Access block: A review of potential solutions

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Contents

Executive summary

The Australasian College for Emergency Medicine (ACEM) commissioned the Sax Institute to review published literature on solutions to access block applicable in Australia and Aotearoa New Zealand (NZ). The review covered English language literature and concentrated on publications that appeared during 2000–2021. The project principal received advice and briefings from selected experts in clinical emergency medicine and from health service managers with responsibility for acute care.

The nature of access block

Access block has been described in the literature since the 1990s and has become an intractable problem despite numerous initiatives having been devised to mitigate it. ACEM defines *access block* as 'the situation where patients who have been admitted and need a hospital bed are delayed from leaving the emergency department (ED) for more than eight hours…' The time period to which the definition refers is the patient's entire length of stay in the ED, not just the time after the decision is made to admit the patient. Access block only affects admitted patients, and is distinguished from ED overcrowding, which affects both admitted and non-admitted ED patients.

Although it is measured in and reported from EDs, access block is not primarily an ED problem – it is a health system problem, with two main proximal drivers. The first is hospital overcapacity, with a mismatch of bed numbers to population needs – access block would cease to be a problem if hospital bed occupancy were reduced to about 85% from currently prevalent occupancy levels of 95-105%. The second is a widespread lack of integration across the interfaces between EDs and inpatient services, and between inpatient services and other clinical services across the health system. Effective and sustainable solutions to access block mainly involve change outside the ED – across the whole hospital, as well as more broadly across the health system.

Solutions to access block

Evidence from the literature suggests that four types of solutions are likely to be effective in reducing or preventing access block. They comprise:

1. Interventions to achieve reductions hospital bed occupancy, by increasing hospital inpatient bed capacity and freeing of inpatient beds. Many measures designed to free inpatient beds have been implemented across Australian and Aotearoa NZ health services.
2. The establishment of short-stay units, acute medical units and acute surgical units, where patients admitted via an ED can be accommodated, typically for up to 24 hours but sometimes longer, while receiving appropriate multidisciplinary specialist management prior to discharge or transfer to a subspecialty inpatient service.

3. Interventions to expedite patients' transition through the ED/inpatient service interface. Decisions as to the subspecialty inpatient service that is to accept an admitted patient are often complex and can only be resolved by negotiations between ED staff and inpatient teams or between different inpatient teams. This results in delays and can create significant tension. The interventions include recognition of the different imperatives of ED staff and inpatient teams, processes to promote mutual understanding and respect, and leadership that promotes communication and a favourable working environment which is not dominated by power differentials among healthcare professionals.
4. The maintenance of health system-wide time targets for admitted and non-admitted patients' transit through EDs, applied with sufficient flexibility to assure patient safety. The achievement of these targets depends on system and process changes which individually may not affect access block but are effective as combinations of initiatives within a performance-driven ethos.

Potential solutions that do not reduce access block

Evidence from the literature also identifies several interventions that have potential to reduce access block but do not appear to be effective. These interventions may have other benefits such as reducing ED overcrowding, improving the quality of acute care, increasing patient satisfaction with ED services, and increasing staff satisfaction. They include 'pre-ED' interventions that can divert many ED presentations to other sources of prompt health care in the community, and 'within-ED' interventions such as modifications to triaging and streaming arrangements, modifications to the roles and responsibilities of ED staff, process improvement programs, and enlarging the capacity of EDs.

Possible future contribution of virtual health care

Virtual health care systems are on the rise. While virtual care systems provide the potential for improved access to health care, their place in urgent or emergency services is unclear. Pending the evaluation of specific virtual models of care, strategies for the management of patient flow in and out of EDs and the management of access block could be designed to accommodate those new models of care that are shown to be effective.

Quality of published literature on access block

The published literature that refers to access block is extensive. Most of the earlier literature emanated from EDs, as emergency physicians recognised the problem before others. Descriptions and evaluations of interventions continue to be published, but many of the ideas that they cover are not new, and a substantial proportion of the articles reviewed here are at least 10 years old. The published research on access block mainly comprises observational studies with comparisons of a range of parameters (or outcomes) before and after interventions. Recently whole-of-system research reports on access block have proliferated, with studies more frequently led by researchers other than emergency physicians.

A major difficulty in synthesising the literature is the researchers' use of outcome variables that are not always precisely defined and that do not necessarily reflect outcomes of practical importance. An increasing number of articles labelled as systematic reviews are being published, but these are often narrative reviews bringing together loosely related interventions; many are not true systematic reviews. This review has included some qualitative studies, and while these are invariably based in a single institution and reflect the input of small numbers of EDs and hospital staff, they provide great insight into the dynamics of hospital services at a detailed level.

Over the last 15 years, the literature on patient flows through EDs and access block has increasingly made use of modelling studies. Dynamic modelling can make a major contribution to the design of acute care systems, and the outputs of dynamic modelling are often more useful than those of hypothesis-based observational studies.

Most of the pre- and post-intervention quantitative studies evaluate combinations of interventions rather than single interventions. On a pragmatic level this is useful because organisational and system change in complex environments like hospitals rarely allows singular initiatives to occur. The downside is that it is often difficult to determine the extent of benefit or change that can be attributed to a particular initiative; an understanding of this attributability is important in determining whether an intervention is scalable or can be transferred to other settings.

Recommendations

The findings from this literature review suggest four recommendations:

Recommendation 1 – Solutions to reduce access block

ACEM should advocate for:

1a) Increases in hospital inpatient bed capacity and measures to achieve freeing of hospital inpatient beds, with a health system wide initial target of 90% occupancy, aiming for 85%
1b) The establishment and/or maintenance of short-stay units, acute medical units and acute surgical units, with adequate staff and funding, and with governance arrangements that assure their appropriate utilisation
1c) Interventions to expedite patients' transition through the ED / inpatient service interface
1d) The maintenance of health system-wide time targets for admitted and non-admitted patients' transit through EDs, applied with sufficient flexibility to assure patient safety.

Recommendation 2 – Improve integration across the ED / inpatient service interface

ACEM should:

2a) Draw attention to the importance of recognition by ED staff, inpatient service teams and hospital managers that ED and inpatient staff have different imperatives and requirements in delivering safe, high-quality patient care

2b) Seek advice from organisational anthropologists and/or psychologists on methods to develop effective, efficient and sustainable mechanisms for transfer of patient care across the interface, including strengthening communication and relationships across the different groups
2c) Promulgate this advice to health services and relevant professional groups.

(See also Recommendation 3b)

Recommendation 3 – Monitoring and research

ACEM should encourage and/or support:

3a) Specification of indicators to enable health services to collect reliable data on the occurrence of access block at institutional, health service levels, so that access block can be monitored and researched
3b) Conduct of qualitative research that can guide a strengthening of communication and positive relationships between ED staff and inpatient teams
3c) Conduct of dynamic modelling studies to simulate and evaluate changes in hospital performance that have the potential to reduce access block.

Recommendation 4 – Readiness for virtual care services

ACEM should:

4a) Monitor the development of opportunities to improve acute health care through the use of virtual care systems
4b) Advocate for, and undertake, research on the potential effect of virtual care on access block, patient experience and patient outcomes.

1 Introduction: The meaning of ‘access block’ and related terms

The Australasian College for Emergency Medicine (ACEM) commissioned the Sax Institute to review published literature on solutions to access block. The terms of reference of the review are given in Appendix A. This report presents the findings.

ACEM defines ‘access block’ (ACEM, 2021a) as:

> …the situation where patients who have been admitted and need a hospital bed are delayed from leaving the emergency department (ED) for more than eight hours because of a lack of inpatient bed capacity. This includes patients who were planned for an admission but were discharged from the ED without reaching an inpatient bed, or transferred to another hospital for admission, or who died in the ED.

The time period to which the definition refers is the patient’s entire length of stay in the ED, not just the time after the decision is made to admit the patient. The ‘ED length of stay’ (EDLOS) is the time from arrival at the ED to departure, and the term may refer to patients who are treated and discharged or admitted.

Access block only affects admitted patients. ACEM defines an ‘admission’ as follows (ACEM, 2020):

> An admission occurs when a medical decision for the need for inpatient care is made by an appropriately qualified decision maker, a patient is accepted by a hospital inpatient specialty service for ongoing management, and the patient is administratively admitted to the hospital. The decision to admit a patient may be made by a referring specialist prior to the patient’s arrival to the ED, the emergency physician, by an inpatient service, or mutually agreed by some or all of these medical providers.

Inpatient wards are invariably full to capacity, overcapacity, or almost full, and both EDs and inpatient services have a relentlessly high workload. In 2020–21, 29% of all ED presentations were admitted to the hospital where they presented (AIHW, 2022). Access block is common – an ED census conducted in September 2020 showed that, on average, two-thirds of ED patients awaiting admission experienced access block (ACEM 2021b; Richardson, 2021).

Access block is associated with an increased risk of poor outcomes. If more than 10% of patients awaiting admission in an ED experience access block, new patients presenting to that ED have a 10% increase in the risk of death within seven days of admission (Jones and van der Werf, 2020). Access block is described as ‘the single most serious issue facing emergency departments’. Reducing access block is therefore a policy priority for ACEM (ACEM, 2021b) and the health system more broadly. In addition to the increased risk of mortality, access block is associated with increased morbidity and prolongation of hospital admissions (Richardson and Mountain, 2009).

Access block must be distinguished from ED overcrowding. ACEM defines ‘overcrowding’ as ‘the situation where ED function is impeded because the number of patients exceeds ...the physical and/or staffing capacity of the ED’ (ACEM, 2021a). It includes patients undergoing triage, waiting to be seen, undergoing assessment and treatment, or waiting for departure from the ED. ‘Departure’ can mean transfer from the ED into a ward bed or specialist service (e.g. intensive care unit or coronary

intervention unit) in the same hospital, discharge from the ED to home, or transfer to another institution. ‘Departure’ may also refer to patients leaving the ED before being seen, assessed or treated by ED staff, and to patients who die within the ED. Access block contributes to overcrowding, and is described as ‘the principal factor responsible for ED overcrowding’ (ACEM, 2021b), but the terms refer to different problems. Solutions to access block may ease some aspects of overcrowding, but most solutions to overcrowding do not affect access block.

The term ‘access block’ is widely used in Australia, Aotearoa New Zealand (NZ), and the United Kingdom. In many other parts of the world, notably the United States of America, the terms ‘boarding’ and ‘ED boarding’ are used, and they have the same meaning as access block. ‘Bed block’ and ‘admission hold’ or ‘admission hold length of stay’ are also sometimes used as a synonyms for access block.

The importance of preventing and managing access block is highlighted by the increasing demand for ED services. From censuses conducted in June and September 2017 and 2019, the numbers of presentations to Australian EDs increased by 11.4% in June and 5.3% in September, the June figure being affected by the incidence of influenza. The numbers of admissions through EDs to inpatient wards rose by 3.3% (June) and 11.1% (September), and the proportion experiencing access block rose by 46.1% (June) and 26.0% (September) (Richardson, 2021). More recent data, i.e. data from 2020 and 2021, are atypical in that they are affected by community and health service responses to the COVID-19 pandemic.

2 Scope and methods of the review

This report presents the findings of a desktop review of published English-language literature, including grey literature (e.g. government or institutional reports in the public domain), on solutions to access block. The desktop review was supplemented by limited consultation with ACEM staff and office-bearers, and Fellows of ACEM and others whom they nominated.

The structure of the literature search, including the databases and search terms used, is summarised in Appendix B. A large proportion of the articles cited here were identified by secondary searching of reference lists of the papers selected from the primary database search. The project team read the abstracts of 1,190 articles identified in the search and selected those that dealt with solutions to access block proposed and/or implemented and/or evaluated in Australia, Aotearoa NZ, the UK, the USA, Canada, Singapore, South Korea, Taiwan and South America.

The following information was sought:

- What solutions (interventions, initiatives or programs) were proposed or described?
- For what settings were they proposed or described, and how were these settings relevant to the Australian and/or Aotearoa NZ health system?
- Was sufficient detail provided to assess their feasibility, and if so, were they potentially feasible to consider adopting in Australia or Aotearoa NZ?
- Were some or all of the interventions piloted or implemented?
- Were some or all of the interventions (and/or their implementation) audited or evaluated? If so, were they found to be effective? What was the strength of the evidence from these studies?
- Were any cost estimates provided? If so, what were the cost implications?
- To what extent were the interventions scalable or transferrable to other settings, and what was the evidence for this? What key features of interventions might facilitate or inhibit scalability or transfer?

The individuals who were consulted in the course of the project are listed in Appendix C.

Following from this review and the input from the consultations, information on potential solutions to access block was synthesised and analysed.

The project concentrated on potential solutions to access block only. It did not seek to cover factors associated with ED overcrowding that were not related to access block, but some studies which only measured EDLOS tended to conflate access block with other causes of overcrowding. The scope of the project encompassed access block in general hospitals, and did not examine specific issues relating to paediatrics, obstetrics, psychiatry, or other specialties.

The health services in Australia and Aotearoa NZ to which this report refers are public-sector services. No publications referring specifically to private-sector ED services in Australia and Aotearoa NZ were found. Few EDs exist in the private sector in Australia and, as far as could be determined, none exists in Aotearoa NZ. However, system-wide ED data from Australia include presentations to both public- and private-sector hospitals. International publications cover both the public and the private sectors, and do not distinguish between them.

This report assumes that the reader has a general understanding of and familiarity with the design and operations of Australian and Aotearoa-NZ EDs and hospital services, which it does not attempt to describe.

3 Access block is a health system problem

Access block is not primarily an ED problem – it is a health system problem – and requires whole-of-hospital solutions

Access block is not primarily an ED problem. However, because it is measured and monitored in EDs and reported from EDs, it tends to be linked to EDs. As the literature discussed in this report affirms, access block is a health system problem, and effective and sustainable solutions to access block are mostly whole-of-hospital solutions – they mostly apply outside EDs. Access block is due to two major factors:

1. Most hospitals are overcapacity (Cameron et al, 2009), with a mismatch of bed numbers to population needs
2. There is a widespread lack of integration across the interfaces between EDs and inpatient services, and between inpatient services and other clinical services across the health system (Paul et al, 2010).

Many potential solutions have been proposed to reduce access block. They can be described under four headings:

- Interventions that apply before patients arrive in ED (the 'pre-ED' or 'input' phase)
- Interventions that apply while the patient is in the ED (the 'within-ED' or 'throughput' phase)
- Interventions that apply when or after patients move from the ED to other services in the hospital, or after discharge (the 'post-ED' or 'output' phase)
- Wider health service and health system interventions.

The literature of the last 20–25 years contains thousands of reports on interventions to improve the organisation of EDs and the delivery of ED-based services, focusing mainly on the 'pre-ED' and 'within-ED' phases. Yet it has been recognised for decades that EDs are part of a complex system, interconnected with multiple other components of the system, and that viable solutions to access block involve these interconnected components (Lane et al, 2000).

Hospital overcapacity is the main proximal driver of access block

Inpatients in Australian and Aotearoa NZ quaternary, tertiary and regional general hospitals are admitted through one of two streams. The first comprises people with acute health problems who enter through EDs. The second stream comprises patients admitted electively or semi-electively for planned investigations and/or treatments and/or procedures. As the American College of Emergency Physicians has reported (Augustine, 2019):

> Every day, emergency physicians in US emergency departments manage about 411,000 patients and decide that 74,000 would benefit from inpatient services. Those 74,000 patients represent about 70% of the 106,000 patients admitted to hospitals each day.

Because most Australian general hospitals operate at or near full capacity, the acute/ED stream and the elective/semi-elective stream tend to compete for inpatient beds and services. Management of the demand for inpatient beds is complicated by the internal flow of inpatients among the different units within a hospital – intensive care units, high-dependency ward units and standard ward units. Demand management is further complicated by the fact that all or a large proportion of the wards in many hospitals are, at least nominally, devoted to specialist services. The teams that manage patients in any given ward are often acculturated to protect the beds nominally allocated to them, and they can be reluctant to make beds available for patients who do not have a condition within their specialty.

While in principle the elective/semi-elective stream is separate from the acute/ED stream, the former may spill over into EDs, especially when a hospital is overcapacity and regular non-ED sources of care are overloaded. For example, if a patient seen by a specialist gastroenterologist in private practice is found to need endoscopy soon but not urgently, the patient does not have private insurance, and endoscopy lists are full, the patient may be advised to go to the ED instead of waiting for a planned endoscopy admission. Equivalently, if a general practitioner finds that a patient has abnormal renal function and the waiting list for the renal outpatient clinic is so long as to unduly delay specialist assessment and management, the patient may again be referred to the ED. This results in ED staff having to manage elective or semi-elective presentations, inpatient teams not receiving primary referrals for admissions or interacting with GPs, and the ED becoming the primary route of admission for an overcapacity hospital.

The numbers of patients admitted electively can be adjusted according to the availability of beds, operating room availability, and staff levels, but the need for beds to accommodate admissions via the ED fluctuates unpredictably. ED admissions are influenced by a wide range of external factors, and are rarely amenable to clinical or managerial control. The bottleneck created by the combination of the elective and ED patients flowing into a full hospital is the main proximal cause of access block (Winasti et al, 2018). Underlying this is a mismatch of the number of hospital beds to the size of the population, leading to high bed occupancy levels.

The association between high bed occupancy rates and access block and other indicators of safe and effective hospital function have been recognised for many years (Keegan, 2010). In 2020, the COVID-19 pandemic enabled a ‘natural experiment’ as it led to a reduction in ED presentations and efforts to increase bed capacity by measures such as cancelling elective surgery, resulting in a decrease in bed occupancy. A subsequent time series analysis in a single-centre Australian study showed that the main determinants of access block (and ED overcrowding) indeed were reductions in hospital occupancy and elective surgery, rather than volume of ED presentations or ambulance presentations (Bein et al, 2021). Possible ways a of managing the implications of this are discussed further in section 4.2 below.

Integration across health system and hospital interfaces is hard to achieve

Hospital inpatient services have numerous interfaces with other elements of the health system and with the communities that they serve. In the last few decades, much has been done to improve the quality of care and efficiency in *individual* clinical service units (EDs, inpatient units, and community-based health services), but achieving seamless connections *between* them is difficult because they invariably have different imperatives, different modes of operation, different organisational structures, and different professional cultures. They may also be funded from unrelated budgets.

Mitigation of these differences would require changes in the way things are done and the way people think. A well-integrated health service might be expected to have many characteristics that do not exist at present, such as uniformly high levels of health literacy and service awareness in the community, comprehensive transfer of clinical data across sectors, consistently clear communication among health service units, between health professionals, and between health professionals and patients, and an availability of human and infrastructural resources that closely follows changes in populations, disease trends and technologies. It would also require a consistent patient-centredness and generosity of spirit among health professionals that is hard to achieve in an overloaded and often tense working environment.

The interfaces that are most relevant to access block are between EDs and inpatient units, and between inpatient units and the community (or other healthcare facilities) following discharge. Both the ED/inpatient service interface and the inpatient/post-hospital interface can be distorted by performance and financial incentives that can have unintended consequences.

EDs and inpatient units have different imperatives

EDs represent the crossroads of the health system – the point at which people with undifferentiated illness and injury in the community, at all levels of severity, interact with hospital-based services. EDs are expected to manage a uniquely heterogeneous range of patients, ranging from those seeking primary care (perhaps unable to find it elsewhere when they need it) to those needing advanced life support. EDs are the only place in the health system where this happens. In contrast, inpatient services generally manage patients who arrive in hospital wards and specialist units with at least partially differentiated conditions. In this context, ‘undifferentiated’ refers to a patient who presents with a problem or symptoms, but the patient’s condition and/or the acuity and severity of the condition are unknown – the patient might or might not turn out to be ‘very sick’, or might or might not have a life-threatening condition.

The contrasting roles and sources of ED and inpatient services are summarised in Table 1.

Table 1: Roles of emergency departments and inpatient services

Role of emergency department services	Role of inpatient services
• Triage and assess undifferentiated patients rapidly • Provide acute resuscitation, stabilisation, diagnosis and initial management for patients with acute life threatening conditions • Identify and provide initial investigations and management for those who need hospital admission (including for urgent specialist interventions) • Provide immediate diagnostic and management services for the larger number of individuals who have less serious illnesses and injuries and do not need to be admitted.	• Provide the subsequent stages of detailed assessment, definitive diagnosis and management for patients admitted and at least partially differentiated in the ED • Deliver planned treatments and procedures for patients admitted electively • Formulate ongoing management plans, including for rehabilitation, discharge and follow-up.
Source of ED patients – undifferentiated*	**Source of inpatients – differentiated***
• Self-referral or referral from community-based clinical services, e.g. primary care • Ambulance and retrieval services • 'Walk-in' or brought in from the community.	• Referral, usually by community- or clinic-based medical or surgical specialists • ED.

*Differentiated or partially differentiated patients are sometimes referred to EDs if hospitals are overcapacity and regular routes of entry are congested, as explained in the text above.

The imperative for ED staff is to manage all patients arriving at the front door, with clinical problems that might range from immediately life-threatening conditions requiring complex resuscitation and stabilisation, to acute mental health conditions, to minor injuries and illnesses. At least some of those with minor injuries and illnesses could have chosen to attend a community-based primary care service instead, if it were accessible, affordable, and resourced to provide the care that they need, but this is often not the case, especially after-hours. The ED is an unpredictable environment with the pressure of a constant readiness for urgent response. ED staff must have up-to-date critical care skills, the ability to form resuscitation teams, and the ability to manage unstable, undifferentiated patients at any time.

The imperative for staff of inpatient services is less dramatically variable but more comprehensive. They have to ensure that all admitted patients receive the most appropriate medical, surgical and/or psychiatric treatment, and are prepared for the transition to their next destination (their own homes or nursing homes, or other healthcare facilities such as rehabilitation centres or hospices).

The workload is invariably intense in both settings. Both demand constant management of competing priorities, and both are stressful in many ways. While in theory ED staff understand the business of

inpatient services and vice versa, in practice neither group experiences the work demands and pressures placed on the other. Neither the general community nor patients nor inpatient teams always recognise that the regular business of an ED must stop when a critical event occurs, such as the arrival of a patient needing resuscitation. The unique resuscitation skills of ED staff are potentially diverted if a large proportion of their time is spent on the management of differentiated patients waiting for inpatient beds. Conversely, the pressures on inpatient teams to provide efficient comprehensive management for large numbers of complex inpatients with rapid turnover – particularly inpatient teams that have to juggle ward tasks with procedure lists – are also under-recognised. Yet a mutual appreciation of these demands and the development of sustained positive relationships between ED staff and inpatient teams are essential to address the system-wide issues that underlie access block (Paul et al, 2010).

4 Access block: Solutions that work

4.1 Overview

Access block is caused by impedance to the flow of patients admitted to a hospital via the ED. It exists because the number of admitted patients at a given time exceeds capacity to accommodate them in hospital wards and specialist units, or because of other delays in the movement of patients from EDs to wards. It is a problem of patient flow. Interventions that are based in the ED (such as improving efficiency within the ED) do not affect inpatient capacity, so they do not have much effect on access block. Such interventions can reduce overcrowding by decreasing the length of stay in the ED of patients who do not need admission. Various interventions also have the potential to reduce overcrowding by decreasing the numbers of patients presenting to the ED in the first place, but most of the patients who are diverted away from EDs (or themselves decide not to go to the ED) are unlikely to need admission anyway, so there is little or no net effect on the admission load.

The interventions that can reduce access block are of four broad types:

1. Increasing the inpatient bed capacity in hospitals across the health system, and initiatives to free inpatient beds (section 4.2)
2. Diverting patients with acute medical or surgical conditions to acute care units separate from mainstream inpatient services (4.3)
3. Initiatives to minimise delays in assessing and processing ED patients who are to be admitted (4.4)
4. The imposition of time targets for patients' transit through EDs (4.5).

These four types of interventions are often undertaken in various combinations and often overlap.

4.2 Increasing inpatient bed capacity or freeing beds

As noted above, most Australian and Aotearoa NZ acute general hospitals operate with at least 95% of beds occupied. Early modelling suggested that access block is unlikely to occur if occupancy is 85% or less (Bagust et al, 1999), but subsequent modelling based on 23 Queensland hospitals suggested that the figure might be of the order of 90% in modern hospital systems (Khanna et al, 2012).

Reducing access block requires increasing inpatient bed capacity and/or freeing of inpatient beds. Beds can be freed by admitting fewer people, decreasing their length of stay as inpatients, and (overlapping with this) speeding up discharge processes. Reducing elective admissions, most of which are for elective surgery, would also free beds, but this would not be acceptable as a solution except in a crisis such as the COVID-19 pandemic. The effects of the pandemic crisis were large: on average, Australian EDs had 31.6% less access block in June 2020 (during the first pandemic wave) than June 2019 (Richardson, 2021). In health systems elsewhere, other mechanisms result in a reduced occupancy of inpatient beds. For example, in the Netherlands, nursing home patients have

access to sophisticated health care in their residential facilities, and this can obviate the need for transfer to an acute hospital if they become unwell (Orendi, 2008). Length of stay for many ED and elective admissions could also be reduced if rehabilitation and other support services that they currently receive in hospital could be delivered out of hospital.

Lower occupancy can potentially also be achieved by identifying and managing 'avoidable' admissions through the ED. Decision-making regarding patient disposition is discussed in sections 4.4 and 5.2. Contemporary decision-making for hospital admission is stringent and disciplined, and it seems unlikely that many potentially avoidable ED admissions really are avoidable when all the factors influencing the decision to admit are taken into account – especially on a scale sufficient to affect access block. (In this context, avoidable ED admissions should be distinguished from admissions that might be preventable by, for example, improved primary care that reduces the likelihood of acute exacerbations of chronic conditions.)

Hospitals may invoke 'over-capacity protocols' when their inpatient capacity is full and their EDs are extremely overcrowded. In an over-capacity protocol, at least one admitted patient in the ED will be transferred to each inpatient ward in the hospital, thereby spreading the workload across the hospital. The most stable admitted patients are chosen to be placed in inpatient ward locations. If inpatient wards have no free beds, the extra patients are accommodated wherever possible in ward areas. By their nature, over-capacity protocols can reduce access block, but their effects on other dimensions of overcrowding are equivocal, as shown in evaluations from Alberta, Canada, The Canberra Hospital, and Liverpool Hospital in Sydney (Richardson & Hall, 2013; Holdgate et al, 2013; Richardson et al, 2017). Over-capacity protocols – also known as 'over-census protocols' or 'full-capacity protocols' – are usually triggered in response to specific criteria of overload. For example, in The Canberra Hospital, the over-capacity protocol was triggered if criteria of overcrowding were met, and at least 10 admitted ED patients were waiting for a bed, with at least three from the same hospital division (Richardson & Hall, 2013).

A potentially sustainable approach to reducing access block is to reduce the time taken for inpatient discharge processes so that patients who are ready for discharge can vacate ward beds with minimal delays. An intervention that has been widely evaluated, mostly through decision analytical methods, is to change the time of discharge. By means of discrete event simulation modelling using retrospective data from a single Australian quaternary hospital (the Royal Adelaide Hospital), it was found that completing 80% of a day's discharges by 11am would reduce inpatient bed waiting times by 25%. A similar effect could be achieved by concentrating discharges between 10am and 2pm (Khanna et al, 2016). A modelling study based on cross-sectional data from an academic tertiary hospital in the USA showed that shifting peak inpatient discharge time four hours earlier eliminated access block (Powell et al, 2012). Achieving timely discharge will, in many hospitals, require some change in hospital management processes, including discharge planning, identification during the previous day of patients ready to leave the next morning, preparing discharge medications, prescriptions and summaries, and informing family members (Hostetter and Klein, 2020). This requires hospital system changes, but usually does not require changes in ED activity.

Hospital system changes to improve the efficiency of discharge processes include the establishment of 'discharge lounges', which help with vacating inpatient beds expeditiously on the day of discharge. Instead of occupying ward beds while discharge orders are executed (which can take several hours), patients are moved to the discharge lounge to await finalisation of discharge arrangements and transport. Selection criteria for patients to go to a discharge lounge typically include being medically stable, mentally intact, and independent in activities of daily living, not requiring end-stage palliative care, and not requiring oxygen. The availability and organisation of discharge lounges varies. A 2020

review reported that at least 31% of hospitals in the United Kingdom used discharge lounges, while the figure was 7% in a 42-hospital collaborative in the USA. Australian and Aotearoa NZ data do not appear to be available. Reported outcomes from studies elsewhere in the world include reductions in time required to vacate a ward bed and reductions in access block (Franklin et al, 2020). The reductions in time to vacate beds seem relatively small (of the order of one hour), but one hospital in New York State reported that over a four-month period following the introduction of a discharge lounge, the average proportion of patients staying in the ED for over six hours decreased from 25% to 16% (Hernandez et al, 2014).

For initiatives like setting up discharge lounges to succeed, a consistent commitment is needed to sustain them. A discharge lounge requires fitted-out space, needs to be supervised by a registered nurse, and relies on a daily effort to select eligible patients. When a hospital is under pressure (such as with the need to manage COVID-19, or during a winter surge in respiratory disease), the discharge lounge resources are likely to be redeployed. A facility that is only available sometimes, possibly unpredictably, and particularly when hospitals are overloaded, will not be a useful contributor to the prevention of access block.

A further mechanism to lower hospital occupancy is to increase the availability of supported accommodation for patients who are discharged but are unable to care for themselves and do not have access to help from family, friends or institutions. This gap, which is outside the hospital system, may seem to be a remote from the management of access block, and it illustrates the extent to which health system changes well outside EDs are needed to ease the bottleneck in the flow of patients admitted through EDs.

4.3 Using short-stay units and acute medical or surgical units

Since the late 1990s, many EDs and hospitals throughout the world have established short-stay and acute medical and surgical units. These units have a range of different structures, functions, and a confusing array of different names.

Short-stay units

The term *short-stay unit* (SSU or EDSSU) is usually applied to a defined zone in an ED, with an allocated number of beds, that is used to accommodate patients who need to be investigated and/or observed and/or treated for a relatively short period of time, and who can then be discharged directly. The standard duration of SSU care in Australia and Aotearoa NZ is up to 24 hours, but in some EDs, SSUs are used to accommodate patients whose expected length of stay is up to 72 hours (Galipeau et al, 2015). Patients whose hospital stay is solely in an SSU may or may not be formally admitted, with reference to the definition of ‘admission’ cited in section 1. SSUs are usually staffed by emergency medicine specialists or specifically rostered registrars, with support from other middle and junior grade doctors. Nursing care in SSUs is usually provided by trained ED nurses who rotate between the ED and the SSU. The term ‘observation unit’ is sometime used as a synonym for SSU.

The outcome variables in evaluations of SSUs include both condition-specific variables and non-condition-specific variables. Non-condition-specific outcomes listed by Galipeau et al (2015) in their systematic review included death, length of stay, hospital readmission, and patient-reported outcomes. The question motivating evaluations of SSUs is whether they are effective and safe as

alternatives to full inpatient admission. The broad conclusion is that sufficient evidence exists to warrant their implementation (Konyyu et al, 2012).

In studies focusing on condition-specific outcomes, the intervention that has mostly been evaluated consists of a mixture of initiatives, i.e. SSU accommodation combined with one or more other changes in ED service delivery. These studies do not estimate the singular contribution of the SSU itself. For example, Miller et al (2013) reported on a single-centre trial of intermediate-risk patients with acute chest pain who were randomised to an SSU and underwent stress cardiac magnetic resonance (CMR) imaging, versus usual inpatient care by cardiologists. The SSU/stress CMR combination was associated with reductions in the numbers of patients subjected to coronary revascularisation, the numbers of readmissions, the occurrence of acute coronary syndromes within 90 days of hospital discharge, length of stay, and mortality. It did not clearly affect ED length of stay or the occurrence of access block.

Acute medical and surgical units

The purpose of acute medical units (AMUs) is to provide immediate care for medical patients who are admitted via EDs, and who do not have a clear need to be in a critical care unit (e.g. a coronary care unit or an intensive care unit).

The Royal College of Physicians (Acute Medicine Task Force, 2007) defined 'acute medical unit' as:

> A dedicated facility within a hospital that acts as the focus for acute medical care for patients who have presented as medical emergencies…

Scott et al (2009) (after Bell et al, 2008) described acute medical units as:

> Designated hospital wards specifically staffed and equipped to receive medical inpatient [sic] presenting with acute medical illness from emergency departments and/or the community for expedited multidisciplinary and medical specialist assessment, care and treatment for up to a designated period (typically between 24 and 72 h) prior to discharge or transfer to medical wards. These units are supervised by consultants with an interest in acute general medicine, feature multidisciplinary teams that comprehensively assess and manage both medical illness and functional disability, and, in many instances, are geographically co-located with emergency departments and key diagnostic services such as pathology and radiology.

AMUs can be quite large – published descriptions refer to units with up to 80 beds. They have proliferated in many parts of the world since the early 2000s, including in Australia (e.g. Li et al, 2010), Aotearoa NZ (Providence et al, 2010), the Netherlands (van Galen et al, 2017), Denmark (Vork et al, 2011), the United Kingdom (e.g. Reid et al, 2018), the USA (e.g. Kelen et al, 2001), Hong Kong (Lo et al, 2008), Singapore (Goh et al, 2018) and South Korea (Ohn et al, 2017).

Many variations from the description above are evident in different parts of the world. A key feature of AMUs is that their patients – particularly patients who have not been ascribed to specialty-oriented diagnoses – are cared for by consultant-level doctors in multidisciplinary teams. However, the consultants' backgrounds and training differ among health systems. In Australian AMUs, the overseeing medical attendants are usually specialists other than emergency physicians. The equivalent role in the UK is filled by general physicians who have completed acute medicine training (Jenkins et al, 2010; Jones, 2016). In Aotearoa NZ, general physicians with varying subspecialty interests and some with declared specific interests in acute medicine provide acute care in AMUs, but emergency medicine specialists are not involved (Providence et al, 2010). In South Korea's first AMU,

opened in 2015, hospitalists oversee the service. They are described as ‘internists with subspecialty interests’ (Ohn et al, 2017).

In most health systems, patients who have clearly differentiated conditions are referred to subspecialty physicians. They usually bypass AMUs and are admitted directly into specialty wards. The nature of the specialists involved in the admission pathway and the nature of their involvement has an important influence on access block and is discussed further in section 4.4.

In most parts of the world, AMUs are identifiable ward spaces which may or may not be located in close proximity to EDs. However, this is not the case in all health systems. In some places, the number of patients needing to be placed in an AMU exceeds the number of available AMU beds, and the overflow is sometimes distributed across the hospital. Reid et al (2018) note that in Scottish hospitals, AMU services are not necessarily confined to discrete spaces, and the preference is to describe them as ‘acute medical services’.

The heterogeneity of arrangements for AMUs is unrelated to the many synonyms for them. These include medical acute care unit (MACU), medical assessment and planning unit (MAPU), medical decision unit (MDU), medical assessment unit (MAU), acute assessment unit (AAU), emergency medical ward (EMW), and emergency assessment unit (EAU).

It is difficult to draw definite conclusions from the results of studies of the effects of AMUs on access block. Almost all of the studies are observational, with before/after cross-sectional data collections, and adequate control for confounding effects of population changes and other intercurrent phenomena is not usually possible. As described above, AMUs are themselves heterogeneous and, in addition, the interventions which these studies evaluate are invariably blended. The introduction of an AMU in a hospital is invariably and inevitably associated with other changes that are highly likely to affect ED layout, staffing, and organisational culture, and hence patient flow through the ED and the rest of the hospital.

Nevertheless, the results of the studies show consistent trends indicating that AMUs are associated with decreased hospital and ED lengths of stay. Studies that include relevant outcomes consistently show reductions in access block. For example, in St James’s Hospital in Dublin, Ireland, the introduction of an AMU was associated with a 30% reduction in the number of emergency patients awaiting admission, and the median number of patients in ED awaiting beds at 07.00 am reduced from 14 to two (Moloney et al, 2005), while there was a relative reduction of more than 44% in the rate of all-causes inpatient mortality (Rooney et al, 2008). In the Flinders Medical Centre, Adelaide, the proportion of admitted patients waiting in the ED for more than eight hours decreased from 28.7% to 17.9%, and for more than 12 hours, from 20.2% to 10.4%. The rates of unplanned readmissions within seven days and 28 days did not change, and the rate of all-causes hospital mortality dropped slightly but not significantly (Li et al, 2010).

ED-based intensive care units (ICUs) have emerged in the US as a means of reducing access block (boarding) affecting critically ill patients. A review of US literature found that access block among the critically ill occurred frequently, but attempts to quantify it were limited by variations in definitions and facilities, leading to a wide range of incidence estimates (2% to 88% of ICU admissions). ED-based ICUs are, in essence, a variant of AMUs, although unsurprisingly they are smaller than most AMUs. The Massey Emergency Critical Care Center (University of Michigan), for example, has five resuscitation bays and nine beds. The ED-based ICUs are staffed by emergency medicine board-certified physicians, some of whom are also trained to critical care fellowship level, and by nurses with ED and/or critical care training and experience (Mohr et al, 2020).

It is likely that AMUs do and will continue to contribute as part of a solution to access block. In recognition of this, the NSW Agency for Clinical Innovation has reviewed AMUs, using the term 'medical assessment units' (MAUs) (ACI Acute Care Taskforce, 2013), and has supported them with a MAU model of care (ACI Acute Care Taskforce, 2014) and a MAU self-assessment checklist (ACI Acute Care Taskforce, 2015).

Alongside AMUs, many hospitals in Australia and internationally have established acute surgical units (ASUs) over the last 15 years. ASUs are also known as 'acute general surgical units' and 'acute care surgery'. Pepingco et al (2012) described the ASU established in 2006 at Nepean Hospital, a quaternary hospital in Western Sydney, as:

> …a novel consultant-led model of care for assessing and treating all patients who present with an acute general surgical condition. The ASU team consists of a consultant surgeon, two surgical registrars, two resident medical officers and a nurse practitioner working on a 12-hour shift (7 am to 7 pm). The consultant's sole commitment during a shift is management of patients in the ASU…Overnight, there is a dedicated ASU registrar in the hospital and the consultant is on call. All patients who present with acute general surgical conditions or trauma are admitted into and stay under the care of the ASU.

Kinnear et al (2021) have done a systematic review and meta-analysis of evaluations of ASUs, identifying 77 eligible studies from Australia, Aotearoa-NZ, the UK, the US, Canada, Ireland, the Netherlands, Singapore, Thailand, Taiwan, South Korea, Rwanda and Ecuador. The outcomes reported in the studies included time to surgical review and time to theatre, as well as length of hospital stay, proportion of procedures performed after-hours, complication rates, and mortality. They did not report on access block, but time to surgical review, time to theatre, and proportion of procedures performed after-hours taken together are likely to reflect the concept of access block. Compared to traditional models of care, ASU introduction was associated with a mean reduction in time to surgical review of 0.73 hr (95% CI 0.33 to 1.14), a mean reduction in time to theatre of 1.65hr (0.58-2.73), and a near-halving of rates of after-hours operating (odds ratio 0.56, 95% CI 0.46 to 0.69). Kinnear et al conclude that "ASU introduction should be promoted in policy for widespread benefit".

Short-stay and acute medical and surgical units' need for dedicated resources

Although this point is not clearly emphasised in the literature on SSUs and AMUs, their effectiveness depends on being open 24/7, having clear admission criteria to prevent their use as accommodation for patients awaiting transfer to an inpatient service, maintaining consistent compliance with admission rules, and having dedicated staffing and governance to oversee their operations and clinical management, with staff on duty seven days a week. The literature on ASUs is more explicit about this than the literature on SSUs and AMUs (e.g. Pepingco et al, 2012).

Fellows of ACEM who were consulted in the preparation of this report also emphasised the need for adequate funding and staffing of SSUs and AMUs. They noted the importance of entire divisions of medicine or surgery understanding and advocating for the underlying models of care and their intrinsic value. One commentator pointed out that AMUs are likely to increase the end-to-end cost of an admission, and that for this to be acceptable, it should be offset by a demonstrable reduction in overall hospital length of stay. The commentator added that AMUs 'cannot be used as holding bays, and should not accommodate patients that could have been discharged by a capable ED'.

4.4 Minimising delays for patients being admitted

Intuitively, interventions that minimise delays in assessing and managing ED patients who are subsequently admitted to SSUs, AMUs, ASUs, other specialist units and standard wards might have the potential to reduce access block. The evidence, as outlined in section 5 below, is that most of these interventions have beneficial effects for EDs in reducing overcrowding and waiting times for non-admitted patients and improving work flow for staff, but they do not affect access block.

The interventions that appear to be most likely to reduce access block are modifications to the roles and decision-making authority of doctors and nurses at different levels of seniority, and improvements in relationships and communications at the interface between the ED and the inpatient teams that will be responsible for patients' 'post-ED' care.

Decision-making for admission or discharge of an ED patient – 'disposition' – is often complex, having to take into account the patient's medical and social needs, and an assessment of the risks and benefits of discharge versus admission (Trinh et al, 2021). Other factors that influence the decision include bed availability in the hospital, and of course the patient's wishes. In Australian hospitals, the responsibility for the decision is usually relegated to a senior decision-maker – typically an emergency medicine registrar or a credentialled emergency physician. For a patient with a level of medical or surgical acuity definitely warranting admission, the decision may be made (or at least foreshadowed) at the time of triage. Otherwise, the decision is made as the patient is assessed, investigated and given initial treatment in the ED.

The environment in which this decision is made can directly influence access block. For example, a study from the Flinders Medical Centre in Adelaide, South Australia, found that a decision to admit made outside working hours was associated with an access block duration three hours less than if the decision had been made inside working hours; and that for every additional patient in the ED at the time of the admission decision, the average duration of access block was increased by almost 10 minutes (Perimal-Lewis et al, 2014).

A major complicating factor that follows from the disposition decision, especially in larger hospitals, is the determination of the specialty or subspecialty inpatient service that is to accept the admitted patient, and related to this, the decision on whether the patient's destination is an ICU, a monitored ward bed, a high-dependency ward bed, or a standard ward bed. The initial determination of the most appropriate specialty inpatient service is usually made by the emergency medicine registrar or consultant, who then contacts the relevant rostered specialist or team.

The ED staff member's decision is usually based on the patient's highest-priority presenting problem. This is often challenged by the proposed specialist or specialty team, especially for patients who do not have a definite high-acuity diagnosis, those who have multiple significant co-morbidities, and elderly patients. Anecdotes abound of specialty teams rejecting a patient and advising the ED staff member to refer the patient to different specialty team, and of the latter team pushing back to the former team or suggesting a third team. When this challenge to ED staff arises, it inevitably leads to delays, creates or prolongs access block, and generates tension between the ED and inpatient services. Any subsequent referral of a patient back and forth among inpatient services further prolongs access block and spreads tension among senior clinical staff across the hospital. The tension is undoubtedly heightened by the pressure on clinical service delivery faced by both ED staff and inpatient teams.

Physician disagreement is noted in the literature (Trinh et al, 2021), and the differences in imperatives between EDs and inpatient services outlined in section 3 provide a context for this disagreement. The

differences were highlighted by Monaghan (2022) in his second review examining unplanned and emergency admissions to a single Australian teaching hospital. Following from his discussions with inpatient teams, he wrote:

> What was lacking…was a fundamental understanding or ownership [by inpatient teams] of the processes and challenges for inpatients getting into their service…I came away multiple times with the strong impression from the inpatient leads of a dedication to providing the best care for the patient in front of them, but not to those that should or will soon be in front of them. This limited view is one of the fundamental causes of the performance challenges that the site is facing.

Anecdotal reports of tension between ED staff and inpatient teams abound. The analysis and resolution of their differing imperatives in the interests of patients are matters for organisational anthropology and resilience engineering. Stephens et al (2011) undertook an ethnographic observation of physicians with authority to recommend ED patients for ICU admission in a single major US urban academic hospital with a Level 1 trauma centre. The study observed admission processes for eight patients. Among the barriers to admission and transfer from the ED to the ICU were:

> Need to obtain proof of severity of illness prior to admission. Although patients requiring ICU care were identified quickly, admission often required that patients had proof that they met criteria to qualify for ICU care. Therefore, attending physicians would delay initiating the admissions process until laboratory results, imaging studies and certain care activities had been completed. For… [one example patient, this] was associated with a six-hour delay in initiating the admission process.

And:

> ICU personnel challenge need for ICU care. In two patient cases, the ICU initially rejected the patient. The patients were ultimately accepted for admission to the ICU after the ED attending physician further described the patient's condition to the ICU attending physician; however, this required additional time, delaying the admission process.

Stephens et al (2011) imply that reimbursement and regulatory policies in the USA may partially explain ICU physicians' demand for proof of criticality prior to acceptance of a patient. They suggest that interventions to reduce access block for ICU-bound patients should include organisational, reimbursement and policy redesign, specifying a level of proof that is appropriate in view of the resource pressures in the ED and the ICU. Their advice certainly resonates with the Australian anecdotes.

Kanjee et al (2021) used focus group techniques to examine conflicts between emergency physicians and internal medicine physicians in the context of transfers of patient care from an ED to an inpatient service. The study was based in the Harvard-affiliated Beth Israel Deaconess Medical Center in Boston. Conflicts centred on patient disposition issues (whether the patient should be admitted at all; whether the patient should go to the ICU or the admitting physician's ward; whether additional testing was necessary before transfer to the ward) and what they described as 'contextual issues' (emergency physicians taking internal medicine physicians' questioning as implied criticism; the latter finding insufficient information about the patient in clinical notes; mutual lack of understanding of each other's perspectives and workloads, with subsequent inter-departmental animosity; the stress of heavy workloads, leading to a tendency for each side to try to offload work to the other; some internal medicine physicians feeling that emergency physicians' rapid management and disposition decisions could compromise patient safety, with emergency physicians holding the opposite view). Kanjee et al and their focus group participants suggested several solutions, including clearer documentation, pathways and decision rules for patient disposition, development of interdisciplinary teamwork, and the establishment of traditions of joint training, leadership meetings and social events.

In an online questionnaire survey based in a Brisbane quaternary hospital, Lawrence et al (2016) found that trainee medical staff (internal medicine trainees and emergency medicine trainees) also had differences regarding admissions via the ED. Most internal medicine trainees considered that the ED admission workup standard was lower than the inpatient standard, and that it could lead to inappropriate admissions, but ED trainees did not agree. Internal medicine trainees ordered additional tests in the ED – their aim was to identify or exclude urgent pathology. ED trainees, by contrast, were focused on ensuring that nothing that threatened life or limb was missed. It was clear that the different imperatives of emergency physicians and internal medicine physicians (described in section 3) were embedded early in their careers. It seems clear that in their work, ED physicians are inculcated with the importance of maximising the analogue of the statistical concept of sensitivity, that is, ensuring that that high-risk diagnoses are not missed. On the other hand, internal medicine specialists maximise specificity by applying their field of expertise to patients whose conditions most closely align with their field. Of course, high sensitivity does not preclude high specificity, and vice versa.

It seems likely that, if the tensions and conflicts such as those identified above could be resolved, delays in admissions from EDs could be reduced. The ethnographic and focus group studies and surveys do not (and could not) establish a relationship with access block, but they do help to explain the interactions that sustain access block and provide a rationale for facilitating these interactions.

In addition to the mutual acculturation solutions suggested by Kanjee et al (2021) and their focus group participants, helpful processes that have been implemented include written guides specifying admission criteria for patients with particular conditions, such as guides for intensive care unit admission. Other than standardised admission protocols (noted below), these do not appear to have been evaluated in the literature.

Mechanisms that clarify the authority to decide on the inpatient service to which an admitted patient is destined have also been recommended. Direct involvement of senior medical staff in the decision has been shown to reduce access block time. A controlled pre- and post-intervention study in a Korean tertiary hospital evaluated a policy whereby only attending (i.e. credentialled) emergency physicians could refer medical admissions to the relevant subspecialty medical team. This resulted in a decrease in the time from admission order to ED departure from 481.89 minutes to 362.37 minutes – a reduction of just under two hours (Shin et al, 2018). Another Korean study, concentrating on patients with pneumonia, particularly highlighted the importance of involving senior emergency physicians in the disposition decision after hours (between 6.00 pm and 6.00 am) (Han et al, 2021).

A further mechanism to clarify authority regarding admission is to admit all medical patients to a general medical unit, at least initially, while uncertainties in determining priorities for management are sorted out. An example of such uncertainty surrounds the elderly patient with early dementia and musculo-skeletal co-morbidities who presents with a respiratory condition – would the patient benefit more from admission to a geriatric unit or a respiratory medicine unit? In hospitals where an AMU is available, admission to the AMU is an obvious solution – and this type of situation may partially explain why AMUs help with access block. If an AMU is not available, designation of a senior clinical decision-maker, whose decision on the destination in-patient service is not readily open to challenge, is likely to be helpful. After, say, 24 hours, in the light of accumulating information on the patient's clinical course, the decision could be reviewed, and the patient could be transferred to a different service if indicated.

In addition to these mechanisms, standardised admission protocols have been found to be effective. A focus group of senior internal medicine residents in three tertiary teaching hospitals in Alberta,

Canada, worked together to produce a standardised admission protocol accompanied by a simple form to collect data on causes of admission delay. Following implementation, the protocol was evaluated, adjusting for the differing admission volumes and varying numbers of junior trainees across the three sites. At one site, the decision-to-admission time was reduced from 4.8 to 2.4 hours; at the second, from 4.0 to 2.6 hours; and at the third, from 1.8 to 1.7 hours; the overall average was 1.3 hours. The three most commonly reported reasons for delay were unclear patient disposition, high consultation volume, and unstable patient status (Kachra et al, 2016).

4.5 Introducing ED time targets

Over the last 15 years, many health services throughout the world have introduced time targets for the management of ED patients. Compliance with these targets has been widely incorporated in hospital performance monitoring and reporting.

Time targets have been very effective in reducing access block as well as ED overcrowding. For example, a record-linkage study in five Western Australian hospitals showed a reduction of up to 13.2% per quarter in access block following the introduction of a four-hour rule (Ngo et al, 2018). In 2009, the Aotearoa NZ Ministry of Health introduced a 'Shorter Stays in Emergency Departments' target, requiring 95% of patients to be admitted to, transferred from or discharged from an ED within six hours of arrival (National Health Board Poari Hauora ã-Motu, 2011). To evaluate the apparent effects of the target, a cohort study compiled nationwide data on selected ED process and outcome indicators three years before and three years after it was introduced. A reduction in ED length of stay of 2.9 hr was reported (Jones et al, 2017).

The Australian Government Department of Health introduced a National Emergency Access Target (NEAT) in 2012 with a target of four hours. Compliance requirements were raised progressively, with variations among jurisdictions. For example, in Queensland, the compliance requirement for all ED presentations (not only those leading to admission) was 70% for 2012, 78% for 2013, and 82% for 2014. A retrospective pre-post study conducted in the Princess Alexandra Hospital, a tertiary referral hospital in Brisbane, showed that, for all patients admitted from the ED, 12% exited the ED within four hours prior to the introduction of the NEAT (January-March 2012), compared with 32% (January-March 2013) and 36% (January-March 2014) afterwards. Time spent in the ED over these periods fell very significantly from 9.7 to 6.7 to 6.1 hours (Sullivan et al, 2014).

The NEAT has been abandoned as a nationally imposed target in Australia, and the individual states and territories have set four-hour targets with their own compliance requirements defined as hospital performance indicators. The original intention was for the NEAT to follow the UK in having a four-hour target with 98% compliance (Mason et al, 2012) by 2015. However, evidence emerged from the UK of an association of increased rates of adverse patient outcomes with high rates of compliance with the four-hour target, presumably because of the imposition of time pressure in managing patients with uncertain diagnoses and/or complex conditions. A multi-site retrospective study, based on data from 59 Australian hospitals that were fed into a regression model, found that for ED admitted patients, hospital standardised mortality ratios declined to the point where NEAT compliance reached 65%, but increased above that figure. The corresponding inflection point for all ED presentations (admitted and non-admitted) was 83% (Sullivan et al, 2016). ACEM has recommended a set of tiered targets: at least 60% of patients needing to be admitted should have a maximum ED length of stay of four hours; for at least 80%, it should be a maximum of six hours; for at least 90%, it should be a maximum of eight hours; and for all patients it should be a maximum of 12 hours. The hospital executive should be notified any patient with an ED length of stay of more than 12 hours (ACEM, undated).

The effectiveness of the Aotearoa NZ six-hour target and the Australian and British four-hour targets influenced the Taiwan Ministry of Health and Welfare to implement a one-hour rule in 2018 for admission of critically ill patients from the ED to an ICU. A before-after study in a large tertiary hospital showed that the proportion of patients transferred to the ICU within one hour increased from 3.1% to 65.9%, and the median ED length of stay decreased from 129.5 to 52.0 minutes (Yang et al, 2021).

Time targets work by putting whole-of-site pressure on hospitals, and on the health system beyond individual hospitals, to improve processes. The necessary changes are not limited to EDs. Sullivan et al (2014) listed four key themes for the design and implementation of the changes:

> First, it was recommended that a formally constituted organisational structure be created with senior executive sponsorship for engaging senior clinicians, enacting change strategies and providing resources where needed…Second, business intelligence was required to build a transparent learning collaboration whereby data on NEAT compliance and patient outcomes could be gathered, analysed and disseminated across the entire hospital on a regular basis as a stimulus for change. Third, improving NEAT compliance needed to be seen as a whole-of-hospital patient flow problem, not just one confined to the ED, requiring full engagement of inpatient units towards improving performance. Fourth, major redesign of existing clinical processes, work practices and bed management operations had to occur within several departments. Meeting NEAT was framed as a sociocultural challenge requiring professional 'grassroots' commitment and movement.

Based on these themes, the Princess Alexandra Hospital implemented 26 reforms, grouped under four headings: reforms within the ED; reforms involving the ED-inpatient unit interface; hospital-wide interventions; and monitoring and feedback. Sullivan et al (2014) list all 26 reforms in an appendix to their article.

5 Interventions that are ineffective or lack evidence

5.1 Overview and context

The interventions outlined here include those that were intended to address access block but did not, and those that were intended to address other ED issues (mostly, overcrowding) and were also evaluated with reference to access block. Some of the published evaluations refer to an intention to reduce access block but used outcome measures that did not separate access block time from other components of ED length of stay.

While not reducing access block, many of these interventions are likely to contribute to other improvements in ED performance and have benefits for patient and healthcare worker experience. Many of them are likely to be implemented in parallel with effective solutions to access block, and some may be essential components of effective solutions. For example, process improvements in EDs are likely to be introduced to achieve ED time targets. When an institution introduces changes, the changes are rarely singular, and the relative contribution of an individual initiative to ED performance or access block is often difficult to discern.

EDs across Australia and Aotearoa NZ vary greatly in size, capacity, staffing, organisation, operations, and organisational culture. The variation reflects the populations that they serve as well as institutional history and other contextual factors at hospital, local health service and state levels. It is influenced by a wide range of relationships – relationships among ED staff, and between ED staff and hospital- and non-hospital-based providers. Importantly, the dynamic within an ED is also influenced by the presence of junior health professionals and students, and by institutional attitudes towards the training of health professionals.

While all of these variations make each ED unique, most EDs in Australia and Aotearoa NZ function along broadly similar lines. This particularly applies to EDs of similar size in hospitals of similar type. The literature on ED-based solutions to access block mostly describes interventions directed at these common features of EDs. Each ED is unique in its staffing profile, and in the capabilities and engagement of individual staff members in their roles and responsibilities. This makes research on the factors associated with staffing and their effects on patient flow difficult to interpret and generalise outside single institutions. Studies showing that interventions did not affect access block should be read with this context in mind.

The interventions outlined here comprise those directed at the ‘pre-ED’ or ‘input’ phase (section 5.2) and the ‘within-ED’ or ‘throughput’ phase (5.3) of emergency care.

5.2 ‘Pre-ED’ interventions

The majority (generally at least two-thirds) of patients presenting to EDs are not admitted. As noted in sections 3 and 4.2, for access block to occur, the ED admissions combined with elective admissions must saturate the available inpatient bed capacity. Flow principles suggest that, if the number of patients presenting to ED can be reduced and the proportion requiring admission remains constant, the number requiring admission should also fall, diminishing the pressure on inpatient beds and admission processes. In practice, however, ‘pre-ED’ interventions that might reduce the volume of presentations to an ED are much more likely to apply to patients who do not require admission. While these interventions might help to alleviate overcrowding, they cannot be expected to have much effect on access block.

Interventions in the ‘input’ or ‘pre-ED’ category include:

- Patient education by means of printed material or personal contact (e.g. by nurses, including home-based education for diabetes patients)
- Increases in community-based healthcare capacity and accessibility, including pre-hospital diversion of low-acuity patients to primary care services
- Healthcare worker payment mechanisms and financial disincentives for patients to attend EDs
- Online ‘pre-ED’ triaging.

The reported outcomes of almost all of the published ‘pre-ED’ interventions have been limited to reductions in the numbers of presentations to EDs *per se* (Rahman Morgan et al, 2013). Hardly any studies have reported on the effects of such interventions on ED length of stay or access block. One study did show a decrease in ED visits that resulted in hospitalisation following an intervention that gave patients financial incentives to use alternative sources of care. This study was done within the context of the US managed care system (Wharam et al, 2007), and is unlikely to apply in the Australian context.

The conclusion is that ‘input’-based interventions may have value in improving the appropriateness of utilisation of community-based health services and EDs, and in reducing ED overcrowding, but they do not offer potential solutions to access block.

Looking to the future for ‘input’-based interventions, health services in Australia are developing virtual hospital systems that provide online expert support for the assessment of patients who might otherwise present at EDs, as well as online support to general practitioners, primary care nurses and ambulance crews (Hutchings, personal communication, 2022; Northern Health (Victoria), 2022). This type of support is also being introduced by central ambulance services. With innovations in the online technology that connects to remote wearable diagnostic and monitoring equipment, virtual hospital systems may have the potential to funnel certain types of patients directly into virtual hospital care. It can be speculated that such new models of care could bring major changes to ED services and alleviate access block, but achieving this will depend on the solving some obvious logistical challenges. Evaluations are not yet available. ACEM has issued an Interim Position Statement on Telehealth in Emergency Medicine (ACEM, 2022). According to some users, the terms ‘telehealth’, ‘virtual health care’ and ‘virtual hospital’ have distinct meanings, and ACEM uses telehealth as an umbrella term.

5.3 Interventions within EDs

Most of the published literature on interventions that have equivocal value in reducing access block concentrates on activities and processes within EDs. They comprise:

- Triage and streaming systems and their organisation and staffing
- Process improvement programs
- Increasing the size of EDs, i.e. increasing the numbers of beds
- Increasing the numbers of staff, modifying the types or mix of staff
- Modifying the decision-making responsibilities of staff regarding patient disposition (admission or discharge).

Triage and streaming

In an umbrella systematic review, De Freitas et al (2018) reported on systematic reviews of the inclusion of physicians in the triage team, which otherwise is nurse-led. The systematic reviews of physician-assisted triage (where a physician is available to expedite patients' transit) and the presence of a physician managing patients with the triage team, showed that ED length of stay decreased by up to 45 min (median). A systematic review of having a senior physician in triage who assisted in the management of patients before they moved into the main ED, however, found that this variously increased or decreased length of stay, depending on patients' acuity levels (Abdulwahid et al, 2016). In using ED length of stay as the outcome measure, the reported studies did not separate patients who were subsequently admitted, so they do not provide direct information on access block.

In their systematic review of triage-related interventions, Oredsson et al (2011) defined *streaming* as:

> ...routines where patients, following triage or brief evaluation, are divided into different processes (streams) according to more or less defined criteria. The most common example of streaming involves the use of a separate process, usually called fast track, to handle patients with less serious symptoms.

They reviewed 16 studies assessing the effects of streaming. Two of the studies divided patients according to the likelihood of admission or discharge, and allocated medical and nursing staff into two teams – a team for patients likely to be admitted, and a team for patients likely to go home. One of the studies, based in the Western Hospital, Melbourne, found that this streaming, together with ED process re-design, moved patients in triage categories 3-5 faster through the ED, but made access block worse for those in triage categories 1-2 (Kelly et al, 2007). In the Flinders Medical Centre, Adelaide, King et al (2006) found that a similar arrangement was associated with a slight improvement in access block. The 13 studies investigating the effect of fast track clearly pointed to a shortening of ED length of stay for non-admitted patients. However, where it was documented, ED length of stay for admitted patients was unchanged (O'Brien et al, 2006). Thus, streaming with fast track can improve ED times for non-admitted patients and does not adversely affect access block, but it does not convincingly alleviate or reduce access block.

Other triage-related interventions have included point-of-care testing, where some laboratory tests are performed within the ED, and arrangements whereby nurses are authorised to request X-rays, usually limited to patients' distal anatomical regions. While these interventions may have speeded some non-admitted patients' passage through EDs, there is no evidence that they affected access block (Oredsson et al, 2011).

Process improvement

The process improvement program most reported in the literature in connection with ED performance is the adaptation of Lean manufacturing principles developed by the Toyota Motor Company in the mid-20th Century. Lean manufacturing is described by de Boucourt et al (2011) as

> …an integrated socio-technical system…a production philosophy which considers any resource expenditure for any goal other than the creation of value for the end customer to be wasteful and therefore a target for elimination.

Holden (2011) suggested nine things for successful implementation of Lean principles in EDs, reiterated by the American College of Emergency Physicians Emergency Medicine Practice Committee (2016):

> …be ready for change, take a human-centred approach, secure expertise, obtain top management support and resource allocation, secure leadership, aim for culture change, adapt Lean to the local level, improve continuously, and learn from previous experiences.

It is notable that these nine points include 'take a human-centred approach'. This reflects resolving the consequences of the differing imperatives of ED staff and inpatient teams, described in sections 3 and 4.4 above.

A systematic review by Tanzariello et al (2015) identified 15 primary studies on the use of Lean principles in EDs; 14 were before/after comparisons, and one was a retrospective cohort study. Evidence indicated that the application of lean methods resulted in improvements in healthcare within EDs and reductions in length of stay, but the authors did not draw specific conclusions about access block.

Many published articles referred to interventions or combinations of interventions designed to improve ED performance, but whether or not the interventions deliberately or explicitly included process improvement initiatives was often unclear. 'Process improvement' implies a reorientation of workplace culture along the lines suggested by Holden (2011), quoted above. It implies a change in thinking, over and above steps to reorganise individual components of ED services. The available information leads to the conclusion that process improvement programs are worthwhile because they improve the quality of care and the ED work environment; and while process improvement methods *per se* do not seem to constitute a solution to access block, they might provide a framework for various changes that could reduce access block. Isfahani et al (2019) outline barriers to the implementation of lean techniques, and the lack of clarity surrounding their benefits may be due to the difficulties of applying these techniques.

Increasing the size of EDs

Single-institution studies have shown that expanding EDs without addressing other retardants of patient flow in a hospital does not help with access block (Han et al, 2007, Mumma et al, 2014). Indeed ED expansion may increase the frequency of access block and prolong it by increasing the number of people waiting in the ED for an inpatient bed.

Consultation to decision time

*'*Consultation to decision time' is the interval between the time when a consultation by an inpatient service is requested and the time of the disposition decision. Delays and access block are especially

likely where the relevant specialist (or the registrar or fellow representing the team) is tied up with other clinical commitments, e.g. in the operating room. As described in section 4.4, a further delay may arise if there is uncertainty as to which inpatient service will accept an admission.

Various measures have been introduced to try to minimise these delays. Beckerleg et al (2020) conducted a systematic review of nine studies that covered a variety of methods to expedite admission. These included the use of SMS paging of non-ED-based consultants or teams at regular intervals to remind them that a patient was waiting in the ED for their attention; the creation of an acute surgical service; education, goal-setting and audit and feedback; institutional guidelines and standardised admission protocols; modifications to staffing schedules; and direct consultation to senior physicians. Although the authors reported on ED length of stay and not specially on access block, it seems likely that a large reduction in ED length of stay is likely to encompass a reduction in access block time.

Some of the interventions were successful, as described in in sections 4.4 and 4.5 above. Others were of equivocal value. Evaluations of SMS messaging have inconsistent results. Cho at al (2011) examined the effects of introducing a computerised consultation management system, with software generating SMSs if a representative of the consulting service had not arrived in the ED within 20 min of the original request, and again at three and six hours. While the time to a disposition decision was reduced, they reported '…no significant reduction in the interval between the time of disposition decision and the time when the patients left the ED'. However, the waiting time data analysed by Kim et al (2012) – studying the effects of sending SMSs at two, four and eight hours – showed a beneficial effect on the frequency of access block.

Staff numbers and responsibilities

The literature has evaluated the effects of increasing the numbers of staff in EDs in compliance with health system standards, particularly for nurse-patient ratios. Again, the results are not consistent. In one Californian ED, compliance appeared to be associated with improvements in patient flow and reductions in ED length of stay (Chan et al, 2010), suggesting (but not demonstrating) a beneficial effect on access block. However, in another Californian ED, all ED waiting times – including 'admission time' – increased after mandatory nursing ratios were introduced (Weichenthal & Hendey, 2009).

The role of nurse practitioners in Australian and Aotearoa NZ EDs continues to evolve, and their scope of practice varies. In other health systems and some Australian remote settings, nurse practitioners have a broad scope of practice and broad clinical responsibilities. Those working in Australian and Aotearoa NZ EDs often have a leading role in fast-track environments, tending to concentrate on non-admitted patients.

International literature on nurse practitioners in EDs may therefore not be informative for Australia and Aotearoa NZ. In their umbrella systematic review, Bittencourt et al (2020) examined two systematic reviews of employing nurse practitioners in EDs. The nurse practitioners had the authority to assess, diagnose and treat patients, prescribe medications, and refer patients to specialists. The more recent of the two systematic reviews (Jennings et al, 2015) was described as being of moderate quality. It covers 14 primary studies – two randomised controlled trials, two non-randomised controlled trials, and 10 observational studies – of which nine measured ED length of stay. Of these, five found that the presence of nurse practitioners was associated with meaningful reductions in ED length of stay, while four found no difference. Indicators directly relating to access block were not reported. The results suggest that the presence of nurse practitioners can improve patient flow within an ED, but it is

not clear whether the nurse practitioners represented an overall increase in the ED workforce or substituted for other clinicians. In the studies covered in another systematic review (Elder et al, 2015), the involvement of nurse practitioners was found to be associated with reductions in ED waiting times, but again, none of the studies reported on access block.

In a recent study in Nepean Hospital, Sydney, Mallows (2022) examined ED presentations and dispositions over a five-month period in 2019 in relation to varying levels of medical staffing of the ED: Fellows of ACEM (FACEMs), non-FACEM senior decision-makers, and more junior medical officers. He found that, while increases in the numbers of FACEMs and senior decision-makers led to improvements in aspects of ED performance that relate to overcrowding, they did not affect compliance with four-hour time targets for admitted ED patients.

6 Discussion and conclusions

6.1 Solutions to access block

Access block is a hospital- and health system-wide problem. It is not primarily an ED problem, but it tends to be identified with EDs because it is monitored in EDs and reported with other ED performance indicators. Most of the effective solutions to access block depend on changes across the hospital and across the health system.

Four **types** of solutions can reduce the incidence and/or duration of access block.

1. The most effective solution is to **increase inpatient bed capacity and free inpatient beds** so that bed occupancy is reduced from the present level (typically 95%-plus), with an initial target of 90%, aiming for 85%
2. The establishment of **short-stay units, acute medical units and acute surgical units** clearly helps to diminish the numbers of admitted patients waiting in EDs, provided that these units have adequate staff and funding and are not used as holding wards
3. Access block can be reduced by **expediting patients' transition through the ED / inpatient service interface**
4. Health system-wide **time targets** for admitted and non-admitted patients' transit through EDs are demonstrably effective in overcoming access block.

Implementing these types of solutions depends on many practical interventions at more detailed levels. Most of the specific interventions contribute to more than one of the solutions.

Increasing inpatient bed capacity and freeing inpatient beds

Increasing the numbers of inpatient beds across the health system is an essential solution, not only to address access block, but also to provide for population growth. In most Australian and Aotearoa NZ hospitals, many programs and systems are already in place to free inpatients beds in order to control or reduce bed occupancy, and coverage of these is beyond the scope of this review. They include casemix funding programs that define funded condition-specific hospital lengths of stay; active monitoring and management of patient flow, inpatient discharge protocols to ensure that discharged patients can be accommodated, supported and treated as necessary in the community; concentrating discharges in specified time periods each day; mechanisms to ensure that patients' needs on the day of discharge are met promptly; and the provision of discharge lounges. The feasibility and effectiveness of the discharge management initiatives are likely to vary according to the characteristics of patients (e.g. age, cognition, morbidity profile, mobility, self-efficacy), the characteristics of their communities (e.g. family structures and support), geographical factors (e.g. rural or remote versus urban hospital, and distance from patients' places of residence), and the nature of the healthcare environment (e.g. the availability of general practitioners, community nurses, and community-based allied health professionals, and the quality of communication among these professionals and between them and the hospital). From all this, it is clear that solutions to access

block and associated factors may operate and have effects that are far from the floor of the ED and indeed often well beyond the hospital campus.

SSUs, AMUs and ASUs

Acute units work because they provide patients admitted through the ED with appropriate multidisciplinary specialist management and accommodation that are usually separate from mainstream inpatient units and their associated bed management issues. However, acute units for ED admissions can only work if they do not become saturated and overloaded, if policies are enforced to prevent their inappropriate use, if they operate 24/7 and if they have adequate dedicated staff and governance arrangements to support these policies. Such policies are likely to depend on conditions specific to individual hospitals and the size and staffing of each acute unit. Patients who need to stay for longer than the maximum allowed time in an acute unit (typically up to 72 hr) can be transferred to inpatient units. However, this can re-impose the same problem of finding an inpatient bed as causes access block. The value of acute units is not only in their contribution to patient flow and the avoidance of access block; they also provide a mechanism for delivering high-quality specialist acute care. AMUs and ASUs that are run by senior generalists can remove some of the decision-making tensions regarding patient disposition following admission (discussed in section 4.4 and below) by providing a pathway that does not impose on contested mainstream inpatient ward beds.

Patients' transit through the ED/inpatient service interface

The literature and anecdotes affirm that decision-making processes and related tensions at the ED/inpatient service interface are a cause of difficulty and delay that often contribute to access block. A senior decision-maker in the ED usually decides whether a patient should be admitted, but the subsequent decision and agreement on the inpatient service that will care for the individual as an inpatient can require time-consuming negotiation between ED staff and inpatient services. Engagement of the inpatient team in the decision can also cause delays if the team is preoccupied with priorities outside the ED (e.g. if team members are involved in procedures or busy clinics running on fixed schedules). ED staff and inpatient teams have strong but differing imperatives, and inpatient teams often insist that ED staff order investigations beyond those required for initial diagnosis and ED management before they accept a patient – or even before they consider accepting a patient.

In some settings, perverse incentives militate against a well-functioning ED/inpatient service interface. For example, it may be easier for a consultant who is a visiting medical officer with a private practice base to bill for seeing a patient in the ward than in the ED. Admitted patients may therefore be held in the ED until extra investigations requested by the consultant are completed and considered. In another example, priority rules for imaging may also inhibit the smooth flow of patients across the interface. Some hospitals give absolute priority for imaging to ED patients, and this priority is lost as soon as a patient is transferred from the ED to a standard ward, sometimes leading to long delays for imaging of ward-based patients. Where this occurs, it may at least partially explain inpatient teams' insistence that patients moving from the ED to the wards do not leave the ED until all immediate investigations are completed (Willcocks, personal communication, 2022).

Reducing the tensions that beset the ED/inpatient service interface depend on consistent professional leadership and the creation and maintenance of working environments that enhance communication among specialty inpatient teams, and between ED staff and inpatient teams, and on the development of a workplace culture that circumvents power differentials among healthcare staff. Agreed and

acknowledged admission protocols that can help to resolve difficult decisions about the placement of patients have also been shown to be effective in reducing access block. Decision aids such as these protocols are likely to be especially helpful for inpatient service placement decisions affecting certain groups of patients whose needs may involve two or more specialty teams: the elderly, particularly those with dementia or severe cognitive impairment; patients with mental health conditions; patients who have multiple complex co-morbidities; and patients whose clinical presentation clearly warrants admission but defies even a provisional diagnosis in the short term.

ED time targets

The demonstrated effectiveness of ED time targets in reducing or preventing access block is likely to be attributable to the existence of a reportable, quantified performance criterion driving a multiplicity of process changes. Evaluated separately, most of these process changes do not have a consistently beneficial effect on access block. Collectively, however, and when framed within a performance ethos, they work. When applying time targets, it is important to retain sufficient flexibility to ensure that clinical complexity can be accommodated safely. Evidence from overseas indicates that an inflexible insistence on a very high proportion of ED patients meeting time targets can lead to adverse outcomes for complex patients who need more time for assessment and initial treatment in the ED.

It should be noted that the multiplicity of process changes that make time targets work have additional benefits that are not directly related to the reduction of access block. These include the mitigation of overcrowding, reductions in waiting times for patients, improvements in patients' satisfaction with ED services, and improvements in work flow and work satisfaction for staff. Indeed almost all of the potential solutions listed in this review as having little or no effect on access block may have other benefits.

6.2 Virtual care systems

Virtual care has become a fixture of health service delivery over the last decade, and its applications and utilisation have expanded greatly in response to the COVID-19 pandemic. A further impetus has been the proliferation and increasing sophistication of wearable biometric devices that can be monitored remotely and online communications between healthcare professionals. The design, delivery and evaluation of virtual care services have become major policy preoccupations of health departments and funding agencies.

Over the coming years, virtual health care systems will continue to be assessed for their potential contribution to acute or emergency services. Developments that rely on virtual care systems are already occurring in 'pre-ED' patient management in Australia (e.g. the Victorian Virtual Emergency Department). Virtual care and virtual hospital opportunities have not yet featured in the literature on the flows of admitted patients and access block. At a time of change, it seems prudent to ensure that any new strategies for the management of patient flow in and out of EDs and the management of access block should be designed to accommodate virtual care, and to take whatever benefits might arise from its development.

6.3 Research on access block

The published literature that refers to access block is extensive. Descriptions and evaluations of interventions continue to be published, but many of the ideas that they cover are not new. A substantial proportion of the literature in the reference list below is 10-20 years old. The persistence of access block and other flow problems in EDs and through hospitals suggest either that the implementation of the available knowledge is very difficult, or that the problems are getting worse (possibly as a result of population growth and ageing), or both.

The published research on access block mainly comprises observational studies with comparisons of a range of parameters (or outcomes) before and after interventions. Most of the earlier literature emanated from EDs, as emergency physicians recognised the problem before others. Descriptions and evaluations of interventions continue to be published, but many of the ideas that they cover are not new, and a substantial proportion of the articles reviewed here are at least 10 years old. The published research on access block mainly comprises observational studies with comparisons of a range of parameters (or outcomes) before and after interventions. Recently whole-of-system research reports on access block have proliferated, with studies more frequently led by researchers other than emergency physicians

Some of the published studies are prospective, but most are cross-sectional or retrospective. Some are controlled, but most studies do not have control groups. Unsurprisingly, few randomised controlled trials are reported; neither the research questions nor the study settings lend themselves to randomisation. An increasing number of articles labelled as systematic reviews are being published, but these are often narrative reviews bringing together loosely related interventions, and are not true systematic reviews. Meta-analyses are uncommon, which again is unsurprising, given the heterogeneity of interventions. Many research publications are based in single institutions; while single-centre studies can be informative, most of those reviewed here do not provide sufficient information to determine whether an intervention is scalable or transferable to other institutions.

This review has included some qualitative studies, and while these are invariably based in a single institution and reflect the input of small numbers of EDs and hospital staff, they provide great insight into the dynamics of hospital services at a detailed level. The insights that they cover include an understanding of the relationships among different groups of hospital staff and the importance of these relationships in the delivery of high-quality health care.

Most of the pre- and post-intervention quantitative studies evaluate combinations of interventions rather than single interventions. On a pragmatic level this is useful because organisational and system change in complex environments like hospitals rarely allow singular initiatives to be implemented. The downside is that it is often difficult to determine the extent of benefit or change that can be attributed to a particular initiative, and an understanding of this attributability is important in determining whether an intervention is scalable or can be transferred to other settings. The particular combination of interventions that work in one institution may not be possible to replicate or implement as a ‘package’ in other institutions.

Over the last 20 years, and particularly since about 2009, the literature on patient flows through EDs and access block has increasingly made use of modelling studies. Dynamic modelling can make a major contribution to the design of acute care systems. Models are ‘built’ using empirical data, assuming that existing parameters will continue to be applicable and relevant, and differing values of test variables can then be fed into the model to explore varying scenarios. The outputs reveal the

magnitude of effect of specific changes, combinations of changes, and interactions between changes. These outputs are often more useful than hypothesis-based observational studies.

A major difficulty in synthesising the literature covered in this review is the researchers' use of outcome variables which are often imprecisely defined and which do not necessarily reflect the outcomes of practical importance. The most frequently occurring example is the use of ED length of stay or reductions in ED length of stay (not otherwise specified) as an outcome. Aggregated estimates of ED length of stay often include the time spent in ED by both admitted and non-admitted patients, and are presented as summary statistics such as the mean or modal length of stay. Such data become almost impossible to interpret. It would be helpful to encourage collection of data on ED length of stay that separates admitted and non-admitted patients. Where possible, it would also be helpful to break the ED length of stay of admitted patients into operationally meaningful components, such as time for assessment by ED staff, time for assessment by and agreement with the accepting inpatient team, and time for bed management and transfer arrangements.

A surprising gap in the literature on access block is the lack of research on patient perspectives. Australian data on patient satisfaction with ED services are available, but most of the literature relating to access block is confined to medical decisions made on behalf of patients by healthcare professionals. Yet the decision to admit a patient can be heavily influenced by social and logistic issues with which patients or their carers are more likely to be familiar. It is important to emphasise and re-emphasise the truism that health care exists for the benefit of patients.

6.4 Recommendations

The findings from this literature review suggest four recommendations.

Recommendation 1 – Solutions to reduce access block

ACEM should advocate for:

1a) Increases in hospital inpatient bed capacity and measures to achieve freeing of hospital inpatient beds, with a health system wide initial target of 90% occupancy, aiming for 85%
1b) The establishment and/or maintenance of short-stay units, acute medical units and acute surgical units, with adequate staff and funding, and with governance arrangements that assure their appropriate utilisation
1c) Interventions to expedite patients' transition through the ED / inpatient service interface
1d) The maintenance of health system-wide time targets for admitted and non-admitted patients' transit through EDs, applied with sufficient flexibility to assure patient safety.

Recommendation 2 – Improve integration across the ED / inpatient service interface

ACEM should:

2a) Draw attention to the importance of recognition by ED staff, inpatient service teams and hospital managers that ED and inpatient staff have different imperatives and requirements in delivering safe, high-quality patient care

2b) Seek advice from organisational anthropologists and/or psychologists on methods to develop effective, efficient and sustainable mechanisms for transfer of patient care across the interface, including strengthening communication and relationships across the different groups
2c) Promulgate this advice to health services and relevant professional groups.

(See also Recommendation 3b)

Recommendation 3 – Monitoring and research

ACEM should encourage and/or support:

3a) Specification of indicators to enable health services to collect reliable data on the occurrence of access block at institutional, health service levels, so that access block can be monitored and researched
3b) Conduct of qualitative research that can guide a strengthening of communication and positive relationships between ED staff and inpatient teams
3c) Conduct of dynamic modelling studies to simulate and evaluate changes in hospital performance that have the potential to reduce access block.

Recommendation 4 – Readiness for virtual care services

ACEM should:

4a) Monitor the development of opportunities to improve acute health care through the use of virtual care systems
4b) Advocate for, and conduct, research on the potential effect of virtual care on access block, patient experience and patient outcomes.

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Glossary

Term	Definition
Access block (synonyms: boarding, ED boarding, bed block, admission hold, admission hold length of stay)	'The situation where patients who have been admitted and need a hospital bed are delayed from leaving the emergency department (ED) for more than eight hours because of a lack of inpatient bed capacity. This includes patients for who were planned for an admission but were discharged from the ED without reaching an inpatient bed, or transferred to another hospital for admission, or who died in the ED.' (ACEM, 2021a). The time period to which the definition refers is the patient's entire length of stay in the ED, not just the time after the decision is made to admit the patient.
Acute medical unit (AMU) (synonyms: medical acute care unit (MACU), medical assessment and planning unit (MAPU), medical decision unit (MDU), medical assessment unit (MAU), acute assessment unit (AAU), emergency medical ward (EMW), emergency assessment unit (EAU)	'Designated hospital wards specifically staffed and equipped to receive medical inpatient [*sic*] presenting with acute medical illness from emergency departments and/or the community for expedited multidisciplinary and medical specialist assessment, care and treatment for up to a designated period (typically between 24 and 72 h) prior to discharge or transfer to medical wards. These units are supervised by consultants with an interest in acute general medicine, feature multidisciplinary teams that comprehensively assess and manage both medical illness and functional disability, and, in many instances, are geographically co-located with emergency departments and key diagnostic services such as pathology and radiology.' (Scott et al, 2009, after Bell et al. 2008)
Acute surgical unit (ASU)	A model of care for assessing and treating all patients who present with an acute general surgical condition. All patients who present to the ED with acute general surgical conditions or trauma are admitted into and stay under the care of the ASU.
Admission	'An admission occurs when a medical decision for the need for inpatient care is made by an appropriately qualified decision maker, a patient is accepted by a hospital inpatient specialty service for ongoing management, and the patient is administratively admitted to the hospital. The decision to admit a patient may be made by a referring specialist prior to the patient's

Term	Definition
	arrival to the ED, the emergency physician, by an inpatient service, or mutually agreed by some or all of these medical providers.' (ACEM 2020)
Consultant to admission time	The interval between the time when a consultation by an inpatient service is requested by ED staff and the time of the disposition decision.
Departure	Transfer from the ED into a ward bed or specialist service (e.g. intensive care unit or coronary intervention unit) in the same hospital, discharge from the ED to home, or transfer to another institution. Departure may also refer to patients leaving the ED before being seen, assessed or treated by ED staff, and to patients who die within the ED.
Discharge lounge	A holding area to which patients ready for discharge are moved on the day of discharge to await finalisation of discharge arrangements and transport, thereby freeing ward beds. Selection criteria for patients to go to a discharge lounge typically include being medically stable, mentally intact, and independent in activities of daily living, not being in end-stage palliative care, and not requiring oxygen.
Disposition	The decision to admit, discharge or transfer a patient. The disposition decision may also encompass agreement on the inpatient team to which an admitted ED patient's care is to be transferred.
Emergency department (ED)	The department of a hospital responsible for the provision of medical and surgical care to patients arriving at the hospital in need of immediate care. Emergency department personnel may also respond to certain situations within the hospital such cardiac arrests.
ED length of stay (EDLOS)	Time from a patient's arrival at the ED to departure; the term may refer to patients who are treated and discharged or admitted.
Lean principles	An integrated socio-technical system for a production philosophy that focuses the use of resources on defined goals, and treats other uses of resources as distracting, wasteful, and targets for elimination. The system has its origins in complex manufacturing processes and has been adapted to health services design and implementation.
National Emergency Access Target (NEAT)	A time target introduced by the Australian Government Department of Health in 2012, requiring defined proportions of ED patients to have disposition decisions within 4 hr. The NEAT has been abandoned as a nationally imposed target in Australia, and the individual states and territories have set four-hour targets with their own compliance requirements defined as hospital performance indicators.

Term	Definition
Overcapacity	The situation where a hospital's inpatient capacity is full and it is required to accommodate more patients.
Overcapacity protocol (synonyms over-census protocol, full-capacity protocol)	Hospitals may invoke over-capacity protocols when their inpatient capacity is full and their EDs are extremely overcrowded. In an over-capacity protocol, at least one admitted patient in the ED will be transferred to each inpatient ward. If inpatient wards have no free beds, the extra patients are accommodated wherever possible in ward areas.
Short-stay unit (SSU or EDSSU)	A zone in an ED, with an allocated number of beds, that is used to accommodate patients who need to be investigated and/or observed and/or treated for a relatively short period of time, and who can then be discharged directly. The standard duration of SSU care in Australia and Aotearoa NZ is up to 24 hours, but in some EDs, SSUs are used to accommodate patients whose expected length of stay is up to 72 hours.
Streaming	Streaming is a process 'where patients, following triage or brief evaluation, are divided into different processes (streams) according to more or less defined criteria. The most common example of streaming involves the use of a separate process, usually called fast track, to handle patients with less serious symptoms.' (Oredsson et al, 2011)
Undifferentiated patient	A patient whose condition is undiagnosed, and/or the acuity and severity of the condition are unknown – the patient might or might not turn out to be 'very sick', or might or might not have a life-threatening condition.
Virtual care (synonyms telehealth, virtual health care)	Virtual care safely connects patients with health professionals to deliver care when and where it is needed. Virtual care complements face-to-face care, and can be delivered by telephone, video conference, remote monitoring (using technology to collect and send medical data to an app, device or service), or 'store and forward' (where a patient allows clinical information to be collected and sent electronically to another person or site for evaluation or management).

Appendix A: Terms of reference of the review

The following is an extract from the consultancy scope paper for this review, produced by the Australasian College for Emergency Medicine.

The Project

With a number of governments responding quickly to our call to implement the Hospital Access Targets, ACEM needs to accelerate its work in articulating appropriate solutions to access block.

ACEM has been working with key members through its committee structures and via a member consultation to identify potential systemic solutions to the issue of access block. Many suggestions have been made for responses within the ED, however ACEM does not consider ED-specific solutions alone will be sufficient to address the problem.

Rather, we need to continue to engage with, and promote, solutions that address the systemic causes of access block. It is essential the solutions that we propose are backed up by any available evidence. Solutions that can be implemented with minimal adjustment in the Australian and Aotearoa New Zealand context are ideal, however we are also open to solutions that would need to be trialled in the local context before being widely adopted.

There are a number of complicating factors in promoting solutions:

- The diversity between EDs across Australia and in Aotearoa New Zealand,
- The need to advocate for changes across the hospital and health system, impacting on other medical specialities, and
- The associated costs with the implementation of solutions.

ACEM is seeking a consultant with high level knowledge and expertise working on issues in the hospital and health systems of Australian and/or Aotearoa New Zealand. In particular, knowledge of patient flow between different parts of system is essential.

Project Goal

Present recommendations for evidence-based access block solutions for piloting and/or implementation in Australia and Aotearoa New Zealand.

Proposed Outputs

Project Report

ACEM requires a written report detailing a range of potential solutions to access block, with recommendations about the solutions that will have the greatest impact and feasibility. The report should also briefly highlight any ideas that have been tried and found not to be successful.

The report will be fully referenced with available academic evidence and any relevant grey literature such as project evaluations and other reports. This will enable ACEM to provide a transparent basis for its decisions and recommendations to both its membership and to government.

The report is to be based on a desktop literature review and consultation with external parties is not required. ACEM will organise a briefing for the consultant with a small group of senior FACEMs at the start of the process to help contextualise the issue.

Presentation to Health System Reform Committee

The report will be presented to the ACEM Health System Reform Committee at an upcoming meeting (date to be advised). This Committee, made up of Fellows of ACEM, has responsibility for driving work on access block solutions.

Appendix B: Literature search specifications

Search terms

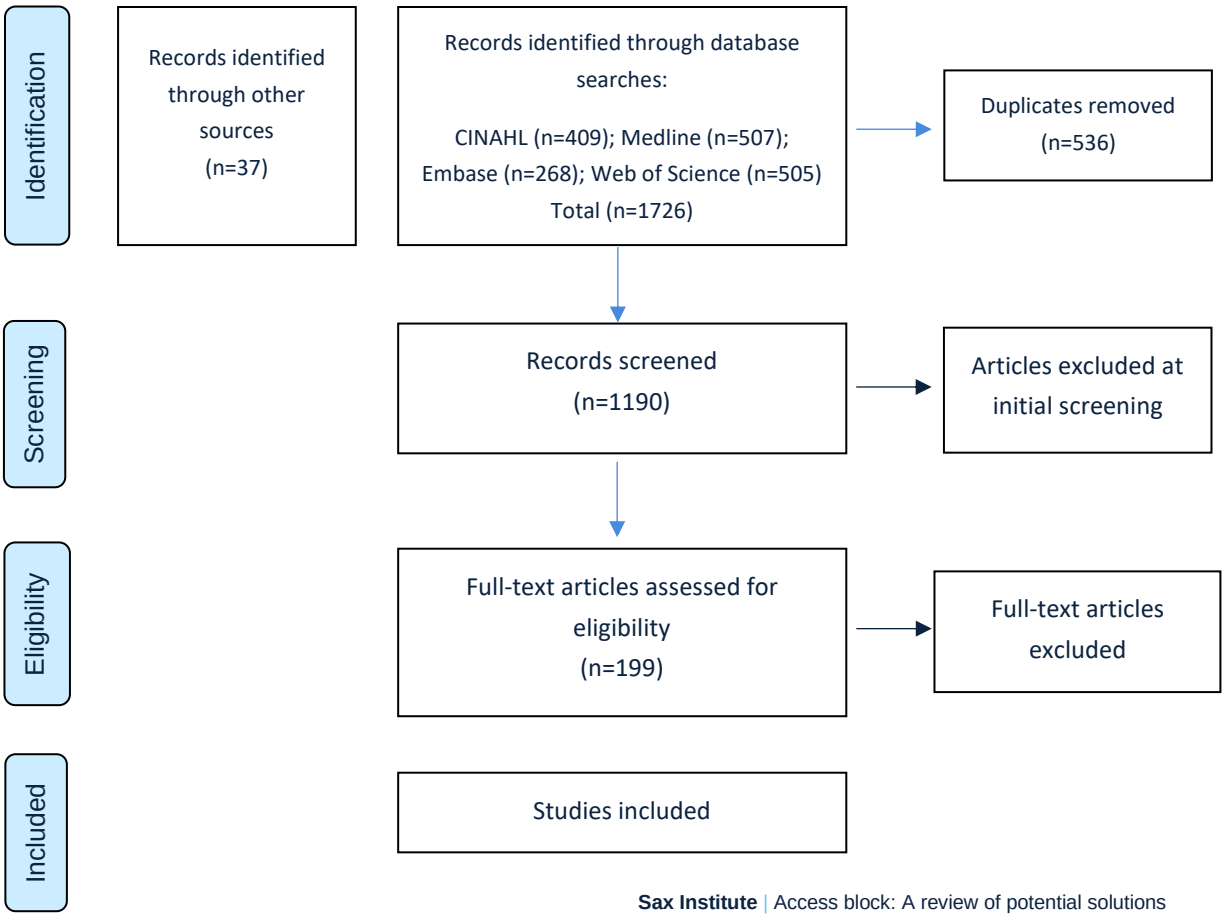
- Search terms included: “emergency service”, “emergency department”, “ED”, “crowding”, “access block”, “overcrowding”, “boarding”, “intervention”, “initiative”, “strategy*”, “patient discharge”, “referral”.

Inclusion/Exclusion criteria

- We included studies from Australia, Europe, North America, Japan, Taiwan, Hong Kong, Singapore, South Korea and South America.
- We included only English-language studies.
- Search results were limited to 2000 to 2022.
- We excluded studies from other countries.

The PRISMA diagram is provided in Appendix 1.

Appendix 1: PRISMA diagram



Appendix C: Advice and consultations

We acknowledge and thank the following for providing briefings and other advice that contributed to this review.

Peter Allely, ACEM Western Australian Faculty Board Chair, and Director of Emergency Medicine, Sir Charles Gairdner Hospital, Perth

Trevor Chan, ACEM NSW Faculty Board Chair, and Clinical Director, Emergency Care Institute, NSW Agency for Clinical Innovation

Adam Cresswell, Head of Public Affairs, Sax Institute

Danielle Currie, Senior Modeller, Sax Institute

Timothy Frommer, Staff Specialist in Emergency Medicine, The Canberra Hospital

Stephen Gourley, ACEM Northern Territory Faculty Board Chair, and Director of Emergency Medicine, Alice Springs Hospital

Owen Hutchings, Medical Director, rpaVirtual, Sydney Local Health District

Peter Jones, Director of Emergency Medicine Research, Auckland City Hospital and Auckland District Health Board

Dean Pritchard, Director of Medical Services, Seymour Health, and Emergency Physician, Northern Health, Melbourne

Clare Skinner, President, Australasian College for Emergency Medicine, and Senior Staff Specialist in Emergency Medicine, Hornsby Ku-ring-gai Hospital, Sydney

Suzanne Smallbane, Director of Clinical Services – Medical, Calvary Hospital, Bruce, ACT

Alan Tankel, Director of Emergency Medicine, Coffs Harbour Hospital, NSW

Karlene Willcocks, Executive Director, Diagnostic & Sub-Specialty Services, Gold Coast Health, Queensland

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