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## Report on the 4-h rule and National Emergency Access Target (NEAT) in Australia: time to review

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### Abstract

**Objective.** The aim of the present study was to provide a summary of a systematic review of literature reporting benefits and limitations of implementing National Emergency Access Target (NEAT), a target stipulating that a certain proportion of patients presenting to hospital emergency departments are admitted or discharged within 4 h of presentation.

**Methods.** A systematic review of published literature using specific search terms, snowballing techniques applied to retrieved references and Google searches was performed. Results are presented as a narrative synthesis given the heterogeneity of included studies.

**Results.** Benefits of a time-based target for emergency care are improved timeliness of emergency care and reduced in-hospital mortality for emergency admissions to hospital. Limitations centre on using a process measure (time) alone devoid of any monitoring of patient outcomes, the threshold nature of a time target and the fact that currently NEAT combines the measurement of clinical management of two very different patient cohorts seeking emergency care: less acute patients discharged home and more acute patients admitted to hospital.

**Conclusions.** Time-based access targets for emergency presentations are associated with significant improvements in in-hospital mortality for emergency admissions. However, other patient-important outcomes are deserving of attention, choice of targets needs to be validated by empirical evidence of patient benefit and single targets need to be partitioned into separate targets pertaining to admitted and discharged patients.

**What is known about the topic?** Time targets for emergency care originated in the UK. The introduction of NEAT in Australia has been controversial. NEAT directs that a certain proportion of patients will be admitted or discharged from an emergency department (ED) within 4 h. Recent dissolution of the Australian National Partnership Agreement (which provided hospitals with financial incentives for achieving NEAT compliance) has prompted a re-examination of the 4-h rule, the evidence underpinning its introduction and its benefits and risks to patients

**What does this paper add?** This paper is executive summary of key findings from a systematic literature review on the benefits and limitations of NEAT (the 4-h rule) commissioned by the Queensland Clinical Senate to inform future policy and targets.

**What are the implications for practitioners?** There is evidence that a time-based target has been associated with a reduction in in-hospital mortality for emergency admissions to Australian hospitals. Concerns remain regarding a time-based target alone being used to drive redesign efforts at improving access to emergency care. A time-based target should be coupled with close monitoring of patient outcomes of emergency care. Target thresholds need to be evidence based and separate targets should be reported for admitted, discharged and all patients presenting to the ED.

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## Introduction

The National Emergency Access Target (NEAT), introduced into Australian hospitals in 2011, stipulates that a certain proportion of patients will be discharged, admitted to hospital or transferred within 4 h of arrival in the emergency department (ED), hence the term the '4-h rule.' This reform, designed to improve access to emergency care and reduce ED overcrowding, evoked considerable anxiety about the possible consequences of lower-quality care resulting from a time-based target being used to drive delivery of emergency care.<sup>1,2</sup>

A re-examination of the 4-h rule, the evidence underpinning its introduction and its benefits and risks to patients has been prompted by the recent dissolution of the Australian National Partnership Agreement, which provided hospitals with financial incentives for achieving certain NEAT compliance rates, and the current downward revision of compliance rates in the UK amid reports of poor-quality care in EDs.

As a means of informing future policy decisions around the most appropriate NEAT compliance targets, the Queensland Department of Health commissioned a systematic review of existing literature pertaining to NEAT and its implementation in Australia and the UK. This article provides an executive summary of the key findings of that review; the full review, in the form of a monograph, is available as Supplementary Material to this paper.

## Methods

A systematic review of published literature was undertaken using specific search terms, snowballing techniques applied to retrieved references and Google searches. Results are presented as a narrative synthesis given the heterogeneity of included studies. More detail as to exact methods are published in the full monograph.

## Results and Discussion

### *ED overcrowding*

ED overcrowding was initially measured in terms of 'access block' (defined as the percentage of admitted patients remaining in the ED for more than 8 h). In 2011, this was replaced by a NEAT compliance rate (the percentage of all patients leaving the ED within 4 h of presentation). This more stringent time window was aimed at reducing ED overcrowding and improving access to emergency care in all Australian hospitals.<sup>3,4</sup> As detailed in the Supplementary Material, this was a political directive at the Federal level that was agreed to by the States and Territories and supported by financial incentives to individual hospitals.

Introduction of NEAT was spurred by Australian research showing direct correlations between longer stays in the ED and both longer in-patient stays and higher in-hospital mortality. Richardson<sup>5</sup> and Sprivulus *et al.*<sup>6</sup> were the first to show that overcrowding in EDs was associated with prolonged ED length of stay (LOS) and increased mortality for patients admitted acutely via the ED. Liew *et al.*<sup>7</sup> and Richardson<sup>8</sup> also highlighted the

positive relationship between LOS in ED and an increased in-patient LOS, with the former study quantifying the increased in-patient LOS for increasing ED LOS (Table 1).

### *Benefits of NEAT*

Recent research suggests that, in general, the introduction of NEAT and the ensuing system of care redesign has led to a reduction in ED overcrowding in many centres in association with improved outcomes for patients seeking emergency care.

### *Improvement in timeliness of accessing emergency care*

Access to emergency care in some states has improved significantly, as measured by waiting time by triage category, ambulance off-stretcher times, ambulance redirection, average ED LOS and access block.<sup>9</sup> This improved access has been achieved despite an average growth in ED presentations nationally of 5% per annum over the past 4 years, which has been disproportionate to the rate of population growth.

Kelly *et al.*<sup>10</sup> highlight that a 10-min reduction in total treatment time in the ED may not seem important to an individual patient. However, when achieved for 40 patients per day, it adds up to 400 min (i.e. >6 h) of additional cubicle availability within the ED.

### *Improvement in mortality for patients admitted to the hospital from the ED*

Several studies, both overseas and in Australia, reveal that improving ED overcrowding is associated with a decrease in adjusted in-hospital mortality rates among patients admitted through the ED.<sup>5,6,11–15</sup> In Western Australia, Geelhoed *et al.*<sup>11</sup> studied six hospitals in Perth (three tertiary and three secondary hospitals) following the introduction of the 4-h rule and found that improvements in access block and ED overcrowding were associated with an overall significant decrease in mortality rate from 1.12% to 0.98% in tertiary hospitals, but had no effect in secondary hospitals (where access block also did not improve). Recent work from a large Australian tertiary hospital has shown a halving in deaths of emergency admissions to hospitals associated with a halving of ED LOS. A strong inverse relationship was noted between NEAT compliance rates and the adjusted risk of death for emergency admissions to the hospital.<sup>16,17</sup>

In the UK, Kelman *et al.*<sup>18</sup> examined hospitals across 155 National Health Service (NHS) trusts and found that as the

**Table 1. Correlation between emergency department length of stay (LOS) and mean in-patient LOS<sup>7</sup>**

ED LOS (h)	Mean in-patient LOS (days)
<4	3.73
4–8	5.65
8–12	6.6
>12	7.20

percentage of hospitals achieving >98% compliance with the 4-h target increased from 1.24% to 59.4%, the mean in-hospital mortality rate for emergency admissions across all hospitals reduced by approximately 25%. However, this association was not confirmed in all studies performed at the level of individual hospitals.<sup>19</sup>

#### *Improvement in mortality of patients discharged from the ED*

Improvements in mortality in patients discharged from ED in association with NEAT are more difficult to quantify because of the necessity of having access to linked data between hospital admissions and death registries. Using linked records across multiple population-based health administrative databases in Ontario and deaths recorded in a central registry, Guttman *et al.*<sup>12</sup> investigated the relationship between mortality at 7 days for patients discharged home from the ED and ED LOS. The risk of death increased incrementally with each additional hour of mean waiting time. For mean LOS  $\geq 6$  h compared with <1 h, the adjusted odds ratios (OR) and 95% confidence intervals (CI) for death and admission were 1.79 (1.24–2.59) and 1.95 (1.79–2.13), respectively, among high acuity patients, and 1.71 (1.25–2.35) and 1.66 (1.56–1.76), respectively, among low acuity patients. Interestingly, Guttman *et al.*<sup>12</sup> found no increased risk of death among patients who left the ED without being seen (adjusted OR 1.00; 95% CI 0.97–1.02).

#### *Limitations of NEAT*

The review also examined the potential harms that could be caused by time-based strategies to reduce ED overcrowding. Within Australia, implementation of the 4-h rule has evoked expressed fears around time targets undermining quality of patient care by placing more value and emphasis on time spent in the ED rather than outcomes achieved for patients and hence potentially pressuring clinicians to make hastier and inappropriate management decisions.<sup>2,20,21</sup> Moreover, it was argued that the stipulated 4-h targets were not founded on evidence, but on a belief that increasing timeliness of care in the ED correlates closely with better quality of care and patient satisfaction.<sup>22,23</sup>

#### *Using a time-based measure in isolation for measuring quality of care*

Process metrics (e.g. time targets) examine performance in delivering health care rather than actual outcomes for the patient.<sup>24</sup> The advantages of process measures are that they are easy to measure, often visible in real-time, relatively objective, transferable across sites and often under the direct control of clinicians.<sup>24</sup> The NEAT compliance rate is a time-based process metric, reflecting the time it takes to deliver the health care rather than the quality of the care.

The disadvantage of process metrics used in isolation (like NEAT) is that they do not assess the consequence of the process in terms of patient-important clinical outcomes. In the case of NEAT, the assumption is that faster care is better care with demonstrable patient benefit in the majority of cases. However, it is not just the time taken to deliver care, but other important factors in care delivery that also contribute to the quality of the care delivered. An exclusive focus on process

rather than outcomes may manifest as the moving of patients prematurely from the ED to other areas of the hospital in order to ‘stop the clock’ (e.g. clinical decision units, in-patient beds and short-stay wards). Although this improves NEAT compliance rates, it does not necessarily improve care or patient outcomes.

There needs to be a balance between NEAT-induced efficiency and patient safety.<sup>20</sup> In particular, it needs to be determined whether there is an association between shorter ED stays and increased rates of adverse events, such as death, cardiac arrests or clinical deterioration during the early stage of hospital admission. Sullivan *et al.*<sup>17</sup> have shown that monitoring of these outcomes among patients admitted through the ED is critical in engaging clinicians in system redesign that leads to improved access to emergency care.

A secondary issue is that if time-based measures of NEAT compliance are to be regarded as important performance metrics, then more resources and processes must be potentially directed towards maximising the accuracy of such measures. The recent Queensland Audit Office report into emergency medicine measures highlighted the potential inaccuracies in the time measures recorded by the current patient information and management system.<sup>25</sup> The use of time as a measure in isolation or, for that matter, the use of any measure in isolation runs the risk of inciting ‘gaming’ or less stringent and standardised interpretations of the measure such that institutions are seen as more likely to meet the target.<sup>18</sup>

The Mid-Staffordshire Trust investigation<sup>26</sup> illustrated how an isolated time-based target for care can have serious unintended adverse consequences. The Stafford Hospital had above average compliance with the 4-h rule, but patients and staff reported that care that was not patient focused and a safety signal was noted in the form of an elevated hospital standardised mortality ratio (HSMR). Subsequent analysis confirmed that hospital to be a consistent mortality outlier, despite better than average 4-h rule performance, which then served as the trigger for a full-scale investigation into its many failings in care.<sup>26</sup> This disclosed a surge of discharges from the ED (either home or to a ward bed) occurring in the last half hour before the 4-h clock would tick over. The investigators speculated that ‘gaming was introduced to avoid punitive incentives’.<sup>26</sup> Mason *et al.*<sup>27</sup> found a similar significant surge of elderly patients being discharged home or admitted to wards within the last 20 min of the 4-h period across several UK hospitals.

Such ‘gaming’ has led many investigators to propose a suite of patient-focused outcome measures that should be monitored closely in tandem with a time-based target for access to emergency in-patient care.<sup>17,28</sup>

#### *NEAT is a threshold target*

NEAT is a threshold target (i.e. a certain proportion of patients need to exit the ED within 4 h). It makes no difference whether a patient stays in an ED 4 h and 1 min or 12 h; both fail to meet the target. There is no delineation of the ‘tail’ of patients not meeting the target who have very long stays in the ED.<sup>25</sup> This may create a perverse incentive to direct clinical and process priority to patients who can still potentially meet the 4-h target at the expense of patients who have already ‘breached’ the

target and whose care is consequently deprioritised despite this being potentially contrary to clinical need.

Moreover, the threshold NEAT compliance rate that balances the benefits to patients of NEAT because of more timely and appropriate acute care versus the harms that may result from rushed and inappropriate management and disposition decisions has not been determined on the basis of empirical analysis. Despite an intuitive belief that the 'higher the better', there may be a threshold target above which higher compliance rates result in more, not fewer, in-hospital deaths among admitted patients.

#### *Total NEAT compliance measures two very clinically different streams of patients within a single metric*

NEAT is a gross or composite measure of the care of clinically different patient populations. In most Queensland EDs, approximately 70%–75% of patients presenting to that ED are discharged and approximately 25%–30% are admitted to a hospital or short-stay ward. In contrast with the processes required to admit an acutely ill or complicated patient to hospital, those required to discharge a patient from the ED within 4 h are smaller in number, lower in complexity and within the control of the ED itself. In addition, this patient group tends to be younger, healthier and have better outcomes than patients admitted to hospital. As such, most hospitals have been able to achieve NEAT compliance rates for discharged patients in the order of 85%–95%.<sup>29</sup>

In contrast, the care of admitted patients is more complex and requires greater integration and optimisation of more hospital processes. These patients are also more likely to experience adverse clinical outcomes arising from suboptimal care. Not surprisingly, this patient group has a consistently lower NEAT compliance, with an average rate for all Queensland public hospitals for 2013–14 being 52.9%.<sup>29</sup> This differential in compliance rates for discharged versus admitted patients may skew organisational and clinical priorities by encouraging an excessive focus on improvement in the discharged patient stream that is easier to achieve and that then contributes disproportionately to the overall (or total) compliance rate for all ED patients. This detracts from a greater focus on improving compliance rates for admitted patients who are the sickest and most vulnerable group, and potentially have more to gain from timely appropriate care.

Currently there are several Australian hospitals that are achieving average overall NEAT compliance rates of 75%–80%, while only admitting 30%–40% of their patients to an in-patient or short-stay ward within 4 h. These hospitals, which are mostly small or regional institutions, tend to have lower overall admission rates indicative of lower acuity patients compared with metropolitan or tertiary hospitals, which attract higher admission rates by virtue of their more complex casemix. Thus, such institutions are disadvantaged when comparing overall NEAT compliance rates between hospitals. This has consequence in that the only patients for whom direct evidence of benefit from NEAT exists are those who are admitted<sup>5,11</sup> and yet most clinical redesign efforts aimed at achieving high overall NEAT compliance rates have focused on NEAT compliance for discharged patients.

#### *Policy implications*

The evidence presented in this review of improved in-hospital mortality for patients admitted from the ED resulting from improved access to ED care would support an ongoing need for a time-based emergency access target. However, the review has generated some guiding principles, stated below, that should underpin formulation of future policy direction with regard to NEAT. An overriding principle is that quality of patient care and clinical outcomes should remain the primary focus of any target revision.

- (1) A time-based emergency care access target should be retained and further work is underway to generate an evidence-based target.
- (2) The target should be separated into admitted, discharged and total NEAT compliance rates. This specification of subtargets will allow assessment of patient outcomes and clinical redesign efforts focused on particular patient populations. Any focus on admitted patient NEAT would require direct monitoring of patient outcomes and assignment of appropriate resources in measurement and clinical redesign efforts.
- (3) Direct measures of patient outcomes are needed in addition to time targets. Process measures such as a time-based target should not be considered in isolation, but rather nested in a matrix of quality metrics that include outcome measures and are standardised and evidence based.<sup>17</sup>

#### **Competing interests**

The authors have no competing interests to declare.

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