

Hospital bed occupancy: more than queuing for a bed

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Hospital bed-occupancy rates have been proposed as a measure that reflects the ability of a hospital to properly care for patients. Whether this measure can be considered useful in guiding the planning and operational management of hospital beds in a way that improves how well patients fare while in hospital depends on the answers to two questions. Firstly, does the bed-occupancy rate influence patient outcomes? And secondly, what would be an appropriate level of occupancy to aspire to?

Does bed-occupancy rate influence patient outcomes?

The Australian Medical Association,¹ Irish Medical Organisation² and the Australasian College for Emergency Medicine³ consider bed-occupancy rates above 85% to have a negative impact on the safe and efficient operation of a hospital. In the United Kingdom, the Department of Health has found that bed-occupancy rates exceeding 85% in acute care hospitals are associated with problems in handling both emergency and elective admissions.⁴ A target bed-occupancy rate for UK hospitals of 82% has been instituted as one measure of quality. Recently, the Australian Government has included bed-occupancy rates as a hospital performance measure for the planned national health and hospitals network.⁵

There are a number of known factors from different lines of evidence that support the use of bed occupancy as an operational target and measure of quality. These include the risk of cross-infection between inpatients in overcrowded wards and the need for timely admission to an appropriate ward of patients presenting to emergency departments (EDs) or for booked surgery. Staff welfare may also be adversely affected by high bed-occupancy rates.

Risk of cross-infection

Most reports concerning inpatient cross-infection consider the spread of methicillin-resistant *Staphylococcus aureus* in hospitals, and this has been shown to correlate with bed-occupancy rates (Box 1).⁶⁻¹⁰ The UK House of Commons Committee of Public Accounts has “repeatedly noted that high levels of bed occupancy are not consistent with good control of infections”.¹¹ Hospital overcrowding (high bed occupancy) contributes significantly to the rate of hospital-acquired infections, and hand-hygiene compliance falls as the indications for hand washing increase during periods of understaffing and high workload.¹²

Admission from emergency departments

The influence of hospital bed occupancy on outcomes for patients presenting to EDs across a number of Western countries is outlined in Box 2.¹³⁻¹⁸

In the UK during 1997–98, average bed-occupancy levels varied between around 50% and 99%.¹⁹ However, most National Health Service (NHS) acute trusts reported periods during which inpatient bed demand exceeded availability. At those times, emergency patients were more likely than usual to be assessed and have treatment initiated in EDs before moving to an inpatient ward. Furthermore, those hospitals with higher average bed-occupancy

ABSTRACT

- Timely access to safe hospital care remains a major concern. Target bed-occupancy rates have been proposed as a measure of the ability of a hospital to function safely and effectively.
- High bed-occupancy rates have been shown to be associated with greater risks of hospital-associated infection and access block and to have a negative impact on staff health.
- Clinical observational data have suggested that bed occupancies above 85% could adversely affect safe, effective hospital function. Using this figure, at least initially, would be of value in the planning and operational management of public hospital beds in Australia.
- There is an urgent need to develop meaningful outcome measures of patient care that could replace the process measures currently in use.

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rates cancelled a significantly higher proportion of elective operations and had longer delays in the transfer of patients from the ED to inpatient beds. It was acknowledged that “hospitals with average occupancy levels above 85 per cent can expect to have regular bed shortages and periodic bed crises”.¹⁹ It has been suggested that reducing bed-occupancy rates below a “threshold” level should reduce excessive waiting times in EDs.¹³

Observations made within the NHS have been used to develop a discrete-event stochastic simulation model to study the relationship between demand and available hospital bed capacity.²⁰ This model suggests that there is a discernible risk of a hospital failing to provide sufficient beds, and thereby safe, efficient care, when average bed occupancies exceed 85%. A hospital with an average bed occupancy of 85% would be expected to “be short of beds for admissions on four days in a year”, with disruption of normal function of up to 8 weeks. The authors concluded that “spare [bed] capacity is essential if an emergency admissions service is to operate efficiently and at a level of risk acceptable to patients”. In 2005, the average hospital bed-occupancy rate was shown to be 84% in the UK compared with 64% in the Netherlands, with the same number of acute beds per head of population in both countries. In the Netherlands, where, notably, nursing home patients have access to care that avoids the need for admission in an acute facility, admission decisions were not affected by bed pressures.¹¹

Bed-occupancy rates do seem to influence ED performance in New South Wales. Based on published hospital performance data,²¹ there is a significant negative association between bed-occupancy rates and ED admission performance ($r = -0.48$; $P = 0.03$) in the 20 largest general public hospitals with EDs. It is also notable that there is no correlation between bed-occupancy rates and cancelled surgical bed-days ($P = 0.54$).

1 Effect of hospital bed-occupancy rate on methicillin-resistant *Staphylococcus aureus* (MRSA) infection rates

Country	Comment on MRSA infection rate
Northern Ireland ⁶	Related to bed-occupancy rate and inpatient bed turnover interval.
United Kingdom ⁷	Related to bed-occupancy rate.
UK ⁸	Related to bed-occupancy rate. Additional ward beds related to increased infection rate, even with increased staffing.
Malta ⁹	Increased in medical wards with > 100% occupancy.
UK ¹⁰	Related to bed-occupancy rate. 10.3% increase in infection rate for occupancy > 90% compared with infection rate at 84% occupancy.

2 Effect of hospital bed-occupancy rate on patients presenting to the emergency department

Country	Comment on emergency department effect
England ¹³	Increased access block (AB).
Canada ¹⁴	Increased AB, especially with bed-occupancy rate above 90%. Delay in patients reaching an appropriate inpatient bed.
Australia ¹⁵	Increased AB and length of hospital stay.
Australia ¹⁶	Increased AB, especially with bed-occupancy rate above 90%. Bed-occupancy rate did not affect consultation and admission rates.
Australia ¹⁷	Increased AB and in-hospital mortality.
United States ¹⁸	Bed-occupancy rates above 80% progressively delayed discharge and admission to a ward.

Risks to staff welfare

Risks to staff resulting from hospital overcrowding are equally concerning. Risk of hospital-acquired infection is not restricted to patients. Staff mental health may also be impacted by overcrowding. A significant association has been shown between high hospital bed-occupancy rates and the initiation of antidepressant therapy among nursing and medical staff at 16 Finnish hospitals.²² In this study, occupancy rates above 85% represented exposure to excess bed occupancy. A trend of increasing antidepressant use corresponded to occupancy levels above 85%, and became significant at occupancy rates more than 10 percentage points in excess of this level (hazard ratio, 1.7). There was a significant dose-response-type pattern to the association ($P=0.013$). Excess bed occupancy was more common in internal medicine than in surgical wards.

What is an appropriate level of occupancy?

It appears that hospital bed-occupancy rates are a measure of hospital performance — but what level is optimal? Bain et al²³ argue that the application of a single level of “ideal or safe occupancy” oversimplifies the modelling of hospital throughput. They call for further study to gain a better understanding of the processes involved in the generation of long waiting lists and access block. Their logic is sound in relation to that aspect of the bed-occupancy debate, but the literature shows that patient movements into and through a hospital are not the only events influenced by bed occupancy.

Overall, there is sufficient evidence to support the contention that bed-occupancy rates provide a useful measure of a hospital's ability to provide high-quality patient care. An 85% target is a reasonable starting point that may need to change over time and between facilities. However, before we can make significant advances in improving patient outcomes there must be a shift away from the reliance on administrative and process measures, such as length of stay and waiting lists, currently in use as proxy indicators of efficiency and quality. There are very few true patient outcome measures available to assess the function of the health care system. We have much to do just to establish and validate such measures, and, until we do, we are dependent on best-guess (albeit rough-guess) processes. We are incapable of measuring what we really need to know, and, even if we could, we are constrained by a

system that probably could not respond. Proper quality improvement would require monitoring and appropriate adjustment of the provision of health services. Political, community and personal patient preferences and expectations make this all the more difficult.

Competing interests

I am a board member of the Australian Medical Association (NSW).

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