

Public hospital bed crisis: too few or too misused?

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Abstract

- Increasing demand on public hospital beds has led to what many see as a hospital bed crisis requiring substantial increases in bed numbers. By 2050, if current bed use trends persist and as the numbers of frail older patients rise exponentially, a 62% increase in hospital beds will be required to meet expected demand, at a cost almost equal to the entire current Australian healthcare budget.
- This article provides an overview of the effectiveness of different strategies for reducing hospital demand that may be viewed as primarily (although not exclusively) targeting the hospital sector – increasing capacity and throughput and reducing readmissions – or the non-hospital sector – facilitating early discharge or reducing presentations and admissions to hospital. Evidence of effectiveness was retrieved from a literature search of randomised trials and observational studies using broad search terms.
- The principal findings were as follows: (1) within the hospital sector, throughput could be substantially improved by outsourcing public hospital clinical services to the private sector, undertaking whole-of-hospital reform of care processes and patient flow that address both access and exit block, separating acute from elective beds and services, increasing rates of day-only or short stay admissions, and curtailing ineffective or marginally effective clinical interventions; (2) in regards to the non-hospital sector, potentially the biggest gains in reducing hospital demand will come from improved access to residential care, rehabilitation services, and domiciliary support as patients awaiting such services currently account for 70% of acute hospital bed-days. More widespread use of acute care and advance care planning within residential care facilities and population-based chronic disease management programs can also assist.
- This overview concludes that, in reducing hospital bed demand, clinical process redesign within hospitals and capacity enhancement of non-hospital care services and chronic disease management programs are effective strategies that should be considered before investing heavily in creating additional hospital beds devoid of any critical reappraisal of current models of care.

What is known about the topic? There is a growing demand for inpatient care in Australia, with presentations to public hospital emergency departments increasing by 4.9% per year over the last 5 years and admission numbers increasing by 3.6% per year. Increasing numbers of hospital beds may give only short-term reprieve in lowering bed occupancy rates if little attention is given to improving hospital efficiency by internal process redesign or by decreasing demand for acute hospital beds by improving capacity of the non-hospital sector to manage sub-acute illness and chronic disease.

What does this paper add? This article provides a narrative meta-review of the evidence of effectiveness of various reform strategies. The key findings are that, within the hospital sector, patient throughput could be substantially improved by: outsourcing public hospital clinical services to the private sector where appropriate; implementing whole-of-hospital reforms, which facilitate more flexible and dynamic bed management (especially where it relates to systems of care for acutely ill patients); separating acute from elective beds and services; increasing the numbers of day-only admissions; and curtailing ineffective or marginally effective clinical interventions. However, the potentially biggest gains in hospital productivity will come from improved access to residential care, rehabilitation services and domiciliary support for hospitalised patients who no longer require acute inpatient care, combined with decreased need for hospitalisation as a result of population-based chronic disease management programs led by primary care agencies, and acute care and advance care planning within residential care facilities.

What are the implications for practitioners? A public debate must start now on how the healthcare system and the role within it of hospitals should be re-configured in managing future population healthcare needs in a sustainable way. In the meantime, all hospitals must consider implementing reforms with potential to improve their productivity and reduce access block for those who really need acute hospital care.

Background

Recent reports have again highlighted concerns around whether the supply of public hospital beds in Australia is sufficient to meet growing demand for inpatient care.^{1,2} The Australian Institute of Health and Welfare in June 2009 reported a 37% increase in hospital admissions over the last decade, with public hospitals accounting for 60% of all admissions of which the majority (74%) involve care of medical presentations.¹ Presentations to public hospital emergency departments (ED) have increased by 4.9% per year over the last 5 years with admission numbers increasing by 3.6% per year.

This increased demand has occurred on a background of 30% decrease in numbers of public acute hospital beds over the last two decades – currently 2.7 per 1000 population.¹ More efficient use of hospital beds, reflected in the decrease in average length of stay (LOS) from 6.2 days two decades ago to 3.3 days now,¹ has come from changes in medical technology, rise in same day admissions (now 50% of all admissions), advent of casemix-based funding, and growth in post-hospital community services.

However the curves for declining LOS and rise in same day admissions have levelled off over the last 5 years due to the expanded spectrum of hospital services and the numbers of patients with complex chronic illness.¹ Current bed occupancies in many tertiary public hospitals regularly exceed the agreed safe level of 85%.² Demographers warn of a 62% increase in numbers of hospital beds required by 2050 if current trends in bed utilisation continue coupled with exponential rise in numbers of patients aged 75 years and over requiring hospital care.³

The Australian Medical Association has advocated that the national public hospital bed stock be increased by 3750 beds (equal to 7% increase on current numbers) if current demand (let alone future demand) is to be adequately met.² However, such an increase will provide reprieve from the current bed saturation by no more than 7 years,³ and result in inefficient bed utilisation if not closely aligned with catchment population growth and health service plans.⁴ Substantial increases in bed numbers will considerably raise demand for workforce and funding that may be difficult to meet, and the rise in hospital outputs may not be commensurate with the rise in investment if current hospital processes and healthcare practices as a whole are not subject to reform.

The final report of the National Health and Hospitals Reform Commission (NHHRC) has placed timely access to quality care in public hospitals as a priority for reform in the immediate future.⁵ Key to this is additional funding of up to AU\$1 billion for hospitals to ensure bed availability for emergency presentations and more elective medical and surgical admissions. In the longer term, the Commission's recommendations for optimising use of hospital beds include: separating the provision of elective and emergency services in public hospitals; sponsoring a substantial investment in, and expansion of, sub-acute and non-acute care services that reduce the need for hospital care; improving hospital efficiency by introducing 'activity-based funding' from the Commonwealth based on casemix classifications – initially 40% of the 'efficient cost' of inpatient care, with the aim of increasing this to 100% over the next 5 years; and promoting clinical process redesign and better governance structures within hospitals coupled with public reporting of

performance indicators comprising a series of access targets for specific services.

What effect will these reforms have in easing pressure on limited numbers of public hospital beds? Are the proposed reforms based on evidence of effectiveness, and have potentially effective strategies been overlooked? This article provides an overview of the current state of play in managing hospital bed demand, and, for purposes of simplifying the analysis, groups strategies for managing demand into two basic categories that are not mutually exclusive: those primarily targeting the hospital sector aimed at increasing capacity and throughput, and reducing readmissions; and those primarily targeting the non-hospital sector aimed at facilitating early discharge or reducing presentation and admissions to hospital. Evidence of effectiveness was retrieved from a literature search of randomised trials and observational studies using broad search terms, with results of systematic reviews or high quality individual studies being given greater weighting. However, for some strategies, only data from specific demonstration sites were available, which were included if these showed a definite strategy effect. This report does not aim to provide an exhaustive analysis of all literature relating to every strategy mentioned but instead presents a narrative meta-review. The article concludes the most effective means for ameliorating hospital bed crises are clinical process redesign within hospitals that improves internal efficiency, and expansion of non-hospital, sub-acute care services and chronic disease management programs combined with greater use of palliative care and advance care planning in residential care facilities.

Discussion

Strategies targeting the hospital sector

The Productivity Commission in 2006 estimated the gap between optimal and current efficiency levels within hospitals to be between 20 and 25%.⁶ Greater use of existing beds could be obtained by extending hours of operation of elective services in surgery, endoscopy, angiography, and interventional radiology to 12 h per day, 7 days per week, but this would require significant changes in current professional culture, staff awards and rosters, and funding arrangements. The following strategies could be more readily implemented and do not necessarily require substantial increases in funding or staffing levels.

Outsourcing public hospital clinical services to the private sector

Elective surgery is one area of hospital activity in which excess public demand can be shared with the private sector. Such an approach has resulted in the transfer of 15% of all elective operations in the NHS to private providers over 3 years.⁷ A similar program in Queensland – Surgery Connect – contracts the private sector to perform elective surgery on 'long wait' category 2 and 3 public patients when local public hospital capacity has been exceeded. Since 2007, it has reduced the total numbers of public elective surgery patients within the state whose operation was overdue by 19.1% over 20 months, with the sharpest drop (by 46.1%) occurring in category 3 patients i.e. surgery to be performed within 365 days (Michael Zanco, Director, Hospital Access Unit, Queensland Health, pers. comm., 2009). However,

concerns about continuity of care and retention and training of surgeons in public hospitals have been voiced by professional organisations.⁸

Re-engineering clinical processes within hospitals

Reviewing and redesigning the way work units within hospitals function and interact, on the basis of 'lean thinking' principles derived from commercial industry, has been demonstrated to enhance hospital efficiency if applied at the whole hospital level. Some hospitals that have redesigned their emergency care systems have seen a 16% decrease in acute medical admissions and 4% decrease in acute surgical admissions.⁹ Australian experiments involving 60 acute hospitals in NSW and Flinders Medical Centre in Adelaide have noted sustained decreases in ED access block and shorter elective surgery waiting lists.¹⁰ Such redesign programs have multiple components.

(A) Redesign of emergency care systems.

1. *Reconfiguration of EDs into functional areas* for targeted management of different types of patients: high acuity–high complexity (or critical care areas) to deal with critically ill or highly urgent cases, most of whom will then be transferred to highly specialised areas such as intensive care and coronary care units; low acuity/low complexity patients who have minor illness or injury and are likely to be discharged within 12–24 h (observation bays); and low to medium acuity/high complexity patients who are likely to require more than 24 h stay and have more undifferentiated, multi-system problems for which psychosocial and environmental factors often play a significant part in their presentation.
2. *Co-location of medical assessment and planning units (MAPUs) with EDs* to which low to medium acuity/high complexity patients are transferred for further management. These units comprise wards specifically staffed and equipped to receive medical patients who then receive expedited multidisciplinary and medical specialist assessment, care and treatment for up to a designated period (typically between 24 and 72 h) before discharge or transfer to medical wards.¹¹ These units feature daily, consultant-led ward rounds, early multidisciplinary assessment, and prioritised access to ancillary services such as pathology and radiology. These units aim to discharge up to 50% of patients directly to the community, and can reduce inpatient mortality by 25%, LOS (by up to 2 days) and ED access block by 30%.¹¹
3. *Admission avoidance and rapid response community teams within EDs* that, using validated screening techniques and access to community support, identify patients who need more domiciliary care and arrange such care, avoiding the need for hospitalisation.¹²
4. *Multi-purpose short stay wards adjacent to ED* to which fully assessed and medically stable patients are transferred if they are deemed capable of undergoing treatments or procedures and being discharged within 24 h.
5. *Dedicated emergency surgical teams* comprising registrars and consultants whose exclusive role is to be on call to assess and organise emergency surgery for patients presenting to ED,^{13,14} as opposed to on-call surgical staff being

unavailable due to operating theatre commitments involving elective patients.

6. *Nurse-led discharge planning in ED* that focusses on patients with previous multiple presentations to ED who are being discharged home ('frequent flyers'). This strategy has been shown to significantly reduce re-presentations.¹⁵

(B) *Acceleration of patient transit from admission to discharge.* Hospital stay can be reduced by interventions, which hasten the time of discharge.¹⁶ These include: (1) more systematic use of clinical guidelines and care pathways that decrease LOS without compromising safety¹⁷; (2) regular multidisciplinary meetings using patient journey boards that focus team efforts on meeting a nominated date of discharge; (3) daily morning ward rounds by medical teams that take precedence over clinics or other discretionary activities; (4) nurse-led discharge whereby nurses are authorised, especially after-hours, to discharge patients who meet certain clinical criteria rather than wait for consultant rounds¹⁸; (5) access to transit and discharge areas so beds can be vacated quickly; (6) timely access to comprehensive geriatric assessment teams, aged care and assessment teams, and other gate-keepers who determine patient eligibility for geriatric rehabilitation beds, residential care beds or transitional care packages; (7) same-day consultant responses for inter-speciality requests for advice on acute management; (8) prioritised access to urgent pathology and radiology services required for acute cases¹⁹; and (9) routine assignment of medical teams to surgical patients at high risk of prolonged stay and perioperative complications.²⁰

(C) *Better integration of inpatient care with post-discharge care.* Hospital stays and readmissions can be significantly reduced by using models of care that target specific hospital populations and transfer aspects of care to the community as part of early discharge programs, and for whom inpatient discharge planning involving multidisciplinary teams is combined with post-discharge support such as nurse home visits, telephone contact or community services. The appointment of nurse discharge co-ordinators combined with re-engineering of peri-discharge procedures that include transmission of management plans and discharge summaries from hospitals to community providers can significantly reduce representations.^{21,22} Patient populations with most to gain include older patients with chronic disease,^{23,24} patients with heart failure,²⁵ and those with acute mental illness²⁶ acute stroke,²⁷ or having undergone major cavity surgery or orthopaedic operations.

Rigorous bed management

Hospital overcrowding with bed occupancies >90% severely impact on efficiency and create slow-resolving bed crises. The most frequent precipitant of such crises is a surge in acute presentations superimposed on a hospital bed management system incapable of anticipating or responding to such surges. Achieving a daily balance between acute and elective hospitalisations and between admissions and discharges by means of real-time monitoring of bed status using appropriate information technology and mandated bed management procedures can avoid such crises and reduce LOS.^{28,29} In achieving this balance, a few key innovations are necessary, underpinned by hospital re-orientation towards acute care as the main service priority.

1. Functionally separating acute and elective beds and services within the hospital (in some cases geographic separation) so that they constitute parallel, not competing, care systems that operate, where necessary, with separate funding and staffing. Such a strategy improves elective flows and reduces time to operation for acute cases.³⁰
2. Converting as many elective patients requiring treatments and operations as possible into day-only cases receiving care in dedicated day therapy and procedure units.³¹ In the UK up to 75% of all elective operations are now performed as day-only cases³² compared with current Australian rates of 50%. Increasingly, operations such as laparoscopic cholecystectomy³³ and percutaneous coronary angioplasty³⁴ can be performed as day-only cases.
3. Establishing 23-h surgical short-stay wards that can accommodate acute and elective surgical patients whose episode of care can be delivered within a 23-h envelope. As mentioned above, such a ward may be sited adjacent to the ED and accept medical as well as surgical patients at times of overflow from ED and MAPU. These wards can accommodate numerous procedures relating to hand surgery, simple fractures, ENT surgery, head and neck surgery, and gastrointestinal surgery.³⁵
4. Achieving close to 100% admission on the day of surgery for all elective procedures and achieving close to 0% for unplanned cancellations, by ensuring 100% of elective patients attend pre-operative assessment and medical optimisation clinics that may be nurse-led.³⁶ Such a strategy saves hospital bed-days and renders surgical lists more efficient.
5. Establishing free-standing ambulatory surgical centres that can serve as safe and efficient substitutes for inpatient hospital care for selected elective procedures.^{37,38} However, the ability to manage patients who unexpectedly experience acute complications requiring higher acuity care needs to be considered.

Introducing casemix based funding

Many state and territory health departments throughout Australia have introduced, or are introducing, casemix-based funding arrangements that encourage greater public hospital efficiency. The most elaborate of these arrangements exist in Victoria, which introduced casemix-based funding in 1993.³⁹ Various studies have shown reduced LOS for different clinical conditions without any rise in readmissions or adverse events.^{40,41}

Curtailling inappropriate or inefficient care

Studies performed in the US estimate that clinically inappropriate interventions account for between 25 and 50% of inpatient bed-days.⁴² To date, no similar study has been undertaken in Australian hospitals despite the availability of validated appropriateness criteria for various procedures,⁴³ and the means for determining care eligibility for public funding based on evidence of effectiveness.⁴⁴ Audit and quality improvement activities should aim to curtail clinical interventions that strong evidence suggests are ineffective or of marginal value (such as arthroscopy for uncomplicated osteoarthritis and coronary angioplasty for stable angina) and to minimise unwarranted variation in LOS. In

Queensland, continuous monitoring and feedback of diagnosis-specific, risk-adjusted LOS and readmission rates to individual hospitals – presented as variable life adjusted displays (VLADs) – encourage institutions to respond to unfavourable trends in outcomes that cannot be explained by random variation.⁴⁵

Other hospital reforms

Additional strategies that may help reduce LOS include regular peer-compare feedback of LOS and readmission data to individual clinical units, implementation of improved information technology systems including automated notes and electronic physician test ordering and prescribing,⁴⁶ and interventions designed to reduce medical error.

Strategies targeting the non-hospital sector

These comprise hospital demand and avoidance programs that aim to provide a clinically appropriate level of care in non-hospital settings.

Enhancing sub-acute and post-acute services

Census surveys of hospital bed use based on validated appropriateness criteria in Australia⁴⁷ and Canada⁴⁸ indicate ~70% of acute hospital bed-days are inappropriate as a result of impaired access to residential care, palliative care, rehabilitation services, domiciliary care, community services and family support. Data from a 2002 census of 99% of public hospitals in Australia revealed that 1521 older patients occupying 3% of hospital beds and up to 18% of bed-days were awaiting transfer to nursing homes.⁴⁹ There is potential for huge savings in hospital bed-days if non-hospital sub-acute and post-acute services were better resourced and managed. This will involve additional funding but will incur less opportunity cost given the lower daily expenditures of such services per patient compared with in-hospital care.

In Victoria, by contracting a range of non-acute hospital services, the Hospital Demand Management Strategy was associated with a plateau in hospital demand between 2001 and 2007, but was then followed by renewed increase in demand.⁵⁰ As far as the author is aware, no other peer-reviewed reports have explicitly studied the link between expansion of the non-hospital care sectors and decongestion of acute public hospital beds.

Significant numbers of hospital presentations involve patients whose medical condition may not require acute hospital care but for whom family concern, GP assessment, lack of communication between providers, and limited capacity of community-based health and social care services prompt inappropriate hospital referral.⁵¹ Better communication between providers, upskilling of GPs, and greater access to community support may lessen this trend although evidence of efficacy of such approaches is so far lacking.

Improving prevention and chronic disease management

More emphasis on primary and secondary prevention strategies targeting populations at high risk of complications due to frailty, cognitive decline or poorly controlled chronic multi-system disease may substantially reduce need for hospital care. It is estimated that 9% of all hospital admissions in Australia are

'ambulatory care sensitive (ACS)' i.e. potentially preventable if timely, high-quality ambulatory care is available.⁵²

Studies have shown that hospitalisation rates for ACS conditions are higher in areas with fewer primary care physicians and limited access to primary care.⁵³ Population-based chronic disease management (CDM) programs that systematically use evidence-based guidelines, personalised patient self-management strategies and multidisciplinary care including specialist nurses coordinated by a central agency can reduce hospitalisations by up to 27% in patients with heart failure.⁵⁴ Respiratory rehabilitation programs for patients with recent exacerbations of chronic obstructive pulmonary disease can reduce admission rates by up to 87%.⁵⁵ In Germany, CDM programs have reduced hospitalisations for stroke by 34% and for amputation by 45%.⁵⁶ Co-locating specialists with primary care providers in community settings rather than in hospital-based clinics and getting the former to upskill the latter in CDM can reduce the risk of future events requiring hospitalisation by a third, especially within isolated or disadvantaged communities.⁵⁷ To date, MBS-funded CDM plans directed at individual patients supervised by individual GPs have yet to prove their worth,⁵⁸ whereas in the UK, pay for performance schemes for GPs have had very modest effects on improving care of the chronically ill.⁵⁹

Unfortunately, numerous other interventions directed primarily at community-living older populations have not been associated with any significant lessening of need for hospital admission. These include: multi-factorial assessment,⁶⁰ disease prevention⁶¹ and falls and injury prevention;⁶² comprehensive geriatric assessment;⁶³ day hospital care;⁶⁴ intensive home visits;⁶⁵ home-based⁶⁶ or GP clinic-based⁶⁷ medication reviews; and home telecare.⁶⁸

Providing hospital in the home (HITH)

HITH programs based on a medical model whereby doctors undertake home visits and directly supervise care of patients requiring parenteral antibiotic and anticoagulation therapy for conditions such as uncomplicated cellulitis and deep venous thrombosis show reductions in hospital LOS by 1 day and hospital admission rates by up to 55%.^{69,70} However, HITH programs that consist predominantly of nurse-mediated packages of care for community-living patients with pre-existing disease who develop acute illnesses or disease exacerbations are less effective. Recent systematic reviews of studies involving hospital avoidance HITH programs show no decrease in admission rates that in fact tend to rise,⁷¹ and outcomes are worse for early discharge HITH programs for which readmission rates rose by up to 57% for elderly patients with a range of conditions.⁷²

Enhancing acute and palliative care in residential care facilities (RCFs)

The provision of acute care in RCFs has attracted interest as 10% of acute hospitalisations of older patients comprise transfers from RCFs.⁷³ A 'hospital in the nursing home' program based at Gold Coast Hospital (GCH) in Queensland involving local GPs and RCF. Nursing staff, with medical and nursing input from GCH, has resulted in a saving of more than 1500 bed-days over 2 years (Ms Kerry Robinson, project officer, Aged Care Early Intervention and Management [ACEIM], GCH, pers. comm.,

2009). This program uses clinical pathways for managing pneumonia, urinary sepsis, dehydration and pressure areas that reduce the need for hospitalisation.⁷⁴ At the Princess Alexandra Hospital (PAH) in Brisbane, a hospital-based liaison nurse who provides first contact for RCF. Staff requesting advice on the appropriateness of inpatient care has led to 40% decrease in transfer rates over 9 months (Ms Dawn Bandiera, ACEIM officer, PAH, pers. comm., 2009). Overseas experience also indicates that increased availability of primary care (both medical and nursing) in nursing homes results in fewer hospital admissions.⁷⁵ More universal use of advance care directives and palliative care programs should be mandated in RCFs as these reduce hospitalisation rates involving RCF patients by up to 40%.⁷⁶⁻⁷⁸ Even in the absence of advance care directives, simply raising family awareness of the futility of 'heroic' interventions in RCF. Patients with advanced or end-stage disease could help substantially reduce unnecessary hospitalisations in this group. In a recent US study, patients with severe dementia whose relatives were fully informed of the poor prognosis and risk of complications were 90% less likely to receive aggressive care.⁷⁹

Summary

This overview indicates there are no magic bullets for increasing hospital capacity or decreasing hospital demand. Health service managers must carefully appraise potential effectiveness of strategies designed to do either, and not prematurely adopt strategies promoted by enthusiasts that lack proof of concept, adequate pilot evaluations, and evidence of cost-effectiveness.

An overriding theme is that many hospital beds are being misused – occupied by patients who do not require acute hospital care, or patients who do require such care but are receiving it inefficiently. The key findings of this overview are that, within the hospital sector, outsourcing public hospital clinical services to the private sector where appropriate, implementing whole of hospital reforms that facilitate more flexible and dynamic bed management (especially where it relates to systems of care for acutely ill patients), separating acute from elective beds and services, increasing the numbers of day-only admissions, and curtailing ineffective or marginally effective clinical interventions could substantially improve throughput. However, the potentially biggest gains in hospital productivity will come from improved access to residential care, rehabilitation services, and domiciliary support combined with population-based CDM programs led by primary care agencies, and acute care and advance care planning within RCFs.

There remain two elephants in the room: increasingly unsustainable expectations of more hospital care driven by doctors, politicians, the media and the community itself; and inefficiencies maintained by separate funding of hospital and community healthcare by two different levels of government. If the number of public hospital beds are increased in line with current utilisation rates and expected demographic changes, this, together with the rising average cost of hospital admissions, will result in this sector alone consuming the current entire healthcare budget, which is expected to equal 12.4% of gross domestic product by 2032.⁵ A public debate must start now on how the healthcare system and the role within it of hospitals should be re-configured in managing future population healthcare needs in a sustainable way. In the

meantime, all hospitals must consider implementing reforms with potential to improve their productivity and reduce access block for those who really need acute hospital care.

Competing interests

No competing interests exist.

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