

# Emergency department overcrowding: dying to get in?

George Braitberg

*Initiatives to prevent access block should be aimed at long-term structural changes to bed availability to meet the needs of a complex and ageing population; current management practices are creating a growing mismatch between supply and demand*

The Australasian College for Emergency Medicine and the Australian Council on Healthcare Standards have defined access block for emergency patients as the percentage of all patients admitted, transferred or dying in the emergency department (ED) where their total ED time exceeds 8 hours.<sup>1</sup> Simply put, access block is the absence of flow at a system level, not just the ED. In United States literature, access block is referred to as “overcrowding”.

## How does flow stop?

In Australia, the total number of acute hospital beds has decreased over the past two decades, with a 14% decrease in the number of public hospital beds between 1992 and 2002.<sup>2,3</sup> In the US, the number of medical and surgical beds declined by 18% from 1994 to 1999, while ED attendances increased by 15%.<sup>4</sup> During this time, there have been concomitant decreases in inpatient length of stay and more day procedures and day admissions.<sup>5</sup> However, in the United Kingdom, after a period of decline, the number of multiday admissions per 1000 residents increased in 2002 and 2003. This was thought to be the result of postponed demand related to illnesses for which there were waiting lists, and to the increasing burden of chronic disease. In 2003, 30% of the multiday admissions could be attributed to just 20 International classification of diseases, ninth revision (ICD-9) diagnoses, and a third of these were attributable to chronic heart disease.<sup>6</sup>

## Capacity

Capacity decisions in hospitals are generally made without the help of quantitative model-based analyses.<sup>7</sup> Hospital managers have been stimulated to reduce the number of beds and increase the occupancy rates to improve operational efficiency. Modelling is usually based on average bed occupancy. However, this model is not capable of describing the complexity and dynamics of the patient flow. This is known as the flaw of averages.

A formula has been described that can be applied to almost every queuing system.<sup>8</sup> It shows the relation between the expected number of patients in the system,  $EB(t)$ , the average length of stay ( $\mu$ ), and the unscheduled need, described by the Poisson process,  $\lambda$ :

$$EB(t) = \lambda\mu$$

For example, at an intensive care unit (ICU), five patients arrive per day on average. The average length of stay is 6 days. The parameters of this queuing system are:  $\lambda = 5$  and  $\mu = 6$ . Using the above formula, the expected number of patients at the ICU is 30. If management decides to size the unit on this average bed number, operational problems will occur on a regular basis. The probability ( $P_i$ ) that more than 30 beds are occupied at any time is easily calculated according to the formula:

$$P_i = e^{-\lambda\mu}(\lambda\mu)^i/i!$$

where  $e$  = exponential and  $i$  = the number of beds occupied. In this example,  $P_i = 0.45$  (ie, need will exceed capacity 45% of the time).<sup>9</sup>

It has been shown that a high degree of reserve capacity (up to 30%) is required to avoid high rates of surgery cancellations because of unavailable beds downstream.<sup>10</sup> However, most health policy experts believe that a 15% capacity buffer is adequate, and an acute hospital can expect regular bed shortages and periodic bed crises if average bed occupancy rises to 90% or more.<sup>11</sup>

## Ageing population

It is projected that between 1996 and 2016, the general population in Australia will increase by 21% or 3.1 million, the number of people over the age of 65 years will increase by 59% or 1.3 million, and those over the age of 80 years will increase by 76% or 368 000.<sup>12</sup> The effect of the ageing population on access block is twofold. As noted earlier, there is already a relative decrease in access to residential care beds in the community, especially beds designated for high-dependency patients, in the face of a significant growth in the number of people seeking placement.<sup>13,14</sup> It has been shown that incidence rates of institutional aged care double for each 5-year interval from the age of 60 years.<sup>15</sup> The general effect of illness and ageing must also be considered. In one study, undertaken between 1990 and 2004, while there was a 54% increase in the total number of ED patients, there was a disproportionate increase of 198% in the number of patients aged over 70 years, including a 671% increase in the number of those aged over 90 years. The time taken to manage patients increased with age, with older patients (aged over 70 years) being 4.9 times more likely to require admission to hospital than younger patients (aged 30 years or less), and older patients' average length of stay was 6.9 times longer. There were 3.3 times more younger patients than older patients, but older patients occupied 9.8 times more ED bed-days.<sup>16</sup>

## Preventing avoidable hospitalisations

In response to unprecedented and sustained increases in demand for health care services that were placing significant pressures on hospitals, the Victorian Government committed \$582 million as an initial investment over 4 years from 2001–02 to 2004–05 to implement the Hospital Demand Management Strategy. Of this allocation, \$150 million was invested to develop new approaches to caring for patients known to have a high risk of deterioration in their health, and thus preventing avoidable hospital use in the future. These new approaches to patient care were developed, implemented and evaluated through a program called the Hospital Admission Risk Program (HARP). Many patients with complex and chronic illnesses were treated as hospital outpatients or in the community. These programs have shown good initial outcomes with HARP patients experiencing 35% fewer ED attendances and 52% fewer ED admissions, and 41% fewer days in hospital.<sup>17</sup> There are, however, some emerging data that question the sustainability of the early gains of these programs, in the face of age and worsening disease.<sup>18</sup>

## The federal–state divide

In Australia, health care is funded by both federal and state governments. Public hospital funding is largely provided by the state, and primary and subacute care is funded by the federal government. Aged care provides a good example. The federal government has responsibility for residential aged care. In the absence of adequate residential capacity for the aged, patients are inappropriately accommodated in public hospitals. Solving this problem will require a combined approach to stop the “buck passing” between the federal and state governments.<sup>19</sup>

## Outcomes

Access block is not an inconvenience. It is not a problem of EDs. Access block is an illness, and not a benign illness. It has a morbidity and mortality rate and a growing literature about it. A search in MEDLINE (1950 to Week 2 of October 2007) using the keywords *access block*, *crowding* and *overcrowding* identified 163 articles. This Journal alone has published 26 articles in recent years.

We know that access block causes ambulance diversion,<sup>20</sup> independently predicts increased inpatient length of stay<sup>21,22</sup> and increases patient mortality.<sup>23,24</sup> One study reported 43% more deaths in an overcrowded cohort compared with a non-overcrowded cohort of ED patients, with the effect more profound in the older population. Another showed a linear relationship ( $R^2 = 0.95$ ) between the degree of overcrowding and 7-day mortality.<sup>24</sup> There is a high correlation between overcrowding and patients who leave an ED without treatment. Another report showed a 0.665 correlation between increasing overcrowding and the rate of patients who left before being treated.<sup>25</sup> While most of these patients are not in the high-acuity triage categories, tragic consequences can nevertheless arise. In the case of one patient who died of infective endocarditis after being discharged from an ED, the coroner concluded that “it has to be recognised that as a matter of common sense, in an environment of severe overcrowding the potential for error on the part of medical practitioners, especially in a setting where a decision has to be made as to whether a patient should be discharged or not, will inevitably exist”.<sup>26</sup>

A previous editorial in this Journal proposes two solutions — reduce hospital demand and optimise bed capacity.<sup>27</sup> I would propose that we acknowledge the limitations of the first strategy as our population ages and requires increasing community support. As shown earlier, bed capacity needs to be able to meet surge requirements and not the average need. While ED and inpatient reforms have and will deliver some gains, the problem we now face is bed stock. ED overcrowding is not caused by patients in low-acuity triage categories who present to the ED and are able to be quickly discharged. These patients are dealt with through a variety of “streaming” processes (eg “fast track” or “likely discharge” models of care). It is patients who need hospital admission who drive the system into ED cubicle block and overcrowding.

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