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Literature Review of emergency department Staffing Redesign Frameworks

Undertaken for NSW Health

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Executive summary

Purpose

This study presents an overview of the existing Australian and international literature which looks at the staffing of emergency departments models. It is recognised that in response to changing and increasing demand upon emergency departments, there is a need to consider new staffing profiles. These profiles must not only meet the changing needs of patients, but must also be safe, cost effective and satisfactory to both patients and staff. In order to determine the most appropriate staffing profiles for New South Wales emergency departments, it is necessary to determine what lessons have been learned for existing emergency department staffing profiles. This study looks at what the literature can tell us about existing examples of emergency department staffing.

Summary of findings

A number of key principles have been identified from the success of emergency departments both within Australia and internationally. This includes matching peak staffing levels to peak patient periods, utilising senior staff, having appropriate staff and skills, and tailoring emergency department staffing profiles to the unique needs of individual hospitals. These underlying principles are evident when looking at what staffing profiles have been successfully implemented.

There is little literature available which looks at the entire staffing profile of an emergency department and assesses its effectiveness. The few papers that do exist conclude that senior staffing produces the most effective outcomes. Other studies have looked at the appropriate staff combinations of triage, fast track, minor injuries units, care coordination teams, aged care coordination teams and ALERT programs, all of which have been introduced to respond to changing demands upon the emergency department.

With changing staffing profiles of emergency departments, a number of new positions and roles have been identified and their success assessed. These roles include emergency care practitioners, accident and emergency physicians, emergency physicians, emergency nurse practitioners, clinical initiatives nurses, advanced clinical nurses, stat nurse, non-medical technicians, communications clerks, emergency department support officers, and equipment coordinators. The roles which these staff provide within the emergency department have been determined by the demand of patients, and the role the hospital requires them to fill.

While there are some lessons to be learnt from the success of the staffing of various teams, and the introduction of new roles in emergency departments, there are still significant gaps within the literature. There is a need for assessment of the effectiveness of various emergency department-wide staffing profiles (rather than just individual teams within an emergency department).

Emergency Department Workforce Redesign Frameworks

1 Rationale for Emergency Department Redesign

This report provides an overview of the current literature on emergency department staffing, and the frameworks and principles utilised to determine what the best staff and skill mixes are. As a core clinical unit of Australian hospitals, emergency departments influence public perception and patient satisfaction with individual hospitals, indeed they are often the first point of contact for obtaining medical services (NSW Health Statewide Services Development Branch 2006). Additionally, they provide vital services to members of the community who present with a wide range of critical, urgent and semi urgent conditions (Australasian College for Emergency Medicine 2007).

However, it has been noted that there has been a change in both the patients who are presenting to emergency departments, the conditions they are presenting for, and the public expectations of the services. The report *Key Drivers of Demand in the Emergency Department*, noted that the general population's use of emergency departments is growing – by 6.9% annually between 2004 and 2006. This growth was mainly attributed to two very different patient groups – the under 25 year olds, who are primarily presenting with primary care conditions such as injuries and poisonings; and the over 65 year olds who are presenting with chronic disease related conditions in triage 1, 2 and 3 categories. The growth in the under 25 age group attending emergency departments was attributed to changing patient expectations of emergency departments, with patients seeing the emergency department as a convenient and central substitute for primary care. The growth in the number of presenting over 65 year olds has largely been attributed to the ageing of the Australian population, and also the growth of chronic disease prevalence (Booz Allen Hamilton 2007). This change in demand is consistent with what is occurring internationally in comparable developed countries (Wass and Zoltie 1996; Exadaktylos, Evangelopoulos et al. 2008). The general consensus is that this increase in demand from an ageing population with complex needs will continue to grow, and emergency departments will need to adapt their services to meet the changing expectations and needs of the populations they service. This occurrence has already been recognised for hospital inpatients in general, but is still relevant for emergency departments (Schofield and Earnest 2006).

Emergency departments are not seen to be coping with this change – both within Australia and overseas. In response to the delays and lack of access to receiving safe, quality care, inefficiency and increased mortality in emergency departments, process redesign and more appropriate staffing have been flagged as potential ways to bring the safety and quality of care experienced in emergency departments in line with changing patient demand and expectations (O'Connell, Bassham et al. 2008; O'Connell, Ben-Tovim et al. 2008; Phillips and Hughes 2008). In New South Wales this redesign process has occurred through the Clinical Services Redesign Program.

Traditional emergency department processes in New South Wales (and many other regions also), called triage, groups all presenting patients together regardless of their conditions.

Those with less serious conditions, such as minor injuries, are required to wait, with those patients who present with more serious conditions being seen first. This results in low urgency patients continually being shuffled to the end of the queue and having to wait long periods of time to see a doctor and receive pain relief, diagnosis and treatment for their condition. This current model is criticised particularly for waiting times for both urgent and non-urgent patients alike (NSW Health 2006).

The Clinical Services Redesign Program in New South Wales seeks to redesign this emergency department model of care with new and innovative processes. A number of principles underlie the current redesign process. These include: flexible options to streamline patient journeys; separating emergency department patients into urgent and less-urgent groups; creating integration between those who deliver the services and the decision-makers; promoting early patient assessment, fast tracking patients who present with minor (or less-urgent) complaints, beginning treatment early in the emergency department visit; promoting faster care for patients by allowing other clinical staff (not just doctors) to begin patient treatment, reducing overall stay times, standardising care; ensuring emergency department visits are integrated within the larger health care system experience of the patient, and alerting patients to other additional complementary care options (NSW Health 2006).

However, the process of redesign nationally and internationally is still in the early phases and as such there is limited evidence about what changes that have been implemented actually work, particularly about what staffing mixes are optimal to meet the intended outcomes of redesign (Phillips and Hughes 2008). Despite this, there are numerous lessons within the existing published literature and from the experiences of other jurisdictions (both within Australian and internationally) that can be used for emergency department staffing redesign.

2 Methods

An extensive overview of the current peer review and 'grey' literature was undertaken to identify the current knowledge base on the optimal staffing mixes in emergency departments. A number of approaches were utilised, which can be grouped into five main areas and are detailed in Table 1:

- A search of key medical databases was conducted using a set of keyword search combinations;
- key academic peer review journals relating to emergency departments were individually searched using the same keyword search combinations;
- the internet search tools Google and Google Scholar were utilised;
- a number of key Australian and International health websites were browsed and keywords searched for; and
- a number of Australian and International health and health workforce experts were contacted.

Table 1: Sources of information utilised in literature search

Type	Source	Search strategy
Database search	<ul style="list-style-type: none"> - AMED - CAB Global Health - DH Data - Embase - Kings Fund - Medline - National Health Service (UK) Library - The Cochrane Institute 	<p>Keyword search</p> <ul style="list-style-type: none"> - Skill mix and emergency - Skill AND emergency - Staff AND emergency - Workforce AND emergency - Staffing AND emergency - Skill OR staff OR workforce AND emergency AND profile - Skill OR staff OR workforce AND emergency AND mix - Skill OR staff OR workforce AND emergency AND team - Skill OR staff OR workforce AND emergency AND design - Skill OR staff OR workforce AND emergency AND redesign
Individual journal search	<ul style="list-style-type: none"> - Academic Emergency Medicine - Annals of Emergency Medicine - Accident and Emergency Nursing - Emergency Medicine Journal - Emergency Medicine Australasia - European Journal of Emergency Medicine - Journal of Emergency Medicine - Journal of Emergency Nursing - Australasian Journal of Emergency Nursing 	<p>Key word search</p> <ul style="list-style-type: none"> - Skill AND emergency - Staff AND emergency - Workforce AND emergency - Staffing AND emergency - Skill OR staff OR workforce AND emergency AND profile - Skill OR staff OR workforce AND emergency AND mix - Skill OR staff OR workforce AND emergency AND team - Skill OR staff OR workforce AND emergency AND design - Skill OR staff OR workforce AND emergency AND redesign
Internet search	<ul style="list-style-type: none"> - Google - GoogleScholar 	<p>Keyword search</p> <ul style="list-style-type: none"> - Skill AND emergency

		<ul style="list-style-type: none"> - Staff AND emergency - Workforce AND emergency - Staffing AND emergency - Skill OR staff OR workforce AND emergency AND profile - Skill OR staff OR workforce AND emergency AND mix - Skill OR staff OR workforce AND emergency AND team - Skill OR staff OR workforce AND emergency AND design - Skill OR staff OR workforce AND emergency AND redesign
Website search	<p>Australian</p> <ul style="list-style-type: none"> - Australian Institute of Health and Welfare - Australian Health Workforce Institute - Australian Medical Workforce Advisory Committee - Australian Resource Centre for Health Innovations - Australian Society for Medical Research - Department of Health and Ageing, Commonwealth - Department of Health, Victoria - HWA - <p>International</p> <ul style="list-style-type: none"> - American Board of Emergency Medicine - American College of Emergency Physicians - American College of Emergency Practitioners - American Medical Association - Asian Society for Emergency Medicine - Association for Paediatric Emergency Medicine (UK) - Canadian Association of Emergency Physicians - College of Emergency Medicine (UK) - College of Emergency Medicine Residency Directors (USA) - Emergency Residents Association (USA) 	<p>General browse</p> <p>Keyword search:</p> <ul style="list-style-type: none"> - Skill AND emergency - Staff AND emergency - Workforce AND emergency - Staffing AND emergency - Skill OR staff OR workforce AND emergency AND profile - Skill OR staff OR workforce AND emergency AND mix - Skill OR staff OR workforce AND emergency AND team - Skill OR staff OR workforce AND emergency AND design - Skill OR staff OR workforce AND emergency AND redesign

	<ul style="list-style-type: none"> - Emergency Services Collaborative (UK) - European Society for Emergency Medicine - Health Care Commission (UK) - Hong Kong College of Emergency Medicine - Hong Kong Society of Emergency Medicine and Surgery - International Federation for Emergency Medicine - Irish Association of Emergency Medicine - National Health Service (UK) - Nuttfield - Royal Society of Medicine (UK) - Society for Academic Emergency Medicine (USA) - The Best Evidence in Emergency Medicine (USA) - The College of Emergency Medicine (UK) 	
Individual Contacts	<ul style="list-style-type: none"> - Dr David Hutton, North Coast Area Health Service - Dr Paul Rockey, American Medical Association - Mr Peter Carver, Department of Human Service, Victoria - Dr Lucio Naccarella, Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne - Professor John Humphreys, Faculty of Medicine, Nursing and Health Science, Monash University - Professor Peter Brooks, Faculty of Health Science, University of Queensland - Mr Robert Wells, Co-Director Menzies Centre for Public Health, Australian National University - Professor Anthony Scott, Melbourne Institute of Applied Economic and Social Research, University of Melbourne - Ms Susanne Le Boutillier, Queensland Health - Mr Paul Gavel, Sydney South West AHS - Ms Danielle Fréchette, The Royal College of Physicians and Surgeons of Canada - Mr Edward Salsberg, Centre for Workforce Studies - Professor David Goodman, Dartmouth Medical School 	

	<ul style="list-style-type: none">- Professor Tom Ricketts, School of Public Health, University of Northern Carolina- Professor Russell Robertson, Northern Western University- Professor Christine Kovner, College of Nursing, New York University- Mr Andy Knapton, NHS Workforce Review Team, National health Service- Assistant Professor Daniel Patterson, Department of Emergency Medicine, University of Pittsburgh	
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3 Principles and Frameworks for Determining Staffing of emergency departments

3.1 Assessing the Success of Emergency Department Staffing Redesign

In a number of emergency departments, staffing has been redesigned in order to meet the changing demand for services. In order to determine whether the change in staffing patterns has been successful, or not, staffing profiles should be assessed, as not all innovations produce the intended results (see, for example Goodacre, Mason et al. 2004).

There are three common factors that are purported to be an indication of the success of a skill mix: 1) cost effectiveness, 2) safety, 3) satisfaction from both patients and staff (Medical Practices Committee 2001; NSW Health 2006). This is consistent with the aims of the New South Wales Emergency Department Workpractice Review Project which evaluated the implementation of emergency department-wide models of practice, and the introduction of new staff roles and positions (Morris, Ieraci et al. 2001).

The recognition that increased overall demand is occurring in conjunction with tightening health budgets creates the need for any changes in staffing profiles to be cost effective ones (Exadaktylos, Evangelopoulos et al. 2008). Furthermore, few would not argue that any new service delivery within the emergency department must be justified in terms of patient safety. New staffing arrangements should also be satisfactory to staff, and create better job satisfaction - within Australia it is reported that only 50.5% of emergency medicine specialists are satisfied with their workload, and 53.6% believe they are overworked (Australian Medical Workforce Advisory Committee 1997).

In response to the changing demands upon emergency departments, a number of principles have been proposed for the redesign of emergency department staffing. This has mostly been to ensure that patient care is safe and efficient, and deals with increased numbers of patients overall, increased numbers presenting with minor injuries or conditions that may be more appropriate for primary care, and the increase in elderly patients.

3.2 Matching staff and patient peak periods

Matching the peak periods of patient presentation to peak staffing periods is a key recommendation when determining appropriate staffing of emergency departments (Department of Human Services 2005). A report undertaken for the Victorian Department of Human Services on emergency department staffing, noted the mismatch between peak patient admission times and peak staffing times. Emergency department demand profiling generally revealed that peak emergency department demand times ran from 10-11 am through to 10-11pm. However, staffing patterns tended to follow the traditional 8-9am to 5pm working shifts. The same report noted that some emergency departments had addressed this mismatch by employing part time staff to commence at 12 noon in order to match staffing to patient demand (Sykes, Pilla et al. 2005). Other studies have also used this approach when designing their staffing profile (Zimmermann 1995; Beales 1997; Brewer and Jackson 1997; Travers and Lee 2006) in order to alleviate overcrowding, and reduce waiting times in the emergency department.

3.3 Utilising Senior Staff

Two studies have looked at the impact of more senior staffing on the outcomes in emergency departments. Thornton and Hazell (2008) and Salazar *et al.* (2001) both looked at the impact of emergency department operation during and after a junior doctor strike in New Zealand and Spain respectively, when the junior doctors were replaced by more experienced senior staff members. Both studies reported increased emergency department performance when emergency departments are staffed by senior staff members. Thornton and Hazell (2008) reported significant improvements in the number of patients being seen in maximum waiting times, reductions in patients who left without being seen, reduced length of stay, and reduced access block. Salazar *et al.* (2001), also reported significantly reduced length of stay, and also reduced numbers of laboratory tests and radiographs per patient with staffing by more experienced staff members.

From a patient safety perspective, Holliman *et al.*, (1995) showed the importance of having more senior attending emergency physicians supervising junior residents in emergency departments. Bucheli and Martina (2004) also found that having a second experienced emergency physician on evening emergency department shifts significantly reduced length of stay for outpatients.

The need for a 'critical mass' of experienced, senior staff across the emergency department has also been raised in Victoria (Department of Human Services 2008) and in other studies (Australian Health Workforce Advisory Committee 2003). The Australian Health Workforce Advisory Committee highlighted the importance of leadership, management, advanced skills and experience in its emergency department workforce principles (Australian Health Workforce Advisory Committee 2006).

The importance of skilled staff has also been raised within the United Kingdom (UK), where it is recognised that greater staff numbers is not associated with reduced waiting times (Audit Commission 2001). Increasing overall numbers in emergency departments may not produce better outcomes; this may be more reliant on utilising correctly skilled staff instead (Carver and Abiuso 2007).

3.4 Appropriate Staffing

The increase in the proportion of patients presenting with minor injuries has created the need for two levels of staffing skills. Indeed, some hospitals have divided the emergency department into two sections or teams – one for patients with minor injuries who can be treated and returned to the community more quickly, and one for more critical patients who meet the typical concept of emergency patients. The skills and staff experience needed within the different teams vary. The minor injuries teams, which aim to treat patients in a reasonable period of time, thereby reducing overall emergency department waiting times, are generally made up of nurses and nurse practitioner trainees. Whereas higher acuity teams need different skills, mostly relating to the specialist treatment of trauma (Sykes, Pilla *et al.* 2005). Doing this meets a key workforce principle raised by the Australian Health Workforce Advisory Committee, that opportunities for interdisciplinary team work should be maximised (Australian Health Workforce Advisory Committee 2006).

While having senior staff has been shown, above, to be a guiding principle for efficient emergency department operation, the increasing proportion of patients presenting with minor injuries has also pointed to an ongoing need for less skilled staff. These staff have been utilised in the emergency department to treat less critical patients with minor injuries, (Beales 1997; Sakr, Angus et al. 1999; Grouse and Bishop 2001; Sakr, Kendell et al. 2003; Ashman 2004) thus freeing up the time of more experienced staff to be utilised in complex cases. This will also meet an additional workforce principle raised by the Australian Health Workforce Advisory Committee that the capacity and expertise of staff should be maximised through the planned allocation of roles and tasks to appropriate staff (Australian Health Workforce Advisory Committee 2006). This highlights the importance of having a diverse staff profile to deal with emergency department-specific patient demand and matching skills to patient needs.

3.5 Individual hospital basis

The need to tailor the emergency department staffing profile to the needs of individual emergency departments, based upon area-specific demand has been highlighted within Victorian research of emergency department staffing, and also advocated by New South Wales in the *Clinical Services Redesign Program* (Auditor General Victoria 2004; NSW Health 2006). It is recommended that each hospital make decisions on emergency department staffing based upon their patient numbers, case mix and acuity, and match staffing skills, numbers and peak times to this individual need (Auditor General Victoria 2004). This approach has been specifically utilised in determining the staffing profile of Victorian fast track services, which are based upon individual characteristics and presentation patterns of the hospital. This is seen to be the most appropriate method to determine staff mix by the Victorian Auditor General (Auditor General Victoria 2004).

4 Types of Teams and Roles that have been utilised

4.1 An Emergency Department Staff Profile

There is very limited literature available on the staffing profile of emergency departments that actually tests the success of certain staff mixes. One of the few studies testing the outcomes of a particular staff mix was conducted in New Zealand by Thorton and Hazell (2008) during a five day junior doctor strike, when these positions were replaced by senior hospital staff members. The results were obtained when the emergency department had the following staffing profile: the Fellows of the Australasian College for Emergency Medicine were rostered 24 hours per day, three career medical officers, one senior nurse during each shift, and phlebotomy service operating between the hours 0800 and 2400 (normally only 1200 to 2400). This combination of staff was utilised in an emergency department with 47,500 annual presentations in 2006. The usual emergency department staffing was three registrars per day, four per afternoon, and three per night, one house officer per shift (except the Wednesday day shift), two consultants per day and between one and two consultants in an afternoon shift. The study showed that the strike period staffing profile significantly improved the number of patients being seen in maximum waiting times, reduced the number of patients who left without being seen, reduced length of stay, and reduced access block.

The Australasian College for Emergency Medicine (ACEM) and Queensland Health both outline ideal staffing profiles for emergency departments of different characteristics (Australasian College for Emergency Medicine 2004; Queensland Health 2005). The ACEM breaks hospitals down into five categories (Major Referral Emergency Department, Urban District Emergency Department, Major Regional/Rural Base Emergency Department, Rural Emergency Service, and Primary Care/Remote Rural Emergency Service) and details the ideal nurse and medical staffing. This allows some tailoring of emergency department staffing according to individual hospital needs and characteristics, in accordance with the classification system. Nurse staffing roles include RNs, nurse educators, nursing director, nurse managers, and clinical nurse consultants. Medical staffing roles include a medical director, emergency specialists, advanced training registrars, and medical officers. The recommended combination and coverage of these roles vary between emergency department classifications. However, no staffing ratios are provided, nor any evidence presented as to how these recommended profiles will improve emergency department performance. Queensland Health have similar recommendations and guidelines for different emergency departments (Super-specialist Emergency Service, Emergency Service 1, Emergency Service 2, Emergency Service 3, Primary Emergency Service), but also do not detail what improvements can be obtained.

The British Association for Emergency Medicine (2005) detailed a matrix of different skills which were recommended for emergency departments. This consisted of complex leadership roles such as management, education and research; complex multi-tasking roles that require knowledge of a range of clinical problems to allow treatment of patients, plus supervision and interaction with other staff, management and leadership duties; clinical decision makers to assess, treat and dispose of patients; clinical skills staff to train staff members within the department; and non-clinical skills staff to facilitate the smooth operation of the emergency department. Three examples of staffing profiles, detailing the number and type of staff needed are also provided. This has been done for small (less than 40,000 attendances per year), medium (40,000 – 70,000 attendances per year), and large (70,000-100,000 attendances per year) emergency departments. The minimum number of consultants, doctors, and nurse practitioners are described for each size of emergency department. However, no justification or overview of the benefits of these combinations are provided.

4.2 Staffing on emergency department Units

4.2.1 Triage Staffing

Most triage staffing arrangements generally consist of a triage nurse and clerical support worker. However, innovative triage staffing has been introduced in some emergency departments as a means of reducing waiting times, length of stay, and hence overcrowding in the emergency department. These approaches have generally involved introducing an additional team member, often a senior medical practitioner into triage to assist the triage nurse. As a large proportion of the patients presenting to emergency departments do so with only minor injuries, the presence of an experienced medical officer allows for many patients to be treated at triage without progressing further into the emergency department.

This approach was adopted in Austin hospital in Victoria, and had the follow on impact of reducing waiting times (Sykes, Pilla et al. 2005). However, the extent of the reduction in

waiting times was not reported. Other studies reported similar findings. Subask *et al.* (2004) found that having a combination of a doctor and a nurse in triage improved waiting times, and there was an overall increase in the number of patients treated and discharged within 20 minutes compared to traditional nurse-led triage. Similar results were found by Terris *et al.* (2004) who looked at the benefit of the IMPACT team (combination of senior doctor and nurse in triage) on waiting times in triage and within the emergency department overall.

However, the benefit of having a senior medical practitioner in triage may only be realised when used in conjunction with existing triage arrangements (triage nurse, clerical support and senior medical officer). Lyons *et al.* (2007) in an English study which looked at patient waiting times in triage under different staffing arrangements (triage only staffed by either E grade nurse (minimum of one year emergency medicine experience), charge sisters/nurses, emergency nurse practitioner, or consultant emergency physician) found no significant difference in patient waiting times.

4.2.2 Triage Liaison Physician

The impact of a Triage Liaison Physician in aiding triage RNs was determined by Holyrod *et al.* (2006). It was found that having a Triage Liaison Physician reduced patient waiting times in the emergency department, and reduced the proportion of patients who left without being treated. The physicians performed triage and patient care, assisted triage RNs, responded to incoming calls, and undertook administrative duties. Travers and Lee (2006) assessed a similar arrangement, with a senior emergency physician being placed in triage with the triage nurse during peak time periods. Doing this resulted in significantly decreased waiting times for patients with non-life threatening conditions.

4.2.2.1 Dyad Team

Bristow and Herrick (2002) discussed the use of a Dyad Team composed of a social worker and nurse case manager in United States (US) emergency departments. The purpose of the Dyad team was to reduce inappropriate and costly admissions to emergency departments, when other means of care would be more appropriate. Within the US there is Federal legislation that requires all patients to be screened upon presentation to an emergency department to determine their need for admission. Such arrangements are not in place within Australia, with anyone who presents to an emergency department qualifying for care. However, the use of a Dyad team may still be useful where the emergency department has a minor injuries/conditions team to identify the potential for more appropriate care outcomes for patients who present with only minor injuries, or who utilise the emergency department as an alternative to primary care. The social worker's role includes undertaking psychological assessments, emotional support, counselling (particularly for substance abuse), and the potential to refer to other forms of community care; whereas the nurse case manager will undertake clinical assessment and monitor for the need of hospital admission.

A similar multidisciplinary team of a social worker and nurse case manager has been implemented in the US (Brewer and Jackson 1997), but is not exclusively used in triage. This type of team was also introduced in response to the increase in the number of patients presenting to the emergency department as a means of accessing primary health care, and who could be more cost-effectively treated in other settings. The staffing was designed to coincide with peak emergency department activity hours and thus aimed to reduce the patient overload and waiting times, in addition to providing more appropriate care. The social

worker dealt with crisis management and discharge plans for outpatients, whereas the nurse case manager took on a clinical partnership role. The types of patients referred to the team included the elderly and those with complex and chronic health conditions.

4.2.3 Fast track

Fast track is useful in dealing with the large numbers of patients presenting to emergency department with minor injuries, and can thus reduce overall emergency department waiting times. The Victorian Auditor General documented the staffing structure of fast track services within Victorian emergency departments. The six hospitals assessed structured their staffing with either dedicated or shared nursing and medical staff according to the characteristics and presentation patterns of the hospital (Auditor General Victoria 2004). There was however, no quantitative assessment of how appropriate these combinations were. The Victorian Department of Human Services has also documented current staffing practices within fast track services in Victorian emergency departments (Department of Human Services 2008). It was noted that a combination of senior medical, nurse and allied health workers were needed in fast track. Three fast track staff profiles were identified: nurse-operated services, nurse practitioner services, and team-structured services, and their benefits, based upon the views of the authors, were documented.

Nurse-operated services are based upon permanent or dedicated senior nursing staff, including clinical nurse specialists and triage staff, and have medical staff available for support on request. The benefits of this profile were seen to be a whole-of-patient care focus that lasts the entire patient journey, patient education and health promotion opportunities, staff satisfaction, opportunity to develop senior nurses, increased number of senior staff within the emergency department, and the service being staffed by a common group of nurses leading to continuity of service. Negative aspects were perceived to be the trade-off of senior nurse time in supervising and mentoring other areas of the emergency department (Department of Human Services 2008).

Nurse practitioner-led services had the same benefits as the nurse-operated services, but reduce the need for involvement of medical staff. Patients also reported greater satisfaction with the nurse practitioners. However, the use of a nurse practitioner exclusively in fast track may not be the most efficient use of the individual's experience and capacity within the emergency department, and thus the nurse practitioner being in a shared role within the emergency department may be more appropriate (Department of Human Services 2008).

Team-structured staffing of fast track is based upon a dedicated staff member (usually a nurse practitioner) and a rotating roster of other senior nursing, medical and allied health staff members. The permanent staff member provides continuity of service provision, whereas the rotating staff allows for other skills to be utilised when required. Such a profile is associated with high levels of staff satisfaction, however no outcomes specific to patients are detailed (Department of Human Services 2008).

4.2.4 Minor Injuries Unit

Minor Injuries Units (MIU) are seen as an alternative to Fast Track and have been adopted within the UK as a part of emergency department reform and aim to reduce the burden of the increasing number of minor injury presentations to emergency departments. Ashman (2004) makes the comment that these should be staffed by at least one nurse practitioner per shift.

This is supported by Beales (1997), who describes the staffing profile of an MIU in London. This unit is currently staffed by one H-grade nurse, 5.2FTE G-grade nurses, one 0.6FTE F-grade nurse, and a Turkish speaking health advocate (the unit services a large Turkish and Kurdish community). A further F-grade nurse has also been appointed which rotates between positions within the emergency department. At least two nurse practitioners are on duty during peak attendance times, and at least one at other times. All staff members have at least five years experience working in emergency departments, including experience at F-grade or above, and have completed two UK emergency nursing courses (the ENB199 and 998). Additionally, a one month in-house training course was developed to train staff in theoretical and practical emergency department issues. Since the introduction of the MIU, the emergency department waiting times for patients decreased, with 81% of triage categories 3 and 4 patients being seen within two hours, and there was increased patient satisfaction. Sakr *et al.* (2003) compared the safety and effectiveness of patient care and costs involved for a nurse practitioner run MIU and a doctor led emergency department in the UK. The patients treated by the nurse practitioners in the MIU received fewer treatment errors, and had shorter waiting times than those treated by doctors in the emergency department. However, the cost of running the MIU was more than that for operating the emergency department.

4.2.5 Care Coordination Teams

A number of multidisciplinary teams have been introduced to the emergency department in response to the increasing number of patients who present with complex problems, such as the elderly. In 2000, a Care Coordination Team (CCT) service was introduced in Victoria to ensure emergency department patients were given services that would aid their return to the community. The teams were staffed by nursing and allied health personnel. The target population included elderly people, frequent emergency department users, and those with complex medical problems. Of the patients who were seen by a CCT, after 12 months only 2.1% had an unplanned re-presentation, no patients died or suffered an adverse event, no patients who were initially assessed by emergency department staff as being likely to be admitted to hospital were admitted after being seen by the CCT (that is, all were discharged home), and emergency department staff, patients, and community service providers satisfaction with the services was high (Moss, Flower *et al.* 2002). However, no comparison was made to outcomes before the CCT was introduced.

4.2.6 Aged Care Coordination Team

This team, consisting of staff from numerous disciplines (nursing, occupational therapy, physiotherapy, social work speech therapy, and dietetics) was introduced in Victorian emergency departments specifically to address the needs of the increasing proportion of aged care patients presenting. Some members of the team covered all shifts in the emergency department, thus ensuring continuity of service. Staff report that the team resulted in a reduction in elderly patients presenting at the emergency department (Sykes, Pilla *et al.* 2005).

4.2.7 ALERT (Assessment, Liaison and Early Referral Team)

In response to the increasing number of patients with complex needs, who often present at emergency departments, the ALERT team was implemented in a Victorian emergency department. The team targets aged patients with health problems, disability, or substance abuse issues who are at high risk of representing to the emergency department. The team

provides joint care planning for these patients with other health and service providers within the community, and is staffed by a social worker, physiotherapist, occupational therapist, nurses, a dietician and case managers (Department of Human Services 2007). As a result of the implementation of the ALERT program, there has been a reduction in emergency department presentations, increased communication with other community and health care providers, and higher patient satisfaction. However, the authors did not report the extent of these improvements or test for significance.

4.3 Individual Roles within the emergency department

A number of individual roles have been introduced into emergency departments in order to meet changing demands.

4.3.1 Emergency care practitioner

Emergency care practitioners (ECP) were introduced in the UK to bring the multitude of services available in a hospital to patients, in the interest of reducing hospital admissions. The development and specifics of the ECP role are detailed in the Department of Health report *The emergency care practitioner report* (Modernisation Agency/Department of Health 2004). ECPs are expected to diagnose and treat patients, and also identify any potential complications which may need further treatment. They also may refer patients to other care services. ECPs operate within the emergency department and also in primary care after hours services, ambulance services and in primary and community care services. It is noted that there is currently no evidence of the benefit of an ECP in emergency departments over other professionals (ECP Team 2007).

4.3.2 Accident and Emergency Physician

In response to increased hospital admissions via the emergency department, the Accident and Emergency Physician role was introduced in the UK. The role of the Accident and Emergency Physician was to divert appropriate emergency department patients away from hospital admission, using their clinical experience and access to diagnostic tests. The roles were filled by middle grade doctors who possessed postgraduate training in both general medicine and emergency department medicine (Goodacre, Mason et al. 2004). However, in a study by Goodacre *et al.* (2004) it was found that the presence of an Accident and Emergency Physician did not actually reduce the number of hospital admissions. Such a finding highlights the importance of testing new roles, and staffing profiles to determine whether they are meeting their intended outcomes.

4.3.3 Emergency Physician

In response to overcrowding issues in Tamworth Base Hospital's emergency department an emergency physician was rostered on site at nights and the impact assessed. It was found that having an emergency physician was associated with reduced length of stay (normally 96 minutes, with the emergency physician this was reduced to 48 minutes), fewer hospital admissions (27 admissions compared to 15) and significantly reduced initial pathology tests (Donald, Smith et al. 2005). Bucheli and Martina (2004) looked at the effect on patients' waiting time associated with the introduction of a second emergency physician during peak patient periods in an emergency department in the UK. The introduction of the second emergency physician was associated with significantly reduced emergency department

patient waiting times, but there was no change in the waiting times of patients who were subsequently admitted to hospital.

Holliman *et al* (1995) detailed the importance of having attending emergency physicians supervise more junior emergency department residents. This study found that the attending emergency physicians frequently made major and minor changes to the resident's patient care plans. From 1,000 study patients, 153 major changes to care plans were made, and 353 minor changes made. Of these, in 17 patients potentially life or limb-threatening errors were corrected by the attending emergency physicians.

4.3.4 Emergency Nurse Practitioner

The role of a nurse practitioner extends beyond the traditional one for nurses and can cover prescription of medication, initiation of diagnostic imaging and tests, referral of patients to specialists, and admitting and discharging patients (Tye, Ross *et al.* 1998; Sykes, Pilla *et al.* 2005). The role in emergency department covers health promotion and education, as well as advanced nursing. Hudson and Marshall (2008) detail the differences in emergency nurse practitioner roles, education and experience in Australia, the UK and the US.

Nurse practitioners generally assume responsibility for the patients who present to emergency department with minor injuries (Byrne, Richardson *et al.* 2000). In addition to staffing separate MIUs, they may also have a vital wider role in an emergency department, as discussed in a number of studies conducted in the UK. The emergency nurse practitioner is seen to operate in a similar fashion to the US physician assistant. However, physician assistants must operate under the guidance of a doctor, whereas nurse practitioners can operate independently within emergency department teams.

A number of studies have compared the role of physician assistants and junior doctors and nurse practitioners within emergency department. Sakr *et al* (1999) concluded that emergency nurse practitioners can provide equal or better care in the emergency department to junior doctors. The nurse practitioners were better at recording medical histories and fewer of their patients had to seek unplanned follow-up. There was no significant difference between the accuracy of examination, number of errors made, adequacy of treatment, planned follow-up, requests for radiography, or interpretation of radiographs. Similar findings were documented by Byrne *et al.* (2000) who compared patient satisfaction between those treated by emergency nurse practitioners and doctors in an emergency department. Patients who saw an emergency nurse practitioner were significantly more likely to have received health education, first aid advice, written care instruction, informed of who to contact for further assistance and advice from home, and were less worried about their health, than those who saw a doctor in the emergency department. However, it should be noted that the role of the emergency nurse practitioner is not well defined, and there is variation between hospitals as to what services such individuals are able to provide (for further discussion, see Tye 1997; Tye, Ross *et al.* 1998).

Within Australia, a transitional emergency nurse practitioner role has been introduced. The role is filled by "experienced emergency nurses who were working towards authorization as an emergency nurse practitioner" (Fry and Rogers 2009). Based upon a survey of senior emergency physicians working with the transitional emergency nurse practitioners, the role

was deemed to be a safe and efficient way to meet increasing demand on the emergency department.

4.3.5 Clinical Initiative Nurse

The clinical initiative nurse is an Australian role developed to provide health education and initiate treatment of patients in the emergency department waiting room before they are seen by medical staff. The position is filled by senior emergency department registered nurses who undergo advanced, multidisciplinary clinical training (Hudson and Marshall 2008). There is little evidence about the outcomes achieved by clinical initiative nurses in the emergency department, There is some anecdotal evidence that the roles assist in reducing waiting times (Cashin, O'Connell et al. 2007).

4.3.6 Advanced Clinical Nurse

Advanced clinical nurses were introduced in New South Wales and their impact assessed in the Emergency Department Workpractice Review Project. The role was filled by registered emergency department nurses within a minimum of three years experience in emergency nursing. The exact roles undertaken by the Advanced Clinical Nurses can be found in the *Emergency department workpractice review project report: Introduction of workpractice model and development of clinical documentation system specifications* (Morris, Ieraci et al. 2001). A number of benefits of the role were documented: the average waiting time to receive active treatment for patients presenting to the emergency department with conditions covered by the standing orders of the nurses was significantly shorter (mean reduction of 29 minutes) than the waiting time to see a medical officer; and patients received pain relief significantly earlier (average reduction of 20.5 minutes) than if they had waited to be treated by a medical officer. With regards to patient safety, no adverse medication incidents were recorded as a result of the nurses treating patients (Morris, Ieraci et al. 2001).

4.3.7 Stat Nurse

Zimmerman (1995) outlines the use of a floating stat nurse within US hospitals. The stat nurse is employed to cover unexpected and fluctuating peaks in demand throughout a hospital, but particularly in the emergency department. Within Deaconess Medical centre in Washington, a critical care resource nurse is employed which can be accessed by all departments, with the emergency department having priority. The qualification for the nurse is 2 years of emergency department experience. Within the Good Samaritan Regional Medical Centre in Arizona, two nurses are rostered on in the peak times.

4.3.8 Non-medical technicians

In order to cope with the increasing number of patients who present to the emergency department with only minor medical complaints, one New South Wales hospital (the Nepean Hospital in Sydney, New South Wales) has employed non-medical technicians to treat these patients. The non-medical technicians were experienced emergency department nurses who were already working in the department. The introduction of this role resulted in 10 minute shorter median waiting times in triage categories 3 and 4, and a reduction in the percentage of patients who left without being treated (Grouse and Bishop 2001).

4.3.9 Communications Clerk

It is reported that as much as 20% of doctors time is spent on non-medical activities (Sykes, Pilla et al. 2005). In order to alleviate some of this burden and free up more time for clinical

work, two emergency departments in Victoria have introduced a communications clerk. This role was designed to specifically to take up the clerical tasks of clinical staff and involved gathering test results and admissions details, communication with wards and other clinical staff, managing rosters and timesheets, following up on appointments and liaising with other community services and hospitals (Sykes, Pilla et al. 2005). The aim of this role was to ensure clinical staff are able to devote as much of their time as possible to actual clinical duties.

As a part of the New South Wales Emergency Department Workpractice Review Project the impact of the introduction of a communications clerk was evaluated. A communications clerk was rostered sixteen hours per day, seven days per week. This project found that the communications clerk freed up 34 clinical hours each week by undertaking communications duties such as telephone calls and paging that would normally have been undertaken by clinicians. The report stated that using a communications clerk for these duties was more cost effective, saving \$930.92 per week, based upon mean clinician pay rates, for telephone calls alone (Morris, Ieraci et al. 2001).

4.3.10 Emergency Department Support Officer

In New South Wales the effect of the introduction of an Emergency Department Support Officer was trialled. This was a non-clinical role which supported the emergency staff and assisted in transport duties, and providing patient comfort. A support officer was on duty in morning, evening and night shifts seven days per week, and there were cross-over shifts during peak activity days. It was found that the support officers undertook 228 hours of duties each week which normally would have been undertaken by a clinician, leading to savings of \$4,446.73 in wages per week (Morris, Ieraci et al. 2001).

4.3.11 Equipment Coordinator

An equipment coordinator was introduced to emergency departments in New South Wales and the impact assessed. The role was filled by an enrolled nurse who was responsible for ordering stock and mending equipment. It was found that the position saved 9.7 clinical hours per week, and 19.9 managerial hours per week, and equated to savings of \$362.36 in salaries per week (Morris, Ieraci et al. 2001).

4.4 Lessons from approaches that did not work

While most studies found that there was some improvement in the operation of emergency departments as a result of staffing redesign, some authors found that improved outcomes were not always experienced, or were critical of proposed changes. Goodacre *et al.* (2004) found that in their study the presence of an Accident and Emergency Physician did not reduce the number of hospital admissions coming from an emergency department. This was seen as a failure of staffing redesign as the Accident and Emergency Physician role was introduced specifically to reduce the number of emergency department patients being admitted to the hospital.

Another criticised approach to emergency department redesign is the introduction of mandatory minimum staff ratios. It has been noted that as a result of the introduction of mandatory nurse to cubicle staffing ratios in Victorian emergency departments, a number of cubicles had to be closed due to insufficient staffing numbers (Auditor General Victoria

2004). This was an unexpected and unintended outcome. It has been proposed that such methods for determining emergency department staffing are not effective nor safe, as they do not consider the patient mix of individual hospitals, length of stay, staff skill mix, or peak patient periods (American Health Consultants 2002).

Table 2: Key literature sources describing the staffing of emergency departments

Study	Country	Why reform was undertaken	Part of emergency department looked at	Factors looked at	Methods	Results	Key Points
(Thorton and Hazell 2008)	NZ	In response to a junior doctor strike	Whole Profile	Maximum waiting time per triage category Length of stay Patients who did not wait to be seen Hospital bed occupancy Access block percentage	Key performance indicators assessed 5 days before the strike, during the strike and after the strike	No difference in number of patients presenting or patients to doctor ratios. Significantly improved number of patients being seen in maximum waiting times, reductions in number of patients who did not wait to be seen, reduced length of stay, reduced access block	Principles of consultant model of emergency department staffing, and seniority of inpatient staffing resulted in improved emergency department performance.
(Salazar, Corbella et al. 2001)	Spain	In response to resident physician strike	Whole profile	Length of stay Rates of use of laboratory tests and radiology procedures Patient walkouts Patient/physician ratios Hospital admission rates Home discharge rates Unscheduled return rates Mortality rates	Comparison of strike period and non-strike period	Reduced length of stay, laboratory tests per patient and radiographs per patient during the strike	Senior physicians produce better outcomes than junior physicians in emergency department in terms of length of stay and resources used.
(Queensland Health 2005)	Australia – QLD	No reform, recommended	Whole profile	None – no supporting theory or evidence	n/a	n/a	Outlines ideal staffing for emergency

		profile					departments with varying characteristics
(Australasian College for Emergency Medicine 2004)	Australia	No reform, recommended profile	Whole profile	None – no supporting theory or evidence	n/a	n/a	Outlines ideal staffing for emergency departments with varying characteristics
(British Association for Emergency Medicine 2005)	UK	Increasing number of patient attendances	Whole profile	Theory			Outlines skill mix and staffing profile for three sizes of emergency departments
(Lyons, Brown et al. 2007)	England	To meet maximum (4hr) waiting times introduced by Dep. Of Health	Triage. Comparison of E grade nurse (min 1 yr emergency medicine experience), charge sisters/nurses, emergency nurse practitioner, consultant emergency physician	Patient time in triage Number of observations undertaken by staff Staff time away from triage	Observation for 16 hrs of an emergency department in London and interviews with triage staff.	No difference in waiting time between the roles	Different staff on triage do not make a difference to triage waiting times, and thus more experienced staff may be better utilised in other areas.
(Subash, Dunn et al. 2004)	UK	Long waiting times	Triage. Combination of nurse and doctor in triage	Triage time Time to see doctor, radiology, admission, and discharge	8 days randomly selected – 4 for three hours of combined doctor and nurse triage, and the other 4 for normal nurse led triage	Median times spent in triage, to see a doctor, and to radiology was reduced in the intervention group More patients were seen and discharged within 20 minutes within the intervention	Combination of doctor and nurse triage resulted in better waiting and triage times in the emergency department.

						group	
(Terris, Leman et al. 2004)	UK	To meet maximum (4hr) waiting times introduced by Dep. Of Health	Triage. Use of IMPACT team (emergency medicine consultant and senior emergency department nurse).	Waiting time for triage and waiting time in emergency department	IMPACT team rostered for four periods of four hours per week for three months. Waiting times compared for when IMPACT team was rostered and comparable time with no IMPACT team.	With the IMPACT team present: No patients waiting for more than 4 hours for an initial clinical consultant 48% of patients were discharged home immediately after assessment and treatment Overall reduction in waiting time.	IMPACT team (combination of senior medical and nurse staff) improves patient waiting times in triage and in emergency department overall.
(Department of Human Services 2008)	Australia – VIC	Emergency department redesign aimed to reduce costs, and improve quality and time of care. Fast track specifically designed to improve waiting times of less serious illness and injury.	Fast track		Overview of current fast track services in Victorian emergency department, and theoretical advice for fast track staffing	Fast track in Victorian emergency department made up of 42% medical staff, 48% nursing staff and 9.5% allied health staff.	Need a combination of senior medical, nurse and allied health workers in fast track. 3 Staffing structures have been implemented in Vic: 1. Nurse operated 2. Nurse Practitioner 3. Team structured
(Auditor General Victoria 2004)	Australia – VIC	Growth in demand and signs of pressure (increased	Fast track, nursing		Overview of fast track profiles, overview of methods to determine nurse		Victorian hospitals have used various combinations of dedicated and shared medical and nurse staff

		ambulance bypass, congestion, and waiting times for inpatient beds)			numbers		depending in the characteristics and presentation patterns of the hospital. Four of the six hospitals audited had dedicated nursing and shared medical staffing arrangements. The introduction of an enterprise bargaining agreement which mandated the nurse staffing ratio of one nurse to three cubicles in emergency department has a negative impact – resulting in bed and emergency department cubicle closures.
(Ashman 2004)	USA	Long emergency department waiting times	Minor Injury Units		Theory		One nurse practitioner on duty each shift
(Beales 1997)	England	Increase in patients presenting to emergency departments with minor injuries	Minor Injuries Unit	Waiting times, patient satisfaction	Discussion		Staffing profile of Minor Injuries Unit discusses, and the outcomes achieved from the operations of the unit in terms of reduced waiting times, and improved patient satisfaction.
(Sakr, Kendell et al. 2003)	UK		Minor Injuries Unit staffing by	Process errors, waiting times, costs	Before and after cohort study	Fewer process errors were made on	The nurse practitioner MIU provided safer and

			Nurse practitioners		comparing nurse led MIU and doctor led emergency departments.	<p>patients treated by nurse practitioners (9.6%) than patients treated by medical staff in the emergency department (13.2%). Waiting times were shorted in the MIU (average of 19 minutes) compared to the emergency department (average of 56.4 minutes).</p> <p>Increasing number of referrals for patients in the MIU than the emergency department, and there were higher costs associated with running the MIU than the emergency department (£41.1 for the MIU and £40.01 for the emergency department)</p>	more effective patient treatment than the emergency department, but at a slightly higher cost.
(Sakr, Angus et al. 1999)	UK	Increasing demand for emergency department services, and reduced available doctors	Comparison of junior doctors and emergency nurse practitioners	Adequacy of care – history taking, patient examination, interpretation of radiographs, treatment decisions, advice offered to patients, unplanned	Patients who presented to an emergency department with a minor injury were randomly assigned to either an emergency nurse	Nurse practitioners made fewer clinically important errors than junior doctors (9.2% and 10.7% respectively), but this difference was not significant. The nurse	Emergency nurse practitioners can provide equal or better care in the emergency department to junior doctors.

				follow-ups.	practitioner or a junior doctor who undertook a clinical assessment. The patient was then also assessed by a senior emergency department physician and the clinical assessment compared with that undertaken by the emergency nurse practitioner or the junior doctor.	practitioners were better at recoding medical history and fewer of their patients had to seek unplanned follow-up. There was no significant difference between the accuracy of examination, adequacy of treatment, planned follow-up, requests for radiography, or interpretation of radiographs.	
(Byrne, Richardson et al. 2000)	UK		Comparison of doctors and emergency nurse practitioners	Patient satisfaction – education, advice, received of care instructions	Qualitative questionnaire mailed to emergency department patients	Patients who saw an emergency nurse practitioner were significantly more likely to have received health education, first aid advice, written care instruction, informed who to contact for further assistance and advice from home, and were less worried about their health, than those who saw a doctor in the emergency department.	Patients were generally more satisfied after seeing an emergency nurse practitioner than a doctor in the emergency department
(Bristow and Herrick	USA	Increasing	Dyad Team –		Theory		The combination of a

2002)		number of patients with minor complaints presenting to emergency department	Social Worker and Nurse Case Manager				social worker and nurse case manager can reduce the number patients with home-treatable conditions being admitted to emergency department. The skills of both professionals contributes to holistic patient care when used together.
(Brewer and Jackson 1997)	USA	Increase in patients presenting to the emergency department as a means of assessing primary care, and could be more cost effectively treated in another setting	Nurse case manager and social worker		Qualitative overview of one hospital's experience with implementing a nurse case manager and social worker in the emergency department	Reduction in adverse impacts after discharge, improvement in after-hours access to medical services, improved communication with patients, cost-effective treatment decisions, improvement in patient outcomes	
(Moss, Flower et al. 2002)	Australia – VIC	Increasing demand, increasing ambulance bypass, shortage of aged-care beds.	Care Coordination Team	Adverse outcomes, mortality, unplanned re-presentation, discharge, emergency department staff satisfaction, patient satisfaction, and community service provider satisfaction	Descriptive analysis of the service six and twelve months after commencement	After 12 months only 2.1% had an unplanned re-presentation, no patients died or suffered an adverse event, no patients who were initially going to be admitted	CCT model, being staffed by nurse and allied health personnel was successful in aiding the discharge of patients from emergency department

						to hospital in emergency department resulted being admitted (that is, all were discharged home), and emergency department staff, patients, and community service providers satisfaction with the services was high	
(Holyrod, Bullard et al. 2006)		emergency department overcrowding	Triage Liaison Physician	Length of stay in emergency department, patients who left without being treated, and ambulance diversion	Assessment of outcomes during three 2 week blocks during which time 7 days were randomised to be staffed by the Triage Liaison Physician	The presence of a Triage Liaison Physician reduced proportion of patients who left without being seen by 25%, reduced waiting in emergency department by 36 minutes (reduction in waiting time varied between 2 and 53 minutes).	Presence of a Triage Liaison Physician is beneficial in emergency department for reducing waiting times and patients leaving without being seen.
(Travers and Lee 2006)	UK	Patient dissatisfaction with long waiting times	Emergency Physicians in triage	Waiting time (registration to doctor) of mid-triage category (, serious but not life threatening, and, non emergency) patients	Comparison of 10 days of each control and intervention period to test the impact of assigning an emergency physician to assist triage nurse in peak periods	Days with an emergency physician in tirage saw a decrease in average waiting time of patients classified as 'non emergency patients' from 35.5 minutes to 19 minutes, with 78%	Having a senior emergency physician in triage, along with the usual triage nurse, reduced waiting times for non-life threatening patients.

						<p>being seen within 30 minutes compared to 48% on days without the emergency physician.</p> <p>Waiting time of PACS 2 patients also significantly decreased with the emergency physician in triage.</p>	
(ECP Team 2007)	UK	Increasing demand in emergency department, increasing numbers attending emergency department with minor complaints	Emergency Care Practitioners		Theory		Outlines roles and skill of emergency care practitioners, notes lack of evidence of their impact in emergency department
(Goodacre, Mason et al. 2004)	UK	Increasing hospital admissions via the emergency department	Accident and emergency physician	Medical and non-medical hospital admissions Referrals to other hospitals	Audit of six-months of Accident and Emergency Physician workload, with days randomised to "Accident and Emergency Physician present" and "Accident and Emergency Physician absent".	Presence of an Accident and Emergency Physician was associated with a reduction of 0.7 medical admissions per day, an increase of 1.1 non-medical admissions per day, and 0.3 transfers to other hospitals per day. However, these	Having an Accident and Emergency Physician in the emergency department did not significantly reduce the hospital admissions from and emergency department

						differences were not significant.	
(Holliman, Wuerz et al. 1995)	US	Patient safety	Attending emergency physicians supervising emergency department residents	Number and type of changes to patient care plans produced by emergency department residents	Emergency department residents performed an initial examination of emergency department patients. Patients were then presented to an attending emergency physician and any changes to the patient care plan were noted.	In the 1,000 patients that were a part of the study, 153 major changes were made to care plans, and 353 minor changes were made. Of these, 17 limb or life-threatening errors were corrected.	Attending emergency physicians frequently corrected errors made by emergency department residents.
(Fry and Rogers 2009)	Australia	Increase in overall emergency department demand, and number of minor injury presentations.	Transitional emergency nurse practitioners	Safety and efficiency	Survey of senior emergency physician staff to assess work performance of Transitional Emergency nurse Practitioners	Senior emergency physician staff deemed the transitional nurse role to be safe and efficient, and supported the role.	There is anecdotal evidence that the transitional emergency nurse practitioner role assisted in meeting the needs of emergency departments and was efficient and safe.
(Donald, Smith et al. 2005)	Australia – NSW	emergency department overcrowding	Emergency physician in a rural hospital	Length of stay in emergency department, waiting times, admissions, specialist consultations, use of diagnostic tests, emergency	Retrospective analysis of the outcomes experienced between two groups – when an emergency physician was	Having an emergency physician was associated with reduced average length of stay, fewer hospital admissions, and significantly less pathology tests. There	Having an Emergency physician resulted in reduced length of stay, lower hospital admissions rates, and less pathology tests.

				department representations within 7 days	rostered and when one was not rostered.	was no impact on waiting times nor re-representation.	
(Bucheli and Martina 2004)	UK	emergency department waiting times leading to overcrowding	Emergency physicians	Length of stay for outpatients and inpatients	Comparison of data on patients managed before and after the introduction of a second emergency physician in peak periods of an emergency department.	The addition of a second emergency physician during peak patient periods is significantly associated with decreased length of stay for outpatients, but no significant difference for inpatients.	The addition of a second emergency physician during peak patient periods is significantly associated with decreased length of stay for outpatients.
(Zimmermann 1995)	USA	Fluctuating activity levels within emergency department and wider hospital	Stat nurses		Discussion of uses		Outlines roles and perceived benefits of Stat Nurses
(Grouse and Bishop 2001)	Australia – NSW	Increase in patients presenting with minor injuries	Non-medical technicians	Waiting times, number of patients who left without being seen.	Prospective cohort study of two match patient groups, one when non-medical technicians were working, and the other when they were not working.	The non-medical technicians were associated with patients having 10 minute shorter median waiting times in triage categories 3 and 4, and a reduction in the percentage of patients who left without being treated.	Non-medical technicians complement medical staffing in emergency departments by taking up some of the minor injury patient burden, reducing waiting times and the proportion of patients who left without being treated.

5 Gaps in the Existing Literature

The Medical Journal of Australia recently published a supplement discussing emergency department process redesign. It noted that during such system improvements, evidence lags behind and practice is often informed by 'philosophies' or 'theories' (Phillips and Hughes 2008). This can be seen in current emergency department staffing redesign, particularly within Australia. There is some evidence about the benefit of certain positions in an emergency department, and the outcomes produced by different teams. There are also some guidelines on what an emergency department staffing profile should look like. However, there is a large gap in current literature that looks at what combinations of staff work best across an emergency department, and thus there is very small evidence base to guide decision making on the safest and most effective and efficient staffing models of emergency departments that meet changing demand and expectations.

Most of the evidence that is presented looks at patient safety and quality of care, primarily in the form of waiting times or length of stay. Some studies have also looked at patient satisfaction. However, there is a gap in the literature about evidence in terms of the cost effectiveness of various roles, and staff satisfaction. More emphasis could also be placed upon patient satisfaction, rather than just length of waiting times.

In addition to the potential lessons outlined above in the existing, yet fragmented literature on emergency department teams, and individual positions, there are also some lessons to be learnt from the broader health staffing literature. While this literature is also scanty, the reader may be able to draw lessons from it which may be able to be innovatively applied to the emergency department setting.

6 General Principles

6.1 Ability of nurses in primary care

Laurant *et al.* (2009) found that patient health outcomes in primary care were similar for doctors and nurses. Patients treated by nurses reported higher satisfaction with care, received longer consultations, and received more health information than those treated by doctors. No difference was found in the health outcomes, process of care, resource utilisation or cost between doctors and nurses. This study suggests that nurses are capable of providing similar standards of primary care as doctors.

6.2 Staff ratios

The use of ratios to determine nurse numbers has been criticised within the wider health literature. The UK Healthcare Commission noted that ratios are too simplistic and do not measure the skill mix present but rather workforce overall (Healthcare Commission 2005). Shinkman (2002) raises a similar issue to that experienced in Victorian emergency departments, that the introduction of mandatory staff to patient ratios caused the closure of beds in some hospitals.

Despite this criticism of the use of mandatory nurse to patient staffing ratios, Aiken *et al.* (2002) found that higher patient to staff ratios were associated with a number of adverse

outcomes in hospitals for both patients and staff. For each additional patient assigned to a nurse, there was a 7% increase in the likelihood of patient death within 30 days of admission, and a 7% increase in the odds of failure-to-rescue. Each additional patient was also associated with a 23% increase in the odds of nurse burnout and a 15% increase in the odds of nurse dissatisfaction with their job.

6.3 Use of experienced nurses

A recent Australian study by Duffield *et al.* (2007) found that the increasing proportion of registered nurses within a hospital significantly improved patient outcomes by decreasing adverse events, such as pressure ulcers, pneumonia, sepsis, falls and injury. The use of a high proportion of registered nurses within hospitals has also been strongly recommended by the American Nurses Association. Hospitals with higher registered nurse skill mixes experienced fewer cases of secondary bacterial pneumonia, post operative infections, pressure ulcers, and urinary tract infections (American Nurses Association 2000; Emergency Nurses Association 2003). Similar results were found by Cho *et al.* (2003) and Needleman *et al.* (2002), both of whom looked at the effects of different ratios of registered nurse staffing in US hospitals. Cho *et al.* (2003) found that a one hour increase of registered nurse working time per patient day was associated with a 8.9% decrease in the odds of developing pneumonia. An increase in the proportion of registered nurses by 10% was associated with a 9.5% decrease in the odds of pneumonia.

Furthermore, both the American Nurses Association (2000) and Stanton and Rutherford (2004) found that higher overall nurse staffing numbers were associated with shorter overall length of stay and less adverse patients outcomes (pneumonia, shock, cardiac arrest, and urinary tract infections) (American Nurses Association 2000; Stanton and Rutherford 2004).

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