The Implications of Activity Based Funding for Emergency Departments:

A Comprehensive Literature Review

Suggested citation

Kate Wylie, Anthony Bell, Gerry FitzGerald, Julia Crilly, Ghasem (Sam) Toloo, John Burke, Ged Williams (2014) *The Implications of Activity Based Funding for Emergency Departments: A Comprehensive Literature Review*. Queensland University of Technology, Brisbane, Australia.

ISBN: 978-1-921897-98-6

Disclaimer

Opinions and views expressed in this monograph are those of the authors and do not necessarily reflect the opinions and views of the organizations who have funded or provided the project with data and information.

Further Information:

Dr Anthony Bell
Emergency Department, Queen Elizabeth II Hospital
Cnr Kessels and Troughton Roads
Coopers Plains, QLD 4108
Email: Anthony.Bell@health.qld.gov.au

The Implications of Activity Based Funding for Emergency Departments:

A Comprehensive Literature Review

Statewide Workforce and Activity-Based Funding Modelling in Queensland Emergency Departments Project (SWAMPED)

Authors

Kate Wylie[1]
Anthony Bell[1,2,3]
Gerry FitzGerald[4]
Julia Crilly[5,6]
Ghasem (Sam) Toloo[4]
John Burke[7]
Ged Williams[5,6]

Authors' affiliations

1. Queen Elizabeth II Hospital, Brisbane, Queensland, Australia
2. Clinical Access and Redesign Unit, Brisbane, Queensland, Australia
3. University of Queensland School of Medicine, Brisbane, Queensland, Australia
4. Queensland University of Technology, Brisbane, Queensland, Australia
5. Gold Coast Hospital and Health Service, Gold Coast, Queensland, Australia
6. Griffith University, Gold Coast, Queensland, Australia
7. Royal Brisbane and Women's Hospital, Brisbane, Queensland, Australia

Acronyms

ABF– Activity Based Funding
ACO- Accountable Care Organisation
AHWAC- Australian Heathcare Workforce Advisory Committee
DNW- Did Not Wait
EAU– Express Admissions Unit
ECP- Emergency Care Practitioner
ECWU– Emergency Care Workforce Unit
ED- Emergency Department
ENWT- Emergency Nursing Workforce Tool
EP- Emergency Physician
ENP- Emergency Nurse Practitioner
FTE- Full Time Equivalent
GP- General Practitioner
IHPA- Independent Hospitals Pricing Authority
LOS- Length of Stay
MOC- Model of Care
NEAT- National Emergency Access Targets
NSW- New South Wales
RN– Registered Nurse
SAFE-T- Senior Streaming Assessment Further Evaluation after Triage Zone
SHO- Senior House Officer
SMO- Senior Medical Officer
SWAMPED- Statewide Workforce and Activity Based Funding Modelling in Queensland
TENP- Transitional Emergency Nurse Practitioner
TDABC- Time Driven Activity Based Costing
URG– Urgency Related Group
WA- Western Australia
WT- Waiting Times

Acknowledgements

The authors would like to acknowledge and thank the following organisations for their generous funding and support of the research project and significant role in improving this monograph.

- Queensland Emergency Medicine Research Foundation (QEMRF) for funding the project through the research grant awarded to Dr Anthony Bell (Principal Investigator);

- Centre for Emergency and Disaster Management (CEDM), Queensland University of Technology (QUT) for providing infrastructure support and commitment of the key academic staff time (Prof. Gerry FitzGerald, Chief Investigator);

- The University of Queensland (UQ) for in-kind support and commitment of the key academic staff time (Dr Anthony Bell, Principal Investigator);

- Griffith University for in-kind support and commitment of the key academic staff time (Dr Julia Crilly and Dr Ged Williams, Chief Investigators);

- Queensland Government Department of Health and related units and hospitals for in-kind support and commitment of the key medical staff time (Dr Anthony Bell; Dr Julia Crilly; Dr John Burke; Dr Ged Williams).

- Australian-American Fulbright Commission which through its scholarship program provided Dr Anthony Bell (Principal Investigator and a 2013 Fulbright Scholar) the framework for SWAMPED and the opportunity to experience emergency medical systems in the USA first hand.

Table of Contents

List of Tables

Executive Summary

Emergency Departments (EDs) locally, nationally and internationally are becoming increasingly busy. Within this context, it can be challenging to deliver a health service that is safe, of high quality and cost-effective. Whilst various models are described within the literature that aim to measure ED 'work' or 'activity', they are often not linked to a measure of costs to provide such activity. It is important for hospital and ED managers to understand and apply this link so that optimal staffing and financial resourcing can be justifiably sought. This research is timely given that Australia has moved towards a national Activity Based Funding (ABF) model for ED activity. ABF is believed to increase transparency of care and fairness (i.e. equal work receives equal pay). ABF involves a person-, performance- or activity-based payment system, and thus a move away from historical "block payment" models that do not incentivise efficiency and quality.

The aim of the Statewide Workforce and Activity-Based Funding Modelling Project in Queensland Emergency Departments (SWAMPED) is to identify and describe best practice Emergency Department (ED) workforce models within the current context of ED funding that operates under an ABF model.

The study is comprised of five distinct phases. This monograph (Phase 1) comprises a systematic review of the literature that was completed in June 2013. The remaining phases include a detailed survey of Queensland hospital EDs' resource levels, activity and operational models of care, development of new resource models, development of a user-friendly modelling interface for ED mangers, and production of a final report that identifies policy implications.

The anticipated deliverable outcome of this research is the development of an ABF based Emergency Workforce Modelling Tool that will enable ED managers to profile both their workforce and operational models of care. Additionally, the tool will assist with the ability to more accurately inform adequate staffing numbers required in the future, inform planning of expected expenditures and be used for standardisation and benchmarking across similar EDs.

Summary of the Findings

Within the remit of this review of the literature, the main findings include:

1. EDs are becoming busier and more congested

Rising demand, barriers to ED throughput and transitions of care all contribute to ED congestion. In addition requests by organisational managers and the community require continued broadening of the scope of services required of the ED and further increases in demand. As the population live longer with more lifestyle diseases their propensity to require ED care continues to grow.

2. Various models of care within EDs exist

Models often vary to account for site specific characteritics to suit staffing profile, ED geographical location (e.g. metropolitan or rural site), and patient demographic profile (e.g. paediatrics, older persons, ethnicity). Existing and new models implemented within EDs often depend on the target outcome requiring change. Generally this is focussed on addressing issues at the input, throughput or output areas of the ED. Even with models targeting similar demographic or illness, the structure and process elements underpinning the model can vary, which can impact on outcomes and variance to the patient and carer experience between and within EDs. Major models of care to manage throughput inefficiencies include:

A. Workforce Models of Care focus on the appropriate level of staffing for a given workload to provide prompt, timely and clinically effective patient care within an emergency care setting. The studies reviewed suggest that the early involvement of senior medical decision maker and/or specialised nursing roles such as Emergency Nurse Practitioners and Clinical Initiatives Nurse, primary contact or extended scope Allied Health Practitioners can facilitate patient flow and improve key indicators such as length of stay and reducing the number of those who did not wait to be seen amongst others.

B. Operational Models of Care within EDs focus on mechanisms for streaming (e.g. fast-tracking) or otherwise grouping patient care based on acuity and complexity to assist with minimising any throughput inefficiencies. While studies support the positive impact of these models in general, it appears that they are most effective when they are adequately resourced.

3. Various methods of measuring ED activity exist

Measuring ED activity requires careful consideration of models of care and staffing profile. Measuring activity requires the ability to account for factors including: patient census, acuity, LOS, intensity of intervention, department skill-mix plus an adjustment for non-patient care time.

4. Gaps in the literature

Continued ED growth calls for new and innovative care delivery models that are safe, clinically effective and cost effective. New roles and stand-alone service delivery models are often evaluated in isolation without considering the global and economic impact on staffing profiles. Whilst various models of accounting for and measuring health care activity exist, costing studies and cost effectiveness studies are lacking for EDs making accurate and reliable assessments of care models difficult. There is a necessity to further understand, refine and account for measures of ED complexity that define a workload upon which resources and appropriate staffing determinations can be made into the

future. There is also a need for continued monitoring and comprehensive evaluation of newly implemented workforce modelling tools.

This research acknowledges those gaps and aims to:

- Undertake a comprehensive and integrated whole of department workforce profiling exercise relative to resources in the context of ABF.
- Inform workforce requirements based on traditional quantitative markers (e.g. volume and acuity) combined with qualitative elements of ED models of care;
- Develop a comprehensive and validated workforce calculation tool that can be used to better inform or at least guide workforce requirements in a more transparent manner.

Introduction

Emergency Departments (EDs) throughout Australia are becoming increasingly congested due to the combined impact of growing demand, increased complexity of care and access issues. Such congestion has both clinical and organisational adverse effects.[1]

Demand is growing in health care systems that are already overburdened and faced with rising costs of care, ED overcrowding and subsequent ambulance diversion.[2] These factors fragment and threaten the quality of care patients receive and is neither desirable nor sustainable.[2,3] Complexity of care is also increasing, as patients survive longer with severe chronic diseases that are now able to be managed due to enhancements in health technology and evidenced based practices. Infrastructure (particularly hospital beds) is proportionately less than demand requirements, leading to rationing of services and blocked access of patients requiring admission.[4] Finally the challenges of meeting health care consumer demand, are compounded by an historic deficit in the health workforce and future problems associated with the changing demographics of the population, and ageing workforce and a relative shortage of people in their working years.[3,5]

As a result of the mismatch between supply and demand pressures within EDs, the Australian Government has identified the need for policy reform which includes the introduction of a time-based performance measure, i.e. the National Emergency Access Target (NEAT), and the implementation of an Activity-Based funding (ABF) model for hospitals including EDs.[6] The pre-ABF funding for EDs in Australia was based on historical and political considerations and was not related either to the real costs associated with delivering care, or to the clinical and organisational outcomes desired. The introduction in 2010-11 and roll-out in 2011-12 of ABF for public hospital inpatient care and the development of ABF for EDs have been identified as mechanisms for driving improvements in outcomes and efficiency. However, as the two funding models can lead to significantly different outcomes for different hospitals based on their staffing resources and requirements, the potential impact of the new funding model warrants careful consideration to ensure it is reflective of optimal care and outcome delivery.

In Australia, varying levels of experience and system maturity exist across the State jurisdictions in administering ABF.[7] However there is no experience in the public sector of ABF for EDs as at present, EDs are funded from within global hospital allocations. It is also recognised that adjustments need to be made to ED caseloads to account for factors relating to the variable complexity of the patients and for essential clinical support activities such as teaching and training, research and emergency preparedness.[8] Newnham et al.[9] acknowledge that this shift is likely to occur for emergency and acute medical admissions to hospitals and in the context of NEAT and clinical redesign initiatives, they call for a detailed evaluation of the impact that these policy changes will have on patient care and outcomes, resources, training and costs of care delivery.

The overall aims of this research project are to link best practice ED workforce models to available ED funding (that operates under an ABF arrangement) whilst contributing to the development of an improved national activity and outcome based ED funding model.

The specific objectives of the research are:

1. To identify the current status of translation of ABF funding to EDs in Queensland;
2. To identify and critically appraise models for funding of EDs which are activity and outcome based;
3. To identify the impact of ABF funding models on EDs in Queensland;
4. To identify the workforce implications of ABF funding models and propose a state-wide ED clinical workforce framework;
5. To develop an ABF-based emergency workforce modelling tool that is evidence-based using available financial, workload and workforce data to inform future system wide planning. This will enable EDs to benchmark, profile and plan their workforce; including medical, nursing, allied health and support staff.

The evidence derived from this research project will inform proposals for improved ED efficiency including changes to emergency models of care. Clarity around ED funding is required before workforce sustainability can be realised. FitzGerald and Ashby[2] highlight opportunities that exist for improved ED performance and quality; if demand can be managed, capacity of the overall system addressed and efficiencies gained through a better integration of emergency care at the community and inpatient interface. Successful achievement of targets such as NEAT will require attention to whole of hospital overcrowding that result in ED access block issues. These issues impact on ED workload over and above the funding position that an ABF model would provide based on activity alone.

Context and rationale

In terms of its contribution to hospital efficiency, the key function of an ED is to evaluate, treat and discharge patients when appropriate. If strategies are implemented in or by the ED that allow for inpatient admission avoidance, the ability to recoup the additional expenditure on resources associated with inpatient care is also possible. There are certain economies of scale associated with 'front-loading' the care of admitted patients in the ED, but these advantages are lost beyond the first few hours of care as the amount of continued work required causes efficiency to fall. Once the responsibility for care has been transferred to an inpatient treating team, the ED becomes unsuitable from the perspective of both patient experience and quality of care. Stokes in his review of the four-hour rule introduced in WA identified "consultant clinician-led discharge from ED", particularly the redirection of ambulatory care sensitive conditions, as an area requiring more effort.[10]

The WA four hour rule Program Review, showed that for all its success in achieving improved time-based targets, it fundamentally changed the balance of 'ED delivered' versus 'non ED delivered' models of care.[10] Acute assessment units, cohorting of patients and reorganisation of ward spaces along with a shift in radiology ordering were all shown to reduce the LOS in the ED. Respondents reported a shift in acuity from ED to the ward units with flow on effects to non-ED nursing, ancillary and allied health staff resulting in truncated lengths of stay.[10] The WA experience is that resources have not increased in line with demand. However, now that robust clinical redesign has achieved what it can in terms

of efficiencies, the challenge is to redistribute the workforce and build capacity, all in an ABF environment.[10]

Relative understaffing can impact negatively on patient safety and patient outcomes.[134] Staffing calculations based only on the number of patients and/or number of departmental beds fails to take account of patient acuity, patient length of stay in the department, numbers waiting to be seen, and the impact of non-clinical staff.[11] The ability to inform emergency staffing requirements, accounting for these factors is important for a number of reasons. First, it allows for the ability to more accurately inform adequate staffing numbers. Second, within the constraint of health care budgets it can inform planning of expected expenditures. Finally, it can be used for standardisation and benchmarking across similar EDs.[11]

Health workforce planning and models of care for EDs was addressed by the Australian Health Workforce Advisory Committee (AHWAC) in 2006.[12] Workforce redesign with an interdisciplinary focus and alternative models of care were elevated as core principles along with engaging the support of other hospital departments. They advocated that business process redesign should only occur with a patient centric focus, and in the context of broader hospital changes that would focus on improving the patient journey. Even in the pre national health reform context, AHWAC highlighted that the projected workforce profile would likely be misaligned as newer models of care were taken up. What is evident from anecdotal experiences is that clinical redesign processes are now forcing hospital executives to critically appraise the historical funding allocations and workforce distributions across the whole of the hospital.

Regarding workforce and clinical process redesign, health policy formulation and its inherent health care reform should be driven by relevant evidence. However, the comprehensive research agenda to guide such policy and health care reform is the missing element.[13] The core plank of contemporary reform in Australia is to move to a national ABF model[6] which poses a series of challenges in its application to EDs. Early on in the National Health reform debate it was proposed that developmental work was still needed to achieve a consistent National activity based classification and costing methodology for Emergency Department services.[14] The model used to inform the National ED ABF model is based on an Urgency Related Group (URG) activity-based funding methodology devised approximately 20 years ago by Jelinek.[15] However, this URG model has not undergone any significant development or validation despite recommendations from the Victorian Department of Health just prior to its implemention.[16] The 2012/13 National Efficient Price Determination funding report informs the Emergency Department URG (Version 1.2) price weights and therefore the potential revenue apportioned by EDs.[17] The report incorporates the consultation that occurred with the State jurisdictions as undertaken by the Independent Hospitals Pricing Authority (IHPA). It is this that represents the starting point for our consideration of ABF in its application to workforce and models of care. The relative cost weightings for URG categories are currently averaged and based on aggregated adjusted patient level data. In the US, Kaplan and Porter advocate for true patient level costing using a "Time Driven Activity Based Costing (TDABC)" methodology to fully understand the true cost of delivering care arguing that existing approaches are not representative of actual cost structures.[18]

Another model, this time developed within Australia aims to provide an indication of departmental workload. The Emergency Care Workload Unit (ECWU) methodology[19] considers patient acuity (according to triage), disposition, overall number of patients and the individual costing of each presentation. This is used to estimate and define the workload of an ED in emergency care workload units. The model was validated in six separate EDs and can be used to demonstrate the relationship between staffing in each of the ED clinical streams and overall workload. Whilst the model can be used to track changes over time in a given ED it can also be used for benchmarking full time equivalents, in this context, across different EDs. What is not known is the optimal workload per staff member in EDs in general but offers insight into how equitable distribution of staffing and budget allocation based on workload can be accomplished.

Regarding the ED nursing workforce, research has been undertaken in order to validate the Emergency Nursing Workforce Tool (ENWT) within Queensland public hospitals. When compared to the standard way of calculating ED staffing requirements, results indicated:

1. There was no significant difference in FTE nursing requirement when standard vs. new (ENWT) methods were compared;
2. The ENWT was more efficient (i.e. timely) and
3. The ENWT had better predictability than existing methods for calculating FTE nursing requirement.[11]

The researchers indicated that the methodology underpinning the ENWT may be useful to inform staffing requirements in settings other than the ED (e.g. intensive care, operating room) and disciplines within the ED other than nursing (e.g. medicine, allied health, porterage). Furthermore, findings from this research can be used to inform ED managers and health service planners regarding a standardised approach to calculating emergency nursing workforce needs.

Interstate efforts to develop a workforce tool occurred in 2009 with the NSW Health ED Workforce Research Project[20] resulting in the ED Workforce Analysis tool.[21] A four phase approach involving diagnostic, solution design, reporting and final testing was applied to a cross section of NSW EDs in consultation with a Reference Group and managed by a firm of external consultants. Data was collected via structured interview and process mapping sessions. Throughput and catchment characteristics were recorded as were access to services, staffing profiles, access to education and stated models of care. EDs were then classified according to scenario groups and the tool developed to assist decision makers in the correct distribution of skill mix across clinical disciplines in NSW EDs. The tool is designed to be workshopped by clinical and managerial staff and provides for a structured approach to considering the skill mix characteristics of any given ED. The NSW tool was developed prior to the implementation of the National Health reform agenda[14] and the NEAT. Furthermore URG based ABF funding had not been considered, even though significant investments had begun to be made in addressing clinical redesign at that time. This is evidenced by the methodology adopted in the NSW context.

Significance of Research and Translation to Clinical Practice

There are lessons to be learned from prior models developed and identified through this review. The funding model for EDs under ABF is evolving. The ongoing challenge for ED leaders (both Medical and Nursing) is the transition from a historical funding model to an ABF funding model. As the funding environment becomes increasingly competitive it is important that ED Directors understand their department's financial position in balancing the potential revenue under ABF against their existing cost structure (including salaries, pathology, radiology, clinical supplies and overheads). This would inform funding submissions, business cases and provide the financial rationale for developing them.

Under ABF, which is modified by jurisdiction specific purchasing initiatives, future resourcing (mainly human capital) will inevitably be linked to activity, performance and safety and quality indicators. This research will provide the means whereby ED leaders may be able to link ABF models to a workforce framework.

Of significance for the State health authorities, who now act as purchasers of public hospital services with responsibility for system wide planning, performance and accountability will be an independently derived and validated workforce tool for use within and between Hospital and Health Boards. Developing knowledge and expertise in this area will be important when opportunities to influence optimal ED funding arise.

Thus research is necessary to identify how a more sustainable and contextually appropriate workforce may be developed locally and at a State-wide level. It will have implications for education and training of the multidisciplinary emergency health workforce.

The first stage of this project examines the intellectual and operational context from the perspective of the published literature. It is focussed on the development of a clear understanding of the conceptual basis for the further research and to help guide the development of detailed research methods, analytical processes and interpretation. This systematic literature review was undertaken to gain a comprehensive overview of what is occurring in EDs globally in regards to best practice workforce models and outcome based funding models. The findings will be used in the following phases of the SWAMPED research project in the development of a tool that can be used to accurately inform adequate staffing numbers and inform planning authorities of expected expenditures. Further it may be used for standardisation and benchmarking across similar EDs.

Methods

A literature review and major document analysis was undertaken to identify current international models of funding and workforce. A number of approaches were utilised which involved:

- A search of key medical databases using a set of keyword search combinations (Table 1);
- A focussed review of the contents of 11 national and international emergency medicine, nursing and health economic journals (Table 2);
- Snowballing identification of references of most recent and relevant papers.

The systematic review sought to identify current trends in demand and services provided in ED, their funding models, workforce models and performance measures that foster and promote service development. An effort was made to identify existing knowledge and debate around the interest areas rather than seeking to identify effective interventions and outcomes only.

The retrieved literature was organised around the following themes: ED demand management, operational models of care, workforce models of care, human resourcing including staff scheduling,workforce shortages and financing models. Articles were automatically excluded if the date of publication made it no longer relevant; it was published in a language other than English or included data from an emergency medicine system in an underdeveloped country.

The combination of search strategies produced a list of 456 articles. Titles were reviewed for inclusion by the four research team members. The titles were screened for relevance to the project and were included if they appeared to relate to the management of Emergency Departments and in particular to operational models of care, resource allocations models (including financial), the factors that appear to be driving changes in those models and workforce models.

A total of 229 article abstracts were included in a second level screen for relevance, impact and significance. The abstracts of the articles selected for full review and analysis stage were those that appeared to make a significant contribution of new information; that is they appeared to provide evidence to support the analysis of both models of care and resource allocation. A total of 122 articles met this criterion for full review.

At both stages, three reviewers screened the articles independently. If all reviewers agreed then the article was included or excluded as appropriate. The outcomes for the remaining articles were documented and sent to investigators to seek agreement (a Modified Delphi approach). Where only one investigator strongly considered the article should be included then it remained included.

The final analysis stage involved the Research Assistant (KW) reading all articles and constructing a table outlining key findings and implications (see Table 3). The total number of articles were divided by themes and sent to one of the three Chief Investigators for review and to confirm the findings and outcomes. The Chief Investigators separately reviewed the articles for one of the themes and amended or accepted the interpretation. Included in this report (and Table 3) are only those articles that appear to be sufficiently well designed to make the findings robust (i.e. 116/122 articles). They are peer-reviewed, from reputable sources or contributed by experts in the field of emergency medicine, emergency nursing, health policy or health system finance. Additionally, they are articles which investigators feel that make a significant, timely or unique contribution to the development of our understanding in this research area.

Findings

ED Congestion: Trends and Management

Already acknowledged within this report is that consistent with global trends, Emergency Departments throughout Australia are becoming increasingly congested, and there is growing concern regarding the impact this is having on patient outcomes and the emergency practitioner workforce. Within the literature, the reasons for congestion broadly include an increase in demand, inefficient or ineffective ED processes and obstacles preventing a smooth disposition of patients. Asplin et al's[22] conceptual model of the emergency care system identifies three distinct phases within the emergency care pathway: input, throughput and output. These will be used to highlight the ED congestion trends and management strategies in the following discussion.

Input and Demand Trends

Input factors resulting in congestion include a general growth in demand for Emergency Care, with the literature suggesting a growth rate between 3-6% across Australia.[23] This rate is far higher than the national population growth rate of approximately 2%[24] and reflects an absolute increase in the utilisation per capita rate of 2% per annum. Significant industry research has been invested into determining the cause for this increase in demand with a number of reasons identified.

One explanation in the public discourse regarding growth in ED demand is that lower acuity presentations, or patients who could possibly be managed within primary care facilities, are misusing EDs in order to access free or convenient care.[25,26] According to Masso et al[25] there is a general belief that ED congestion would be alleviated if healthcare systems were better "organized." Certainly this explanation is supported in the USA, where legislation entitles all Americans to free emergency care, with ED congestion rates far higher in communities where insurance rates are low.[27] Another explanation of ED growth is a reduced access to primary care. Fewer general medical practitioners working within community-based facilities prevent convenient access;[23] and the ED is the most commonly known and utilised alternative.[5,28]

Contrary to the argument about use and misuse of the system by lower acuity visits, others suggest that the EDs' most visible and indispensable role in the community remains the treatment of seriously ill and injured patients where growth is also occurring.[23] As a result of both the aging population and higher prevalence of chronic disease, the population is becoming sicker and the need for acute care has increased.[23] This is further reinforced by a considerable number of GP referrals to EDs[23] suggesting that rather than boycotting primary care facilities, community members are first seeking primary care services and then only being sent to EDs for stabilization, diagnostics and second opinion if required. Understanding why patients attended the ED was the focus of an Australian study undertaken in 2004–05 in New South Wales.[25] Findings indicated that (perhaps contrary to the belief of some) that "free care" was not the main reason for presentation.[25] Rather, reasons for ED utilisation include patient's belief that their condition was too urgent for their GP or the incident or illness necessitating care occurred outside of primary care hours.

Similar results are noted in a more recent Queensland study, the results of which are in press.[29]

With the world-wide trend of increased demand for ED services, there is considerable debate regarding the cost of providing such care. Emergency care expenditure accounts for between two and ten percent of the entire health care budget in the USA.[30] The extent of the expenditure, coupled with the concerns that congestion is causing adverse patient outcomes has resulted in both legislated and research efforts to reduce ED input. These have been documented in the literature and are described in more detail next.

In the USA, the recently legislated healthcare reforms may impact emergency care provision. By reducing the number of uninsured Americans it is anticipated this will subsequently reduce the number of people accessing emergency care. However, due to a primary care provider shortage in the USA, the extent to which this will improve congestion remains unclear. The American health system reform also sees the introduction of "Accountable Care Organisations" (ACO) which are anticipated to transform the demand for diagnostics, pathology, radiology and therefore type of people accessing EDs.[31] Categorisation of care into specialised Emergency Medicine facilities and regionalization of emergency care have also been discussed within the USA reform. It is thought that with this model, where there is better organisation of the people presenting, the ED will operate more efficiently.[5] Finally, "Care Coordination" an initiative aimed at streamlining communication, transfer and enabling greater access to patient records is being implemented within the American health care system. It is believed one of the benefits will be reduced ED presentations as a greater quality of care will be received from primary care providers and ACOs.[5] As with any large scale legislation and system changes such as this, time and robust research will tell whether these changes are translated into improved health outcomes within the community at large.

Healthcare reform in Canada, the UK and Australia include investment in health prevention and improving primary care. Efforts include incentivizing medical students to enter primary care to reduce skills shortages, building GP super clinics, upgrading existing health care infrastructure and the introduction of after hour GP responsibilities.[26,32] Mixed opinions have been documented regarding these strategies with some experts suggesting a greater investment is required to improve and maintain these systems than is required to cover the cost of increasing ED demand.[28] This will continue to be a discussion involving much debate due to the complexities involved in calculating the exact costs of providing an emergency care service.

Models of Care to reduce ED attendances (i.e. input) have been investigated in the UK. Observational research has evaluated the benefits of a "treat and discharge" service provided by Emergency Care Practitioners via the ambulance service. Preliminary results suggest that treatment plans provided by the Emergency Care Practitioners (ECP) were consistent with those provided by an Emergency Medical Officer. [32,33] As the care provided by the ECP was accessed offsite, the number of ED presentations was reduced. It was inferred that this strategy was effective at reducing ED congestion at both ends of the ED system as it also prevented unnecessary admissions caused by elderly patients that are admitted due to unknown social circumstances.[33] Other documented strategies that attempt to reduce ED

congestion during the input phase include the establishment of minor injury units (MIU) as conduits to EDs,[34,35] telephone triage systems[36] and walk-in centres.[37]

Outside of the healthcare system, the literature indicates that USA businesses are gaining the support of private insurers to employ health professionals onsite to assess and treat employees rather than paying the insurance overheads that occur as a result of receiving primary or emergency care. Analysis of the cost-effectiveness of this service suggests that employing and resourcing an acute care nurse practitioner full-time is more affordable than paying expensive insurance excesses.[37] This model of care has implications on the utilization rate and congestion of EDs if this model becomes more mainstream.

Regardless of all health reform attempts to reduce ED input, it is suggested that growth in demand is only part of the explanation for ED congestion.[24,28] As a result ED throughput and outflow obstruction also requires consideration.[26]

Trends in Managing Throughput Efficiencies

ED throughput comprises two distinct phases. Phase one being triage, room placement and assessment; and phase two diagnostic testing, treatment and disposition planning. Apparent within the literature is that demand and access to EDs are being addressed at a government level, whereas throughput efficiencies are being addressed at a local network, hospital or even departmental level. There is an ever increasing abundance of research being conducted aimed at trialling and evaluating innovative operational and workforce models of care which reform ED internal processes. Cohesiveness of the patient team, layout of ED, staff schedules and ratios, quality of documentation and communication systems, availability of specialist services all affect this component of ED care.

Callander and Schofield[38] previously reviewed the available ED literature on workforce models and concluded that there was a paucity of holistic ED staffing profile data. In the main, new roles and stand-alone models were evaluated in isolation without considering the global impact on the entire staffing profile. The rationale for conducting evaluation of new workforce models were commonly cited as a response to increasing demand, the matching of staff to peak patient presentations and analysing the impact on patient flow when utilising more senior staff. In terms of operational Models of Care; individual roles, care teams and unit-based care models are all described across the range of clinical disciplines. Balancing cost effectiveness in an ABF environment without sacrificing quality and safety is the main challenge but there is a scarcity of cost-benefit analysis of what combinations of staff work best.

A summary of the studies on Workforce and Operational Models of Care, and their documented outcomes are presented next.

Workforce Models of Care

According to Paw,[39] an appropriate level of staffing is the single most important factor in providing prompt, timely and clinically effective patient care within an emergency care setting. The consistent message within the literature when considering the development of such a staffing model is the complexity involved in doing so.[40] Unlike inpatient departments, the non-routine and variable workload of an ED, at times of surge, adds a number of complications to the process. Fluctuations in volume, the clinical range of different

conditions treated in an ED and the variation in symptoms related to each diagnosis, provide justification that staffing cannot be based on employee to bed ratios alone. Factors such as volume, acuity, historic patterns of demand and patient expectations also need to be considered, all while keeping cost-effectiveness a priority.

We did not locate any studies that examined the staffing profile of an ED as an entire entity. Instead the literature focuses on individual clinical models of care, how they affect throughput outcomes (such as proportion of Did Not Wait (DNW), Length of Stay (LOS) and Waiting Time (WT) to Treatment) and skilled workforce shortages (mostly specialist Emergency Physicians [EPs]).

One of the most prevalent individual roles evaluated within the emergency literature is the Emergency Nurse Practitioner (ENP). Although national legislation and government registration policy causes slight role variation across different nations, ENPs generally assume the responsibility for patients presenting with minor injuries or illnesses and operate within demand management throughput systems such as Fast-Track and See-and-Treat.[41-44] Research evaluating ENP models of care consistently report reduced WT[40,45,46] and LOS[41,47] for lower acuity patients and increased patient satisfaction.[34,48] Evidence also exists suggesting ENPs offer improved quality of care (reduced errors causing adverse events, lower unplanned re-presentation rates), improved continuity of care[40] and better use of resources when compared to their Senior House Officer (SHO) counterparts.[34,41,49] Other benefits to Emergency Care services achieved through an ENP service include increased job satisfaction for senior nurses, and reduced concern regarding the Emergency Physician skill shortage.[34] There is a scarcity of research analysing the cost effectiveness of these roles. Of the literature that does exist, there are opposing opinions regarding the cost benefit of ENPs. One common theory is that the ENP role promotes cost inefficiencies due to the higher remuneration expense and regulated shift conditions of ENPs over SHOs.[34] The opposing view is that expenses saved from improved resource rationing (both materials and additional nursing resources), lower re-presentation and adverse events rates, and lower training costs as a result of less frequent turnover rates by far makes up for additional salary costs.[34,35]

A second nursing role evaluated within the literature is the Clinical Initiatives Nurse (CIN). This role is reported to primarily operate within the waiting room and is able to initiate treatment to patients prior to being seen by the EP.[50] While there are suggestions that this role greatly improves patient satisfaction levels and reduces DNW rates and WTs, there is no evidence to suggest any ED congestion relief or reduction in LOS.[50]

In an attempt to improve LOS, the presence of additional medical officers in demand management systems has been trialled.[51-56] Not surprisingly, outcomes suggest presence of additional staff will improve throughput targets for the discharging of patients however do not have a significant impact on overall LOS as the role is not able to influence admitted patients timeframes.[52,56] The presence of a senior EP in triage produces similar outcomes with the additional benefit of a potential reduction in ambulance diversions.[51,53,54] Whilst both models used additional rather than reallocated staff, and thus would have incurred an increase in staff salary expenditure, formal cost-benefit analyses were not included in these studies. Other studies involving MOs were those that evaluated the benefits of 24-hour consultant or senior level coverage. From the literature reviewed, the presence of additional

senior staff has been associated with increased triage, diagnostics, patient flow and admission efficiencies.[57] A cost-benefit analysis is required for this model, especially given that providing 24-hour senior coverage is a significant expense requiring numerous employees to satisfy the shift requirements. Also required for this SMO model is the consideration on workforce planning and training. Currently there would be limited potential to achieve this as an industry standard given limits to the number of College recognised consultant physicians (i.e. Fellow of the Australian College of Emergency Medicine, FACEM) currently in the workforce. In addition, there would be implications on the training of registrars. If 24-hour coverage is to be introduced it needs to be considered on department-by-department basis depending on acuity and presentation trends[58] amongst other components.

Models of care using support staff have also been examined. The impact of these models on departmental outcomes has been analysed. Within the USA the use of Physician Assistants (PA) within the ED has been widely implemented.[59,60] Assuming a similar role to the ENP, outcomes suggest they are able to manage up to 8% of presentations in a shift, and have a proven effect on reducing both LOS and DNWs.[59,60] Additional benefits include that they provide an alternative to employing additional MOs, thus enabling flexibility and stability within the medical workforce and they are less costly than MOs.[60] There is currently no literature demonstrating the utilization of PAs in Australia and it is unclear what medico-legal and training requirements would be required to develop this role.

Evidence exists that the use of ED scribes to assist physicians administratively can facilitate ED productivity. ED scribes can enable EPs to assess more patients per hour and is a cost effective solution over employing additional clinicians in demand management systems.[61] There is no evidence however to suggest that scribes improve LOS.[61]

There was little in the literature that supported the use of Allied Health Practitioners within EDs to improve ED congestion specifically. A consistent theme within the literature is that any benefit on ED throughput outcomes is diminished by the limited operational hours allied health services tend to operate within the department.[62-65] A qualitative study indicated that the availability of allied health services actually contributed to longer stay as they create a dependency on their service and do not offer 24 hour coverage.[64] One exception was a study by Jibuike[66] which highlighted the advantages gained by implementing an Extended Scope Physiotherapy service specifically to assess and treat acute knee injuries. Outcomes from this study suggest that post implementation of the new service there were fewer orthopaedic admissions reducing medical time requirements, however it was not reported if the differences were statistically significant.

Studies that highlight reported benefits of allied health services in a more general sense do exist. These include the use of clinical pharmacists within the ED to reduce the number of medication errors and resulting adverse events,[67,68] and the use of a radiographer-led radiology service to reduce interpretive errors made by EPs.[69] A systematic review inferred that in some studies the "Care Coordination Teams" were effective in reducing unnecessary social admissions in elderly populations and significantly reduce re-presentations.[70] However, the results were not consistent in all studies reviewed and no cost-benefit analyses were performed. It was inferred though that from fewer adverse events and re-presentations,

in addition to improved clinical outcomes reducing the need for admissions, there were some cost benefits. Finally, one qualitative study revealed that the presence of allied health appeared to contribute positively towards team unity, staff satisfaction and retention rates and that (although not proven) was assumed to impact on lower departmental HR expenditure.[64]

Operational Models of Care

Many innovative Operational Models of Care have been trialled within EDs to assist with minimizing ED throughput inefficiencies. Similar to Workforce Models of Care, statistically significant benefits are typically observed in lower acuity patients however there are mixed results recorded on overall throughput outcomes.

Fast-Track systems are useful models of care for dealing with a large number of lower acuity patients presenting with minor injuries or illnesses.[41,45,46,48,71,72] They typically operate over reduced hours depending on historical demand of the ED and are staffed by a varying mix of SHOs and ENPs.[45,46,48,71,72] Ambulatory areas, See-and-Treat Services, Minor-Injury-Units and Rapid-Intervention-and-Treatment-Zones are all seen as alternatives to Fast-Track and have been implemented in health care systems globally to better manage throughput. The literature suggests benefits of these models include improved patient flow and continuity of care, greater patient satisfaction in addition to reduced WT and LOS for lower acuity patients during the hours of operation.[41,45,46] There is a paucity of evidence confirming or disproving the cost effectiveness, however several studies do suggest operating these as outpatient clinics incur far greater financial costs than that for operating the ED over capacity with higher staffing levels.[28,45,48,72]

An Australian study by Shetty et al[73] demonstrated the effectiveness of a unique model titled "Senior Streaming Assessment Further Evaluation after Triage Zone" (SAFE-T zone). The aim of the model was to maintain patient flow despite access block and overcrowding. Similar to Fast Track models the SAFE-T zone operated over a restricted daily schedule. A governing principle was that all presentations, with the exception of those requiring resuscitation, were seen on arrival by an SMO, SHO, RN and were triaged. This enabled them to be transferred to an early treatment zone to commence intervention or to Fast Track to manage urgently and be discharged. Acute care beds were quarantined for high acuity patients or to be made available at times of surge capacity. Unlike other workforce and operational models of care, outcomes of this study demonstrated WT improvements across all ATS categories, and LOS improvements to both high and low acuity patients during SAFE-T zone hours. Off-stretcher times and ambulance diversion rates also improved.[73] Surprisingly though there was no change to the proportion of DNWs. Improved outcomes for this model should not be unexpected given that all staff were additional resources rather than reallocated and therefore the department incurred a significant increase in on-costs.

"Quick Diagnostic Units" have been introduced in Spain to manage referrals from GPs to EDs. Due to health system inadequacy causing inaccessible outpatient diagnostic services; GPs were increasingly referring suspected cancer patients to EDs to facilitate a hospital admission or rapid diagnosis.[16] Quick Diagnostic Units, staffed by Internal Medicine Specialists, operate as silos to EDs and were effective at reducing the ED LOS due to reduced unnecessary ED admissions.[16] The application of this model in other countries is as yet

untested as far as we are aware. In Australia we have seen the development of Medical Assessment and Planning Units (MAPU), Clinical Decision Units,[78,79] Rapid Assessment and Planning Units, Surgical Assessment Units, as an extension of the ED or stand alone with various staffing models include EPs and ED nurses, while others are independently staffed units. These throughput models also require further exploration and evaluation[80] to determine which model and staffing profile will result in the most efficacious service.

Finally, the use of non-traditional beds as a Fast Track type system to address seasonal demands was investigated.[75] Non-traditional beds included trolleys in hallways and conference rooms. While outcomes of the study suggest the use of additional beds facilitated the maintenance of throughput targets despite demand surges,[75] the lack of research conducted into patient outcomes, satisfaction levels and occurrence of adverse events significantly reduces the ability to compare findings from this study with others.

Express Admission Units (EAU), Observation bays and Clinical Decision Units (CDU) are models of care that specifically address phase 2 (diagnostic, treatment and disposition) throughput efficiencies. Buckley et al[75] describe the EAU essentially as an ED discharge lounge. It is a five-bed ward staffed and funded by inpatient services, where patients are held until an inpatient bed becomes available. The study demonstrated the presence of the EAU reduced ED LOS of both admitted and discharged patients, effectively improving ED throughput.[75] A number of studies were sourced that evaluated the impact of observations bays and clinical decision units.[76-78] The literature consistently demonstrates these models are effective in reducing the number of inpatient admissions. From the models identified, it appears that the most effective in reducing ED LOS is the one where the staffing is independent of the ED. Limited description on resource limitations- such as material, staffing or financial- were provided in these studies making further comparisons difficult.

Opening new (additional) or available (but previously unstaffed) beds within the ED as a means of improving throughput has been studied. Generally, findings suggest that additional infrastructure and corresponding staffing can impact positively on some but not all throughput outcomes and sustainability of positive outcomes appears time limited.[76]

Throughput models of care that are workforce or operationally based can make some impact on ED patient and service outcomes. The optimal configuration of these models is unclear.

Outputs

Asplin et al[21] suggest that ED output is the ability to move patient out of ED into inpatient bed or onto an appropriate outpatient follow up schedule. The inability to do this causes ED outflow obstruction[26] and is typically a result of lack of physical beds, poor accessibility to available inpatient beds due to inflexible systems or protocols, isolation precautions, cleaning delays, over reliance on ICU / HDU beds, inefficient diagnostics or delays in discharging hospitalized patients to post-acute facilities.[21]

With the focus of this review being on ED models of care and economic analyses accounting for ED activity, this literature search did not specifically retrieve articles on the outcomes associated with output efficiencies. From the literature it is indicated that managing ED output congestion or delays (often termed access block) requires entire hospital accountability. This includes implementing strategies such as inpatient teams being

responsible for achieving access block targets rather than the ED;[81] surgical and outpatient scheduling to be coordinated around ED demand peaks;[76,82] coordinated weekend discharges;[76,83] consideration of the layout of the hospital;[83] operational direct admissions policies,[44] using protocols promoting the use of the hospital discharge lounge for ED patients undergoing short-term treatment or awaiting transport,[76] using nurse led or criteria led discharge protocols[44] and transferring stable admitted patients to inpatient hallways rather than ED hallways.[83]

ED output systems, particularly those facilitating discharge home, appear to be the focus of federal and state health care reform rather than the individual hospital. Hampering output capability may be the availability of and access to outpatient and follow up care services that may result in ED representation, contributing to the ED congestion cycle. Whist models of care delivery within the ED are important considerations when accounting for ED activity, also important is the ED workforce profile.

The Global Emergency Department Workforce Profile

Within the ED, there is an inseparable relationship between staff number, staff practice and staff efficiency.[84] Research regarding ED staffing requirements has arisen from a number of countries; across a variety of professions; and across a variety of settings (metropolitan and rural environments).[85-87] Major areas of research emerging regarding ED staffing includes the profiling of existing workforce arrangements, predictions of future workforce, and the human resource considerations informing the development of workforce scheduling arrangements. Common to most of these areas is the realisation that adequate staffing in the ED is imperative in order to meet patient safety needs and health service key priority indicators. Also, despite the presence of several methodologies used for staffing calculations, it has been recognised that there is still a necessity to refine measures of ED complexity and workload to determine appropriate staffing levels in the future.[11] Furthermore, a costing/economic element of workforce requirements was not a standard component of the studies cited here, and is therefore needed.

Influences on Current Staff Profile

Literature published from the USA profiles the current Emergency Medicine Workforce with recurrent themes emerging. The most prevalent theme is that of a skilled workforce shortage affecting emergency disciplines, both medical and nursing.[88-91] Understaffing is considered the major obstacle to modernizing emergency care[92] and is therefore a substantial industry concern regarding skills shortages and despite its perceived popularity in training schools,[93] supply is not meeting demand.[5] Based on growth projections, the literature suggests that there are simply not enough training positions to generate the required number of registered physicians and qualified nurses.[88,92] Increasing demand is also creating industry retention challenges, as department congestion causes staff performance to degrade facilitating workforce burnout and high levels of staff to leave the profession.[90,5] One qualitative workforce study indicated that almost one quarter of EPs were not satisfied with their jobs,[45] a risk factor associated with high turnover. Job dissatisfaction within the ED has been attributed to increased public scrutiny, the introduction of poorly received working time

directives and inadequate access to specialists, equipment and resources;[90] all influences that exist within the current ED climate.

Evident in the literature is that in most nations, workforce numbers and shift schedules remain largely based on historical department-specific scheduling trends, conventional rostering methods and professional regulations.[94] An Australian study of the nursing workforce suggested the lack of a standardised system able to calculate the number of staff required per shift is causing inequities between departments and high levels of frustration within the workforce.[95] As a result there has been a number of workforce guidelines and even legislation introduced and the impact of these analysed.[88,91,95] Early impression papers being generated on the introduction of mandatory nurse to patient ratios in Victoria, Australia and the USA demonstrate that inadequate consideration was given to EDs when calculating the ratios as there is no provisions to account for acute fluctuations in patient acuity and/or volume.[88,96] There is also no consideration of the impact they will have on the achievement of time-based working directives. There is a clear consistent message that department schedules should not be based on volume alone.[97,98] Scheduling models, such as the Murray Model in Canada, that are based on acuity (ATS) and volume do exist.[99] However these too receive critical feedback as they omit time demands of patients awaiting transfer, the impact of co-morbidities as well as teaching and training activities. A number of studies suggest that patient census, acuity, LOS, intensity of intervention, department skill-mix plus an adjustment for non-patient care time should all be considered.[84,86,96,99]

Finally, factors influencing the current Emergency Workforce include the substantial global health care payment reforms and the lack of a clear understanding of what 'efficiency' is and entails. Healthcare system payment reforms in Canada, UK and Australia appear to be shifting from historical block payments to activity or patient-based funding models and the impact of these on Emergency Medicine remains unclear. While the literature collectively supports that the new models will improve treatment transparency, concern exists regarding how these models will impact on the provision of care and workload expectations. There is also a general consensus that ED care can be delivered in a more efficient manner however, according to Ward et al[84] the definition of efficiency within the ED remains unclear. Efficiency could relate to time, expenses or appropriateness of patient receiving treatment.[84] Until the significance of efficiency within the ED is clarified, it will continue to create uncertainty within ED workforce affecting recruitment, retention and workforce planning efforts.

Predictions of Future Workforce

A number of articles attempted to predict factors that will impact on the future of the Emergency Workforce. Published in the USA, these predictions are made predominately in an attempt to ensure that the industry can continue to meet Emergency Care quality outcomes and ensure patient satisfaction.[5,88,83,100,101] Dominating the literature in this area is the significant encouragement from the Colleges of Emergency Medicine to make a shift toward a predominant specialist emergency physician workforce.[5] Although a growing majority of physicians working in EDs are specialist EPs, other specialists and general practitioners continue to staff EDs, particularly in rural communities and where recruitment efforts have been unsuccessful.[5,100,102] Although a specialist EP workforce is generally perceived as a positive way to further cement the foundation of Emergency Medicine,

concerns exist, due to supply issues previously highlighted. The expected impact of this recommendation is an increased departmental expenditure on both remuneration and training. Department efficiencies may be lost due to greater number of training positions and greater training demands placed on senior physicians.[93,103] Similar arguments apply to nursing workforce in the ED.[5,102] With departmental costs already being heavily scrutinised and the impact of funding model reforms unknown, it is unsurprising that the researchers indicate some workforce apprehension.[93,100]

HR Influences on the development of Workforce Schedules

Not only do current workforce staff schedules result in suboptimal utilisation of health care providers,[84] scheduling has also been shown to impact on career longevity and therefore staff attrition.[104] Within the literature, broader human resourcing considerations such as recruitment, retention and rostering have been applied to ED workforce shortages and inefficiencies with some notable key findings.

Despite political pressure to minimise ED expenditures, HR experts suggest making a substantial investment in the recruitment and retention of staff. Astles[105] suggests that hiring "the right" team members, keeping them engaged in professional and productive environment and avoiding litigation keeps the team functioning and providing high quality patient care. Another benefit of acquiring the right staff-mix is the ability to maximise productivity and safety.[106,107] Luria et al[108] suggest that productivity (and thus process improvement) will improve as a result of an informed, highly adaptable workforce. The study further suggests that this type of workforce is achieved through communicating a vision, enabling access to staff development and coaching, setting expectations/ accountability, having transparent performance measures and providing incentives and rewards; all traditional HR concepts.[108] It is also inferred that costs allocated to these processes will be returned as a result of savings from reduced turn over, improved processes and less frequent adverse events that can result from having an ineffective workforce.[108]

In regards to schedule design, in addition to department and patient factors previously highlighted, HR literature draws attention to the necessity of considering training requirements of professional colleges, professional regulations set by unions, and human factors including staff satisfaction, quality of life and circadian rhythms.[15,109-111] It is widely accepted that proposing a scheduling solution that meets all requirements is highly complex. Finally, the importance of investing in roster development has been emphasized. Experts acknowledge that the person responsible for preparing, time invested in preparation, fairness and adherence to departmental rules all impact on the successful implementation of the roster, staff satisfaction and overall department productivity.[15,111, 112]

Workforce Advisory Tools

There are few papers that highlight the attempts made at developing a workforce advisory tool or algorithm. Paul & Lin[113] discuss a simulated program designed to be used by departments to expose bottlenecks unique to their department. The article suggests that due to complexities of the ED system, the development of a normative model advising adequate staffing levels would be incredibly complex.

Sinreich & Jabali[94] demonstrate by using a linear optimization algorithm they were able to downsize the ED workforce while maintaining performance. As the model is driven by the need to reduce costs it initially appeared promising for researchers; however a significant weakness was identified. While the framework considers LOS, it does not consider DNW, staff and patient satisfaction or readmission rates indicating possible safety concerns. Additionally, it does not factor in professional regulations such as penalty rates when making scheduling recommendations that could therefore counteract any cost benefits achieved through downsizing. More contemporary roster systems (e.g. eRoster used within the Queensland Health system) go a long way to mitigating against weaknesses in earlier electronic rostering systems.[114]

Taylor et al's research reflects contemporary thinking in that it is noted that there is a need for a workforce management system to assist with scheduling and resourcing. The foundations of such a tool must be based on examining all aspects of complex working tasks and HR considerations in detail.[115] Although the development of a tool will identify common practices that are ineffective and has the possibility of causing workforce discontent, it is likely to facilitate industry change.[115]

Principles influencing Emergency Department Financial Frameworks

Evidence exists that suggests there is a global concern regarding the rising cost of health care and the proportion of GDP that is consumed by healthcare expenditure. This concern is driving the political agenda to reduce unnecessary spending through the reformation of health care systems. With the revision of funding and remuneration models included on reform agendas, there is an increasing amount of literature describing new legislation and financial agreements; and forecasting the likely effects these will have on the ability to provide emergency health care.

There is a common perception from within the literature that ED expenditure is large due to the high fixed costs associated with providing a 24-hour service.[30,94] This perception creates the general belief that EDs are accountable for a disproportional amount of the healthcare budget. According to experts however, true ED expenditure is highly complex to calculate.[30,116] While the large fixed overheads are undeniable, there is evidence to suggest that this is offset by low marginal costs for every additional patient and therefore an efficiently operating ED is actually a cost-effective healthcare provider.[30,94,116] Furthermore, a US-based study demonstrated the pivotal role EDs play in the overall contribution to growth in hospital admissions as a source of activity and revenue for hospitals.[117] While this report quantifies the benefits in the US context, it would be informative to replicate this study in the Australian context.

Articles summarizing reform efforts indicate that a number of nations (Canada, UK, USA and Australia) with developed healthcare systems are moving away from historical funding models and towards a person-, performance- or activity-based payment system.[118] Broadly used in Canada, UK and Australia, the move away from "block payment" models is because there are no incentives for being productive and no financial reward earned for being efficient.[118] Additionally, there are unexplained funding differences between similar departments within the same health care system creating workforce tensions.[118,119] Finally, there is a societal expectation that funding should be nationally equitable; less affluent and

rural communities should not suffer with insufficient services.[120] The historical models of funding that exist within the current healthcare do not currently achieve this demand. Under the new bundled, performance- or activity-based funding frameworks patients are essentially seen as creating value rather than cost and therefore the models promote efficiency and discourage waste. They are also believed to increase transparency of care and fairness– equal work receives equal pay.[118] Inefficient hospitals will suffer operating within these funding models,[118] therefore departments have no option except to become more resourceful.[2]

The introduction of the new ABF type models does not come without apprehension and criticism. It is generally acknowledged that the impact on EDs specifically is unclear. In instances where departments have been funded purely on ABF resourcing models they have experienced huge financial deficits; this is particularly so for teaching hospitals as there is no reimbursement for training and research.[120] Additionally, in EDs where presenting symptoms often do not reflect the final diagnosis, there can be a 500% variation in nursing workload for patients with the same DRG.[8,116] This has obvious implications on patient expenditure and the ability to keep costs within budget targets. One concern within Australian literature that remains largely unresolved, is the department being remunerated based on a "National Efficient Price", while wages, conditions and workforce allocation frameworks are determined by the State, and differ significantly.[121] It is believed this too will contribute to ED funding deficits. Granted that inadequate ED funding has been linked to worsening outcome such as increased waiting times and higher rates of death and disability,[42] there is certainly justification for some concern.

Other criticisms include that the introduction of ABF may cause patients to be "underserved" with the pressure to keep department expenses to a minimum. It has been observed in USA with the introduction of a capitated physician remuneration model, that the reduction in the number of diagnostic tests requested in an attempt to reduce overheads resulted in an increase of missed diagnoses and diminished patient outcomes.[122] Finally, there is a belief that any cost savings achieved through increased productivity are offset by the costs involved in employing additional administrators and data tracking technologies required to record and store activity data.[118] As data integrity is imperative, protocols and procedures of entry must be consistent to facilitate robust record keeping. The exact cost and efforts involved with implementing and maintaining these remains unknown.

Very few solutions to overcome the potential shortfalls of the system are yet to be evaluated and published. As a result, nations (in particular the USA) are reluctant to fully commit to ED reimbursement models. Recommendations that have been made include funding the ED with its own unique "mixed funding model" where fixed costs necessary for keeping the department operational to meet minimal requirements are paid for in block amounts, and additional expenditures are funded based on activity. To overcome workload differences with the same DRG or presentations requiring complex or specialized care there is evidence to support the requirement for risk-adjusted grants to make up the gap.[120]

Finally, there is an overwhelming need to better understand the actual costs of operating an ED. Much speculation exists anticipating the cost of ED expenditure resulting in a huge variation in outcomes. Some research has been published attempting to break down the

physicians costs into clinical, training and research tasks to gain a better understanding of expenditure,[123] however there is not enough conclusive analyses to gain comprehensive insight into operational costs.

Principles influencing ED financial frameworks are varied but maturing at a rapid rate particularly within the current economical climate impacting on health care decision-making. Further development and refinement of these principles is required to provide an evidenced-based approach to underpin ED financial activity models.

Gaps in the literature

Continued ED growth calls for new and innovative care delivery models that are safe, clinically effective and cost effective. This review of the literature was designed to inform the application of activity based funding models for EDs. Although comprehensive, gaps in the literature were identified and are highlighted next.

Previous research has identified a conceptual model for understanding causative factors of access issues at the input, throughput and output areas of the ED. Negative outcomes from access issues within each of these main areas have been identified.

At the input stage there is a detailed understanding of factors that influence demand growth and the relative resulting impact on initial access to ED services. The value of demand management strategies is not however clearly defined within the literature. These strategies need to be properly identified and evaluated objectively as to their impact on ED demand. The role of specialised or tailored EDs (e.g. those for trauma, paediatrics, mental health and aged >65), warrant consideration and formal evaluation.

At the throughput stage, there is a need for evidenced-based research indicating the most efficient and cost effective staff mix within an ED. There is also a need for cost benefit analyses on emerging health care models. With the move to ABF within Australian EDs, initial outcomes of ABF resourcing are required. Particular consideration for how teaching/training costs and other overheads are accounted for in budgets is required. A bottom up cost profiling of ED activity that would allow a URG cost reconciliation[18] may provide an initial framework for this process. Cost effective measures of performance that can be shown to improve efficiency and effectiveness need to be clearly identified and supported for implementation and evaluation at sites that are most likely to benefit. Research into the financial arrangements in Private Australian EDs and patient outcomes is required to see if these are similar or different to Public EDs. Finally, further research into the size effect (i.e. treatment spaces and presentations) on optimal ED functioning, clinician productivity and quality indicators is required. Research into optimal size ED is required to know the relationship between economies of scale and economies of distance between EDs in the same geographical region.

At the output stage, further research is required on the impact of observation, short stay or medical assessment units on minimising Access Block and the extent to which non ED based staffing models impact upon patient flow and staffing requirements in the ED itself.

Understanding the impediments to early discharge of admitted patients is required. Also, research considering the financial contribution that patients admitted via ED have on hospital revenue in the Australian context is required.

A comprehensive understanding of the ED system as a whole that accounts for input, throughput and output elements is needed to achieve clinically meaningful and cost-effective outcomes. Although various models accounting for and measuring health care activity exist, it is unclear which model best measures cost-effective ED service delivery in an accurate, reliable and valid manner. There is a necessity to further understand, refine and account for measures of ED complexity and workload in order to determine appropriate staffing levels in the future. There is also a need for continued monitoring and comprehensive evaluation of newly implemented workforce modelling tools.

Workforce and clinical process redesign, health policy formulation and its inherent health care reform should be driven by relevant evidence. However, the comprehensive research agenda to guide such policy and health care reform has not, as far as we are aware, been developed and is required. This review is a major step in addressing this gap. An ABF based Emergency Workforce Modelling Tool that enables ED managers to profile both their workforce and operational models of care is required. The development and utilisation of such a tool may assist with the ability to more accurately inform adequate staffing numbers required, inform planning of expected expenditures and be used for standardisation and benchmarking across similar EDs in the future.

In summary, there will be ongoing research that aims to comprehensively inform safe, efficient and effective ED service delivery. Specifically, with the requisite parts:

- To undertake comprehensive and integrated workforce profiling, not simply looking at a single role or professional group;
- To understand the most useful measures to inform a calculation tool for workforce requirements; and
- To provide a comprehensive and validated workforce calculation tool that can be used to better inform workforce requirements within an ABF context.

Conclusion

It is widely acknowledged that demand for ED services is increasing. Meeting this demand in a safe, clinically efficient and cost effective manner can be challenging but is paramount. A variety of models of care have been described within the literature that aims to address increasing demands on ED services. These models are often implemented in order to address a particular aspect of flow (i.e. input, throughput or output issue). The structures and processes of similar models often vary. Evaluations of various models are often single site studies, varied in methods used and outcomes measured. Inherently lacking in the literature is a clear picture of what cost-effective model(s) are best to implement in the ED, based on their unique attributes such as location, staffing profiles, models of care, presenting demographic, numbers and acuity. Some concepts are acknowledged in the ED literature but are not able to be confirmed or generalised due to all EDs due to the small size samples or individual department/workforce unit studied. For instance Nurse Practitioners have been shown to be efficient and effective in a very small number of Australian studies with very small numbers. If this were a generalisable finding we would have seen a proliferation of this position in the system, which we have not.

Generalisable findings have been shown for whole hospitals and whole professional groups in hospitals, however the ability to generalise these findings specifically to the ED environment on each occasion is also fraught with difficulty and bias. The question remains, "does it matter"? That is, do we need to further analyse these findings to inform the ED environment more precisely, or should the ultimate outcome be safety, effectiveness, LOS and cost in hospital over all, regardless of whether the ED is or is not relatively efficient?

Answers to these questions are required in order to accurately and comprehensively inform funding models that are activity based and relevant to the ED service into the future.

Table 1: Database Search Strategy

Database	ED Concept		Workforce Concept		Funding Concept	
	Controlled Vocabulary Term	**Key Words**	**Controlled Vocabulary Term**	**Key Words**	**Controlled Vocabulary Term**	**Key Words**
Medline, Academic Search Elite	Emergency Medicine	"emergency medicine" OR "emergency services, hospital" OR "emergency room" OR "accident and emergency"	Workforce	"workforce" OR "rostering" "staff scheduling"	Funding	"funding" OR "casemix" OR "health economics" OR "financ* models" OR "activity-based funding" OR "investment"
CINAHL	Emergency Medicine	"emergency medicine" OR "emergency services, hospital" OR "emergency room" OR "accident and emergency"	Workforce	"personnel staffing and scheduling" OR "hospital; workload"; "pharmacist" OR "physi* therapist" OR "Occupational Therapist" OR "speech*"	Funding	"funding" OR "casemix" OR "health economics" OR "financ* models" OR "activity-based funding" OR "investment"
Cochrane Library (systematic reviews)		"emergency medicine" OR "accident and emergency"		"workload"; "staffing"	Funding	-
Current Contents	Emergency Department	"emergency medicine" OR "emergency services, hospital" OR "emergency room" OR "accident and emergency"	Workforce	"workforce" OR "personnel scheduling and staffing" OR "rostering" OR "models of care"	Funding	"funding" OR "financ* models" OR "health economics" OR "investment"
Google Scholar	Emergency Department	"emergency medicine" OR "emergency room"	Workforce	"workforce" OR "staff scheduling" OR "manpower"	Funding	"funding source" OR "activity-based funding" OR "casemix" "financing models"
EMbase	Emergency Department	"emergency medicine" or "emergency room"	Workforce	"personnel management"	Funding	"Funding" OR "financial management"

Table 2: Individual Journal Search

Journal Title	Publication Dates / Volumes
Emergency Medicine Australasia	Vol 25 (2013), 24 (2012), 23 (2011), 22 (2010)
Medical Journal of Australia	Vol 198 (2013), 197 (2012), 196 (2011), 195 (2010)
Emergency Medicine Journal (BMJ)	Vol 30 (2013), 29 (2012), 28 (2011), 27 (2010)
Annals of Emergency Medicine (USA)	Vol 61 (2013), Vol 60 (2012), Vol 59 (2012), Vol 58 (2011), Vol 57 (2011), Vol 56 (2010), Vol 56 (2010)
American Journal of Emergency Medicine (USA)	Vol 31 (2013), 30 (2012), 29 (2011), 28 (2010)
Academic Emergency Medicine (USA)	Vol 20(2013), Vol 19 (2012), Vol 18 (2011), Vol 17 (2010)
Journal of Emergency Medicine (international)	Vol 44 (2013), Vol 43, 42 (2012), Vol 41, 40 (2011), Vol 39, 38 (2010).
Canadian Journal of Emergency Medicine (CAN)	Vol 15 (2013), Vol 14 (2012), Vol 13 (2011), Vol 12 (2010)
Australasian Emergency Nursing Journal	Vol 15 (2012), Vol 14 (2011), Vol 13 (2010)
Health Affairs	Vol 32 (2013), 31 (2012), 30 (2011)
Journal of Health Economics	Vol 32 (2013), Vol 31 (2012), Vol 30 (2011), 29 (2010)

Table 3: Literature Sources and Key Findings.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
No author; 2012; [122]	Queensland Nurse; Article (brief).	Emergency Department, Funding.	IHPA needs to address major state-based differences such as staffing numbers, pay and conditions and workload allocation tools used within government health organisations to set the NEP. NEP should be based on the characteristics of service provided rather than the setting to ensure consistency.	Researchers must acknowledge workforce concerns and implications these concerns will have EDs concerns.
No author; 2000; [150]	ED Management, Discussion paper.	Emergency Department, Staffing.	EDs in some states of USA are running dual staffing streams – stream for public and another for private patients. As a result, private patients are being assessed and treated quicker than non-insured patients. Questions are being raised regarding whether this is considered "legal" as there is arguments it is breaching legislation that entitles all Americans to free emergency care and compromises the relevance of a triage system	Demonstrated need for consistent and equitable workforce tool to ensure both private and public patients have access to reputable and evidence based quality care.
No author; 1984; [101]	Annals Of Emergency Medicine; Policy document.	Emergency Medicine, Staffing.	Emergency department should be organized in a manner consistent with other major clinical departments. The Medical Director of Emergency Department should be on the executive committee of the hospital. It is ideal for the ED to be staffed with board certified Emergency Medicine specialists.	Significant to model of care and staff scheduling design. Sets a standard for ED staffing that will help guide the development of Australian models
ACEP; 2010; [151]	Annals of emergency medicine, Expert Opinion Paper.	Emergency Medicine, Staffing.	Longevity in a career in Emergency Medicine and staff well being is significantly reduced by the ongoing occurrence of rotating shift work. In order to minimize the impact of rotating shift work the American College of Emergency Physicians has a number of principles: ▪ Shifts should follow circadian principles, ▪ Overly long shifts or long stretches of shifts should be avoided, ▪ Isolated night shifts or long stretches of night shifts are	Factors presented in this study are relevant when designing shift schedules. These impact staff satisfaction rates that directly correlate to staff retention and sustainable workforce.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			recommended. ▪ Patient volume, patient acuity and non-clinical responsibilities should be taken into consideration when designing schedules.	
Antioch, K. M., & Walsh, M. K; 2004; [121]	The European Journal Of Health Economics, Research Paper.	Medicine, Funding.	Highlights short falls of case-mix / activity based funding for complex medical conditions that results in hospitals (particularly teaching hospitals) experiencing a significant funding deficit. Within DRG patient heterogeneity is not necessarily reflected in coding to reflect the varying degrees of complexity. States payment per case amount is determined by policy rather than bench marking, limiting ability for physicians to meet quality standards within budget requirements. Supportive of use of risk-adjusted specified grants is best solution for overcoming the "gap" between DRG payment and actual cost.	Draws awareness to the limitations of an entirely ABF based financing model. Application of a risk based approach allows for patient focussed allocative efficiency and distributional justice matched to cost structures for specific patient group types. Provides a basis for supplementing a case mix approach with a capitated block funded approach for specific groups.
Arya, R; et al.; 2010; [61]	Academic Emergency Medicine; Retrospective Study.	Emergency Department, Workload.	Presence of ED scribes associated with an increase in productivity in terms of patients treated per hr (by 0.08 for every 10% increment of scribe use/shift) and relative value unit (by 0.24 units for every 10% increment in scribe use/shift). i.e. with scribes, 0.8 additional patients seen/hr and US$91 billed dollars generated. No change to patient ED LOS.	The use of scribes may be worth considering in ED staff profile design as it is a more affordable option than employing a greater number of physicians to manage increased workload. As scribes not shown to impact ED LOS access issues would require consideration.
Armstrong, P; White, A; Thakore, S; 2008; [103]	Emergency Medicine Journal (BMJ); Prospective Observational study.	Emergency Medicine, Workload, Staff Scheduling.	The shorter rotation of foundation year 2 (4 mth) doctors vs. SHO (6mth) scheduling rosters found no difference in productivity (seeing approx 1.19 and 1.24 new patients per hour, respectively). In both groups, lower productive seen in first month. Impact on middle and senior staff due to more frequent induction programs, need for supervision and frequent training, lack of decision-making confidence, less focused history taking and lack of familiarity with ED environment.	This study has implications on rostering / scheduling as may need greater access to middle and senior staff at times of rotation due to supervision and training requirements. Data could be used to inform training organisations when considering future curriculum

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
				plans. Relates to the concepts "learning curves" and diminishing returns. Training cost considerations. Uses no. of patients seen per hour as an indicator of productivity only and does account/adjust for other factors such as patient complexity, quality of assessment.
Astles, P. D; 1992; [105]	The NAHAM Management Journal; Feature Paper.	Emergency Department, Staffing.	Offers advice on recruitment/selection procedure to ensure EDs' staff selection is of high quality. Suggests that EDs generate up to 40% of total hospital revenue. 70% of community population judges a hospital by the ED experience.	These factors are relevant to designing a workforce tool that enhances retention and workforce sustainable. However the points are largely opinion based and not evidence based.
Bache, J.; 2001; [40]	Emergency Medicine Journal, Reflective Paper.	Accident & Emergency, Models of Care.	EDs will always have an intrinsic difficulty in establishing adequate staffing levels due to the unpredictable and variable workload. Perceived benefits of an established NP service include: ▪ Improved waiting times, ▪ Increased job satisfaction, ▪ Improved quality of care, ▪ Increased patient satisfaction, ▪ Better use of resources, improved continuity of care. Perceived disadvantages of NP model: ▪ Staffing difficulties or loss of role satisfaction, ▪ Opposition from other staffing groups, ▪ Funding, ▪ Limitations from protocols, ▪ Medico-legal concerns, ▪ Staff dependency and recruitment difficulties.	If using NP model within ED, main qualities are: experience, common sense, ability to accept responsibility, ability to recognise limitations, ability to ask for help. NP MOC (and operational model adopted) important to consider when formulating evidence-based ED workforce profile.
Beales, J; 1997; [33]	Accident & Emergency Nursing,	Accident and Emergency, models of care.	ED NP model of care addressed local problems: access to minor injuries services that GPs unable to provide, enhanced communication between ED and GPs, telephone advice.	ED NP MOC that is protocol driven should be considered when formulating ED workforce profile if

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
	Reflective paper		NPs more expensive than SHO however SHO delegates some tasks to other nurses thus impacting on work output.	problem is access to services and need for enhanced communication between ED and GPs. Cost effective analysis needed.
Bell, D; Mason, S; 2010; [34]	Emergency Medical Journal; Opinion Paper.	Emergency Medicine, Models of Care.	Emergency care changing as a result of: ▪ Better disease understanding, ▪ Access to diagnostics, ▪ Emergency care access targets, ▪ Working time directives (LOS etc) Patient outcomes vary between services and these differences are not adequately explained by demographic factors or illness severity.	To overcome these issues a whole systems approach with collaboration rather than barriers from professional, geographical and organisational restraints is needed. To deliver improved care will require changes to the process of care, including robust initial and ongoing clinical assessments across primary care, the ambulance service and secondary care to increase the understanding between health care professionals.
Berger, E; 2011; [31]	Annals of Emergency Medicine, Perspective Paper.	Emergency Medicine, Funding.	Argues that Accountable Care Organisations (ACOs) will improve care and lower costs in an attempt to move the US health care system towards sustainability. Anticipates ACOs (coupled with other reform initiatives including the de-structuring of fee-for-service payment system) may impact upon demand for EDs. They will force health care organisations, including EDs, to better coordinate care and create value (by lowering costs) for geographically defined populations of patients.	Allowing for a difference in context the collaborative elements entailed by ACOs could be used as a basis for collaboration in the context of competition between Australian Health Services. Financial arrangements and payment models should reflect the work done.
Binder, D. S., Crandall, C. S., & Hauswald, M; 2003; [16]	Annals of Emergency Medicine, Original Paper	Emergency Department, Staff Scheduling.	Describes methodology for EDs to design an "equitable" self-selected staff schedule. Benefits of this scheduling method: ▪ Improved staff satisfaction (retention / recruitment) ▪ Individuals get to make their own schedule, ▪ Ability to distribute shifts based on own needs, ▪ Optimise own personal workload,	Implies that there is a strong correlation between job satisfaction and scheduling. This impacts workforce retention / skills shortages and ability to meet growing demand.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Perception of working less on basis of own shift values. Limitations of this scheduling method include: ▪ Individual physicians remuneration will vary due to shift reimbursement, ▪ Schedules designed in advance.	
Binder, L. S., et al.; 1990; [58]	Annals Of Emergency Medicine Perspective piece.	Emergency Medicine, Staffing.	Perspectives of five emergency physicians on how to meet the college requirements of supervising EP residents 24/7 when attending or SMO coverage is not 24/7. Considers balancing residents' need for supervision with opportunity to make decisions independently. Discusses retention of senior staff and long-term impact of interrupted circadian rhythm.	Scheduling of SMOs / residents needs to meet the training / supervision requirements outlined by professional bodies.
Bosch, X., Jordán, A., & López-Soto, A; 2013; [17]	American journal of emergency medicine, Research Paper (longitudinal cohort study).	Emergency Medicine, Models of Care.	Evaluation of randomly selected patients (n=4127) treated by "quick diagnostic unit" (QDU; unit designed to accept referrals from ED, GP, outpatients to avoid ED visits and hospital admission). QDUs (staffed by consultant in internal medicine, RN, part-time secretaries; 5 hrs Mon- Fri) provide: rapid and easy access to diagnostic tests and prompt and effective diagnosis. Provides evidence to suggest that QDU reduce both ED demand and unnecessary admissions by around 84-91% (relieving access block) for particular cohort of patients (e.g. cancer, iron-deficiency anaemia, lung abnormalities, masses, chronic diarrhoea). Evident cost – benefit with QDU vs. hospitalisation (726 vs. 3241).	Access to health care differs across countries. QDU MOC may be useful if issue is high volume of GP referrals for diagnostics/ expedited outpatient care (i.e. stabilization and second opinion regarding management), ED and hospital crowding. Awareness for referral requires regular (annual) education; over time referral process changed from ED – QDU to more primary care - QDU.
Bucheli, B., & Martina, B; 2004; [71]	European Journal Of Emergency Medicine, Controlled Trial.	Emergency Department, Demand, Staffing.	Investigates the impact of additional medical personnel on LOS. The goal of emergency departments is to provide prompt, caring service and avoid a prolonged LOS. Overcrowding leads to prolonged LOS in ED and is associated with increased hospital LOS and costs. Provides evidence that additional MO will reduce waiting times, DNWs and LOS in fast track or "outpatient" ED model of care. Additional staff had no effect on patient admission.	Supports access block as the cause for extended LOS rather than ED demand. To be taken into consideration in workforce design models.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Buckley, B. J., et al.; 2010; [75]	The Journal of Emergency Medicine, Before-and-After Interventional Study.	Emergency Department, Demand.	Express admission unit (EAU) evaluated. Features of EAU include: ▪ 5 bed inpatient ward away from ED ▪ Staffed by 1-2 RNs (based on mandated ratios) ▪ Medically managed by inpatient teams ▪ Average LOS in EAU was 6-8 hours ▪ Used as a holding facility while inpatient beds were being sourced and cleaned and admission procedures were being undertaken. Outcomes: Controlled for daily census and acuity, ED LOS reduced significantly for both admitted (8h 21 to 7h 41) and discharged (3h 41 to 3h 35) patients. No impact on waiting times (around 41-50 mins).	EAU MOC may be useful if issue is lack of inpatient beds and access block. Improvements in ED LOS can be achieved despite overall increase in daily ED volume.
Callander, E; Schofield, D; 2011; [38]	Emergency Medicine Australasia; Literature Review.	Emergency Department, Workforce models.	Little evidence exists to guide decision making on the safest and most effective and efficient staffing models of EDs that meet changing demand and expectations. Of the literature reviewed: senior staffing, matching peak staffing levels peak patient demand, having appropriately skilled staff mixes and designing the staff profile based upon individual hospital needs produces the most effective outcomes.	Implications on workforce model design within the ED. More evidence is required to assess effectiveness of the entire ED staffing profile.
Carter, A. J. E., & Chochinov, A. H; 2007; [45]	Canadian Journal of Emergency Medicine. Systematic Review.	Emergency Department, Workforce Models.	Review of literature on ED NP MOC identified NPs: can reduce wait time, lead to high patient satisfaction, provide quality of care equal to mid-grade resident (greater accuracy with more experience, regardless of profession), less cost effective than residents.	Supportive of NP MOC within fast track systems in EDs and rural communities if extended hours required. NP can be seen as a 'value added service' (not a Dr substitute). Further costing analysis required that accounts for training, experience, medico-legal concerns, medical and nursing support.
Carter, M. W., & Lapierre, S. D; 2001; [111]	Health Care Management Science.	Emergency Department, Staffing.	Investigates causes of ER scheduling problems. Suggests "good" scheduling results in improved recruitment and greater staff attrition.	Staff scheduling requires considerable investment and is unique to the ED context.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Unlike nursing profession, Physician scheduling is not unionized and therefore not heavily regulated instead are governed by a number of "rules." These can / do include: ▪ 16 h between end of a shift and beginning of next shift. ▪ 2-4 consecutive days ▪ Days off are normally grouped in blocks a least 2 consecutive days, 3 after night shifts. ▪ Preferable to have Saturdays and Sundays grouped ▪ Weekends off should be evenly distributed ▪ Shift types (days, evenings, nights) should be evenly distributed Quality of the schedule depends on the person creating it. Important factors to consider when developing a schedule are: ▪ Time needed to prepare; ▪ Person preparing; ▪ Fairness ▪ Adherence to department rules. Shifts should be scheduled according to demand / visit frequencies and ED attendance.	There is no sound evidence based for the opinions developed.
Chenoweth, D., et al.; 2005; [37]	Journal of Occupational and Environmental Medicine; Research Paper (Benefits – cost analysis study)	Workforce, Models of Care.	Investigate the benefits of an established NP worksite service in reducing company healthcare (insurance) costs for 1200 employees & 3084 dependents. Cost of running an "in-house" NP program was significantly less (saving US$1.3 Million/year) than if they didn't have service and staff / family were accessing existing health care facilities.	Although undertaken in a non-typical healthcare context, model may be useful to other large out of hospital organisations where health care is required (e.g. mining sites).
Coates, D., Rawstorne, S., & Benger, J; 2012; [33]	Emergency Medicine Journal; Case Review Study.	Emergency Department, Demand (utilization).	Investigates the accuracy of actions of "Emergency Care Physicians" on reducing ED presentations and hospital admissions. Emergency Care Physicians are typically RNs or paramedics who attend to emergency calls in the community. In this study they treat the patient and discharge at the scene. Investigators confirm evidence that the attendance of ECPs does reduce ED presentations and further hospital admissions.	Cost effective strategy for health system to implement to reduce ED presentations and admissions (access block). This could significantly reduce ED congestion and relative adverse effects.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			This is particularly notable with older patients who have a tendency to be admitted due to uncertainty regarding social circumstances. The greater level of experience in ECP the greater ED / admission avoidance.	
Considine, J., et al.; 2012; [72]	International Journal of Nursing Practice; Research Paper (Descriptive, exploratory study).	Emergency Department, models of care, demand	Evaluate the role of emergency nurses on "rapid intervention and treatment zones (RITZ)" (i.e. fast track) through chart audit (n=193 patients randomly selected who presented over 3 mth period) and observation (12 hrs). RITZ effective for particular cohort (i.e. fast track patients): most discharged home, short ED LOS. Level of experience or designation of RITZ nurse did not affect waiting time or ED LOS (NB. those working in role were advanced practice nurses at a minimum). RITZ model (hybrid of fast-track and ED discharge): multi-disciplinary; 0700-0200; specific geographical area in ED.	Staffed as multi-disciplinary team (clerk, advanced practice nurse, Physician) RITZ considered as effective demand management model.
Cooke, M. W., et al.; 1998; [57]	Journal of Accident & Emergency Medicine; For Debate Paper.	Emergency Department; Staff Scheduling.	Presents argument for and against having senior cover in ED 24 hours a day. For: ▪ ED medicine provides a 24 hr service. Emergencies presenting in the middle of the night might be less common however deserve the same level of care. ▪ 24 hr senior coverage enables emergency care to be managed more efficiently ▪ Triage – reduced workload, ▪ Ordered less tests ▪ Fewer admissions ▪ Fewer referrals to other teams ▪ Less re-presentations of lower acuity patients ▪ Reduced access block (better management of patient flow).	Small departments will not warrant senior cover. If EDs are considering increasing coverage, research must be undertaken into the benefits: outcomes, efficiency and cost-effectiveness.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Against: ▪ Should a department wish to develop a 24 hr consultant led service there should be sufficient number of presentations to make it feasible. ▪ To have 24 hr coverage would mean the department would have to significantly increased number of SMOs on the team (to meet clinical and non-clinical demands). Skills shortages in AUS of FACEM would make this very challenging. ▪ Potential isolation of senior staff from other departments in the hospital. ▪ In 24 hr system senior skills are not utilised and instead becomes an additional "pair of hands." This is bad cost effectiveness.	
Cooper, M. A., Lindsay, G. M., Kinn, S., & Swann, I. J; 2002; [46]	Journal of Advanced Nursing. Randomised Controlled Trial.	Accident and Emergency; Models of Care, Staffing.	Evaluate NP vs. junior doctor led fast-track MOC. Outcomes: ▪ Time to be seen was significantly shorter with NPs than SHOs (49 vs. 70 mins). ▪ Greater patient satisfaction with NP care due to perceived better communication & information giving. ▪ Better clinical documentation with NPs ($p<0.001$) ▪ No difference with recovery times, level of symptoms, time off work, unplanned follow up, admission rates or missed injuries.	Outcome supportive of NP led MOC in ED fast track for patients aged >16 years. NP led model works if there is a set patient criteria, and measurable outcomes. Single site study in UK, more AUS research required on NP led models for fast track or other patient groups that includes longer term follow up.
Courtney, L. R; 2004; [126]	Emergency Medicine Clinics of North America. Article.	Emergency Medicine, Staffing	Hiring "the right" team members, keeping them engaged in professional and productive environment and avoiding litigation help keep the team functioning and provide quality patient care.	Applies broad HR recruitment principles to ED context to be considered when hiring staff. HR principles arguably reduce HR overheads and create department efficiencies therefore abiding by these could lead to some cost benefits. Opinion based and not evidence based.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Corfield, A. R., & Cowan, G. M; 2011; [125]	European Journal of Emergency Medicine. Perspective Paper.	Emergency Departments; Demand.	Suggests there are 4 non-clinical practice areas or systems that can assist EPs with managing increasing demand in the ED. These include: ▪ Resource management (situational awareness, teamwork, effective communication) ▪ Effective Handover ▪ Organizational culture (linkages back with recruitment / selection) ▪ Safe systems.	It may be worthwhile exploring what administrative or non-clinical protocols are in place in ED to streamlined communication / handover processes.
Crone, P. W., & Whitlock, M. R; 1993; [97]	Archives of Emergency Medicine. Research Paper.	Accident and Emergency; Workload, Funding.	Hospital management should use workload (volume AND acuity) rather than number of beds to determine the human resources required to staff an ED.	Recognition of this study to be applied when determining department HR / scheduling.
Dalsey, W. C., & Binder, L. S; 1997; [93]	Academic Emergency Medicine. Perspective Paper.	Emergency Department; Workforce	Emergency Medicine is popular and requested training positions and training programs are growing. It is anticipated that supply and demand principles will cause a finite end to the growth when less desirable jobs in less desirable locations are the only positions available for FACEM. Concerns have arisen over evidence suggesting the number of EPs required per annum is significantly less than those being produced. Outcome is the desire to produce EPs must be balanced with the long-term impact of creating an excess of EPs.	The availability and accessibility of the future workforce and ability to meet demand. Opinion based with no evidence.
Davis, J. E.; 1995; [127]	Journal of Nursing Management, Descriptive comparative survey & interviews.	Accident and Emergency, Workforce.	16 EDs from across UK used to answer the question: how many nurses are needed in an A&E department? Findings: Historically RN staffing has been based on patient throughput however increasing evidence to suggest that individual departments need to make an individual assessment based on: ▪ Operational policy ▪ Skill mix & scope of practice ▪ Workload (volume X acuity) of department ▪ GP admissions	RN resources within the ED are necessary to meet patient expectations as it impacts on perceptions of the entire health care system. Many factors need to be considered when making recommendations on workforce / staffing models. Collecting information via face to face methods (1-1.5 hrs) enabled

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Peak periods of attendance ▪ Medical cover and support ▪ Layout of hospital and department ▪ Support services (pharmacy, radiology, pathology and availability ▪ Training and supervision of junior staff ▪ Number & timing of clinic attendances	comprehensive understanding for staffing calculations.
Decker, M. C., & Debehnke, D. J; 2002; [119]	Academic Emergency Medicine, Brief Report	Emergency Department, costs	Demonstrates a model of how to break down physician costs into clinical, training and research tasks and calculate costs associated with each activity on an annual basis. These require dedicated time and the model postulates a mechanism for distributing departmental revenue to these activities.	Useful to consider the relative contributions of education, research and training to overall output of academic EDs beyond clinical service delivery. In the Australian context the cost of non-clinical time could be assessed with a modified mission based budgeting model.
Dinh, M., Walker, A., Parameswaran, A., & Enright, N; 2012; [48]	Australasian Emergency Nursing Journal, Controlled Trial.	Emergency Department, Models of Care.	Evaluates the perceived (patients) quality of care of fast track system and compares NP and MOs quality of care within the low acuity demand management system. Outcome: ▪ Slightly higher patient satisfaction with NPs; ▪ No difference in patient outcomes or adverse events; ▪ No documented difference in time to be seen, admissions or LOS. Weakness of article is no cost benefit analysis or consideration of hours worked.	ED NPs in fast track worthwhile MOC; multi-site comparisons needed that includes economic analysis.
Doan Q, S. V., Kissoon N, Sheps S, Singer J; 2011; [59]	Emergency Medicine Australasia, Systematic Review.	Emergency Department, Workforce.	Physician Assistants (PAs) are fully licensed medical practitioners who are trained to provide care under the direction and supervision of a doctor. In the US, PAs must have specific experience or training in emergency medicine. PAs are used frequently and fully integrated in USA. Growing interest of PAs in Aus, Can and Europe. Literature review of studies in USA indicate the following: ▪ Between 13-96% of EDs used PAs (national vs. state survey results); figures significantly higher in academic EDs.	PA model of care in the ED may be a less expensive alternative to hiring more MOs; Financial, licensing and legal implications need to be addressed if implemented in AUS, Canada, or Europe; Different health care systems with different funding models warrant

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Scope of PA practice includes triage, taking history, evaluating laboratory data, instituting treatment, fast track (demand management), trauma and administration (attend bed allocation meetings, liaison between inpatient and ED teams, follow up investigations). ▪ Little literature showing quality of care outcomes. ▪ PAs increased achievement of waiting time targets, decreased LOS and higher patient satisfaction. ▪ Some evidence to suggest reduces costs in US health care system	evaluation of PAs in countries outside the USA.
Drescher, M. J., et al.; 2007; [129]	The Journal Of Emergency Medicine, Cross-Sectional Study.	Emergency Medicine, Workforce, Staffing.	Outlines emergency medicine model that existed in Israel in 2003 following the formal recognition of emergency medicine as a specialty. Makes generalizations regarding two types of worldwide EM models "European" and "Anglo-Saxon" with the difference being the ED is staffed by specialists from other fields (ortho, anaesthetics) with additional trauma / resuscitation training as opposed to having a EM (diagnostics) specialty themselves.	No implications on study – highlights an inferior EM model to that existing in Aus. Also rather dated.
Dubinsky, I.; 2012; [99]	Canadian Journal of Emergency Medicine; Original Research .	Emergency Department, Workload.	Canadian EDs formulate optimal physician staffing around "the Murray model" a formula based on volume and ATS scores. There are concerns arising regarding its validity as it omits time demands on EP to manage admitted patients awaiting transfer, administration activities, teaching and research activities and other factors such as patient demographics / co-morbidities.	There is a need for a workload model to plan physician numbers required per shift that includes the identified variable workload factors. Rostering based on volume and acuity alone could have detrimental effects to patient outcomes. This article has a strong alignment with the purposes of this research.
Edwards, C. J., Jasiak, K. D., & Hays, D. P.; 2010; [130]	Advanced Emergency Nursing Journal, Insights column.	Emergency Department, Models of Care.	Role of Emergency Pharmacists (Eph) discussed can include: ▪ Acquisition of medication ▪ Preparation of medication ▪ Liaison between pharmacy and department ▪ Development of policies and procedures that meet the needs of ED and regulatory committees.	If medication errors and adverse effects are an issue in ED, EP MOD useful. When available, visible, involved patient medication management, they can improve quality of patient care and minimise

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Optimising inventory Advantages: ▪ Significantly less medication errors ▪ Less adverse effects as a result of medication errors and therefore more streamlined patient care. ▪ Greater RN satisfaction Suggests (no evidence) that although it appears costly due to the remuneration of a Clinical Pharmacist, it is actually cost effective as it reduces medication errors by 66%. Does not provide evidence if it reduces LOS or congestion.	costs.
Fertel, B. S., et al.; 2012; [131]	Annals of Emergency Medicine, Brief Research report.	Emergency Department, Demand (utilization).	ED utilization in the USA is captured as occasions of service (all presentations) OR the number of patients receiving care. The difference between these is rarely considered and has a substantial effect on planning and improving ED services. Outcome of the study demonstrates that the population attending EDs remains relatively static and new presentations to EDs is relatively small.	This is difficult to translate to Australian context because of the safety net functions EDs in the US perform to uninsured patients. However, when considering demand management strategies, patients who present frequently can be conceptualised under this model and their impact analysed.
FitzGerald, G., & Ashby, R; 2010; [2]	Emergency Medicine Australasia, Expert Opinion Paper.	Emergency Department	Outlines the implications of the 2010 health reform on emergency medicine in Australia. Suggests the reform is the most fundamental realignment of health responsibilities in 30 years and the outcome is aimed at meeting future demand. Reform is as follows: ▪ Commonwealth to take responsibility financially for community care. ▪ ABF will be major funding pillar for public hospitals. ▪ Establishment of Primary Health Care Organisations and Local Hospital Networks ▪ Establishment of new accountability framework with KPIs. ▪ Establishment of a number of new authorities – INPA, NPA and HHFA to manage pricing, performance and funding. Likely implications on EDs:	

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Focus on prevention and primary care may see a reduction in demand OR at least a change in acuity of presenting patients. ▪ LHHN should enable EP's greater engagement in quality and service standards. ▪ ABF may facilitate efficiencies in the system and ability to cope with increasing demand. ▪ Increased investment in entire hospital system may address some access block issues reducing congestion in the ED.	
Toloo, S., FitzGerald, G., et al; 2011; [1]	Emergency Medicine Australasia, Original Research	Emergency Department, Demand.	Confirms growth in ED demand in AUS however provides evidence to confirm it is not directly related to population growth. Growth in demand is only part of the explanation for ED congestion.	
Fotheringham, D., Dickie, S., & Cooper, M; 2011; [49]	Journal Of Clinical Nursing, Longitudinal study (survey).	Accident and Emergency, Workforce.	Describes the evolution of ENP role in UK over the past decade. Scottish EDs surveyed (1998: n=97; 2009: n=93). Increase ENP in most EDs with minor injuries unit (47% to 89%). Variations in pay, level of formal NP education, roles and scope of practice still evident. Advantages of the NP role noted to be: continuity / quality of care, timeliness of care, improved throughput, career options (motivation, autonomy)	In Scotland, NPs are common within EDs, particularly for minor injuries management. NP MOC useful if flexible, adaptable and well-trained workforce needed. Potential for confusion regarding role description of NPs and advanced practice nurses. Noted potential of NP impacting on deskilling of other staff on minor injury management.
Fry, M. M; 2011; [36]	Australasian Emergency Nursing Journal; Systematic Review.	Emergency Department, Workforce.	B/G: Australian EDs have experienced a change in patient volume, demographics, complexity, ambulance transports, referral patterns and patient expectations. Trend for patients to bypass GPs (who are reducing their work hours) and attend EDs. Aim: Examine impact of afterhours care models on emergency departments, ambulance and general practice services and effectiveness of these services on NP and medical care	If acute care workload, access and large geography are issues, then consider afterhours MOC. International literature considered so some caution required if applying to Aus specific context. More evidence supporting alternative afterhours emergency

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			delivery. Results: Six MOC identified that indicate after hours MOC can reduce GP workload & (to a lesser extent) ED and ambulance services. MOC: minor injuries units, walk in centres, telephone triage centres and advice centres, GP co-op services, ambulance officer managed care, GP services integrated within ED team. Some statistically significant evidence that MIU and telephone triage systems are reducing attendances to EDs. There is little significance demonstrated on the benefits of walk-in centres and further research is required to determine the benefits of extended scope paramedics ("see & treat").	MOC required.
Fry, M., et al.; 2011; [41]	Australasian Emergency Nursing Journal, Observational Study.	Emergency Department, Demand, Workforce.	NSW government introduced the "transitional" emergency NP role into EDs as an innovative redesign strategy to address ED congestion. They were "transitional" as the availability of fully registered / qualified NPs was limited at the time. Aim: Evaluate TENP MOC. TENP were utilised in "see & treat" and "fast track / collaborative" systems (mostly ATS 4 &5). Able to diagnose, manage, disposition. X3 FTE covered 0800-2300, Mon-Sun. Methods: single site, 12mth pre-post, observational study Results: ▪ 10% of ED patients managed by TENP (Mean 1.7 pts/hr) ▪ Overall ED improvements in waiting time, length of stay, re-presentation within 72h, did not waits despite 9% increase in overall activity from one year to the next. ▪ TENPs provide care comparable to doctors for select sub group of patients with musculoskeletal diagnoses. ▪ Single site study, evaluating impact of role on ED outcomes as a whole. Thus, it is possible that other factors may have accounted for changes in outcomes seen (although TENP only redesign initiative implemented during study timeframe).	If demand (increasing presentations, waiting times, ED LOS, DNW) are issues, then consider implementation of ENP role within EDs to manage specific patient group or demand management systems.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Fry, M., et al.; 2012; [50]	Australasian Emergency Nursing Journal, Qualitative Exploratory Study.	Emergency Department, Models of Care.	Aim: explore ED nurses perception of CIN role. CIN role considered as an advanced practitioner beyond the scope of an RN however not as qualified as a NP. CIN role involves managing the care of waiting room (WR) patients including communicating the wait, initiating diagnostics and some treatment (mainly pain management), follow-up waiting room patients. Goal of CIN role is to achieve timely and appropriate patient care & provide co-ordinated care with other ED staff. Method: Multi-centre qualitative study. 36 interviews across 3 sites (12 CINs/site). Findings: Themes: - Managing the WR: patients can be of high acuity in WR, large numbers, stressful during times of overcrowding when no beds in ED, used variety of extended skills - Benefits of CIN: role autonomy, utilisation of advanced skills and knowledge, reduce workload on other medical staff - Situational barriers to the role: overcrowding, access block, performance measures.	When issue is access into ED from WR (i.e. input/ throughput) consider extended practice nursing roles, such as CIN. CIN role perceived as a good strategy to maintain quality outcomes in circumstances of increasing ED congestion however further research needed on CIN role and ED efficiency. Due to situational barriers, EDs need to develop escalation policies that are responsive to overcrowding and minimize patient / staff risk. With extended roles and scope of practice, appropriate policies training and remuneration require consideration.
Gedmintas, A. B., et al.; 2010; [19]	Emergency Medicine Australasia, Research Paper.	Emergency Department, Workload.	This provides a simple method to calculate equitable distribution of staffing and budget allocation based on workload. NHCDC cost data are used to formulate the cost weight applicable to different Urgency Disposition Groups. The resultant "Emergency Care Workload Units"(ECWUs) is therefore a standardised unit of workload factoring in triage urgency, disposition and cost weight.	Provides linkages to newly implemented ABF model in EDs. Models of care and staffing can be assessed against ECWU and benchmarked to better measure ED activity than based on presentations by triage category alone.
Ginde, A. A., et al.; 2010; [88]	Academic Emergency Medicine, Perspective Piece.	Emergency Medicine, Workforce.	Reflects on the shortage and mal-distribution of Emergency Physicians, the increase in demand in ED services and the financial reforms and offers expert opinion to address issues. Solutions offered are consistent with input, throughput and output strategies offered in research papers with some additional focus on recruitment / retention.	Similar workforce trends to those seen in AUS. This article represents a sound basis for the conceptual structure of this research.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Ginde, A. A., Sullivan, A. F., & Camargo, C. A., Jr; 2009; [100]	Annals Of Emergency Medicine, Cross-sectional Workforce Analysis.	Emergency Medicine, Workforce.	Provides a description of the American Emergency Department Workforce in 2008 gained from a workforce survey. Demonstrates that the demand for EPs remains higher than what exists in the industry and therefore many Physicians practicing in the workforce are not EM board certified. The number of board certified is even lower in rural communities due to difficulties with recruitment and retention. There is a need to incentivize rural positions to encourage staff relocation.	Similar trends exist within the AUS ED workforce. When developing a workforce tool the use of non-EP needs to be considered and what impact this has on workload. Total US EP workforce is in the range 10-16/100,000 pop. Rural areas have lower rates than urban areas.
Goodacre, S., et al.; 2004; [52]	Emergency medicine journal; Randomised Control Trial.	Emergency Department, Demand.	Innovative ways of organizing and delivering services are required to manage growing problems of over-crowding and prolonged waiting times. Trialled the use of an A&E physician to review patients referred for admission with an aim to determine whether they were successful in reducing medical admissions. Outcome of study suggested that while there was some reduction in medical admissions, they may have increased admissions to other specialties thus not affecting the overall admission rates.	Additional staff in this capacity does not reduce the number of admissions from ED (reducing ED congestion).
Goodspeed, D. G; 1997; [120]	Best Practices and Benchmarking in Healthcare: A Practical Journal for Clinical and Management Application.	Emergency Medicine, Funding.	Article focuses primarily on trauma or high acuity patients within the pre hospital rather than ED phase. Emergency care systems are designed to meet the medical needs of the most seriously injured or sick people but this paper suggests there is maldistribution of funding to provide appropriate care for the sickest patients especially in rural and remote areas. Also presents referenced argument that health care expenditure could be significantly lower (mainly through work productivity costs) if there is an efficient emergency system in place.	Provides an argument for robust ED funding model especially for resource intensive trauma patients.
Griffiths, J. D., et al.; 2012; [132]	Emergency Medicine Journal, Original Paper.	Emergency Department, Demand.	In response to increasing ED demand, methods such as increased trolley capacity and additional RN staff are utilised. This study uses a simulated model based on actual demand to	This paper has implications on the number of senior medical staff or decision-makers required to

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			identify the capacity and staffing levels that were needed to meet the department targets (NEAT, quality etc). Unlike other studies, this paper suggests that a greater number of decision-makers (such as SMOs) would increase efficiency and patient flow. Also that there would be marginal cost efficiencies achieved as a result of increased operational trolleys.	efficiently manage an ED.
Hackenschmidt, A; 2004; [89]	Journal of Emergency Nursing, Perspective Paper.	Emergency Department, Workforce.	Discusses the effects of mandatory nursing ratios on the Californian health system. An assembly bill was signed into law in 1999 stating: ▪ 1 RN: 4 patients, ▪ 1 RN: 2 ED critical care patients, ▪ 1 RN: 1 trauma / resus patients. Rules must be adhered to at all times (law) including when RNs take breaks. Believed to promote patient safety and quality of care. Difficulties adhering to this in ED where there are fluctuations in volume and acuity of care. Evidence to suggest having rules such as these will contribute to ED congestion and waiting times. Nursing skills shortage is the biggest workforce issue contributing to ability to adhere to rules. It is also believed that the ratios will improve perception of nursing, bringing staff back into the workforce in addition to increasing new recruits.	Volume and acuity as well as variable nature of workload must be taken into consideration when developing base line staffing "ratio" in ED. Studies such as this do not support "ratios."
Han, J. H., et al.; 2010; [51]	The Journal of Emergency Medicine, Retrospective Pre-Post Study	Emergency Department, Demand.	Aim to investigate impact of an additional physician at triage on ED congestion in an academic, Level 1 trauma centre. Outcomes (9 week pre vs. 9 week post): ▪ Waiting room counts/hr reduced (2.7 to 2.2), ▪ Waiting room time reduced (25 mins to 17 mins), ▪ Reduced number of DNWs (4.5% to 2.5%) ▪ Reduced ambulance diversion (5.6 days/mth to 3.2 days/mth), ▪ Reduction in ED LOS ONLY in non-admitted patients (246 mins to 232 mins)	If issue is ED crowding, physician triage can improve some ED input and throughput measures, more so for non-admitted patients. Limited impact on ED LOS for admitted patients (i.e. ED output issues remain).

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Hardy, M., Hutton, J., & Snaith, B; 2013; [69]	Radiography, Randomised Controlled Trial.	Emergency Department, Models of Care (service delivery).	Demand for radiographic imaging is increasing due to its role in clinical-decision making pathways. In UK radiographers are being used to interpret x-ray images and there is evidence to suggest the outcome / quality of reports is of standard equivalent to radiologists. This is a multi-site RCT (n=1502 patients) evaluating immediate (X-ray + radiographer interpreted report -> ED Clinician) vs. delayed (X-ray -> ED Clinician interpreted report, radiographer interpreted report later) reporting for musculoskeletal images within EDs. Outcomes for immediate vs. delayed indicate: ▪ Reduced reporting errors (57% proportional difference) ▪ Reduced costs (1200 vs. 4520 pounds) or 23.40/ patient ▪ No significant change in admission, discharge or referral rate or ED LOS. ▪ Estimated savings (468,000) and estimated costs (253, 000) indicate immediate service is a cost effective MOC.	If timeliness of radiology reports, errors in interpretation of X-rays fro musculoskeletal injuries and costs are issues in the ED then consider implementing a radiographer led service in ED.
Hendriksen, H., & Harrison, R. A; 2001; [64]	Journal of Advanced Nursing, Randomised Controlled Trial	Accident and Emergency, Models of Care.	Aim: to evaluate use of ED Occupational Therapy (OT) on unmet functional outcomes of patients presenting to ED over 75 years of age with limb, rib or back trauma. Methods: Randomised Controlled Trial. Intervention (n=19): OT assessment, related treatment and equipment, Mon-Fri, office hrs; Control (n=20): routine care. 10 week trial. Results: -Improved functional activities better in OT group. No difference in anxiety or demand for primary care. -Despite small sample size (likely underpowered), some evidence that improved patient outcomes (and satisfaction) achieved.	If readmissions due to issues associated with older persons and unmet functional needs as a result of injury is an issue, then consider ED OT MOC. Given that large proportion (68%) presented outside of OT working hours, consideration of extended hrs of services required.
Hennig-Schmidt, H., Selten, R., & Wiesen, D; 2011; [123]	Journal of Health Economics. Controlled Laboratory Experiment	Funding	Describes fee-for-service and capitation models of funding in healthcare. Presents literature review indicating over service in a FFS model and under service in a capitation model. Outcome of an experimental design utilising medical students	Could potentially reflect physicians' behaviour under activity-based funding model of care. While ABF does not affect a physician's remuneration, physicians may

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			supported the investigators hypothesis. The nexus between managed care, physician productivity and physician autonomy is discussed.	receive administrative advice to minimise costs.
Heslop, L; 2012; [133]	International Journal of Nursing Practice, Clinical Paper	Models of Care, Funding.	Highlights the use of DRG to estimate nursing workload/ reimbursement in Australian Health care; discusses its potential limitations including one study showing evidence of up to 500% variation in workload for patient with same DRG. States that government needs a better system to predict/calculate nursing costs to ensure hospitals are adequately reimbursed.	This paper demonstrates weakness in the ABF funding model and highlights the need for actualised nursing work flow data and costing.
Higginson, I., & Guly, H; 2007; [134]	Emergency Medicine Journal, Original Paper.	Emergency Department, Funding.	Discusses the implications of the introduction of "Payment by Results" (PbR) funding model into UK hospital. PbR is a similar funding model to casemix or ABF where health providers are reimbursed standardized tariffs (HRGs) adjusted for complexity. Suggested limitations to this model in EDs include: ▪ Data entry or coding errors understate the actual work performed and thus revenue. ▪ The allocation of overhead hospital overheads. ▪ Lack of transparency about directness of funding stream between Trust, hospital to department. No information about how it will impact on "quality" of patient care. ▪ Financial reimbursement underpinning clinical decision-making.	The article suggests that clinicians need to be informed of importance of data entry, documentation and take responsibility for costs associated with practice.
Higginson, I., Whyatt, J., & Silvester, K; 2011; [42]	Emergency Medicine Journal, Original Paper.	Emergency Department, Demand.	Outlines the outcome of a "demand and capacity" analysis performed on a UK ED and the effects it had on both workforce planning and process redesign efforts. ▪ To deliver high-quality emergency care there must be capacity to meet demand. When demand is too high, performance degrades due to staff working too quickly or under stress. ▪ To understand overall demand, patient arrival patterns and their variation should be considered. Demand should be	Highlights the importance of resolving congestion and keeping on top of demand. Demand management solutions to be considered when surveying EDs and in the development of workforce tool.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			broken down into streams to minimise queue formation and optimise resources. Carve out should be avoided as this disrupts streaming. ▪ A level or chase capacity planning strategy can be chosen. In other words average capacity can be set to meet average demand or staffing staggered to reflect hour by hour variation respectively.	
Holden, R. J; 2011; [135]	Annals of emergency medicine, Review Article.	Emergency Department, Demand.	Systematic review of the literature that demonstrates the effects / outcomes of Lean Thinking on EDs. Summarises the outcomes as follows: ▪ Most common result was introduction of streams. ▪ There is evidence to conclude that lean thinking or process improvement in EDs reduced LOS, DNWs and waiting times. ▪ Some evidence to suggest patient outcomes improved as a result of timelier care, reduced errors. ▪ Mixed effect on staff – some were better aware of work processes, greater engagement, greater staff satisfaction; others high anxiety, threaten autonomy and increase workload.	Supports implementation of process improvement in EDs to address capacity planning and demand management. The challenge is to determine clinical rather than process outcomes alone.
Hooker, R. S., et al.; 2008; [90]	Journal Of Interprofessional Care, Original Research (survey and retrospective observational study using routinely collected data from a random sample of ED attendances over a 4 week period).	Emergency Department, Models of Care.	Highlights the reason for USA EP workforce shortages is due to increasing demand and workforce issues such as inadequate access to specialists, equipment and resources, lifestyle opportunities and salary. Innovative solutions to resolve skilled shortages have been developed including interprofessional practice – the use of PAs and NPs in Emergency Departments. Societal trends effecting demand for emergency medicine include: ▪ Aging population, expansion of the population, ▪ Increasing prevalence of chronic disease, ▪ Rise in uninsured ▪ Rise in illicit drug use, alcohol abuse, acts of violence, obesity and related health compromising behaviour.	Workforce and population trends affecting the USA are likely to be reflected in Australia. If high volume/demand/ acute care labour shortage is an issue, consider PAs as a MOC to supplement existing NP and Physician workforce.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Factors explaining the PA/ENP model of care include: ▪ Economic efficiency, ▪ Improved scope of practice regulations, ▪ Expanded capacity for medication prescription and diagnostics. Main results: Over 10 year time frame: ▪ ED visits increased ▪ No. of patients seen by PAs increased more so than physicians or NPs. ▪ Physicians saw more older persons than PAs and NPs, and fewer patients aged 18-45. ▪ PAs saw three times more patients than NPs.	
Jelinek, G. A., et al.; 1999; [15]	Journal of Quality in Clinical Practice, Retrospective Pre-and-Post Study.	Emergency Department, Staffing.	Retrospective analysis and outcomes of a re-engineered ED. After resignations and recruitment challenges as a result of an ACEM report, the appointment of a new Director, a detailed evaluation with recommended action lead to significant department change. Some of the implemented strategies included: ▪ More qualified staff mix (increased number of registrars only 1 intern/resident), ▪ Investment in staff scheduling (shift accountability to the Dir), ▪ Better working conditions, ▪ Minor cosmetic improvements / improved environment, ▪ Challenging caseload, ▪ Implemented education schedule (teaching, training) ▪ Improved access to resources, ▪ Creation of a team identity.	These are some change management strategies that have an impact on recruitment, staff morale and ultimately patient outcomes.
Jesudason, C., et al.; 2012; [63]	Emergency Medicine Journal, Randomized Controlled Trial	Emergency Department, Models of care.	Investigates the impact of physiotherapy (intervention n=93) vs. usual care, no physiotherapy (control, n=93) service for extended emergency care unit (EECU) patients. Intervention patients seen by physio were typically with	Little evidence to support that physiotherapy MOC for EECU patients results in improved ED output outcomes or in cost savings.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
	with ITT analysis.		musculoskeletal pain, decreased mobility and decreased range of movement. Physio interventions included education, mobility training, exercise programs and equipment prescription. Results: No statistically significant differences for admission or representation rates, return to function rates, use of community health resources, or patient satisfaction. Outcomes do not support physiotherapy service to EEDU is cost effective. Although 79% of the admitted patients seen by physio service were clear to be discharged from safety / physiotherapy perspective other medical reasons impacted on admission requirement.	However study was underpowered to for primary end point. Outcomes of physio service in ED should consider quality of care and services provided by one or two allocated physios as opposed to a variety to optimise skill development and specialisation, communication and relationship building.
Jibuike, O. O., et al.; 2003; [66]	Emergency Medicine Journal, Original Article.	Accident & Emergency, Models of Care.	Aim: To assess extended scope Physiotherapist (ESPT) role in assessing and diagnosing acute knee injuries. ESPT with additional training on radiation protection, X-ray and MRI analysis was involved with initial diagnosis, investigation and management in ED setting; communicates with ED and trauma knee surgeon; able to refer to trauma clinic; able to request X-rays and MRI. Design: 3 month pre (n=100)-post (n=100) descriptive, comparative study Results: ▪ 95% of patients referred to ESPT for knee injury seen within 1 week. ▪ Some additional X-ray and MRIs were requested by the ESPT; most of those identified injury / requirement for further investigation (e.g. surgery). ▪ 59% of patients seen by ESPT were discharged home without further medical review. ▪ 39% referred to trauma clinic. ▪ Reduction in referrals to trauma clinic, reduction in number of admissions.	If there are issues in ED regarding specific (knee) injuries, time requirements of medical practitioners, communication between services and quality of care, consider ESPT MOC. MOC described from UK and so further research on these outcomes and hours of service availability and cost effective analysis required. Person, training and protocols important when considering implementing extended roles such as this.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Katz, E. B., et al.; 2012; [70]	Annals of emergency medicine, Systematic Review.	Emergency Department, Models of Care.	A systematic review on effectiveness of ED-based care coordination interventions. Care coordination is the intentional organisation and communication of patient care activities between providers. Care coordination interventions that interface with out-patient providers can be effective for increasing follow-up rates or reducing ED repeated utilisation. Examples of ED based care coordination interventions: development of educational services / treatment plan for post discharge care continuation, transfer of information from ED to continuing care providers, incorporation of previous health care encounter into ED visit.	Some ED physicians may not see care coordination as part of their role but care coordination is a major goal of reform efforts. Positive influence of care coordination, but no agreement on the optimal method for coordination or most important elements of the intervention. Different interventions may be more effective if different settings. Only RCTs and quasi-experimental studies included in the review; other interventions (not included) may also be effective. Cost-benefit analysis studies required.
Lebec, M. T., et al.; 2010; [62]	Internet Journal of Allied Health Sciences & Practice, Qualitative Study.	Emergency Department, Models of Care.	Aim: describe ED physicians experience with physical therapist/physiotherapist consultation in ED. Methods: Qualitative interviews with 11 ED Physicians. Findings: 3 themes: i. Value of ED Physical therapist: in ED for stakeholders (physicians, patients, department) ii. Challenges associated with implementing/ sustaining ED PT program: unrecognised need for the service, integration of role within ED culture, financial costs/benefits of the role, service availability (i.e. need for extended hrs) iii. ED PT characteristics: personal and professional traits of PT (e.g. better able to relate to patients, caring, good communication, patience, flexibility, clinically proficient, good time management, multi-task) reflected in perceived success of the role. Common perceptions included:	If designing "ideal" ED staff-mix, consider ED PT with extended hrs service. Give time required from service (to assess patient), consideration of ED LOS, space, cost and referral patterns required.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Enhanced clinical practice through extended scope of management options. ▪ Provided an added resource for evaluating the mobility of potentially unsafe patients and enhanced admission / discharge decision-making. ▪ Offer a more comprehensive management approach at point of entry into health system. ▪ Potential for patients to have better outcomes as a result of early intervention. ▪ Provided the department with a "competitive edge" and had implications on recruitment and retention. ▪ Were a potential barrier for ED throughput (hold up treatment space) ▪ Improved productivity – enabled physicians to attend to other patients. ▪ Coverage is a challenge – service was good however limited service times available and it then becomes unclear what to do at other times. Other statements included in article from existing studies include: ▪ PT services have been shown to improve patient satisfaction and achieve follow up treatment.	
Lee, M., Schuur, J., & Zink, B.; 2013; [30]	Annals of Emergency Medicine	Sourced via contents search.	Examines the US national data that indicates the cost of ED care as a percentage of entire health expenditure and reveals it is between 5-10%. Authors believe this confirms the importance of the service within the industry rather than suggesting it is expensive and unnecessary. Demonstrates the difficulties of calculating the exact expenditure of ED due to the variation of presentations, symptoms and diagnostic tests. EDs have a large fixed cost necessary to provide continuous staffing, laboratory testing and radiology etc. Tends to have a low marginal cost for additional patients compared to the average total cost per patient.	The emerging use of Time Driven Activity Based Costing in clinical settings is promoted as a way of obtaining the true cost of care in EDs as opposed to using proxy markers of cost.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Authors believe that Activity-based cost models would be effective at: ▪ Measuring the cost of common ED processes, ▪ Provide ED managers data to improve the value of care, ▪ Enable comparative cost analysis between the ED and alternative sites.	
Lipley, N.; 2004; [92]	Emergency Nurse, Focus Article.	Emergency Department, Staffing.	States that understaffing is a major obstacle to modernizing emergency care. Reports in UK that they have difficulty recruiting to RN posts and that this is having an effect on operations (demand management / fast track systems). Many studies have been conducted and failed to show the relationship between staff numbers and delays to patients being seen.	Inadequate staffing impedes the development of new models of care. Paper reports that Department of Health is piloting a computer-based model to calculate optimized staff allocations based on demand. No follow-up study was found on its effectiveness.
Litvak, E., & Bisognano, M; 2011; [82]	Health Affairs, Perspective Piece	Emergency Department, Funding.	Discusses the implications of the affordable care act (health reform) being introduced into the US healthcare system. It aims to overcome risk of patient being "underserved" in capitation model by imposing financial penalties for avoidable admissions AAC will see an influx of new sicker and older patients in the US hospital system which when coupled with US capital market financial situation (lack of ability to borrow capital to fund expansion projects) will put greater strain on the hospital system. To cope with the strain hospitals will have to reduce hospitalization rates – most efficient way to do this is by increasing bed occupancy. Bed occupancy rates can be improved by looking into the entire hospital system "peaks and valleys" of admissions. By examining surgical schedules and outpatient clinics can identify peaks in admissions and prevent them from occurring.	Entire hospital needs to be invested in improving ED congestion / decreasing access block. It is the only way the problem will be properly addressed. ED congestion and time frames should be seen as entire hospital KPIs not just departmental. Needs to be some accountability held by all department heads – relate bonuses / incentives to access KPIs.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Lowthain, J. A., et al.; 2012; [23]	The Medical Journal of Australia, Retrospective Analysis.	Emergency Department, Demand.	ED demand increasing across Australia 3% - 6%. ED performance is compromised & patient safety threatened with increasing risk of adverse events. ED demand growth exceeding population growth significantly – older people presented at highest per capita rate. Growth is in ATS 2&3 figures however no changes in primary diagnoses. Suggests growth in lower acuity is related to primary care service delivery changes – reduced GP accessibility and increasing copayments. Increasing efficiency alone is unlikely to meet this demand. Fundamental restructuring of MOC is necessary to manage growth. NEAT will not be achieved.	Similar to Fitzgerald article. Trends in presentations assist with predicting what we may be experiencing in EDs over the next decade and assist with preparation.
Lowthain, J., et al.; 2012; [136]	Emergency Medicine Australasia, Retrospective Analysis.	Emergency Department, Demand.	Growth in ED demand coupled with increased number of patients requiring admission leads to access block. Growth is related to aging population, changes in care standards for conditions (thrombolysis) Growth in Victoria ED demand matches national figures. Growth in same day / overnight admissions (contributes to access block) is disproportionate as is the number of elderly people representing. Care coordination between hospitals and GPs is vital for continuity of care (and has benefits in reducing representations).	Alternative models of care are required to manage demand as space / capital infrastructure / human resources are not expanding to meet the demand. Without new models of care adverse events are likely to occur. It also reflect a possible data issue as the development of short stay wards in which patients are defined as "admissions" has an impact on the data for patients admitted. Previously they would have stayed a long time in the ED (perhaps the same time as they do now) but not be classed as admissions.
Luria, J., Buncher, M. J., & Ruddy, R. M; 2011; [108]	Clinical Pediatric Emergency Medicine, Historical Perspective.	Emergency Department, Workforce.	Applies general HR / workforce principles to an emergency physician workforce in an attempt to build a high functioning department. Theory is that productivity (and thus process improvement) will improve as a result of an informed, highly adaptable	This article includes a diagram which identifies key linkages between physician performance and management strategies.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			workforce. This is achieved through: ▪ Communicating a vision, ▪ Access to staff development, ▪ Setting expectations / accountability, ▪ Measuring performance, ▪ Coaching, ▪ Incentives and rewards. Increased motivation results in increased quality of care and more efficient ED outcomes.	
Lutze, M., Ratchford, A., & Fry, M; 2011; [43]	Australasian Emergency Nursing Journal, Retrospective Exploratory Study.	Emergency Department, Models of Care.	Aim: Compare the role of two transitional (training) ENP (TENP) roles in two urban metropolitan (rather than tertiary) hospitals. Methods: Retrospective exploratory study. 3 month period in 2 years, 2 sites. TENP MOC: independently manage minor injuries and conditions for adult and paediatric patients and assist in management of more complex patient conditions in collaboration with medical staff (I.e. see and treat / fast track). Results: ▪ TENP managed 0.6 to 1.04 patients/hr. ▪ TENP mostly managed ATS 4 & 5 patients ▪ Most patients had musculoskeletal/ wound related diagnoses & planned reviews	-If advanced practice nursing role required in ED urban hospital setting, then consider TENP MOC for managing minor injuries. -No comparison with physicians or cost-benefit analysis undertaken and so requires consideration. -Supports the need for state or national clinical practise guidelines to promote transparency of role and enhance efficiencies. -Consider broadening TNP/ENP roles emerging in collaborative management of more complex patients.
Lyneham, J., Cloughessy, L., & Martin, V; 2008; [96]	International Emergency Nursing, Descriptive Study.	Emergency Department, Workload.	Nursing workload impact on patient safety, staff retention and occurrence of adverse events. Adverse events that occur as a result of poor nurse to patient ratios include: ▪ Incomplete tasks, ▪ Medication errors, ▪ Falls, ▪ Increased mortalities. Aim: Identify current workload of clinical nurses, managers	▪ When designing a nominal or "base-line" staff profile, emergency nursing ratios need to be considered. ▪ If issue is staff stress/ burnout/retention/care quality/ high workload consider additional ED nursing staff. ▪ Further research needed that

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			and educators in Aus EDs. Methods: Descriptive study. Survey sent to 394 Aus EDs (21% response rate). Results: ▪ Mean ED nurse: patient ratio1:15 (am); 1:7 (PM); 1:4 (Night); ▪ 27 staff: manager; 23 staff: educator; ▪ Junior staff 10-38%; ▪ Australian ED Nurse:Patient ratio is lower than recommended in the literature.	considers fluctuations in acuity/ activity, cost effectiveness and productivity when considering number of FTE staff.
Malone, R. E; 2003; [91]	Journal of Emergency Nursing, Policy Perspective.	Emergency Medicine, Workforce.	A policy statement outlining the nursing ratios that were mandated by law in California in 1999. Outlines concerns from hospital associations: ▪ Increased health care costs resulting in some closure, ▪ Staff shortage and resulting bed closures. Supporters of the law believe: ▪ Improved working conditions for RNs, ▪ Reduced adverse effects / improved patient outcomes, ▪ Reduced costs (due to reduced expenditure on fixing adverse events)	Identifies legislative reform which has had a direct impact on the staffing levels.
Masso, M., et al.; 2007; [25]	Emergency Medicine Australasia, Qualitative Research.	Emergency Medicine, Demand.	The increasing demand on Emergency Departments has caused much discussion regarding the appropriateness of presentations. ACEM states that the low acuity patient numbers remain low and congestion is caused by access block however many experts believe with better organisation of services and education ED use would more closely match the "purpose they were designed for." The study investigates the spectrum of reasons why lower acuity (ATS 4 & 5) patients attend the ED when they potentially could have been seen and treated by a GP or primary care provider. The outcome of the study was that patients attend EDs because they believed their condition was too urgent for their GP or was out of hours and they required more than just medical treatment and they would be able to access this at the ED.	Possibility that reform efforts to encourage GP attendance for lower acuity problems may not achieve desired results. ED reform should focus on improving throughput efficiencies and access block.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Clinicians believed the greatest perceived benefit was the free cost of healthcare received in an ED. The reasons given by patients for attending the ED appear to have little to do with the characteristics of the GP and therefore attempts to divert patients away from EDs onto GPS may result in wasted efforts.	
McConnell, K. J., Gray, D., & Lindrooth, R. C; 2007; [116]	Journal Of Health Care Finance, Article.	Emergency Department, Funding,	Article describes in detail the funding models that reimburse hospitals and physicians for emergency care across the USA. Medicare, Medicaid and Commercial insurers all separate out the hospital and physician payment components. ▪ Concerning EDs, Medicare current procedural terminology (CPT codes) under FFS reflect service intensity for individual patients however ED consultation codes are paid relatively less that other procedural specialty codes Bundled payments are based on retrospective diagnosis rather than patient acuity of time of presentation and therefore EDs often face difficulties receiving payment for services appropriately provided at the time. Application of the layperson standard in this scenario is not always accurate. ▪ The so called cognitive-procedural gap highlights the challenges of accurately apportioning and calculating ED costs in relation to overall financial stability and the contribution of EDs to the overall profit /loss position of hospitals. ▪ Additional payments under subsidy schemes are in place for low income earners.	Similar / shared viewed of EDs in Australian system. While the profitability is not such a concern, the culture of "perceived burden" that ED creates for the hospital system exists and impacts significantly on process redesign efforts.
McNaughton, C., et al.; 2012; [74]	The American Journal of Emergency Medicine, Historical Cohort Study.	Emergency Department, Demand.	To compensate for increasing ED utilization and in an attempt to reduce the adverse effects of ED crowding, EDs are using non-traditional beds to provide treatment. Aim: Evaluate relationship b/n ED bed assignment and ED evaluation time. Methods: Historical cohort of adults visiting one US ED over 12 month period.	This study supports the use of bed alternatives to manage "surge" however does not address long term ED crowding issues. If throughput (crowding) is an issue, consider use of non-traditional beds but restricting use

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Results: ▪ Non-traditional beds (e.g. hallway) associate with increased evaluation time vs. traditional bed (around 10-13 mins longer). ▪ Variations noted for chief complaint. ▪ There is no consideration of the adverse effects of patients being located away from necessary resources OR patient satisfaction. Additionally there is no consideration of access to staff / cost of running additional treatment spaces.	to patients with specific complaints (i.e. low risk, less likely to require private investigations/ procedures). More research regarding utilisation of non-traditional beds and impact on safety, patient care, satisfaction, costs required.
Molyneux, E., & Robertson, A; 2002; [137]	Emergency Medicine Journal, Editorial.	Emergency Medicine.	Compares emergency department resourcing in affluent nations to under resourced emergency medicine practices in Africa. Suggests that the two emergency medicine models could receive mutual benefits from helping each other. These benefits include: ▪ Advocacy for worldwide EM ▪ Secondments – affluent RNs and MOs can teach in resource deprived departments and learn how to work more efficiently and with minimal resources. Staff from poorer nations can learn and take advantage of latest technologies.	
Moreno-Serra, R., & Wagstaff, A; 2010; [138]	Journal of Health Economics, Retrospective Analysis.	Financing, Activity-Based Funding.	Looks at the effects that hospital payment reforms in Europe and Central Asia had on the entire health system. This is not ED specific and LOS refers to LOS of entire admission. The article suggests that while payment reform is a strategy that should improve the efficiency of health care, the documented outcomes indicates little effect on overall efficiencies. Outcome changes from historical funding models to fee-for-service or Patient-based payments both increased the health expenditure. Additionally FFS increased admissions and had no effect on LOS whereas PBP had no effect on admissions however reduced LOS.	Provides insights when moving from historical budges to patient based payments.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Morphet, J., Considine, J., & McKenna, L; 2011; [104]	Australasian Emergency Nursing Journal, Literature Review.	Emergency Medicine, Staffing, Workforce	Transition to specialty practice (TSPP) programs as initiatives trialled in some EDs to recruit nursing staff. Aim: review literature on TSPP TSPP MOC: provide extended orientation, preceptorship and education; 12 weeks–2 years. Findings: ▪ Demand for ED services is increasing. ▪ Major nursing shortage throughout Australia due to a multitude of factors including aging population, insufficient training programs, increasing professional opportunities outside of nursing, retention issues. ▪ TSPPs are successful for recruitment and short-term retention. ▪ TSPPs are costly (some note cost –effective) & resource intensive to ED.	▪ If issue is nursing workforce shortage/ recruitment/ retention, then consider TSPP MOC in ED. ▪ Further research regarding TSPP MOC in ED focussed on professional development outcomes, safety, quality and costs are warranted.
Morris, Z. S., et al.; 2012; [76]	Emergency Medicine Journal, Literature Review.	Emergency Medicine, Demand.	Provides a broad overview of the literature regarding ED crowding and a summary of available evidence in effective and feasible solutions. Effects of crowding: ▪ Delays to antibiotics and thrombolytic causing untimely death and unnecessary disability, ▪ Increased errors– e.g. mislabelling forms ▪ High DNWs ▪ Impaired patient satisfaction, ▪ Increased violence towards staff, ▪ Prolonged pain and anxiety, ▪ Impaired patient privacy, confidentiality and dignity, ▪ Impaired staff performance and reduced productivity, ▪ Consequences for entire hospital system including impaired infection control standards, ambulance diversions and therefore lost hospital revenues. Evidence based recommendations: ▪ Management behaviour of the lead clinician positively	To be considered when designing ED MOC. Identifies key gaps in the evidence including: ▪ Lack of discussion on the limitations of physical space. ▪ Absence of analysis of which interventions work and how.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			impacted the waiting times, ▪ Increasing infrastructure does NOT reduce crowding, ▪ Observation wards and clinical decision units are effective if used properly and staffed independently, ▪ Schedule elective surgeries over 24/7 schedule to avoid peak admission times, ▪ Direct admissions (without complete work up), ▪ Improve access to transport, community programs and use of hospital discharge lounge.	
Moss, J; et al.; 2002; [65]	Medical Journal of Australia, Retrospective Descriptive Study.	Emergency Department, Models of Care.	ED congestion at study site; concern regarding ability to facilitate safe discharge home, particularly for the elderly, homeless, frequent presenters. Evidence to suggest ED discharge planning can improve identification and community support for patients at risk. Aim: Describe effect of a "care coordination team" on major tertiary ED performance measures. on the CCT MOC: established to prevent unnecessary or inappropriate admissions, minimize re-presentations and provide safe discharge from ED of patients who were frail and living alone, frequently present to ED, homeless, chronic or complex disease and ATOD issues. Methods: 12 month single site study Results: ▪ CCT saw 2532 (6%) of ED presentations. ▪ ED overall performance - Decrease in admission rate (33% to 31%, $p < 0.001$); No change in re-presentation rate. ▪ Staff satisfaction surveys (n=68) indicated: ▪ Positive impact on patient discharge, ▪ Easily accessible service, ▪ Provided quality patient care, ▪ Improvement in staff morale, ▪ Recommended to other EDs. ▪ Accessibility / availability of the team out of hours seen as a	If issue is access block (output), care quality for patients being discharged (particularly elderly, homeless, frequent presenters), consider use of CCT MOC. Consider extended hours of service, based on ED demographic. There is no statistically significant evidence presented in this paper that pertains specifically to the CCT MOC. Some important outcomes not included (i.e. LOS, DNW, cost-effectiveness). Further research is needed.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			limiting factor, despite referral pathways for out of hours presentations.	
Mountain, D; 2010; [139]	Emergency Medicine Australasia, Original Paper.	Emergency Department, Demand.	Discusses implementation, preliminary results and learnings of the introduction of the 4-hour rule in Western Australian EDs. Successful implementation strategies included: ▪ Clinical leads were respected clinicians, ▪ Streaming of care, ▪ Team-based care, ▪ Additional ward rounds and discharge planning, ▪ Change facilitators, ▪ Extra staff, ▪ Reduced or revised elective surgery schedule. Results suggest that all change processes have improved patient flow and reduced length of stay. However the 4 hour targets are not being met or looking achievable Targets are required to drive improvement and hold people accountable. However the target needs to be focused and drive appropriate change. Change in EDs needs to be championed by the right staff – people who believe in the ethos. Change in the ED needs to be a target of the entire system, not just the ED staff. The hospital needs to be educated about the benefits to the system as a whole NOT just what the adverse effects are. Transparency is needed to develop trust in the change process.	Implementation strategies could be used by EDs to assist with any process change (does not need to be to achieve 4 hour LOS). Identifies potential limitations of the four hour rule including: ▪ Gaming ▪ Breaching of clinical standards ▪ Resource constraints
Nestler, D. M., et al.; 2012; [60]	Academic Emergency Medicine, Observational Cohort controlled Before-and-After Study Design.	Emergency Department, Staffing.	Physician Assistant (PA) introduced as an innovative and cost effective strategy to address increasing ED congestion in the USA. Aim: Examine the impact a PA working in Triage on ED performance measures, particularly LOS & DNWs. PA MOC: The PA was an additional staff member (not reallocated from a treatment area) rostered during peak periods of ED presentations. Role was to begin patient	If throughput is issue, consider PA (or similar advanced practice practitioner) MOC to provide triage liaison (to begin patient assessment, order diagnostics) to assist in improving ED LOS, time spent in WR, DNW rate for particular cohort of patients (adults, Cat 3,4,5, no

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			assessment, order diagnostics. Operated: 12:00 – 20:00 Mon and Wed over 4 week period. X2 PAs with at least 4 yrs ED experience used. Service provided to: adults, Cat 3,4,5, no behavioural issues. Methods: Observational Cohort controlled Before-and-After Study Design (8 day pre vs. 8 day post) in one US ED. Results: ▪ Significant difference in ED LOS (PA days: 229 vs. no PA days: 270); ▪ Treatment room time (PA days: 151 vs. no PA days: 187mins); ▪ Lower % of DNWs (PA days: 1.4% vs. no PA days 9.7%); ▪ No difference in waiting room time (PA days: 69 vs. no PA days: 70 mins). Compared to other research investigating similar models but with senior physicians or multiple staff members, similar outcomes noted but less overheads reported in this PA MOC.	behavioural issues). ▪ Experience/training of provider in this role is important to avoid ordering unnecessary diagnostics & associated costs. ▪ Costing and outcomes analysis of single provider vs. coordinated team approach for this MOC required.
Nugus, P., et al.; 2011; [81]	Academic Emergency Medicine, Ethnographic Study.	Emergency Department, Workload.	Access block and overcrowding are associated with work pressure, high staff turnover and staff dissatisfaction, decreased compliance with clinical guidelines, inappropriate decision-making, increased adverse events and mortality rates. Patient flow is complicated by the need to balance tension between urgency and complexity plus making best attempts to avoid unnecessary admission AND prevent re-presentation. Outcomes: ▪ Key decisions impacting patient flow were the decision to admit or discharge, and the decision of diagnosis and treatment plan. These considerably impact how EPs work. ▪ EPs sought to reduce work pressure by avoiding unnecessary tests to diagnose a condition. ▪ ED functions at equilibrium of busyness created by the team. ▪ ED clinicians seek to provide the greatest good for the greatest number of people within resource limitations.	Stated explicitly in the literature the implications are: ▪ ED staff should receive training on the way care is organized, communication and negotiation and the "dynamic system." ▪ Accountability for the ED should be a hospital responsibility NOT the department alone due to its impact on revenue and hospital resourcing ▪ ED outcomes should include quality, financial and organisational targets alongside performance measures.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
O'Connell, T., et al.; 2008; [44]	Medical Journal of Australia, Retrospective Descriptive Study.	Emergency Department, Demand.	Outlines the redesign process of NSW EDs. Findings from initial diagnostics stage include: ▪ Best response to reduce patient demand to improve internal processes, ▪ Acceptance that when one hospital is busy, so are most in the catchment area, ▪ Patterns of presentations are predictable when analysed by season, day of week or hour of day, ▪ As medical teams are becoming increasingly specialised it is becoming increasingly difficult to get them accepted if they have multiple medical conditions. ▪ ED diagnostics are not given priority over other departments. ▪ Ward issues preventing the movement of patients out of the ED include poor discharge planning, lack of communication between staff, adverse events from prolonged admissions. Aim: Describe change in ED KPIs following clinical process redesign in 60 NSW EDs that commenced in 2004 for unplanned arrivals in hospitals. Multi-pronged approach to redesign: ward based and ED based (admitted / non admitted patients). Implemented solutions included: ▪ Greater streaming in EDs – patients who don't need admission, patients who need Short Term admission, patients that need Long Term admission, ▪ Demand management systems supplemented by ENPs or extended scope AH clinicians, ▪ Protocol-based nurse initiated ordering, ▪ Communication boards – including patient movements, ambulance arrivals etc. ▪ Patient flow manager / facilitator who is accountable for moving patients.	If issue is difficulty meeting ED KPIs, consider hospital process redesign and implementation of numerous solutions to improve patient flow.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Ward processes that facilitate better discharge including daily ward rounds, communication boards, regular monitoring of bed allocations. ▪ Refined admission processes including direct admissions and communication rules. ▪ Transparent and real-time analysis of performance. Methods: Retrospective descriptive study. Multi-site. Results indicate improvements in: ▪ Admitted within 8 hrs (approx 62% to 75%); ▪ Time to see health care professional for ATS 3 presentations (approx 58% to 71%); ▪ % of ambulance arrivals offloaded within 30 mins (approx 62% to 73%)	
Parle, J. V., Ross, N. M., & Doe, W. F; 2006; [140]	The Medical Journal Of Australia, Discussion paper.	Accident & Emergency, Staffing.	Evidence from US literature instigated trial of PA role in UK primary care and emergency facilities; primarily in response to EP staff shortages and increasing utilization of EDs. Aim: Implement and evaluate PA role in UK Methods: Role establishment involved curriculum development, caseload (approx 17/day), setting (GP), supervision (by GP). Results: ▪ Role well received by medical community, possessed important qualities (interpersonal communication skills, approach, flexibility, documentation, team work), improved access for patients. ▪ Within EDs the role managed 8% of all attendees (does not specify what ATS scale or acuity). They were supervised by a consultant and sought clarification on treatment planning and prescription.	If issue is high ED utilisation rate / demand on ED services and acute care staff shortages, consider implementing/adapting PA role in AUS EDs as they can offer increased flexibility and stability in the medical workforce. -Still a need to consider legislative issues (i.e. prescribing ability), scope of practice, underpinning model of care (medical), standards and accreditation.
Paul, J. A., & Lin, L.; 2012; [113]	The Journal of Emergency Medicine, Original Study using Discrete	Emergency Department, Demand.	Due to the complexities of the ED system, Discrete Event Simulation (DES) modelling was applied to various ED improvement strategies in one US ED using historical data to identify bottlenecks unique to that hospital. Recommendations derived from the modelling were applied to the ED. These	If overcrowding, patient **throughput** and waiting times are issues, consider applying DES modelling to quantify potential gains from various improvement

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
	Event Simulation (DES) Modelling.		included an additional physician during peak hours (1100 – MN). Result: ▪ Increase in daily patient throughput (182 vs. 192); ▪ Improvement in ED LOS particularly for discharged patients (221 vs. 182mins); ▪ Minimal improvement in ED LOS for admitted patients; ▪ Software for tracking patient beds also implemented – improved streamlining of admitted patients.	strategies. Detailed analysis that is organizationally specific would enable the development of a unique reform or improvement plan. Implementation of this plan could significantly improve ED performance outcomes. Indicates that process improvement (as opposed to more beds) can result in improved outcomes. As this was a US study (where increase in revenue was noted to justify expenditure), application to Aus context required.
Paw, R. C; 2008; [39]	Emergency Medicine Journal, Descriptive Study	Accident and Emergency, Staffing.	Appropriate staffing of the ED is the single most important factor in providing prompt, timely and clinically effective patient care. Outcomes from a survey of 45% of the departments surveyed indicated that they were significantly understaffed. Acknowledged limitations of staffing based on volume or numbers alone (no consideration of acuity given).	ACM made recommendations regarding the staffing levels necessary to carry out core activity to meet performance outcomes.
Perina, D. G., et al.; 2012; [141]	Academic Emergency Medicine, Framework Document.	Emergency Medicine, Models of Care.	Emergency medicine is unique because it is driven by symptoms not diagnosis and therefore has simultaneous therapeutic and diagnostic interventions occurring at one time. This document is one of a series of biannual documents informing readers of the updates to "Emergency Medicine Model of Clinical Practice." The EM Model of Clinical Practice is the core document used for informing medical school curricula, research agenda, specialty examinations, skills acquisitions and clinical competencies.	Highlights the number of medical conditions treated within the emergency context and the range of acuity related to each condition. Could be used to inform DRG planners.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Rabin, E., et al.; 2012; [26]	Health Affairs; Perspective Article.	Emergency Care, Demand.	There is a misperception that crowding results from primary care patients seeking nonemergency care in ED as it is "free." Increasing evidence that the main driver for ED crowding is patient outflow obstruction. ED blockages frequently occur: ▪ When hospital capacity is exceeded, ▪ Inefficient discharge processes, ▪ Empty beds are "reserved" for possible admissions from places other than ED. ED congestion creates a vicious cycle: boarding lengthens hospital stays, which increases hospital occupancy (adverse effects), which increases boarding. Provides arguments both for and against geographic bed plan – pros: better safety, cons: inefficiency. ED efficiencies are becoming more important as health care models move toward ABF or person-based funding. Inpatient wards will rely on new admissions to generate money, as EDs create a significant proportion of the revenue. Profits are maximized by delaying elective surgery – as revenue is only postponed, whereas not admitting an ED patient is revenue lost.	Many arguments supporting system-wide accountability for reducing ED congestion including strategies such as 24/7 support services where 24/7 EDs, patient boarding on the wards (not ED) and improved elective surgical scheduling.
Roberge, D., et al.; 2010 ; [142]	Healthcare Policy, Perspective Article.	Emergency Department, Demand.	Considers the historical and legislative causes of ED overcrowding in Canada. Reports that Quebec ED is one of the most congested in the world as a result of: ▪ Providing free service in EDs however paid for service are primary care clinics. ▪ Employing GP in leadership positions in EDs, ▪ Global funding arrangements enabling inpatient services to close beds at the end of the year to prevent going over budget HOWEVER causing huge follow on effects in the ED, ▪ Poor primary care network.	

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Ross, M. A., et al.; 2001; [77]	Annals of Emergency Medicine, Retrospective, Descriptive Study.	Emergency Department, Demand / Models of Care.	Acknowledges justification for an ED observation unit can be challenging under person-based funding models, because if used correctly done not always have adequate census of patients to provide necessary revenue to staff it according to safety standards. Aim: To evaluate a hybrid observation unit that combines both ED patients (8 beds) and elective/ planned surgical patients (7 beds) that required similar physical and nursing resources. Method: Retrospective, Descriptive before and after study in one US ED. Results: Combined patient types enabled ▪ Better hourly census and nurse resource use rate (3.7 vs. 2.5) ▪ No adverse effect on observation patients (LOS consistent at 15 hrs) ▪ Shorter procedure LOS in hybrid setting vs. traditional setting (4 hrs vs. 9 hrs). ▪ Appeared to be cost effective but no specific financial analysis undertaken.	If potential for ED and minor procedures to be combined consider hybrid ward MOC for reducing ED congesting and avoiding large overheads of a traditional observation ward in smaller EDs. Further site specific cost –effective analysis is required, particularly in Aus context.
Sakr, M., et al.; 1999; [35]	Lancet, Randomised Controlled Trial.	Accident and Emergency, Models of Care.	In UK, EDs faced with increasing workload and reduction in number of doctors. Aim: Compare the ED performance and patient outcomes of nurse practitioner care Vs standard SHO care in one UK ED. Methods: RCT. NP (n=704) vs. junior doctor (n=749) over 6-month period. Compared to Registrar (gold standard). Results: ▪ ENPs were better than junior doctors in terms of history taking, unplanned follow up. ▪ No significant difference for: accuracy of examinations, adequacy of treatment, planned follow-up, requests for radiography, clinically important errors (9-10%), patient satisfaction ▪ Some over requesting of radiology in both groups (when assessed by registrar).	If workload / understaffing are issues, consider ED NP MOC. If training, guidelines and specific patient cohort are identified (i.e. patients with minor injuries) NPs can deliver care that is equal to if not better than junior doctors.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ NPs took more time to assess patients than junior doctors. ▪ Costs more initially for NPs (salary and shift work). If training costs considered, NPs less expensive as junior doctors rotating every 6 months require training, NP – one off.	
Sacchetti, A., et al.; 2002; [143]	American Journal of Emergency Medicine.	Emergency Department, Funding.	Every department should be able to relate its fiscal performance to that of the entire hospital. The USA funding model allocates funds to ED for patients discharged from ED only. Funds for patients who are admitted are given directly to the admitting department (acknowledging that the majority of the patient costs will be acquired as part of that team during their admission). The amount of money a department contributes to the total revenue of the hospital is typically a major determinant in how the service is supported. When considering both admitted and discharged patients, the ED is the major contributing department to hospital revenues.	Basic business suggests that services that contribute to the bottom line should be given most resources and services that do not contribute are eliminated. In health systems funded by activity EDs should / could keep record of the revenue raised through their admissions as a way of gaining entire system accountability for congestion.
Sasson, C., et al.; 2012; [144]	Academic Emergency Medicine, Original Article.	Emergency Department, Workforce.	Describes in detail the American Health Reform (Affordable Care Act) in detail highlighting numerous provisions including; creation of health insurance exchanges, mandates individuals to purchase health insurance and broadens Medicaid eligibility. Reforms includes: ▪ Shift from fee-for-service reimbursement to alternative payment methodologies, ▪ Creation of accountable care organisations to improve care coordination, ▪ Shift site of service from inpatient and ED settings into outpatient care, ▪ Shift to “episodes of care” or “bundled” payments ▪ Penalties for complications or poor quality of care (reduction in amount paid for an episode of care). Implications on ED as follows: ▪ Will continue to be accessible regardless of the ability to	The limitations of the Relative Value Unit (RVU) methodology are useful when considering applicability to Australian context. If an RVU equals service (based on physician work, facility expenses and legal risk profile) multiplied by a Standard Growth Rate (SGR) and a value based modifier, the definition of patient based outcomes, hence “value”, becomes paramount. What is value and how should the cognitive work of EDs be compared to procedural work alone? ED leaders need to evaluate cost profiles, quality attained and

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			pay, ▪ ED attendance will be seen as an indication of poor care received by primary provider, ▪ No decision yet on how EDs will be paid however experts are wanting it to remain the performance based or fee for service rather than bundled model.	determine the contribution of education and research.
Schneider, S., et al.; 2010; [5]	Journal of Emergency Nursing, Original article / Perspective Paper.	Emergency Department, Workforce.	Describes the state of Emergency Medicine workforce and the implications of this on the industry. Issues: ▪ Supply of emergency physicians does not meet the demand, ▪ Shortage of physicians in primary care causing increasing demand on ED that in turn increases the pressure on the workforce, ▪ Non-workforce challenges includes health reform changes and uncertainty of impact on emergency medicine, professional liability reform, over regulation and lack of reimbursement, ▪ Lack of training facilities to educate specialist EPs, nurses and ENPs, ▪ Increasing reliance on emergency nurse workforce however unable to provide quality care. Suggested solutions: ▪ Regionalization on EM (organized system for delivery of care within a region). ▪ Categorisation of care (specialised EM facilities). ▪ Increase efficiency of care to maximize performance – increase regulation of emergency care. ▪ Increase number of training programs. ▪ Incentivise graduate medical education and becoming an EM specialist through tax breaks, HECS reductions and deferment.	With globalization, skills shortages in industries tend to be worldwide.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Schull, M. J., et al.; 2012; [78]	Academic Emergency Medicine, Retrospective Analysis.	Emergency Medicine, Models of Care.	Aim: Evaluate the use of Clinical Decision Units in EDs in Canada. CDU MOC: similar to observation units where patients are admitted for prolonged periods of observations, investigation or treatment. Methods: Retrospective. 7 units with CDUs staffed differently (some with dedicated staff others used existing ED staff) and 9 EDs without CDUs. 12 months pre and 18 months post. Results: 4% of ED patients admitted through CDUs ▪ ED LOS shorter in CDU sites for low acuity and non-admitted patients, ▪ Admission rate: smaller admission rate for high and moderate acuity admitted patients in CDU sites ▪ ED revisit rate: no difference	If throughput and output are issues, consider CDU MOC. Considerations of local context required as MOC best adapted for high volume EDs serving large volumes of intermediate complex cases. Other quality of care and cost measures analysis required.
Shetty, A. G., et al.; 2012; [73]	Emergency Medicine Australasia, Prospective Interventional Study.	Emergency Medicine, Models of Care.	Measure the effectiveness of an innovative model of care – "SAFE-T" zone in a tertiary hospital ED. Aim of safety zone is to maintain patient flow despite access block and overcrowding. Principles of MOC as follows: ▪ Multi-disciplinary staffing, ▪ Only operated 10:00-18:00 daily, ▪ Seen on arrival by SMO, SHO and RN and triaged, ▪ Transferred to an early treatment zone to commence intervention OR fast track system to manage low acuity patients urgently and discharge, ▪ Acute care beds were quarantined for high acuity patients and enabled surge capacity. Outcomes: ▪ Time to treatment improved (73% to 84%), ▪ DNW improved (10.7% to 9.6%), ▪ LOS improved (6hr to 5.5 hr), ▪ Ambulance off stretcher times (% offloaded with 30 mins) improved (74.5% to 79.5%).	"SAFE-T" zone MOC useful (if using existing staffing establishment and space) & used several (i.e. bundled) evidenced based measures to address throughput issues.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Simonet, D; 2009; [145]	Health Care Analysis: HCA: Journal Of Health Philosophy And Policy, Original Article.	Emergency Department, Costs.	Provides detailed information regarding the USA health care system including governing legislation and reforms and the implications these have on the EM system. Demonstrated how the current legislation has led to staff shortages / reduced access to on-call EPs and created the high cost, low reimbursement emergency medicine system. Discusses a number of cost reduction strategies in the ED that are evidenced based or have been studied in literature. These include: ▪ Seeking copayments from patients, ▪ Developing and promoting use of alternative providers of lower acuity care including walk in clinics, expansion of primary care network and observation units, ▪ ED re-engineering, specifically, reducing service units in low demand, combining jobs, categorization of departments, tiered staffing models, space reorganization, improved communication channels.	This paper is specific to the USA healthcare system. There are few implications on AUS ED system as it is not governed by same legislation. Some strategies for cost reduction are applicable but article fails to test the effectiveness of these papers.
Sinreich, D., & Jabali, O; 2007; [94]	Health Care Management Science, Literature Review and Simulation Study.	Emergency Department, Staffing.	The paper describes how using a "linear optimization algorithm" to design staff shift patterns based on ED demand data can downsize the ED workforce while maintaining performance. The need for the staff restructure is completely driven by need to reduce health care costs and therefore while it does look at overall LOS it does not consider other quality outcomes such as DNW, access block, readmission rates etc. Since labour consumes 50% of total cost invested in health care systems any downsizing or streamlining and reorganizing plans need to address staffing issues such as determining the correct size of the workforce and its shift scheduling. Although patterns exist in the patient arrival process, conventional physician work shifts are not adjusted to fit them – nurses typically follow hospital regime of 3 start times per day.	

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			Matching EP capacity to patient needs is critical to EDs' ability to provide timely urgent care. Outcome: ▪ Algorithm consistently develops a schedule where almost every staff member has a unique shift start time and duration. Benefits are that it promotes continuation and less wastage. Weaknesses are lack of designated handover/rounds (proven effectiveness or care coordination), additional costs of over-time/penalty rates, difficulties establishing an ED roster that satisfies union and hospital regulations and staff preferences.	
Smulowitz, P. B., Honigman, L., & Landon, B. E; 2013; [28]	Annals of Emergency Medicine, Original article.	Emergency Departments, Costing	Range of reasons in the USA patients seek out ED for care: ▪ Cannot be refused treatment based on insurance status (i.e. EMTALA act), ▪ Convenience of 24 hour care, ▪ Poor access to primary care providers In the USA there is little incentive for hospitals to prevent ED presentations under current funding models as they make up 50% of admitted patient revenue stream. A significant focus of reform is to try and reduce ED visits to obtain substantial cost savings. Article disbands this myth indicating the infrastructure and recurrent costs required to create an accessible primary care service far exceed the cost of these types of patients to ED because of the low marginal cost of treating additional patients. Three main patient groups (i.e. emergency (resuscitation), acute (non-ambulatory) and fast track) are assessed for the relative achievable cost reduction if policy changes for ED presentations were to be introduced. Intermediate severity patients show the greatest potential for cost savings through alternative pathways to hospital admission, reduced inpatient admissions and more streamlined ED evaluations. As such greater use of observation wards and Skilled nursing	Suggests there is no one size fits all model for ED. Implies that addressing "throughput" factors should be the focus of hospital as the perceived cost reductions associated with low acuity patients are unlikely to be borne out. Value can be improved for patients if payment structures preserve true emergency capability of an ED whilst making it easier to divert unnecessary inpatient admissions.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			facilities with better care coordination to reduce duplication of testing are suggested. EDs should be funded through "mixed model" of both FFS and capitation models – to ensure fixed (departmental and staff costs) and variable costs (consumables, diagnostic and therapeutic intervention) are accounted for.	
Soremekun, et al.; 2012; [53]	American Journal of Emergency Medicine, Before-and-After Analysis.	Emergency Department, Financing, Workforce Models.	2 year before and after study of Physician screening at urban tertiary academic ED. MOC involved: Hours of operation 1100-2300hrs to match peak demand and is an additional staff member (not reallocated). Patients triaged into 3 categories - high, medium and low acuity. Physician screens medium acuity patients and ▪ Identifies whether condition requires urgent attention or potential to deteriorate and sources appropriate treatment space, ▪ Commences evaluation and treatment for people who are able to wait for a bed ▪ Determines whether the patient will require admission or discharge and accelerates the process without use of ED treatment space. Outcomes: Operational. ▪ Decreased LOS for medium acuity patients (374 to 348 mins) ▪ Reduced DNW rate for medium acuity patients (3.2% to 1.8%) ▪ Accelerated time to disposition (294 to 276 mins) for medium acuity patients (enabled greater bed capacity). ▪ MOC allowed safer functional use of ED Costs. ▪ MOC was cost effective.	If increasing patient volume, DNW rates, large numbers of medium acuity patients, ED LOS and access block are issues then Physician screening may be useful MOC to implement. Requires employment of additional staff at front of patient journey. US health care system different to Aus, therefore consideration of cost revenue (US) and cost savings (Aus) warrant consideration.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			▪ Money spent in additional physician position reimbursed by enabling greater number of patients to be seen. ▪ Time to break even $ about 13 months.	
Szczesiul, J. M., et al.; 2009; [68]	American Journal of Health-System Pharmacy, Qualitative Study (survey).	Emergency Department, Models of Care, Pharmacy.	Outcome of survey suggests that in US teaching hospital EDs, clinical pharmacists are not utilised to achieve maximum benefit. Benefits that could be achieved include better patient outcomes, increased patient satisfaction, reduced representations and potential reduced adverse effects (medication errors). No evidence presented on cost effectiveness of service or implications on length of stay.	Physical presence of ED pharmacist should be considered when developing ideal ED model of care in Aus. For best utilisation of ED pharmacist, role can include: inventory modification, providing drug or toxicology information to staff and patients in a structured format (i.e. as part of medical training and to educate patients), report on adverse drug events, provide drug therapy recommendations, advise on cost-effectiveness.
Taylor, C. J., et al.; 1997; [115]	Journal Of Accident & Emergency Medicine.	Emergency Department, Staffing.	Discusses the development of a workload management system to assist with staff scheduling and resourcing. Foundations of such a tool is based on examining all aspects of complex working tasks in detail, assessing patients needs and managing resources in relation to the amount of care each person needs NOT relying on volume alone. The challenge of developing such a tool in A&E is the range of diagnoses that present. Instead they need to focus on the acuity / symptoms rather than the diagnosis. The development of a system such as these will identify some common practices as inefficient and will result in departmental change. Change management practices will be required to keep staff motivated and ensure changes are implemented well.	Significant correlation between this system and the workforce management tool we are envisaging to take account of volume, acuity, length of stay in ED and timed interactivity of individual clinicians.
Terris, J., et al.; 2004; [54]	Emergency Medicine Journal, Observational	Emergency Department, Models of Care.	In an inner city teaching hospital ED, addition of a consultant level ED physician plus triage nurse (IMPACT team) when compared to standard MOC (nurse only, no IMPACT team)	If large numbers of patients waiting to be seen (i.e. input) is an issue, then senior Dr-nurse team at triage

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
	study.		showed significant improvement for: ▪ Numbers waiting to be seen (18 vs. 6) and waiting time > 4hrs to be seen (0 vs. 7). ▪ Almost half (49%) of patients seen at triage by the DR-Nurse team were able to be discharged home immediately after assessment and treatment. ▪ Also believed to have benefits on staff morale, better utilization of skill mix and improved patient behaviour.	to assess and treat may be a useful MOC. MOC likely requires additional staff (not reallocation of staff) for sustainability.
Unterman, S., Kessler, C., & Pitzele, H. Z; 2010; [102]	The American Journal of Emergency Medicine, Retrospective Study.	Emergency Department, Staffing	Article supports AACEM recommendation that EDs should be staffed by EPs not internal medicine or primary care physicians. Compares the quality of care provided to patients by EPs to IMs in an emergency setting. Outcomes: ▪ Higher admission rates for patients seen by EPs however might be explained by the higher level of acuity. ▪ EPs had fewer representations and fewer representations requiring admission. Authors suggest that EPs are better at estimating longer-term risk than IMPs.	Implications on staff shortages and MOC that utilise primary care physicians to manage lower acuity patients and support demand management processes.
Vukmir, R. B., & Howell, R. N; 2010; [55]	Emergency Medicine Journal, Retrospective Report.	Emergency Department, Workforce.	Discusses the concepts of learning curve and law of diminishing returns and links them to the ED – effectively there is only so many additional human resources you can integrate into a department before the maximum output can be achieved (both financially and clinically). Factors increasing the likelihood of an efficient Emergency Physician (exclusive of work ethic, proficiency and expertise) include: ▪ Number of patients presenting for care, ▪ Acuity ▪ Admission rate ▪ Pathology / Radiology turnaround time ▪ Adequacy and effectiveness of support staff ▪ Proportionately more full time to part time staff. A lower	The design of the workforce tool will need to be considerate of availability of resources as they impact upon productivity in the context of overall departmental size, patient volume and workplace enablers or barriers.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
			number of locum physicians or new staff ▪ Moderately sized department (30,000-45,000 presentations per annum)	
Ward, M. J., et al.; 2011; [84]	Academic Emergency Medicine, Expert Opinion / Perspective Paper.	Emergency Department, Demand (efficiencies).	▪ Estimations in USA that 30-40 cents in every dollar is lost on waste and inefficiencies. ▪ The definition of efficiency depends greatly on perspective – payers, patients, staff, and politicians and could be based on time, money or appropriate use of bed. ▪ ED efficiencies are dramatically affected by factors outside of its control. This includes access to patient records, medical staff consultation, pathology / radiology acquisition and reporting and admission processes and inpatient length of stays. ▪ There is an inseparable relationship between staff number, staff practice and staff efficiency. Because of this USA guidelines suggest that patient census, acuity, LOS, intensity of nursing intervention plus an adjustment for non-patient care time should all be considered when decisions regarding nursing levels are being made. ▪ Current workforce staffing models often result in suboptimal utilization of health care providers but widely accepted solutions are not easily identified.	
Wargon, M., Casalino, E., & Guidet, B; 2010; [147]	Academic Emergency Medicine, Retrospective study.	Emergency Department, Demand.	Authors attempt to forecast ED presentations under the belief that predicting ED crowding could facilitate specific solutions to decrease emergency visits. Model focuses on managing demand or volume of ED presentations to address congestion. Outcome: ▪ Forecasting was not reliable for individual hospitals but rather hospital districts / systems. ▪ If using at an individual hospital may over or under capitalize on resources leading to cost inefficiencies/ over spending or poor patient outcomes.	Demand trends are better acknowledged at a health system level rather than site specific.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Weichenthal, L., & Hendey, G. W; 2011; [98]	The Journal of Emergency Medicine, Before-and-After Observational Study.	Emergency Department, Workforce OR Staffing.	Highlights that prior to the introduction of mandatory nursing ratios in California there was no strong evidence to guide what the ratios should be or likely outcomes. Looks at the effect of ratios on DNW, wait times, medication errors and clinically ACS patients who received aspirin and pneumonia patients who commenced ABs WITHOUT increasing the number of FTE employed in ED. Outcome: ▪ Huge increase in waiting time, throughput time and admission time. ▪ No change in medication errors, ▪ No change in DNWs ▪ Improved time to commence ABs ▪ No change in aspirin time.	Introducing staff ratios without increasing funds to increase FTE will have a negative effect on ED congestion.
Whyne, M; Whyne, G; Rowe, B; 2007; [110]	Canadian Journal of Emergency Medicine; Original Research Paper.	Accident & Emergency, Funding.	Alternative funding agreements (or alternative remuneration programs) compared to FFS have resolved staff shortages/ retention issues within Canadian EDs however the impact upon staff satisfaction, ED overcrowding and wait times require further evaluation.	Staff satisfaction is not entirely related to remuneration – also impacted by working conditions. Increased staff / reduced staff shortages does not have an impact on ED demand (access block remains the biggest issue).
Wiler, J. L., et al.; 2012; [148]	Annals of emergency medicine; Original article.	Emergency Department, Financial Models.	Outlines how the Patient Protection and Affordable Care Act affects the existing funding model – moving away from fee-for-service toward episodes of care or global payments. Highlights the challenges of introducing bundled models into the ED – one crucial concern is defining a patient by single disease process and not recognizing the effect of co-morbidities or that EDs treat patients based on symptoms (prospectively) not retrospective diagnostic coding. ▪ Implications of bundled payment models on EDs include increased pressure to keep expenditure to a minimum and therefore potential to increase missed diagnoses. ▪ There should be better transparency in treatment services.	Highlights challenges of introducing bundled payment models (like ABF) into EDs because of the focus on diagnostic groupings not symptom based assessment and management. The value of the ED episode of care for any given patient within a bundled payment system needs quantification. Modelling cost profiles for ED episodes of care is one strategy.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Williams, G., Souter, J., & Smith, C; 2010; [95]	Australasian Emergency Nursing Journal, Discussion Paper.	Emergency Department, Workforce.	Authors recognised a lack of standardized system for calculating the number of nursing staff needed in each ED. They identified significant inequities between departments causing high levels of frustration within the workforce. Describe the development of a taskforce to review existing models and develop a workforce tool to guide department managers on how to "best" staff a department. Outcome as follows: ▪ Existing models were disregarded based on inadequately addressing the number of waiting room patients or lack of recognition regarding acuity of patients. ▪ Other models looked only at direct patient care and fixed hours – did not consider SSU surge staffing or non-direct patient care positions. Their model has specific recommendations for: ▪ Triage staff at > 15000 & > 50000 presentations per annum ▪ Presence of a shift coordinator on duty at > 30000 presentations per annum ▪ NUM >15000 ▪ Nursing Educator ▪ Nursing hours per bed in SSU	Tool is to be used as a starting point to guide development of a standardized, evidence-based workforce guideline.
Williams G., et al.; 2013; [11]	Journal of Nursing Management. Validation study	Emergency Department, Workforce	Revised, assisted method for calculating ED nursing workforce requirements (using the Emergency Nursing Workforce Tool, ENWT) within 18 Queensland public hospital EDs. ▪ No significant difference was noted in FTE nursing requirement when standard vs. new (ENWT) methods were compared. ▪ The ENWT was more efficient (i.e. timely) and had better predictability than existing methods for calculating FTE nursing requirement.	Findings from this research can be used to inform ED managers and health service planners regarding a standardised approach to calculating emergency nursing workforce needs.

Author; Year; [Reference Number]	Source & Type	Search Criteria Triggered	Major Findings / Position / Arguments	Implications
Wilson, K; Cameron, P, Jennings, N; 2008; [47]	Emergency Medicine Australasia; Editorial.	Emergency Department, Models of Care.	Evidence to suggest that the ENP model has successfully influenced: ▪ Decreased length of stay, ▪ Reduced waiting times, ▪ Increased staff and patient satisfaction, ▪ Overall cost effectiveness.	NP role offers opportunity to retain highly skilled nurses. Successful implementation and sustainability of NP role requires medical support. Current scope of NP role is generally for lower acuity patients. Consideration of impact on junior doctor training required but can be addressed with structured education program and training log.
Wu, K.-H., et al.; 2012 ; [56]	The American Journal of Emergency Medicine, Retrospective study.	Emergency Department, Workload.	Investigates if the level of seniority of EP impacts on the admission rate from ED into inpatient beds. Sees importance in this study as inpatient beds are becoming blocked and errors in admission and discharge decisions may place substantial risk of adverse events. Hypothesizes that SMOs should make a more accurate decision regarding the disposition of the patient compared to less experienced doctors. Outcome: ▪ Senior physicians were more conservative in their decision to admit and had greater number of admissions than their less experienced colleagues. ▪ The re-presentation or adverse event rates of junior doctors was no higher than the SMOs.	Implies that a greater number of SMOs are not required to ensure safe admit / discharge decision-making is upheld. However there are big limitations in this study – SMOs are often responsible for overseeing the more complex cases and therefore their decision rates will be higher. Also in AUS it is uncommon for a junior doctor to make decisions regarding the need for admission without consulting a SMO and therefore decision-making capacity is assisted.

References

1. Toloo, S., FitzGerald, G., Aitken, P., Ting, J., Tippett, V., & Chu, K. (2011). *Emergency Health Services: Demand and Service Delivery Models. Monograph 1: Literature Review and Activity trends.* Brisbane: Queensland University of Technology.
2. FitzGerald, G., & Ashby, R. (2010). National Health and Hospital Network for Australia's future: implications for Emergency Medicine. *Emergency Medicine Australasia: EMA, 22*(5), 384-390.
3. Institute of Medicine of the National Academies. (2006) *Hospital Based Emergency Care: At Breaking Point*. Retrieved from http://www.iom.edu/Reports/2006/Hospital-Based-Emergency-Care-At-the-Breaking-Point.aspx
4. Wilson, A. J., FitzGerald, G. J., & Mahon, S. (2010). Hospital beds : A primer for counting and comparing. *Medical Journal of Australia*, *193*(5), 302-304.
5. Schneider, S., Gardner, A., Weiss, L., Wood, J., Ybarra, M., Beck, D., Stauffer, A., Wilkerson, D., Brabson, T., Jennings, A., Mitchell, M., McGrath, R., Christopher, T., King, B., Luelleman, R., Wagner, M., Char, D., McGee, D., Pilgrim, R., Moskovitz, J., Kupas, D., Kruger, J., Stratford, C., Jouriles, N. (2010). The Future of Emergency Medicine. *Journal of Emergency Nursing,* 36 (2), 330-335.
6. Ministerial Council for Federal Financial Relations. (2010). *Activity Based Funding National Framework and Implementation Plan: National Partnership Agreement on Hospital and Health Workforce Reform.* Retrieved from http://www.federalfinancialrelations.gov.au/content/national_partnership_agreements/HE003/ABF_National_Framework_and_Implementation_Plan.pdf
7. Bulhave L, Reid BA. (2007). Mature use of casemix – are we there yet? *Aust Health Review,* 31 (Supp 1), S59 – S67.
8. Ettelt, S., Thomson, S., Nolte, E., Mays, N. (2006). Reimbursing highly specialised hospital services: the experience of activity-based funding in eight countries. London: London School of Hygiene And Tropical Medicine.
9. Newnham, H., Villiers Smit, D., Keogh, M., Stripp, A., Cameron, P. (2012). Emergency and acute medical admissions: Insights from US and UK visits by a Melbourne tertiary health service. *Medical Journal Australia*, *196*(2), 101-103.
10. Stokes, B. (2011) *Four Hour Rule Program Progress and Issues Review.* Department of Health, WA. Perth. Available at: http://www.health.wa.gov.au/publications/documents/FourHourRule_Review_Stokes.pdf. Accessed 10/10/2013.
11. Williams G., Crilly J., Souter J., Veach K., Good N. (2013). A state wide validation and utilisation study of the Queensland emergency nursing workforce tool. *Journal of Nursing Management*, DOI: 10.1111/jonm.12063.
12. Australian Medical Workforce Advisory Committee. (2006). *Health Workforce planning and models of care in emergency departments.* Sydney: AMWAC.
13. Van Der Weyden M. B. (2008). Health Policy and Reform: Gathering the evidence. *Medical Journal of Australia, 189*(3), 169 – 170.

14. Council of Australian Governments (2011*). National partnership agreement on Hospital and Health Workforce Reform*. Retrieved from http://www.ahwo.gov.au/documents/COAG/National%20Partnership%20Agreement%20on%20Hospital%20and%20Health%20Workforce%20Reform.pdf

15. Jelinek, G. A., Mountain, D., O'Brien, D., Rogers, I. R., Wilkes, G., Wenban, J., Carr, J., O'Keefe, S, Martin, P. J. (1999). Re-engineering an Australian emergency department: can we measure success? *Journal of Quality in Clinical Practice, 19*(3), 133-138.

16. Binder, D. S., Crandall, C. S., & Hauswald, M. (2003). Use of a self-selected scheduling method in a large academic emergency medicine group. *Annals of Emergency Medicine, 41*(5), 653-658.

17. Bosch, X., Jordán, A., & López-Soto, A. (2013). Quick diagnosis units: avoiding referrals from primary care to the ED and hospitalizations. *The American journal of emergency medicine, 31*(1), 114-123.

18. Kaplan, R. S., & Porter, M. E. (2011). How to solve the cost crisis in health care. *Harvard Business Review, September 2011*, 46-64.

19. Gedmintas, A. B., Nerolie Bost; Keijzers, Gerben; Green, David and Lind, James. (2010). Emergency care workload units: A novel tool to compare emergency department activity *Emergency Medicine Australasia, 22*(5), 442-448.

20. Price Waterhouse Coopers (2009). *NSW Health Emergency Department Workforce Research Project*. NSW Health, Sydney

21. PricewaterhouseCoopers. (2011). NSW Department of Health Emergency Department Workforce Research Project. NSW Health. Sydney. Available at: http://www0.health.nsw.gov.au/pubs/2010/pdf/ed_workforce_research.pdf. Accessed 10/10/2013.

22. Asplin, B.R., Magid, D.J., Rhodes, K.V., Solberg, L.I., Lurie, N. & Camargo, C.A. (2003). A conceptual model of emergency department crowding. *Annals of Emergency Medicine, 42*(2), 173-180.

23. Lowthain, J. A., Jolley, D. J., Stoelwinder, J. U., McNeil, J. J., & Cameron, P. A. (2012). Demand at the emergency department front door: 10-year trends in presentations. *The Medical Journal of Australia, 196*(2), 128-132.

24. FitzGerald, G., Toloo, S., Rego, J., Ting, J., Aitken, P., & Tippett, V. (2012). Demand for public hospital emergency department services in Australia: 2000-2001 to 2009-2010. *Emergency Medicine Australasia, 24*(1), 72-78.

25. Masso, M., Bezzina, A., Siminski, P., Middleton, R., Eagar, K. (2007). Why patients attend emergency departments for conditions potentially appropriate for primary care: Reasons given by patients and clinicians differ. *Emergency Medicine Australasia*, *19*(4), 333-340.

26. Rabin, E., Kocher, K., McClelland, M., Pines, J., Hwang, U., Rathlev, N., . . . Weber, E. (2012). Solutions To Emergency Department 'Boarding' And Crowding Are Underused And May Need To Be Legislated. *Health Affairs, 31*(8), 1757-1766.

27. ACEP. Emergency Department Crowding: High Impact Solutions. *ACEP Task Force Report on Boarding*. Available at: http://www.acep.org/content.aspx?id=32050. Accessed 20/1/2014.

28. Smulowitz, P. B., Honigman, L., & Landon, B. E. (2013). A Novel Approach to Identifying Targets for Cost Reduction in the Emergency Department. *Annals of emergency medicine, 61*(3), 293-300.

29. Toloo, S., Rego, J., Fitzgerald, G., et al (2013) *Emergency Health Services (EHS): Demand and Service Delivery Models. Monograph 3: Patients' Reasons and Perceptions*. QUT.

30. Lee, M., Schuur, J., & Zink, B. (2013). Owning the Cost of Emergency Medicine: Beyond 2%. *Annals of Emergency Medicine, 61*(5), 1-8

31. Berger, E. (2011). Emergency Physicians Face Uncertainty in Accountable Care Organizations: Health Care Megatrend Brings Threats, Opportunities for Emergency Medicine. *Annals of emergency medicine, 57*(4), A13-A15.

32. Bell, D., Mason, S. (2010). Secondary care and changing face of emergency care. *Emergency Medical Journal, 27*(3), 189-190.

33. Coates, D., Rawstorne, S., & Benger, J. (2012). Can emergency care practitioners differentiate between an avoided emergency department attendance and an avoided admission? *Emergency Medicine Journal, 29*(10), 838-841.

34. Beales, J. (1997). Innovation in Accident and Emergency management: establishing a nurse practitioner-run minor injuries / primary care unit. *Accident & Emergency Nursing, 5*(2), 71-75.

35. Sakr, M., Angus, J., Perrin, J., Nixon, C., Nicholl, J., & Wardrope, J. (1999). Care of minor injuries by emergency nurse practitioners or junior doctors: a randomised controlled trial. *Lancet, 354*(9187), 1321-1326.

36. Fry, M. M. (2011). A systematic review of the impact of afterhours care models on emergency departments, ambulance and general practice services. *Australasian Emergency Nursing Journal, 14*(4), 217-225.

37. Chenoweth, D., Martin, N., Pankowski, J., & Raymond, L. W. (2005). A benefit-cost analysis of a worksite nurse practitioner program: First impressions. *Journal of Occupational and Environmental Medicine, 47*(11), 1110-1116.

38. Callander, E., & Schofield, D. (2011). Emergency Department Workforce Models: What the literature can tell us. *Emergency Medicine Australasia, 23*(1), 84-94.

39. Paw, R. C. (2008). Emergency department staffing in England and Wales, April 2007. *Emergency Medicine Journal: EMJ, 25*(7), 420-423.

40. Bache, J. (2001). Establishing an emergency nurse practitioner service. *Emergency Medicine Journal, 18*(3), 186-189.

41. Fry, M., Fong, J., Asha, S., & Arendts, G. (2011). A 12-month evaluation of the impact of Transitional Emergency Nurse Practitioners in one metropolitan Emergency Department. *Australasian Emergency Nursing Journal, 14*(1), 4-8.

42. Higginson, I., Whyatt, J., & Silvester, K. (2011). Demand and capacity planning in the emergency department: how to do it. *Emergency Medicine Journal, 28*(2), 128-135.

43. Lutze, M., Ratchford, A., & Fry, M. (2011). A review of the Transitional Emergency Nurse Practitioner. *Australasian Emergency Nursing Journal, 14*(4), 226-231.

44. O'Connell, T. B., Bassham, J.; Bishop, R., Clarke, C., Hullick, C., King, D., Peek, C., Verma, R., Ben-Tovim, D., McGrath, K. (2008). Clinical process redesign for unplanned arrivals in hospitals. *Medical Journal of Australia, 188*(6), s18-s22.

45. Carter, A. J. E., & Chochinov, A. H. (2007). A systematic review of the impact of nurse practitioners on cost, quality of care, satisfaction and wait times in the emergency department. *Canadian Journal of Emergency Medicine, 9*(4), 286-295.

46. Cooper, M. A., Lindsay, G. M., Kinn, S., & Swann, I. J. (2002). Evaluating Emergency Nurse Practitioner services: a Randomized Controlled Trial. *Journal of Advanced Nursing, 40*(6), 721-730.

47. Wilson, K., Cameron, P., Jennings, N. (2008). Emergency nurse practitioners: An underestimated addition to emergency care team. *Emergency Medicine Australasia*, *20*(6), 453-455.

48. Dinh, M., Walker, A., Parameswaran, A., & Enright, N. (2012). Evaluating the quality of care delivered by an emergency department fast track unit with both nurse practitioners and doctors. *Australasian Emergency Nursing Journal, 15*(4), 188-194.

49. Fotheringham, D., Dickie, S., & Cooper, M. (2011). The evolution of the role of the Emergency Nurse Practitioner in Scotland: a longitudinal study. *Journal Of Clinical Nursing, 20*(19-20), 2958-2967.

50. Fry, M., Ruperto, K., Jarrett, K., Wheeler, J., Fong, J., & Fetchet, W. (2012). Managing the wait: Clinical initiative nurses' perceptions of an extended practice role. *Australasian Emergency Nursing Journal, 15*(4), 202-210.

51. Han, J. H., France, D. J., Levin, S. R., Jones, I. D., Storrow, A. B., & Aronsky, D. (2010). The Effect of Physician Triage on Emergency Department Length of Stay. *The Journal of Emergency Medicine, 39*(2), 227-233.

52. Goodacre, S., Mason, S., Kersh, R., Webster, A., Samaniego, N., & Morris, F. (2004). Can additional experienced staff reduce emergency medical admissions? *Emergency medicine journal, 21*(1), 51-53.

53. Soremekun, O. A., Biddinger, P. D., White, B. A., Sinclair, J. R., Chang, Y., Carignan, S. B., & Brown, D. F. M. (2012). Operational and financial impact of physician screening in the ED. *American Journal of Emergency Medicine, 30*(4), 532-539.

54. Terris, J., Leman, P., O'Connor, N., & Wood, R. (2004). Making an IMPACT on emergency department flow: improving patient processing assisted by consultant at triage. *Emergency Medicine Journal: EMJ, 21*(5), 537-541.

55. Vukmir, R. B., & Howell, R. N. (2010). Emergency medicine provider efficiency: the learning curve, equilibration and point of diminishing returns. *Emergency Medicine Journal, 27*(12), 916-920.

56. Wu, K.H., Chen, I. C., Li, C.J., Li, W.C., & Lee, W.H. (2012). The influence of physician seniority on disparities of admit/discharge decision making for ED patients. *The American Journal of Emergency Medicine, 30*(8), 1555-1560.

57. Cooke, M. W., Kelly, C., Khattab, A., Lendrum, K., Morrell, R., & Rubython, E. J. (1998). Accident and emergency 24-hour senior cover -- a necessity or a luxury? *Journal of Accident & Emergency Medicine, 15*(3), 181-184.

58. Binder, L. S., Allison, E. J., Jr., Prosser, R., Robinson, W., Spaite, D., & Hamilton, G. C. (1990). 24-hour coverage in academic emergency medicine: ways of dealing with the issue. *Annals of Emergency Medicine, 19*(4), 430-434.

59. Doan Q, S. V., Kissoon N, Sheps S, Singer J. (2011). A systematic review: The role and impact of the physician assistant in the ED. *Emergency Medicine Australasia, 23*(1), 7-15.

60. Nestler, D. M., Fratzke, A. R., Church, C. J., Scanlan-Hanson, L., Sadosty, A. T., Halasy, M. P., Finley, J. C., Boggust, A. & Hess, E. P. (2012). Effect of a Physician Assistant as Triage Liaison Provider on Patient Throughput in an Academic Emergency Department. *Academic Emergency Medicine, 19*(11), 1235-1241.

61. Arya, R., Salovich, D. M., Ohman-Strickland, P., & Merlin, M. A. (2010). Impact of Scribes on Performance Indicators in the Emergency Department. *Academic Emergency Medicine, 17*(5), 490-494.

62. Lebec, M. T., Cernohous, S., Tenbarge, L., Gest, C., Severson, K., & Howard, S. (2010). Emergency department physical therapist service: a pilot study examining physician perceptions. *Internet Journal of Allied Health Sciences & Practice, 8*(1), 1-12

63. Jesudason, C., Stiller, K., McInnes, M., & Sullivan, T. (2012). A physiotherapy service to an emergency extended care unit does not decrease admission rates to hospital: a randomised trial. *Emergency Medicine Journal, 29*(8), 664-669.

64. Hendriksen, H., & Harrison, R. A. (2001). Occupational therapy in accident and emergency departments: a randomized controlled trial. *Journal of Advanced Nursing, 36*(6), 727-732.

65. Moss, J. F., C; Houghton, L; Moss, D; Nielsen, D; Taylor, D. (2002). A multidisciplinary Care Coordination Team improves emergency department discharge planning practice. *Medical Journal of Australia, 177(8)*, 435-439.

66. Jibuike, O. O., Paul-Taylor, G., Maulvi, S., Richmond, P., & Fairclough, J. (2003). Management of soft tissue knee injuries in an accident and emergency department: the effect of the introduction of a physiotherapy practitioner. *Emergency Medicine Journal, 20*(1), 37-39.

67. Rudis, M. I., & Attwood, R. J. (2011). Emergency medicine pharmacy practice. *Journal of Pharmacy Practice, 24*(2), 135-145.

68. Szczesiul, J. M., Fairbanks, R. J., Hildebrand, J. M., Hays, D. P., & Shah, M. N. (2009). Survey of physicians regarding clinical pharmacy services in academic emergency departments. *American Journal of Health-System Pharmacy, 66*(6), 576-579.

69. Hardy, M., Hutton, J., & Snaith, B. (2013). Is a radiographer led immediate reporting service for emergency department referrals a cost effective initiative? *Radiography, 19*(1), 23-27.

70. Katz, E. B., Carrier, E. R., Umscheid, C. A., & Pines, J. M. (2012). Comparative Effectiveness of Care Coordination Interventions in the Emergency Department: A Systematic Review. *Annals of emergency medicine, 60*(1), 12-23.

71. Bucheli, B., & Martina, B. (2004). Reduced length of stay in medical emergency department patients: a prospective controlled study on emergency physician staffing. *European Journal Of Emergency Medicine, 11*(1), 29-34.

72. Considine, J., Lucas, E., Martin, R., Stergiou, H. E., Kropman, M., & Chiu, H. (2012). Rapid intervention and treatment zone: Redesigning nursing services to meet increasing emergency department demand. *International Journal of Nursing Practice, 18*(1), 60-67.

73. Shetty, A., Naren, G., Byth, K., and Vukasovic, M. (2012). Senior Streaming Assessment Further Evaluation after Triage zone: A novel model of care encompassing various ED through put measures. *Emergency Medicine Australasia, 24*(4), 374-382.

74. McNaughton, C., Self, W. H., Jones, I. D., Arbogast, P. G., Chen, N., Dittus, R. S., & Russ, S. (2012). ED crowding and the use of nontraditional beds. *The American Journal of Emergency Medicine, 30*(8), 1474-1480.

75. Buckley, B. J., Castillo, E. M., Killeen, J. P., Guss, D. A., & Chan, T. C. (2010). Impact of an Express Admit Unit on Emergency Department Length of Stay. *The Journal of Emergency Medicine, 39*(5), 669-673.

76. Morris, Z. S., Boyle, A., Beniuk, K., & Robinson, S. (2012). Emergency department crowding: towards an agenda for evidence-based intervention. *Emergency Medicine Journal, 29*(6), 460-466.

77. Ross, M. A., Naylor, S., Compton, S., Gibb, K. A., & Wilson, A. G. (2001). Maximizing use of the emergency department observation unit: A novel hybrid design. *Annals of Emergency Medicine, 37*(3), 267-274.

78. Schull, M. J., Vermeulen, M. J., Stukel, T. A., Guttmann, A., Leaver, C. A., Rowe, B. H., & Sales, A. (2012). Evaluating the Effect of Clinical Decision Units on Patient Flow in Seven Canadian Emergency Departments. *Academic Emergency Medicine, 19*(7), 828-836.

79. Brand, C.A., Kennedy, M.P., King-Kallimanis, B.L., Williams, G., Bain, C.A., Russell, D.M. (2010). Evaluation of the impact of implementation of a Medical Assessment and Planning Unit on length of stay. *Australian Health Review*, *34*(3), 334-339.

80. Scott, I., Vaughan, L., Bell D. (2009). Effectiveness of acute medical units in hospitals: a systematic review. *International Journal for Quality in Health Care*, *21* (6), 397-407. doi: 10.1093/intqhc/mzp045.

81. Nugus, P., Holdgate, A., Fry, M., Forero, R., McCarthy, S., & Braithwaite, J. (2011). Work Pressure and Patient Flow Management in the Emergency Department: Findings from an Ethnographic Study. *Academic Emergency Medicine, 18*(10), 1045-1052.

82. Litvak, E., & Bisognano, M. (2011). More Patients, Less Payment: Increasing Hospital Efficiency In The Aftermath Of Health Reform. *Health Affairs, 30*(1), 76-80.

83. Rabin, E., Kocher, K., McClelland, M, Pines, J., Hwang, U., Rathlev, N., Asplin, B., Trueger, N. S., Weber, E. (2012). Solutions to Emergency Department Boarding and crowding are under used and may need to be legislated. *Health Affairs 31*(8), 1757-1766.

84. Ward, M. J., Farley, H., Khare, R. K., Kulstad, E., Mutter, R. L., Shesser, R., & Stone-Griffith, S. (2011). Achieving efficiency in crowded emergency departments: a research agenda. *Academic Emergency Medicine,* 18(12), 1303-1312.

85. Fee, C., Hall, K., Morrison, B., Stephens, R., Cosby, K., Fairbanks, R.T., Youngberg, B., Lenehan, G., Abualenain, J., O'Connor, K., MD, Wears, R. (2011). Consensus-based recommendations for research priorities related to interventions to safeguard patient safety in the crowded emergency department. *Academic Emergency Medicine,* 18 (12), 1283-1288.

86. O'Brien A. & Benger J. (2007). Patient dependency in emergency care: Do we have the nurses we need? *Journal of Clinical Nursing, 16*(11), 84-94.

87. Wai, A., Chor, C., Lee, A., Sittambunka, Y., Graham, C., Rainer, T. (2009). Analysis of trends in emergency department attendances, hospital admissions and medical staffing in a Hong Kong university hospitals: 5-year study. *International Journal of Emergency Medicine, 2*(3), 141-148.

88. Ginde, A. A., Rao, M., Simon, E. L., Matthew Edwards, J., Gardner, A., Rogers, J., Lopez, E., Camargo, C.A., Piazza, G., Rosenau, A., Schneider, S., & Jouriles, N. (2010). Regionalization of emergency care future directions and research: workforce issues. *Academic Emergency Medicine, 17*(12), 1286-1296.

89. Hackenschmidt, A. (2004). Living with nurse staffing ratios: Early experiences. *Journal of Emergency Nursing, 30*(4), 377-379.

90. Hooker, R. S., Cipher, D. J., Cawley, J. F., Herrmann, D., & Melson, J. (2008). Emergency medicine services: interprofessional care trends. *Journal Of Interprofessional Care, 22*(2), 167-178.

91. Malone, R. E. (2003). Nurse staffing ratios: Progressive policy changes. *Journal of Emergency Nursing, 29*(2), 180-182.

92. Lipley, N. (2004). How many staff is enough? [Article]. *Emergency Nurse, 12*(7), 5-6.

93. Dalsey, W. C., & Binder, L. S. (1997). Workforce projection in emergency medicine: imperfections, but significant implications. *Academic Emergency Medicine, 4*(7), 648-650.

94. Sinreich, D., & Jabali, O. (2007). Staggered work shifts: a way to downsize and restructure an emergency department workforce yet maintain current operational performance. *Health Care Management Science, 10*(3), 293-308.

95. Williams, G., Souter, J., & Smith, C. (2010). The Queensland Emergency Nursing Workforce Tool: A prototype for informing and standardising nursing workforce projections. *Australasian Emergency Nursing Journal, 13*(3), 89-96.

96. Lyneham, J., Cloughessy, L., & Martin, V. (2008). Workloads in Australian emergency departments a descriptive study. *International Emergency Nursing, 16*(3), 200-206.

97. Crone, P. W., & Whitlock, M. R. (1993). The role of activity-related groups in assessing workload in the accident and emergency department. *Archives of Emergency Medicine, 10*(3), 212-215.

98. Weichenthal, L., & Hendey, G. W. (2011). The Effect of Mandatory Nurse Ratios on Patient Care in an Emergency Department. *The Journal of Emergency Medicine, 40*(1), 76-81.

99. Dubinsky, I. (2012). Emergency physician workload modeling. *Canadian Journal of Emergency Medicine, 14*(4), 212-217.

100. Ginde, A. A., Sullivan, A. F., & Camargo, C. A., Jr. (2009). National study of the emergency physician workforce, 2008. *Annals of Emergency Medicine, 54*(3), 349-359.

101. Guidelines for emergency department physician staffing. (1984). *Annals of Emergency Medicine, 13*(12), 1165-1166.

102. Unterman, S., Kessler, C., & Pitzele, H. Z. (2010). Staffing of the ED by non–emergency medicine-trained personnel: the VA experience. *The American Journal of Emergency Medicine, 28*(5), 622-625.

103. Armstrong, P. A. R., White, A. L., & Thakore, S. (2008). Senior house officers and foundation year doctors in emergency medicine: do they perform equally? A prospective observational study. *Emergency Medicine Journal, 25*(11), 725-727.

104. Morphet, J., Considine, J., & McKenna, L. (2011). Transition to specialty practice programs in emergency nursing – A review of the literature. *Australasian Emergency Nursing Journal, 14*(1), 45-49.

105. Astles, P. D. (1992). Selecting the "right" emergency department staffing group. *The NAHAM Management Journal, 18*(2), 4-5.

106. Aitken, L.H., Clarke, S.P., Sloane, D.M., Sochalski, J. & Silber, J.H. (2002). Hospital Nurse Staffing and Patient Mortality, Nurse Burnout and Job Dissatisfaction. *Journal of the American Medical Association, 288*(16), 1987

107. Needleman, J., Buershaus, P., Mattke, S. (2002). Nurse staffing levels and the quality of care in hospitals. *New England Journal of Medicine, 346*, 1715-1722.

108. Luria, J., Buncher, M. J., & Ruddy, R. M. (2011). Workforce and its impact on quality. *Clinical Pediatric Emergency Medicine, 12*(2), 151-160.

109. Emergency Physician Shift Work. (2010). *Annals of Emergency Medicine, 56*(4), 451.

110. Whyne, M., Whyne, G. & Rowe, B. (2007). Variations in monetary distribution among Ontario's Alternative Funding Agreement workload model hospitals. *Canadian Journal of Emergency Medicine, 9*(1), 21-25.

111. Carter, M. W., & Lapierre, S. D. (2001). Scheduling emergency room physicians. *Health care management science, 4*(4), 347-360.

112. Duffield, C., Roche, M., O'Brien-Pallis et al. Glueing it together: Nurse their work environment and patient safety. Final Report 2007. NSW Health. UTS Sydney.

113. Paul, J. A., & Lin, L. (2012). Models for Improving Patient Throughput and Waiting at Hospital Emergency Departments. *The Journal of Emergency Medicine, 43*(6), 1119-1126.

114. Dodd, S. (2011). Managing staff shifts through e-rostering. *Nursing Times, 107*: online issue. Available at http://www.nursingtimes.net/nursing-practice/clinical-zones/management/managing-shifts-through-e-rostering/5033458.article. Accessed 23/1/2014.

115. Taylor, C. J., Bull, F., Burdis, C., & Ferguson, D. G. (1997). Workload management in A&E: counting the uncountable and predicting the unpredictable. *Journal of Accident & Emergency Medicine, 14*(2), 88-91.

116. McConnell, K. J., Gray, D., & Lindrooth, R. C. (2007). The financing of hospital-based emergency departments. *Journal of Health Care Finance, 33*(4), 31-52.

117. Morganti, K. G, Bauhoff, S., Blanchard, J. C., et al. (2013). *The evolving role of emergency departments in the United States. RAND Health.* [Research Report]. Available at: http://www.rand.org/pubs/research_reports/RR280.html. Accessed 10/10/2013.

118. Collier, R. (2008). Activity-based funding: boon or boondoggle? *Canadian Medical Association Journal, 178*(11), 1407-1408.

119. Decker, M. C., & Debehnke, D. J. (2002). Mission-based budgeting hours model: An accurate way to understand physician costs. *Academic Emergency Medicine, 9*(3), 252-254.

120. Goodspeed, D. G. (1997). Benchmarking emergency medical services/trauma systems funding in the United States. *Best Practices And Benchmarking In Healthcare: A Practical Journal For Clinical And Management Application, 2*(2), 45-51.

121. Antioch, K. M., & Walsh, M. K. (2004). The risk-adjusted vision beyond casemix (DRG) funding in Australia. International lessons in high complexity and capitation. *The European Journal Of Health Economics, 5*(2), 95-109.

122. Activity based funding for Australian public hospitals: towards a pricing framework. (2012). *Queensland Nurse, 31*(2), 7-7.

123. Hennig-Schmidt, H., Selten, R., & Wiesen, D. (2011). How payment systems affect physicians' provision behaviour—An experimental investigation. *Journal of Health Economics, 30*(4), 637-646.

124. Don't rely on staffing ratios alone: Here are cutting-edge strategies to use. (2002). *ED Management, 14*(11), 121.

125. Corfield, A. R., & Cowan, G. M. (2011). Human factors and systems in emergency departments. *European Journal of Emergency Medicine, 18*(4), 183-185.

126. Courtney, L. R. (2004). Human resources: A common-sense discipline. *Emergency Medicine Clinics of North America, 22*(1), 153-165.

127. Davis, J., Kuhns, R., & Watson, D. J. (2004). Evaluating emergency medical service: Controlling the rising cost of saving lives. *Journal of Health & Human Services Administration, 26*(4), 485-513.

128. Davis, J. E. (1995). Nursing resources in accident and emergency departments. *Journal of Nursing Management, 3*(1), 11-18.

129. Drescher, M. J., Aharonson-Daniel, L., Savitsky, B., Leibman, J., & Peleg, K. (2007). A study of the workforce in Emergency Medicine in Israel: 2003. *The Journal Of Emergency Medicine, 33*(4), 433-437.

130. Edwards, C. J., Jasiak, K. D., & Hays, D. P. (2010). Applied pharmacology. Clinical pharmacists: coming soon to an emergency department near you! *Advanced Emergency Nursing Journal, 32*(2), 122-126.

131. Fertel, B. S., Hart, K. W., Lindsell, C. J., Ryan, R. J., & Lyons, M. S. (2012). Toward Understanding the Difference Between Using Patients or Encounters in the Accounting of Emergency Department Utilization. *Annals of Emergency Medicine, 60*(6), 693-698.

132. Griffiths, J. D., Knight, V. A., Nelson, A. V., Voake, C., & Williams, J. E. (2012). How efficient can an emergency unit be? A perfect world model. *Emergency Medicine Journal, 29*(12), 972-977.

133. Heslop, L. (2012). Status of costing hospital nursing work within Australian casemix activity-based funding policy. *International Journal of Nursing Practice, 18*(1), 2-6.

134. Higginson, I., & Guly, H. (2007). Payment by results: a guide for emergency physicians. *Emergency Medicine Journal, 24*(10), 710-715.

135. Holden, R. J. (2011). Lean Thinking in Emergency Departments: A Critical Review. *Annals of emergency medicine, 57*(3), 265-278.

136. Lowthain, J., Stoelwinder, J., McNeil, J; Cameron, P (2012). Is the increase in emergency short-stay admissions sustainable? Trends across Melbourne 2000-2009. *Emergency Medicine Australasia, 24*(6), 610-616.

137. Molyneux, E., & Robertson, A. (2002). Emergency medicine in differently resourced settings: What can we offer each other? *Emergency Medicine Journal, 19*(5), 378-379.

138. Moreno-Serra, R., & Wagstaff, A. (2010). System-wide impacts of hospital payment reforms: Evidence from Central and Eastern Europe and Central Asia. *Journal of Health Economics, 29*(4), 585-602.

139. Mountain, D. (2010). Introduction of a 4-hour rule in Western Australian Emergency Departments. *Emergency Medicine Australasia, 22*(5), 374-378.

140. Parle, J. V., Ross, N. M., & Doe, W. F. (2006). The medical care practitioner: developing a physician assistant equivalent for the United Kingdom. *The Medical Journal Of Australia, 185*(1), 13-17.

141. Perina, D. G., Brunett, C. P., Caro, D. A., Char, D. M., Chisholm, C. D., Counselman, F.L., Heidt, J., Keim, S., Ma, O. J. (2012). The 2011 Model of the Clinical Practice of Emergency Medicine. *Academic Emergency Medicine, 19*(7), e19-e40.

142. Roberge, D., Pineault, R., Larouche, D., & Poirier, L.-R. (2010). The continuing saga of emergency room overcrowding: are we aiming at the right target? *Healthcare Policy, 5*(3), 27-39.

143. Sacchetti, A., Harris, R. H., Warden, T., & Roth, S. (2002). Contribution of ED admissions to inpatient hospital revenue. *American Journal of Emergency Medicine, 20*(1), 30-31.

144. Sasson, C., Wiler, J. L., Haukoos, J. S., Sklar, D., Kellermann, A. L., Beck, D., . . . Magid, D. J. (2012). The Changing Landscape of America's Health Care System and the Value of Emergency Medicine. *Academic Emergency Medicine, 19*(10), 1204-1211.

145. Simonet, D. (2009). Cost reduction strategies for emergency services: insurance role, practice changes and patients accountability. *Health Care Analysis: HCA: Journal Of Health Philosophy And Policy, 17*(1), 1-19.

146. Solomon, S. & Sherbon, T. (2012). *National Efficient Price Determination 2012/13*. Canberra: Independent Hospital Pricing Authority.

147. Wargon, M., Casalino, E., & Guidet, B. (2010). From Model to Forecasting: A Multicenter Study in Emergency Departments. *Academic Emergency Medicine, 17*(9), 970-978.

148. Wiler, J. L., Beck, D., Asplin, B. R., Granovsky, M., Moorhead, J., Pilgrim, R., & Schuur, J. D. (2012). Episodes of Care: Is Emergency Medicine Ready? *Annals of Emergency Medicine, 59*(5), 351-357.

149. Zolnierek, C.D. & Steckel, C. M. (2010). Negotiating safety when staffing falls short. *Critical Care Nursing Clinics of North America*, *22*(2), 261-269.

150. No author. (2000). Beware: dual staffing is legal but risky. *ED Management, 12*(1), 3-4.

151. ACEP. (2010). Emergency physician shift work. Policy statement (American College of Emergency Physicians). *Annals of Emergency Medicine, 56*(4), 451.