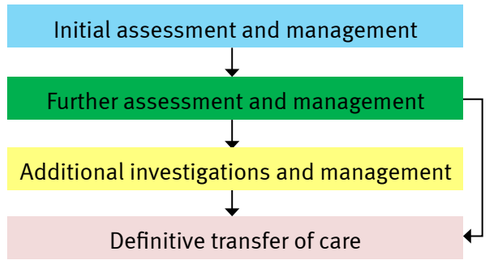
The following delineates all of the considerations necessary for future ED designs.

1. Basis of patient flow
2. Principles of design
3. Elements of design
4. Spatial relationships
5. Models of care
6. Digitalisation and technology
7. Resource considerations

Basis of ED patient flow

The premise of the process of patient flow around which the design concepts are bases is the "3 to 4 step process".

Figure 71: The 3 to 4 Step Process



This process is designed to simplify how patients are managed through their time in ED to ensure the right patient is placed in the right area at the right time. By initially assessing patients, as they arrive, by senior medical and nursing personnel and "streaming" the patient to the appropriate area for definitive assessment and management. Streaming is already a model of care used in the United Kingdom. It involves more than the decision to place patients in the most appropriate area. Initial investigations, including pathology tests using point of care technology, performing other bedside tests (ECG and spirometry) and ordering appropriate radiological investigations is performed at the initial presentation. Patient management can also be commenced. Clinical pathways are commenced before the patient is transferred for further assessment and management.

Some patients will complete their stay at the second stage and their care transferred to an appropriate clinician and/or destination. Other patients may require additional assessment to determine a diagnosis and/or further management before a decision can be made regarding the disposition and transfer of care.

This third stage allows for whatever is necessary for the patient to have definitive decisions made about their care and eventual transfer of care to be made in a supportive and appropriately resourced environment. The context, function, structure and governance of the third stage will vary according to each facilities' case-mix, models of care and governance structure. It may take the form of an extended stay, SSU, acute assessment unit or medical planning unit or any other type of assessment and planning unit. The governance of this area will vary depending on the models of care used for the demand and case-mix.

The term "transfer of care" replaces previously used terms of discharge and admission. The present terms do not reflect the need for a continuum of care and information about patients. A patient focused delivery of care is a continuum and not isolated steps. Clinical handover is well recognised as a significant risk to patients in the continuum of care.

The importance of an appropriate plan of continuing management is clearly delineated and the inclusion of patients in this process cannot be emphasised enough. Patients in EDs vary widely and a holistic approach is important to ensure care is delivered appropriately.

Design

Principles

The age groups and disease profiles of patients presenting to EDs in the future will need to be managed specifically and treated as one cohort. These factors have been identified[1] and summarised in Table 1. EDs will need to be designed, built and resourced for these groups. Processes will need to change significantly to improve flow and timely treatment and disposition. Inherent in design principles are these factors. Individual EDs will have different profiles of age groups and case-mix. These principles apply to all design processes.

1. Access: entry and exit points are identifiable and easily accessible for all patient groups
2. Patient centric: comfortable, access to natural light, privacy
3. Flexibility: able to change capacity according to demand at any one time
4. Expandability: able to expand structurally to meet future demands without interrupting existing operation
5. Suitability: meets desired outcomes for patients and staff
6. Safety: minimises risks for patients, carers, family and staff.

Elements

Single portal of entry is essential to control flow and ensure patients are treated in the right place at the right time. The area should be spacious, well equipped and staffed. Senior medical and nursing personnel are necessary for the early identification of illness severity and type and to ensure early assessment, investigation and management is commenced. This early senior assessment and bedside investigations at this point can markedly reduce diagnostic errors, improve flow and reduce ED LOS, a factor well recognised as increasing morbidity and mortality the greater the LOS for admitted patients.[26, 185, 186]

Elimination of triage and introduction of "streaming" will enhance the principles of right patient, right place and right time. Specific groups, as mentioned above, can have a primary assessment, investigations arranged and performed prior to their placement in an area specifically designed and resourced for their continuing care.

Adequate space, resources and access to point of care or beside testing is essential in any design. Consideration should be given to maximising patient flow by minimising use of fixed placement of trolleys. The use of multiple chairs and/or small waiting areas within the assessment and management areas should be considered. It is not always necessary for patients to occupy a trolley for their entire LOS.

Essential Group Specific Areas (GSA) can be presentation type, age, function or complexity based. These will vary according to age, case-mix and disease profiles of presentations to the ED. Based on survey results and the literature review, there are essential group specific areas common to all EDs.

The essential areas suggested for group specific management in EDs are:

- Critical care/trauma area for adults and/or paediatrics
- Paediatric and adolescent area (for mixed departments)
- Adult acute
- Chronic disease and multiple co-morbidities
- Elderly and frail elderly acute and subacute
- Mental health
- Behaviour management for non-critically ill patients
- Women's health
- Ambulatory/sub-acute/fast track

These are suggested minimum requirements. The type, size and configuration of GSAs will depend on individual ED case-mix and governance. Additional GSAs can be added and changed to suit individual EDs, for example a detoxification area.

It is possible that there will need to be sub-elements within each GSA to reflect the models of care adopted for the specific groups. The current concept of rapid assessment, management and transit (time indicators) through the ED should be replaced by patient focused treatment and outcome based indicators. Therefore, longer LOS may become more common with the purpose of more assessment and multidisciplinary interventions to facilitate transfer of care to the community and avoid admissions. The focus must be "what is best for the patient."

It should be noted that robust patient flow mechanisms must still be in place for patients requiring in-patient management. Without this, unnecessary increased lengths of stay and overcrowding will continue in EDs. Responsibility for patient flow is an organisational one. All clinicians must be involved in ensuring patients are managed in the right place at the right time by the right clinicians.

Spatial relationships

Concepts of spatial relationships define the relationship between people, objects and space. Spatial relationships have functional components and structural patterns.

Functional components

- Intersection: one function crosses with another
- Overlap: similar functions are performed in each
- Containment: one area contains the function of another
- Touching: one function is shared between two areas.

Structural Pattern

- Linear
- Axial
- Grid
- Central
- Radial
- Clustered

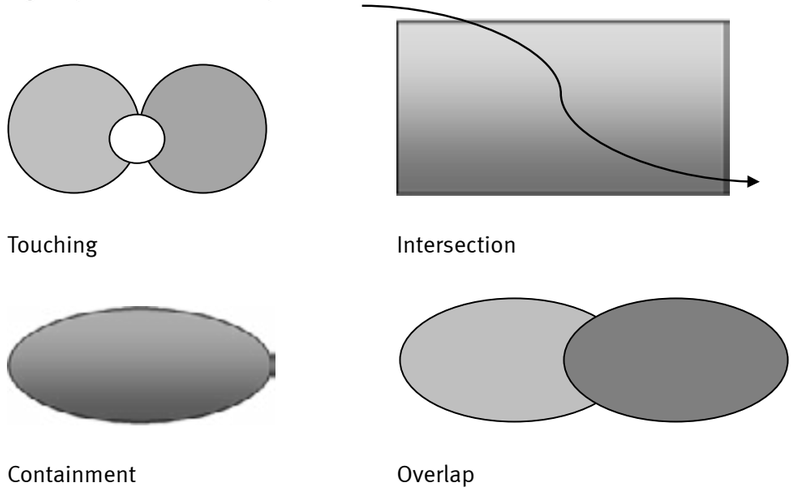
In the functioning of a GSA/pod, it may have one or more of these dimensions.

These relationships are essential in maximising patient flow and capacity demand, especially when the underlying principles are applied. Individual EDs may not need all components but whichever ones are selected, patient focus must be maintained. Some components will be completely self-sufficient and independent of other areas, whilst others may co-exist and share space. The construct of the department as a whole will be dependent upon the demand, case-mix/workload and the models of care adopted.

Essential support and investigation facilities need to be accessible and proximate to the key management areas. It may be necessary to have more than one "hub" of support services within the ED design, especially for patients requiring urgent radiological investigations. Pathology can utilise point of care testing (POCT) or bedside pathology testing (BPT) which negates the need for dedicated pathology areas.

Other support services such as laundry, cleaning, porterage and food/beverage access need to be accessible to or part of each area.

Figure 72: Functional Components



(Refer to Appendices 2 and 3)

Analysis of all of the predictive data, survey results and literature review indicate that ED roles and functions will change significantly over the next decade. EDs are the "front door" of the hospital system. There is no substantial analysis of the reasons people attend EDs. Some evidence suggests patients view EDs as an ideal "one-stop" place for assessment and management of a wide range of complaints without cost at the time of service. As well, patients often consider their primary care practitioner as not having the necessary skills or resources to manage their issues. It is clear primary care in urban areas will become more and more oriented to chronic and complex disease management and health prevention, so additionally, as populations grow, demand will increase disproportionately as indicated previously.

Costs are rising and it is evident that jurisdictions find funding healthcare increasingly difficult. To meet this demand the roles and functions of EDs must change but should do so in a planned manner which meets their patient population needs for emergency care.

EDs will be expected to adopt a significantly increased range of functions. These will extend from critical care to end of life care. The first component for future planning is demand prediction.

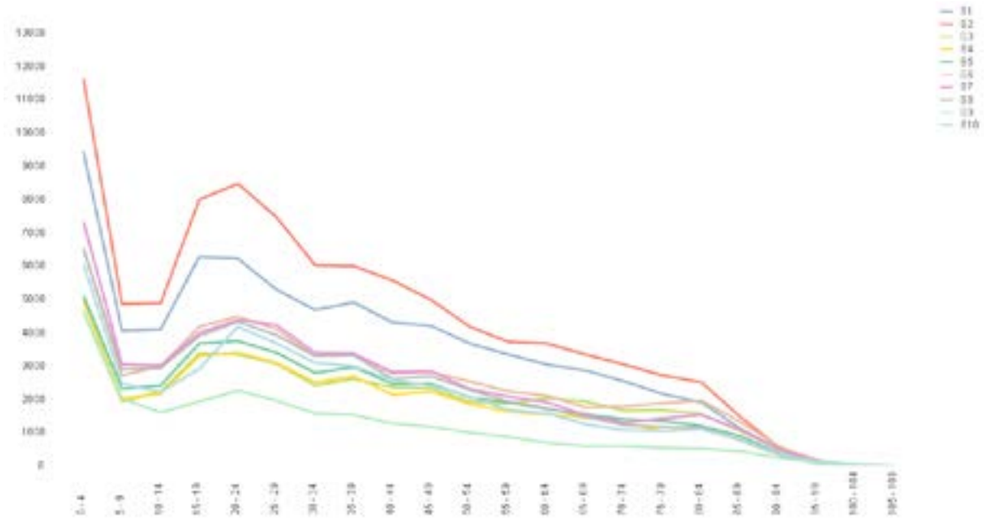
Demand

The data analyses have revealed there are two factors that influence demand: SEIFA and age group.

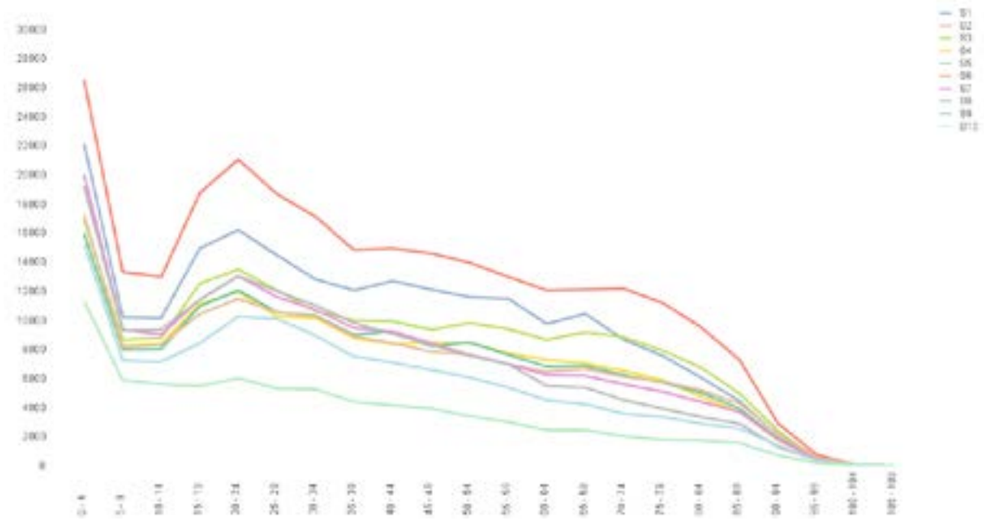
There are consistent patterns across the state indicating certain age groups and SEIFA groups individually and together impact on ED presentations. Whilst CIs were not applied, graphical images clearly show these differences. The pattern has not changed from 2009 to 2016 confirming consistent agreement with the two factors influencing ED utilisation.

Figure 73: Presentations by SEIFA and age-groups 2008-09 and 2015-16

a) 2009



b) 2016



Workload

The second component to be considered impacting future planning is workload/case-mix.

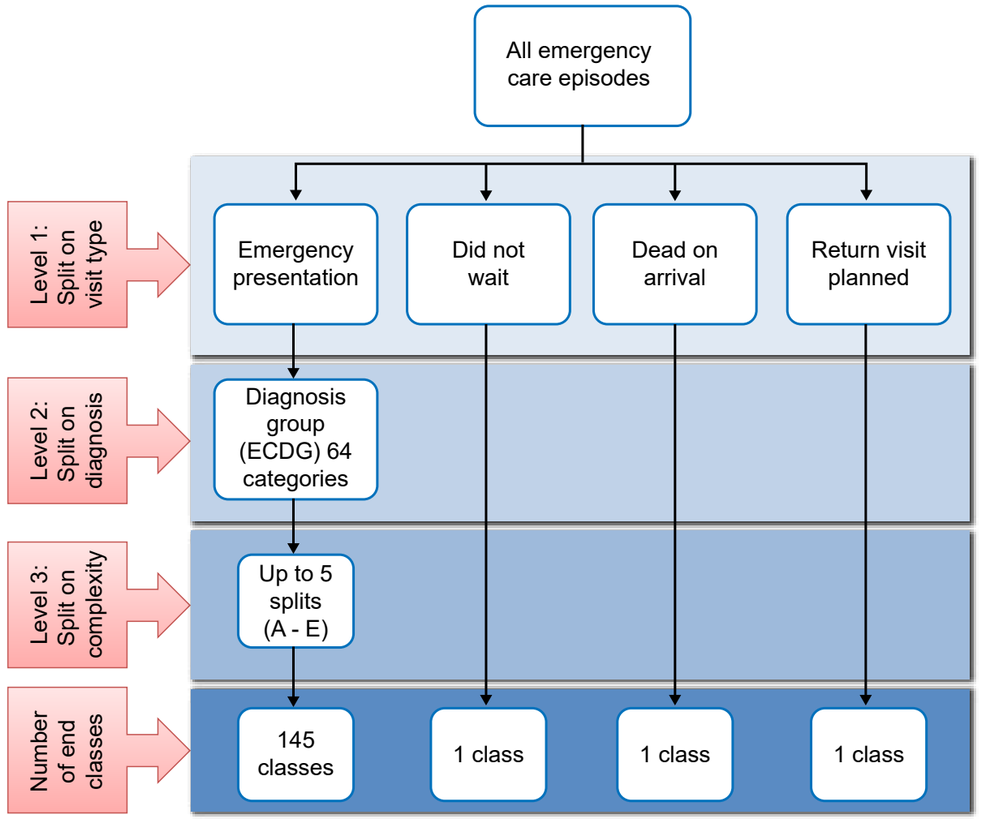
Whilst patterns of URGs across HHSs and individual EDs differed, the differences were not as marked as expected. There were consistent URGs common to all EDs. This is represented in the following tables. Analysis of URGs can provide important information about the case-mix each ED is likely to have in the future. A new formula and classification structure will be introduced in July 2018 which will be based on additional factors apart from ICD codes, disposition and triage categories (see figure 76). URGs will be replaced by Emergency Care Diagnostic Groups.

This will provide important case-mix information that will enhance future planning when matched with predicted demand. With better data quality and the new formula, there will be more defined case-mix/workload information. In the future, the influence of SEIFA, age and a complexity score will enhance these data even more providing important information on ED case-mix and workload.

Table 36: Common Top 12 URGS for the State

URG Non-Admitted	URG Admitted
Injury	Respiratory Diseases
Major Diagnostic Blocks (not elsewhere classified) *	Circulatory System/Endocrine and metabolic disease
Gastrointestinal and Digestive Diseases	Gastrointestinal System and Digestive Diseases
Respiratory Diseases	Neurological Diseases
Did Not Wait	Major Diagnostic Blocks (not classified elsewhere) *
Circulatory System/Endocrine and metabolic diseases	Injury
Genitourinary System	Psychiatric Illness
Illness of the ENT	Urological Illness
Neurological illness	Blood/immune system illness/system infection/ parasites
Blood/immune system illness/system infection/parasites	Eyes/ENT
Psychiatric Illness	System Infection/parasites

Figure 74: IHPA Emergency Care Costing and Classification Project 2014-18 (Final Format)



Future Roles

Future ED roles will include, but are not limited to, the following:

1. Critical care
2. Paediatric care
3. Acute adult care
4. Trauma care
5. Acute deterioration of chronic disease care
6. Multiple comorbidities care
7. Obstetrics and gynaecology care
8. Infectious disease and epidemic management
9. Palliative and end of life care
10. Frail elderly care
11. Extended assessment and management of acute conditions
12. Joint ED-community care
13. Residential aged care in-reach and out-reach service
14. Mental health and behaviour conditions care
15. Displaced persons care.

These are now discussed in further detail.

1. Critical Care: The role of EDs in providing critical care is already established. This role will be extended to providing an intensive care type unit within the department. The demand an hospital intensive care units will not be met by current models. ED Critical Care Units will service a specific group of patients who will not require extended intensive care. This model is already in use in the United States of America.
2. Data revealed significant growth in the under five-years age group. A comprehensive ED paediatric care unit will provide acute care, extended “short stay” care and health promotion/preventative care for children.
3. Adults presenting with acute onset illnesses will still be a significant workload for EDs. A complete range of services will be necessary to manage the spectrum of adult presentations for medical, surgical, orthopaedic and other conditions. This will require a multi-faceted approach and significant resources. To prevent hospital admissions in this group, an extended care function will be required.
4. All aspects of trauma care will be managed within the ED. This will include major initial trauma management. Additionally, minor trauma care, fracture and dislocation reductions, wound care and soft tissue injury care will be managed entirely within the ED.
5. The chronic disease burden has been identified as significant risk for ED workload/case-mix. Acute deterioration in this group will place great demand on EDs. There will need to be a coordinated approach. Ultimately these patients will be managed in a multi-disciplinary clinical decision unit within the ED in conjunction with community services.
6. The chronic disease group will form most of the comorbidities group so will managed similarly. This group will be the most difficult to manage as frequently they do have good coordinated care. The ED is well placed to provide this with liaison with all sub specialties involved in the care. It may be that the acute generalist physician will coordinate this, rather than emergency physicians.
7. Acute obstetric issues may still be managed in an acute labour ward. Early pregnancy complications will become the responsibility of the ED as obstetric resources decrease. Several models for early pregnancy assessment already exist. Care will be extended to other gynaecological presentations as well as sexual health and disease management.
8. There have been two major influenza outbreaks in the last five years. Tuberculosis and other infectious diseases are increasing in prevalence. There was also the recent outbreak of Ebola virus in West Africa. According to the USAID PREDICT program it is inevitable disease epidemics and pandemics will continue to occur with increasing frequency.
9. EDs are already a place where patients are referred at the end of life. End of life care is a component of end of life planning. The increasing proportion of older persons within the general population has implications for EDs in regards to end of life care. This must be considered in future models of care and design.

10. It is expected the “aging” population will create pressure on healthcare services not only by numbers but by complexity, including dementia. Models have already been developed such as GEDI. Future EDs will have a designated and resourced area for these patients to maximise the potential to return to the community rather than be admitted to an in-patient unit.
11. SSU models have proven beneficial for patient flow and outcomes. The future will mean these units will become a combination of short stay and extended stay clinical decision units. Patients will be managed by multidisciplinary teams.

Conclusions

As a result of this research, it is evident that:

From the data analysis, it is clear there are challenges facing healthcare providers and funders. The expected demand for ED services will outstrip resources. Building new hospitals will be expensive both to build and to operate. The estimated cost presently is between $1,500,000 and $2,000,000 per bed to build and the same amount to operate the hospital per year plus inflation. It is cheaper to build larger EDs with expanded roles than build entire new complexes. There is a delay of between 3-5 years from decision to build and opening the hospital, depending on its size and complexity.

EDs are efficient and cost effective. It is safer for patients and outcomes may prove to be better. The present models of acute care are centred on emergency assessment and treatment and, where necessary, in-patient care. These models are changing with more emphasis placed on utilisation models of care to keep patients out of hospital and in the community. Strategies for illness prevention are not as advanced as expected and will be generational in achieving any significant changes in disease patterns. It is important strategies about illness prevention are progressed rapidly and funded accordingly.

It is clear from the data analyses that there are two main determinants of ED utilisation: age and socioeconomic status. Age growth patterns are predictable. Socioeconomic group changes are not predictable to the same degree. Several factors will influence the changes such as creation of new jobs and industries in differing geographical areas than traditional industries, combined with population shifts. Digital disruption is already here and the future work profiles and distribution may alter dramatically. Working from home for instance may change the distribution of the workforce and socioeconomic structure.

Taking into account the growth in population, ED utilisation, changes in age group patterns and socioeconomic factors, future healthcare delivery will have to change. Present models of care will not be sufficient to match demand. The present method of care delivery and subsequent facility design will need to change to match new care models. Therefore, the following are the study conclusions.

Function and Roles

1. Most acute care will be provided at the “front door” by large multi-functional EDs
2. This care will be provided by multidisciplinary teams, for specific patient cohorts in prescribed areas within EDs, independent of the rest of the department. These areas will be self-sufficient.
3. EDs will have the following new roles and functions in addition to existing roles:
   - admission prevention, using alternative disease management strategies
   - age-related patient management such as frail elderly
   - advanced critical care capabilities
   - community outreach/in-reach services
   - end of life care
   - community liaison
   - disease risk modification.

Design Concepts

1. Designing new EDs must include the analysis of predicted growth in population, age groups and socioeconomic status
2. Analysis of these factors will determine the demand and workload
3. Demand and workload will determine the models of care necessary to meet both
4. Spatial analysis will be an important part in the design process to ensure maximising patient management and flow
5. Group Specific Areas will be modelled on all of the above factors.

Models of Care

There will be essential core models of care for future EDs. Other models will be developed as more analysis about case-mix and demand is performed.

These models of care will not necessarily be required in every ED, as new departments are developed or existing ones expanded. Analysis of the workload and demand will determine which models of care are necessary.

1. Streaming
2. “Front loading”
3. Consultant led teams – “early decision process”
4. Presentation and age specific clinical pathways
5. Fast track process
6. Sub-acute management
7. Extended Care Units
8. Paediatric care and short stay capabilities
9. Elderly care
10. Expanded critical care service
11. Condition specific Clinical Decision Unit

12. Residential age care in-reach and out-reach service
13. Early pregnancy assessment service
14. Multi-disciplinary complex/co-morbidities management.

Continuum of Care

Information sharing and community based care and support will become essential. A seamless continuum of care is absolutely necessary to reduce duplication, improve disease management, patient outcomes and high quality safe care.

Conclusions

EDs will need to change both their structure, including design and resource allocation, models of care and the methods of service delivery.

The suggested proposed elements and concepts of design should not be seen as necessarily suitable for all EDs. These elements should form the basis for planning and be combined with data analysis tools developed in the paper mentioned above. The differences in growth patterns for age groups and socioeconomic status impact ED utilisation and admission rates and therefore, will influence the elements of ED design.

Additionally, the models of care adopted to manage the potential case-mix and presentation numbers will influence design. The spatial relationships between various ED functions need to be considered to ensure patient flow is maximised. Therefore, for each new ED design, the input of all of these factors will determine what elements are used and how they will relate to each other and the facility. They will determine what models of care are required and their relationship spatially.

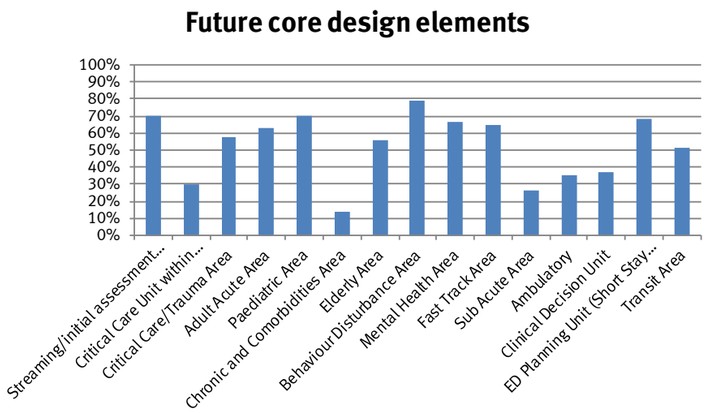
Appendices

Appendix 1: Survey Monkey Results

Future design

There was a wide variety of elements considered as core requirements for future EDs across all EDs. However, mental health and behaviour management figure highly in all responses, in having dedicated areas (79 per cent and 67 per cent respectively). An additional finding of interest is that 70 per cent indicated an initial assessment area and streaming will be necessary.

Figure 1: Future Core Elements



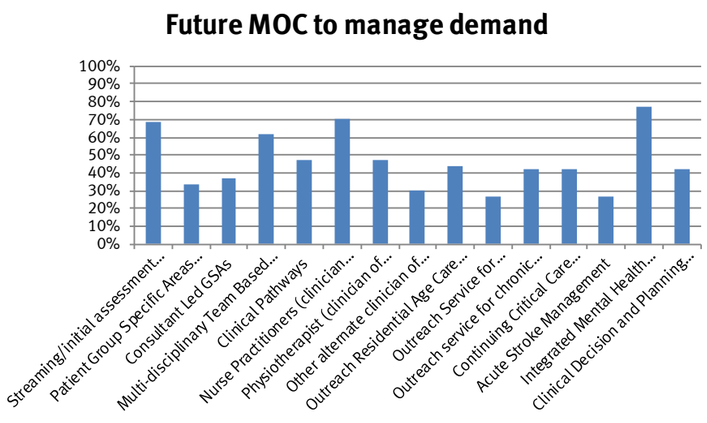
Key:

- Streaming and initial assessment
- Patient Specific Groups (GSA)
- Consultant Led GSA Teams
- Multi-disciplinary Teams
- Clinical Pathways
- Nurse Practitioners
- Physiotherapist of First Contact
- Other Alternative Allied Health Models
- Outreach Residential Aged Care Service
- Outreach Service for Hospital in the Home
- Acute Stroke Assessment Service
- Integrated Mental Health Service
- Clinical Decision and Management Units

Future Models of Care

Again there was a wide variety of models of care thought to be necessary for the operation of future EDs to meet expected demand. This indicates that there will be differing models of care required for the expected demand at individual EDs. This is, most likely, reflective of differing age groups, SEIFA groups and case-mix making up ED workload.

Figure 2: Future Models of Care



Key:

- Streaming and initial assessment
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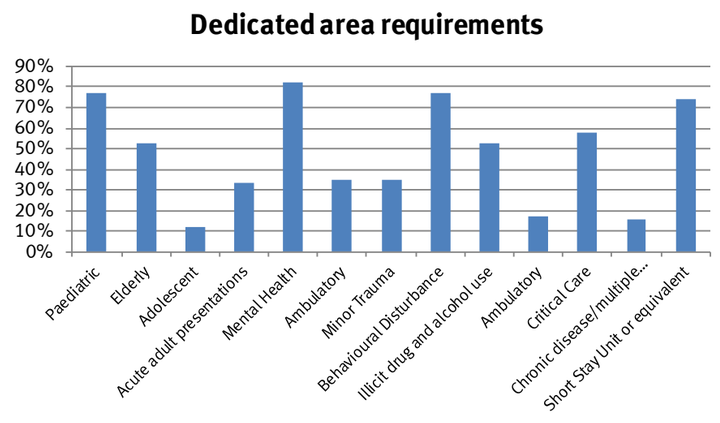
- Clinical Pathways
- Nurse Practitioners
- Physiotherapist of First Contact
- Other Alternative Allied Health Models
- Outreach Residential Aged Care Service
- Outreach Service for Hospital in the Home
- Acute Stroke Assessment Service
- Integrated Mental Health Service
- Clinical Decision and Management Units

Specific and dedicated areas

Views were sought from the respondents about areas within the ED dedicated for specific patient cohorts. These cohorts would be managed by corresponding models of care within the area.

The results indicated the top 4 areas for a dedicated area designed for specific patient cohorts were mental health, behaviour management, paediatric and SSU or equivalent respectively. The results are summarised below. Other areas of importance indicated by responses were dedicated areas for the elderly critical care and alcohol and drug uses services respectively. This is a reflection of changing patterns of disease presentation.

Figure 3: Dedicated Areas



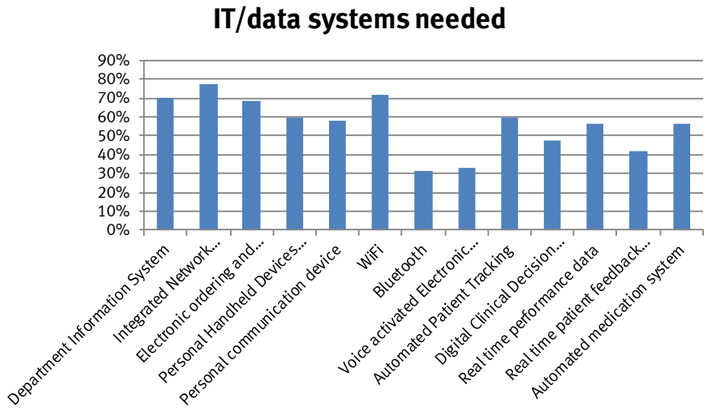
Key:

- Paediatric Unit
- Elderly/Frail Elderly GSA
- Adolescent GSA
- Mental Health GSA
- Minor Trauma GSA
- Behavioural Disturbance Management GSA
- Illicit Drug and Alcohol GSA
- Ambulatory Care GSA
- Critical Care GSA
- Short Stay or Planning Unit

Information technology management and data systems

Respondents were asked for views on present and future requirements for information and data management.

Figure 4: IT/Data Systems



Key:

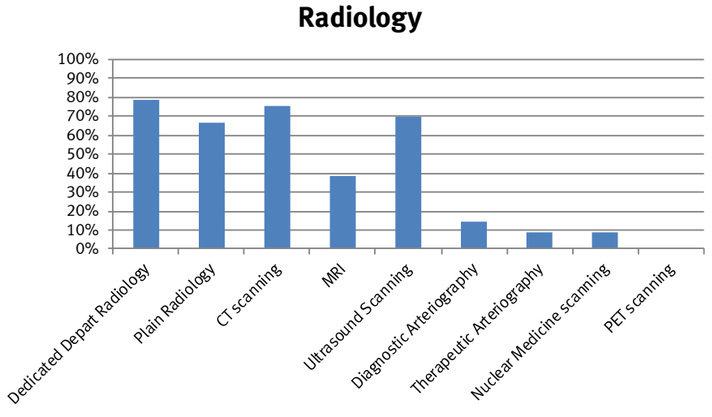
- Department Patient Management System
- Integrated Patient Record Network
- Personal Hand Held IT Devices
- WiFi
- Bluetooth
- Voice Activate Communication Devices
- Automated Patient Record System
- Digital Clinical Decision Tools
- Real time Patient Tracking System
- Automated Medication System

Support services:

Radiology

Radiology was an essential component for ED patient care. There was wide-spread support for dedicated ED radiology (77 per cent) which should include plain radiology, CT scanning, ultrasound scanning and MRI scanning (67 per cent, 75 per cent, 70 per cent and 39 per cent respectively). It was also evident the preference was for these services to operate 24/7.

Figure 5: Radiology



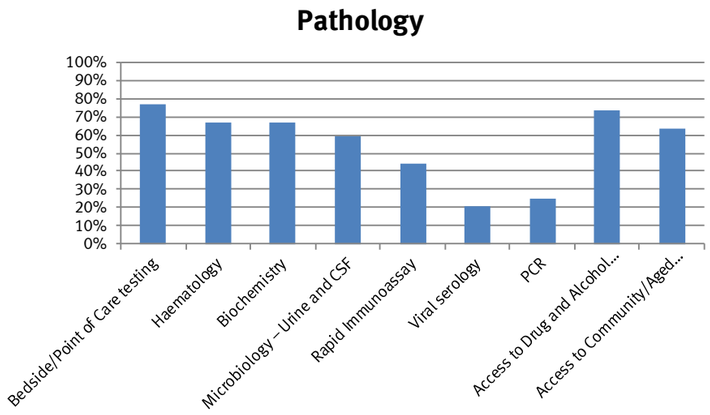
Key:
- Dedicated Department Radiology Service
- Plain Radiology Service
- Magnetic Resonance Imaging
- Ultrasound Scanning
- Diagnostic Arteriography Service
- Therapeutic Intervention Service
- Nuclear Medicine Service
- Positron Emission Tomography Service

Pathology

Pathology was also considered essential. Of interest was the strong requirement for point of care testing (77 per cent).

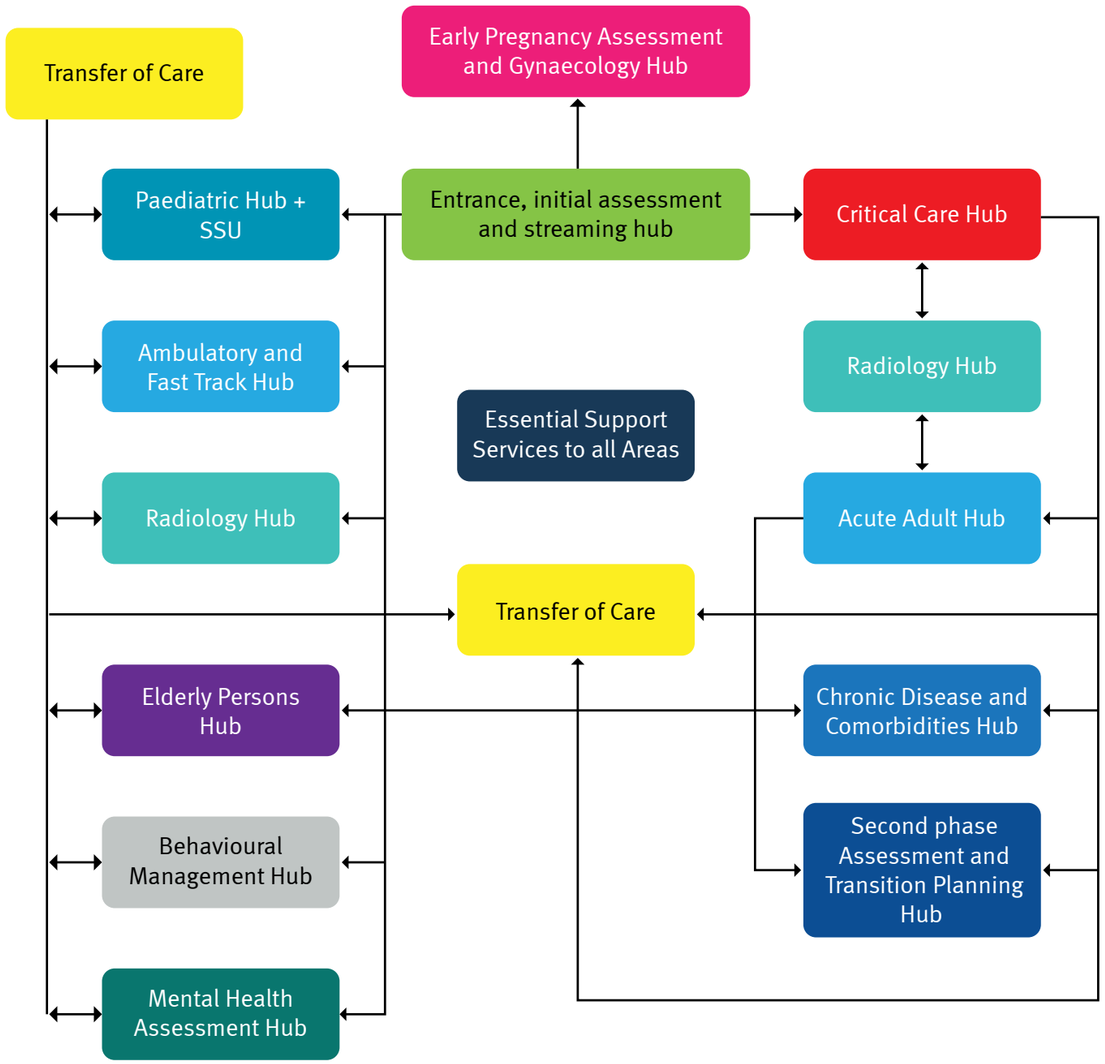
Other support services indicated as important were the provision of a dedicated ED alcohol and drug service seven days per week (74 per cent) and access to community services seven days per week (63 per cent).

Figure 6: Pathology

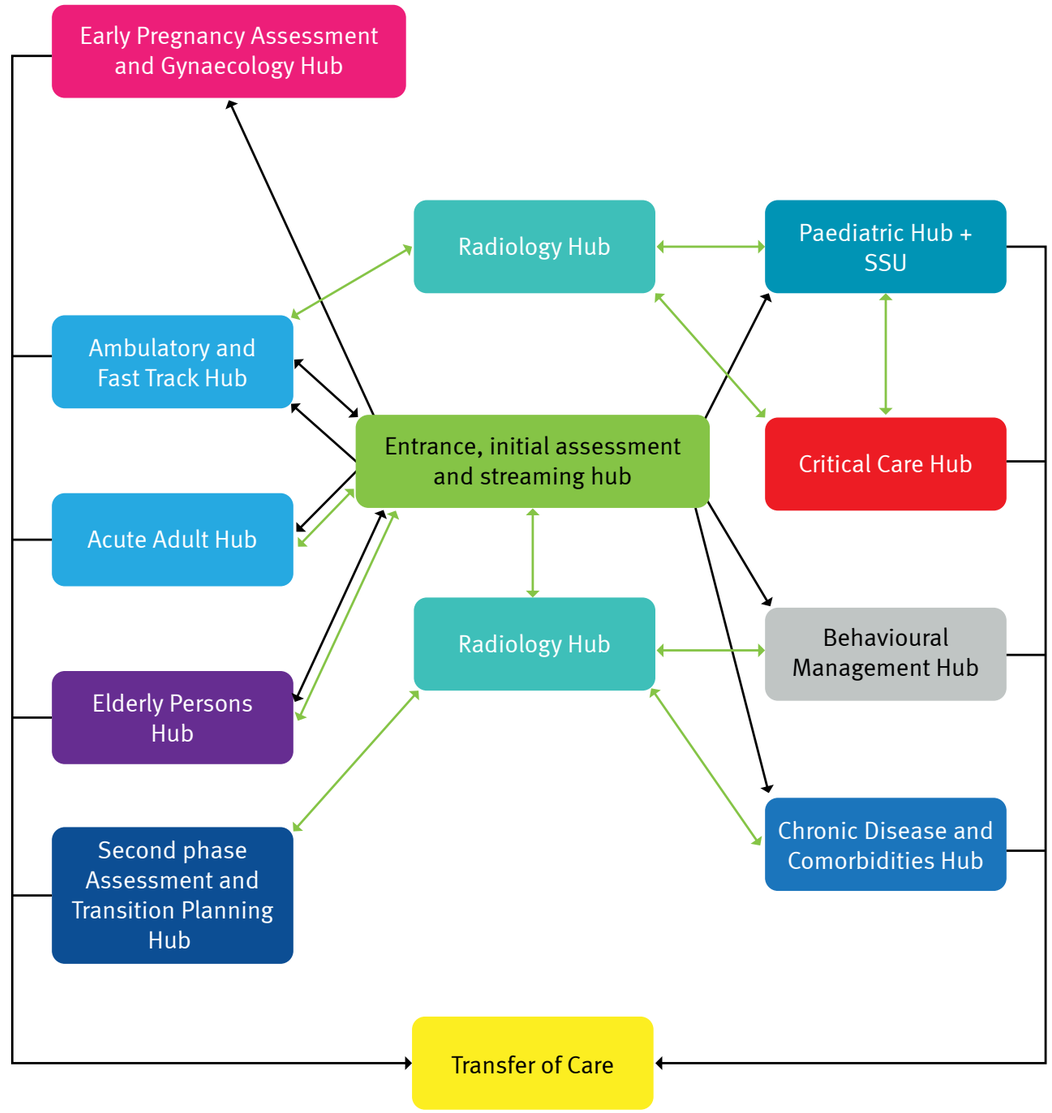


Key:
- Bedside/Point of Care Pathology Testing
- Haematology
- Biochemistry
- Microbiology – Urine and CSF
- Rapid Immunoassay
- Viral Serology Testing
- Polymerase Chain Reaction Testing
- Access to Drug and Alcohol Assay Testing
- Access to Community/Aged Care Services

Appendix 2: Linear Spatial Design



Appendix 3: Radial Spatial Design



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