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EDITORIAL

Associations Between Hospital Occupancy, Emergency Department Function and Ambulance Delays, With Modelled Mitigation Strategies: Evidence From Acute Queensland Hospitals

David Mountain[1,2]

[1]Sir Charles Gairdner Hospital, Perth, Western Australia, Australia | [2]Curtin University, Perth, Western Australia, Australia

Correspondence: David Mountain (david.mountain@health.wa.gov.au)

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ABSTRACT

This editorial highlights three studies that collectively offer a roadmap towards system-level improvement in access, flow and quality of care. These studies used linked data from several Queensland hospitals and explored emergency department (ED)–hospital capacity associations with ambulance, ED and hospital dysfunction. One study found ED occupancy was strongly associated with ambulance dysfunction (ramping, response times). The second study associated hospital occupancy with ED dysfunction. Larger hospitals with occupancies above 85%–90% became dysregulated with rapid overcrowding. The modelling study in three tertiary hospitals reported that reduced admissions (ED or elective procedures), improved discharges (earlier, quicker community discharge, home care) and flexible bed use (any ward, over-census) improved flow. Diverting general practice–type attendances and weekend surgery seemed ineffective. Rapid, adequate flexible admitting capacity seems important for safe, efficient hospital–ED care and ambulance function.

JEL Classification: Emergency medicine, Health services administration

1 | Introduction

The use of rich administrative data is essential to understand system dynamics and problems. This issue of the *Medical Journal of Australia* includes three linked articles [1–3] that require intensive reading and are an important analysis of interlinked issues determining access to emergency department (ED) care. Administrators, policymakers and clinicians will hopefully see a story of the probable causation of the severe healthcare dysfunction seen daily in acute hospitals, potential solutions and, importantly, some unhelpful solutions.

Yoon and colleagues [1] and Riahi and colleagues [2] found important associations, and likely causation of pre-hospital, ED and hospital dysfunction associated with excessive bed occupancy. They linked over 3 million ED attendances at 25 acute Queensland hospitals providing a large dataset to explore associations between ambulance delays, ED flow and hospital occupancy. They explored whether effects were universal across sites and by hospital size [1, 2].

Hassanzadeh and colleagues used discrete event modelling within three tertiary hospitals to assess potential solutions.

Their findings highlight major interdependencies within acute care systems, and the need for monitoring capacity, performance and interventions across the whole system [3].

2 | Key Findings

Yoon and colleagues [1] found strong associations between ED access block (i.e., admitted patients in ED >8 h), patient off-stretcher time (POST; interchangeable with ramping) and ambulance response time. Ramping was strongly associated with ED length of stay. It is possible, albeit difficult, to argue that increased ramping drives access block and ED length of stay. However, access block and ED length of stay increased longitudinally whether patients were ramped or not. More feasibly, delayed ED egress reduces cubicle access, driving ramping. Similarly, how would worse ambulance response time cause ramping (by what mechanism?), but ramped ambulances unavailable to respond clearly can increase ambulance response times? Overall, the findings from Yoon et al. strongly suggest that delayed ED egress drives ambulance ramping, which degrades ambulance response time.

Riahi and colleagues [2] explored relationships between hospital occupancy (hospital capacity marker) and hospital–ED function, measured by 4-h compliance, access block and ED length of stay. Bed occupancy highly correlated with ED function, although it plateaued at high occupancies (e.g., 90%–95%). This plateau was probably from small hospitals that routinely operated at over 100% occupancy, indicating substantial flexible capacity. Hospitals seemingly have specific occupancies beyond which managing inflow is rapidly lost with increasing crowding. In medium to large hospitals, the choke point was 87%–90% (medium, marginally higher), but it was over 100% in smaller hospitals [2].

Previous modelling suggests that larger hospitals manage high occupancies better (from internal flexibility) [4, 5]. However, the small hospital occupancies (e.g., 120%–130%) suggest substantial rapid additional capacity (above base) when choking occurs, which seems unavailable to larger hospitals [2]. Perhaps, rather than trying to stay at specific occupancies, which is operationally difficult due to hospitals' different capacities, flexible capacity should be available in all hospitals [4].

Overfilled hospitals disrupt flow in many areas, such as intensive care units, operating theatres and elective admissions, for example, with queues extending throughout the hospital. However, the ED is particularly vulnerable when there is no flexibility elsewhere. Overcrowded hospitals result in ED patients being ramped, delayed or seen in waiting rooms or corridors, with admitted patients being placed in outlier wards, non-clinical spaces or ED short-stay [4]. Crowding delays healthcare provision, reduces access to ward expertise and increases patient bed moves, complexity, hospital-length of stay and adverse events (including mortality) [6]. Delayed care, with ED wait times over 12 h being now common, affects mostly patients who are older, frail, psychiatrically unwell, and disadvantaged [7, 8].

These studies were done before and during the COVID-19 pandemic, and found that performance was already deteriorating, before accelerating during the pandemic [2]. The true post–COVID-19 period (2024–2025), when COVID-19 became endemic, saw continued poor performance, suggesting ongoing dysfunction [9]. National data suggest we are seeing older, sicker patients, probably with delayed care, in systems that lost functional capacity [10]. Hassanzadeh and colleagues [3] explore potential interventions to improve hospital capacity and ED flow using discrete event simulation modelling of three tertiary hospitals datasets. First, the authors modelled reduced ED or elective admissions into hospitals. Reducing ED admissions improves performance but is difficult to implement. Community programmes show little sustainable success in reducing ED attendances [11]. Reducing elective admissions occurs during crises, and naturally over weekends, creating capacity—weekends are normally better than weekdays with better ED flow and less ramping—but delays appropriate care, which, if prolonged, may return patients to EDs and hospitals [2].

Reducing general practice-type patients in the ED made no difference to ED–ambulance performance, which will not surprise emergency physicians, who understand that ED dysfunction is associated with cubicles being occupied by delayed admissions and not by waiting-room patients awaiting discharge [12].

Second, Hassanzadeh and colleagues [3] assessed whether earlier ward discharges increase ED admitting capacity. Although this increase in capacity provides temporary relief, it cannot manage growing admissions over time and, in my experience, is difficult to maintain.

Using all available beds, that is, outlying to any acute bed or over-census space (e.g., corridors, utility), creates capacity, yet substantial concerns exist, including the need for careful patient selection, frequent bed moves, prolonged 'safari' ward rounds, inexpert care on non-specialty wards, and increased complaints and media reports [13, 14]. When hospitals are routinely over capacity, this state becomes normalised, along with its problems, but with minimal flexible capacity. Strategies that create capacity seemingly work, which suggests that adding true capacity, such as new beds, would improve flow, flexibility and provide better patient care. Fourth, the authors found that the strategy of performing weekend elective procedures provided negligible benefits.

Last, early discharge of patients who completed care but were awaiting placement (i.e., true capacity increase) strongly improved flow. This finding is important, as 5%–10% of acute beds are now occupied by patients who would be better supported in other environments, such as aged-care facilities, disability services and home supported services [15].

3 | Conclusion

These three articles on access to acute care strongly suggest that exit blocks throughout our hospital (and community) systems create access delays for ED and ambulance patients and, probably, other hospital patients. The authors report the importance of flexible appropriate capacity throughout our healthcare system. Some suggested solutions, such as diverting general practice-type patients, have negligible effects. Short-term gains can come

from earlier discharges and flexible bed use, but these measures cannot provide long-term capacity for ageing, comorbid populations. All these linked barriers require capacity increases. This may come from federal and/or state reforms providing more aged or supported home care quicker, and from hospital in the home and community support programmes. However, in my opinion, capacity growth with new hospital beds must be considered to provide flexibility across acute hospitals throughout the year. It is not a failure if beds are sometimes empty, or wards open and staffing increases occur seasonally. It would instead signal a mature, sensible, safer, caring, clinically appropriate and efficient system, which stops routinely denying or delaying care to our most vulnerable patients.

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Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

This article includes no original data.

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