ORIGINAL RESEARCH

Impact of the National Emergency Access Target policy on emergency departments’ performance: A time-trend analysis for New South Wales, Australian Capital Territory and Queensland

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Abstract

Objective: To evaluate the impact of the Australian National Emergency Access Target (NEAT) policy introduced in 2012 on ED performance.

Methods: A longitudinal cohort study of NEAT implementation using linked data, for 12 EDs across New South Wales (NSW), Australian Capital Territory (ACT) and Queensland (QLD) between 2008 and 2013. Segmented regression in a multi-level model was used to analyse ED performance over time before and after NEAT introduction. The main outcomes measures were ED length of stay ≤4 h, access block, number of ED presentations, short-stay admission (≤24 h), >24 h admissions, unplanned ED re-attendances within 7 days and ‘left at own risk’ (including ‘did not wait for assessment’).

Results: Two years after NEAT introduction, ED length of stay ≤4 h...
increased in NSW and QLD (odds ratio [OR] = 2.48 and 3.24; P < 0.001) and access block decreased (OR = 0.41 and 0.22; P < 0.001), but not in ACT (OR = 1.28; P > 0.05). ED presentations increased over time before and after NEAT introduction with a significant increase above the projected trend in NSW after NEAT (mean ratio = 1.07). Short-stay admissions increased in QLD (OR = 2.60), ACT (OR = 1.68) and NSW (OR = 1.35). Unplanned ED re-admissions did not change significantly. Those who left at their own risk decreased significantly in NSW and QLD (OR = 0.38 and 0.67).

Conclusion: ED presentations continued to increase over time in all jurisdictions. NSW and QLD, but not ACT, showed significant improvements in time-based measures. Significant increases in short-stay admissions suggest a strategic change in ED process associated with NEAT implementation. Rates of unplanned ED re-admissions and those leaving at their own risk showed no evidence for adverse effects from NEAT.

Key words: ACT, National Emergency Access Target, NSW, QLD, trend analysis.

Introduction

ED crowding has been identified as a major issue in health services research. Access block, leading to prolonged ED length of stay (EDLOS) for admitted patients has been associated with ED overcrowding. Adverse effects associated with delays in ED have included: increased mortality and morbidity, delayed pain relief, longer hospital stays, increased aggression and delayed ambulance offloads with poorer response times.

The National Emergency Access Target (NEAT) policy was implemented in January 2012 by the Australian government to increase ED flow. The policy stated that 90% of patients presenting to EDs were to be admitted, transferred or discharged within 4 h. Countries implementing similar time target policies, such as the UK and Australia (4 h) and New Zealand (6 h) have found major reductions in EDLOS. In the UK, at its zenith, 98% of all patients left EDs within 4 h. New Zealand also improved with most district health boards reaching their 95% 6 h target. In Australia, the NEAT compliance improved from 64% in 2011–2012 to 73% in 2013–2014. In Western Australia where an adapted version of the UK 4 h target was implemented in 2009, an interrupted time series analysis showed that EDLOS was reduced significantly with the time target policy. In summary, there is limited information on trends or changes associated with NEAT policy. The aim of this study is to assess changes in time-based measures as proxies for ED crowding and access block before and after NEAT in New South Wales (NSW), Australian Capital Territory (ACT) and Queensland (QLD).

Methods

Study design, participants and data source

Time-trend analysis was conducted on a population-wide NEAT intervention in a longitudinal cohort study of patients presenting to 12 participating metropolitan hospital EDs across NSW, ACT and QLD. Data linkage methodology was implemented on de-identified administrative data comprising the Emergency Department Data Collection (EDDC) and Admitted Patients Data Collection (APDC) between January 2008 and December 2013. The NSW and ACT cohorts comprised 1 279 390 persons presenting to six hospital EDs in NSW and two in ACT. Data were linked across NSW and ACT, using unique person identifiers provided by the Centre for Health Record Linkage. The QLD cohort comprised 661 859 persons presenting to the four participating hospital EDs. The Queensland Research Linkage Group provided the linked data. After removal of ineligible ED episodes (0.05%), a total of 1 940 327 (NSW), 668 247 (ACT) and 1 436 464 (QLD) ED episodes of care were retained for analysis.

APDCs were used for identification of patients who were admitted to hospital during and/or right after an ED episode by matching cohort episodes from EDDC with hospital episodes in APDC. A detailed description of this method is presented in Appendix S1.

Outcome measures and definitions

Eight outcome measures were investigated in this study:

1. Percentage with EDLOS ≤4 h (% EDLOS ≤4 h): EDLOS is the length of time between ED presentation and actual ED departure as recorded in the EDDC;
2. Rate of access block: Access block was defined as EDLOS >8 h among patients who were admitted for >24 h;
3. Mean number of ED presentations per hospital per day;
4. Rate of short-stay admission: Short-stay admission was defined as an event where discharge from hospital was ≤24 h after departure from ED. The 24 h threshold is based on the designated use of short-stay units (SSUs) for ED patients who are expected to be admitted for ≤4 h. The majority of these short-stay admissions would be SSU admissions where the patient is still effectively managed and treated by ED staff;
5. Rate of >24 h admissions: ED presentations where the patient was admitted for >24 h from the time of actual departure from ED. The majority of >24 h admissions would be to an inpatient ward, but a proportion of SSU admissions may also exceed 24 h;
6. Rate of all admissions;
7. Rate of unplanned ED re-attendance within 7 days of discharge from ED or short-stay admission: Unplanned ED re-attendance was identified where time of presentation at the next ED attendance was within 7 days of discharge from ED or short-stay admission. Attendances that were discharged as a hospital transfer or as a hospital admission lasting >24 h (i.e. not short-stay admissions), and/or where the next ED attendance was a planned visit were excluded; and
8. Rate of left ED at own risk (LAOR) including those did not wait to be seen by a ED clinician as well as those who left before ED treatment completion: While did not wait to be seen is the term used in the data dictionaries, it should be more appropriately defined as did not wait to be assessed by an ED clinician. This is because a short procedure such as a change of bandage is sometimes classified as being seen by an ED clinician. To reduce potential bias associated with this misclassification, we chose to combine the categories of ‘left ED at own risk’ and ‘did-not-wait to be seen’ for this outcome.

Data analysis

The socio-demographic and clinical characteristics of the sample was first described by cross-tabulating with jurisdiction and policy intervention periods. The Index of Relative Socio-economic Disadvantage (IRSD) by postcode area was obtained from the Australian Bureau of Statistics based on 2011 Census. Two periods were defined: ‘pre-NEAT’ from 1 January 2008 to 31 December 2011 and ‘post-NEAT’ from 1 January 2012 to 31 December 2013. Pearson $\chi^2$ test was performed to analyse differences between pre-NEAT and post-NEAT period for each jurisdiction.

To identify the impact of individual and hospital level effects, multi-level statistical technique in a two-level framework (by hospital and presentation) was used in conjunction with segmented regression analysis. This is a recommended statistical technique for time-trend analysis of population-wide interventions. Numbers of ED presentations (discrete count data) were analysed using Poisson regression and the other outcomes (binary data) were analysed using logistic regression. The impact of NEAT on the outcome measures was assessed statistically with period (pre/post) and calendar quarters as the explanatory variables in the segmented regression model (Appendix S1). The estimated coefficients are also illustrated in Appendix S1 and Figure 1. To account for random variation between hospitals, intercept, slope, change in slope and change in level were entered as random effects in the multi-level model. Projected trends for post-NEAT data were calculated but the analysis period did not allow full testing of non-linear trends as we only had 2 years of post-NEAT data. $P < 0.05$ was used as the threshold for reporting statistical significance. The analyses were conducted and managed using SAS software version 9.4 for Windows (Cary, NC, USA), Stata version 14.2 (College Station, TX, USA) and MLwiN 2.36 (Bristol, UK).

Ethics clearance

The study received ethics clearance from Cancer Institute NSW (HREC/14/CIPHS/30), ACT Department of Health (ETH.3.14.054) and Queensland Health (HREC/14/QGC/30), as well as governance approval from the participating hospitals.

Results

Sample characteristics

The socio-demographic and clinical characteristics of the study sample are presented in Table 1. Differences between pre- and post-NEAT intervention were statistically significant for all characteristics ($P < 0.05$), except for the school holiday period in ACT. Consistent with the growing ageing population in Australia, the proportion of ED attendances for patients >65 years of age increased in all three jurisdictions. NSW had more ED attendances by patients residing in the most socio-economically disadvantaged area, whereas the majority of attendances to ACT EDs were from the least disadvantaged areas.

Approximately one-third of ED presentations in NSW and QLD and one-fifth in ACT arrived by ambulance. NSW and QLD also had proportionally more presentations in Australian Triage Categories (ATS) 1 and 2 than ACT. Over 70% of presentations in all jurisdictions were in ATS 3 and 4. All jurisdictions showed an increase in the proportion of ATS 1–3 cases post-NEAT when compared with pre-NEAT.
| TABLE 1. Socio-demographic, clinical and environmental characteristics of ED patients: percentage of patients with 95% confidence interval (CI) for pre- and post-NEAT periods by jurisdiction |
| --- |
| **Demographic** |
| **Age†** |
| <18 | 19.4 (19.38, 19.52) | 24.2 (24.08, 24.33) | 15.5 (15.41, 15.55) | 19.2 (19.11, 19.30) | 23.6 (23.44, 23.78) | 17.8 (17.74, 17.95) |
| 18–65 | 59.6 (59.52, 59.69) | 60.5 (60.38, 60.67) | 66.5 (66.37, 66.56) | 59.3 (59.17, 59.40) | 59.8 (59.61, 60.00) | 63.7 (63.56, 63.83) |
| >65 | 20.9 (20.88, 21.02) | 15.3 (15.16, 15.38) | 18.1 (17.98, 18.13) | 21.5 (21.41, 21.61) | 16.6 (16.44, 16.73) | 18.5 (18.36, 18.57) |
| **Gender (male)** | 51.2 (51.07, 51.25) | 50.4 (50.22, 50.52) | 50.9 (50.84, 51.05) | 50.7 (50.61, 50.85) | 49.4 (49.16, 49.56) | 49.9 (49.81, 50.08) |
| **Area IRSD‡** |
| 1st quintile (most disadvantaged) | 26.3 (26.22, 26.38) | 0.8 (0.76, 0.81) | 6.3 (6.23, 6.33) | 26.2 (26.11, 26.32) | 0.7 (0.67, 0.74) | 6.0 (5.95, 6.08) |
| 2nd quintile | 13.2 (13.11, 13.23) | 2.7 (2.62, 2.71) | 15.4 (15.29, 15.44) | 12.8 (12.70, 12.85) | 2.5 (2.39, 2.52) | 14.9 (14.85, 15.04) |
| 3rd quintile | 20.9 (20.78, 20.92) | 1.4 (1.40, 1.48) | 14.7 (14.65, 14.79) | 20.3 (20.20, 20.38) | 1.3 (1.27, 1.36) | 14.1 (14.04, 14.23) |
| 4th quintile | 13.5 (13.45, 13.57) | 6.3 (6.18, 6.33) | 39.5 (39.44, 39.64) | 13.6 (13.49, 13.65) | 5.8 (5.71, 5.89) | 40.6 (40.42, 40.69) |
| 5th quintile (least disadvantaged) | 25.4 (25.31, 25.46) | 88.6 (88.47, 88.66) | 20.8 (20.71, 20.88) | 26.3 (26.25, 26.45) | 89.5 (89.34, 89.58) | 21.3 (21.22, 21.45) |
| **Missing** | 0.8 (0.77, 0.80) | 0.3 (0.27, 0.30) | 3.3 (3.27, 3.35) | 0.8 (0.78, 0.82) | 0.3 (0.25, 0.29) | 3.0 (2.97, 3.06) |
| **Clinical** |
| Arrived by ambulance (Yes) | 31.9 (31.78, 31.95) | 19.3 (19.22, 19.45) | 33.5 (33.39, 33.58) | 31.5 (31.39, 31.60) | 20.3 (20.16, 20.48) | 35.5 (35.32, 35.58) |
| Triage category | | | | | | |
| 1 | 1.0 (0.99, 1.03) | 0.5 (0.44, 0.48) | 1.2 (1.21, 1.25) | 1.1 (1.10, 1.15) | 0.4 (0.38, 0.44) | 0.8 (0.83, 0.88) |
| 2 | 12.4 (12.32, 12.44) | 9.5 (9.42, 9.59) | 13.9 (13.84, 13.98) | 14.8 (14.73, 14.90) | 10.8 (10.65, 10.89) | 13.9 (13.85, 14.03) |
| 3 | 36.1 (36.05, 36.22) | 31.2 (31.04, 31.32) | 46.6 (46.47, 46.67) | 36.6 (36.50, 36.73) | 34.2 (34.00, 34.38) | 48.0 (47.90, 48.18) |
| 4 | 39.1 (39.06, 39.23) | 45.1 (44.98, 45.27) | 31.7 (31.62, 31.82) | 37.0 (36.92, 37.14) | 44.2 (44.04, 44.43) | 31.8 (31.63, 31.89) |
| 5 | 11.3 (11.22, 11.33) | 13.7 (13.62, 13.83) | 6.6 (6.51, 6.62) | 10.3 (10.26, 10.40) | 10.4 (10.28, 10.52) | 5.4 (5.35, 5.47) |
| **Environmental** |
| ED shift (on arrival time) | | | | | | |
| Day (08:00–15:59) | 44.5 (44.41, 44.58) | 46.4 (46.30, 46.60) | 46.7 (46.64, 46.85) | 44.7 (44.56, 44.79) | 46.0 (45.82, 46.22) | 45.7 (45.58, 45.85) |
| Evening (16:00–23:59) | 39.7 (39.60, 39.77) | 39.2 (39.07, 39.36) | 37.0 (36.89, 37.08) | 40.0 (39.87, 40.10) | 39.7 (39.49, 39.88) | 38.2 (38.11, 38.37) |
| Overnight (00:00–07:59) | 15.8 (15.75, 15.88) | 14.3 (14.23, 14.44) | 16.3 (16.19, 16.34) | 15.3 (15.26, 15.42) | 14.3 (14.15, 14.43) | 16.0 (15.95, 16.15) |
| Weekend (Yes)§ | 35.8 (35.70, 35.87) | 34.7 (34.59, 34.88) | 35.2 (35.12, 35.32) | 35.5 (35.39, 35.61) | 34.4 (34.19, 34.56) | 35.7 (35.59, 35.85) |
| School holiday (Yes)¶ | 10.9 (10.86, 10.97) | 10.2 (10.12, 10.30) | 10.9 (10.86, 10.99) | 10.8 (10.69, 10.84) | 10.3 (10.14, 10.39) | 10.6 (10.49, 10.66) |

†0.1% were missing or indeterminate for age, gender and triage categories. ‡IRSD by postcode area in the datasets are provided by the Australian Bureau of Statistics from Census 2011 data. §Weekend starts from 18:00 Friday and ends at 07:59 Monday. ¶School holiday period starts from 24th December and ends 31st January. IRSD, Index of Relative Socioeconomic Disadvantage.
### TABLE 2. Trend analysis for key ED outcomes by jurisdiction

| Jurisdiction | Pre-NEAT slope† | Change in level at the beginning | Post-NEAT | Change in slope† | Change in level at the end |
|--------------|-----------------|---------------------------------|-----------|-----------------|---------------------------|
| NSW          | 0.92 (0.85, 0.99)* | 1.09 (0.90, 1.33) | 1.60 (1.46, 1.75)** | 2.48 (1.88, 3.28)*** |                           |
| ACT          | 0.98 (0.87, 1.12)  | 0.92 (0.66, 1.29) | 1.14 (0.98, 1.34) | 1.16 (0.72, 1.88) |                           |
| QLD          | 0.91 (0.83, 0.99)* | 1.15 (0.90, 1.46) | 1.81 (1.62, 2.02)*** | 3.24 (2.31, 4.56)*** |                           |
| NSW          | 1.12 (1.00, 1.25)  | 0.87 (0.72, 1.04) | 0.65 (0.57, 0.74)*** | 0.41 (0.32, 0.53)*** |                           |
| ACT          | 0.85 (0.70, 1.03)  | 1.02 (0.74, 1.40) | 1.14 (0.91, 1.42) | 1.28 (0.81, 2.01) |                           |
| QLD          | 1.15 (1.00, 1.31)* | 1.04 (0.83, 1.30) | 0.41 (0.35, 0.48)*** | 0.22 (0.16, 0.30)*** |                           |
| NSW          | 1.03 (1.01, 1.05)** | 1.02 (1.00, 1.03) | 1.03 (0.99, 1.07) | 1.07 (1.00, 1.13)*  |                           |
| ACT          | 1.05 (1.02, 1.09)** | 0.99 (0.97, 1.02) | 0.97 (0.92, 1.04) | 0.95 (0.86, 1.06) |                           |
| QLD          | 1.04 (1.01, 1.06)** | 0.96 (0.94, 0.98)*** | 1.06 (1.01, 1.10)* | 1.06 (0.98, 1.14) |                           |
| NSW          | 1.04 (0.99, 1.11)  | 1.05 (0.88, 1.26) | 1.15 (1.05, 1.26)** | 1.35 (1.08, 1.69)*** |                           |
| ACT          | 1.11 (1.00, 1.22)* | 1.29 (0.95, 1.75) | 1.17 (0.99, 1.37) | 1.68 (1.14, 2.48)** |                           |
| QLD          | 1.05 (0.98, 1.13)  | 1.54 (1.24, 1.91)*** | 1.35 (1.20, 1.51)*** | 2.60 (1.98, 3.42)*** |                           |
| NSW          | 1.01 (0.98, 1.04)  | 1.00 (0.97, 1.04) | 0.95 (0.90, 1.00)* | 0.91 (0.82, 1.02) |                           |
| ACT          | 1.04 (0.99, 1.09)  | 1.02 (0.95, 1.08) | 0.91 (0.83, 1.00)* | 0.87 (0.72, 1.04) |                           |
| QLD          | 1.00 (0.97, 1.04)  | 0.98 (0.93, 1.02) | 0.95 (0.89, 1.01) | 0.89 (0.78, 1.02)  |                           |
| NSW          | 1.02 (0.99, 1.06)  | 1.02 (0.93, 1.12) | 1.03 (0.96, 1.10) | 1.07 (0.91, 1.25) |                           |
| ACT          | 1.06 (1.00, 1.12)  | 1.08 (0.92, 1.26) | 0.99 (0.88, 1.12) | 1.06 (0.81, 1.40) |                           |
| QLD          | 1.02 (0.98, 1.06)  | 1.16 (1.04, 1.30)** | 1.16 (1.07, 1.27)** | 1.51 (1.24, 1.84)*** |                           |
| NSW          | 0.99 (0.96, 1.02)  | 1.01 (0.97, 1.05) | 1.02 (0.97, 1.07) | 1.05 (0.94, 1.17) |                           |
| ACT          | 1.00 (0.95, 1.05)  | 1.05 (0.98, 1.13) | 0.97 (0.89, 1.06) | 1.00 (0.83, 1.20) |                           |
| QLD          | 0.96 (0.93, 1.00)* | 1.04 (0.98, 1.09) | 1.03 (0.97, 1.10) | 1.10 (0.96, 1.25) |                           |
| NSW          | 1.13 (1.06, 1.20)*** | 0.80 (0.66, 0.95)* | 0.65 (0.61, 0.70)*** | 0.38 (0.30, 0.48)*** |                           |
| ACT          | 0.97 (0.87, 1.08)  | 1.12 (0.82, 1.53) | 0.80 (0.71, 0.90)*** | 0.76 (0.51, 1.13) |                           |
| QLD          | 0.99 (0.92, 1.08)  | 1.02 (0.82, 1.27) | 0.79 (0.72, 0.86)*** | 0.67 (0.51, 0.89)*** |                           |

*P < 0.05, **P < 0.01, ***P < 0.001. †Slope and change in slope are interpreted on a per year basis. ‡Number of presentations is a count variable modelled in a multi-level Poisson model with mean ratio as the estimates, while all other outcome variables are binary variables modelled in a multi-level logistic model with odds ratio as the estimates. §Those who were admitted to hospital for >24 h, who were transferred to another hospital, and/or whose subsequent visit was a planned visit were excluded from the denominator.

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Trend analysis for time-based outcomes

NSW and QLD showed significant reductions in ED time (percentage EDLOS ≤4 h) during post-NEAT compared to pre-NEAT (Table 2, Fig. 1). Estimated percentage of EDLOS ≤4 h at the last quarter post-NEAT was 22.3% more than the projected estimate with no NEAT for NSW and 27.4% more than projected for QLD, but it was only 3.8% more than projected for ACT (last column, Appendix S2). NSW and QLD also demonstrated an improvement in percentage of EDLOS ≤4 h per quarter before NEAT. Trends in percentage of EDLOS ≤4 h were relatively stable throughout the study period.

For access block, compared with the pre-NEAT period, NSW and QLD showed both significant reductions in rate change per quarter as well as a reduction in level at the end of the study (post-NEAT) period by up to 29.8% for QLD. ACT showed a very different pattern with a decreased trend pre-NEAT and no significant change post-NEAT (Table 2, Fig. 1).

Trend analysis for other outcomes

All jurisdictions had significant increases in the number of ED presentations pre-NEAT. This continued without significant change in the post-NEAT period compared with the projected no-intervention level, except in NSW, which showed a significant increase in presentations at the end of the period. For QLD, there was a significantly greater increase in presentation trend post-NEAT, and a moderate increase in level at the end (vs projected) but it was not statistically significant. ACT did not show significant changes post-NEAT intervention (Table 2, Fig. 2).

Short-stay admissions in NSW and QLD showed significant increasing trends per quarter post-NEAT versus the pre-NEAT period. All jurisdictions showed significant increases in short-stay admission rates at the end of the study compared with the projected level without intervention, being 4.2%, 2.8% and 10.4% higher than expected for NSW, ACT and QLD, respectively (Appendix S2). The proportion of >24 h admissions significantly decreased in NSW and ACT versus the pre-NEAT period, but not in QLD. All admissions had an increasing trend post-NEAT in QLD mainly from the substantial increase in short-stay admissions. No other jurisdiction showed significant changes in total admissions.

Unplanned ED re-attendances had no significant changes from trend in the post-NEAT period (Table 2, Fig. 2). Those who left at own risk (LAOR) showed a significant decreasing trend post-NEAT for all jurisdictions that was greatest for NSW, which changed from an increasing pre-NEAT trend. Reduced LAOR percentage versus expected levels without intervention were seen for NSW (−6.2%) and QLD (−1.3%).

Discussion

Our study covered 12 major hospitals in three Australian jurisdictions after NEAT implementation. We found that more patients were discharged from ED within 4 h, and access block decreased in NSW and QLD, but not ACT, with a very different descending trend during the pre-NEAT with no significant change post-NEAT. The reasons for this difference are unclear. Maybe the ACT introduced some interventions to reduce the high proportion of access block over 60% in 2008 compared with 25–35% in the other jurisdictions. Overall, improvement in time targets occurred despite continual increases in presentations as well as increases in presentation of patients >65 years of age (consistent with growing ageing population in Australia) and in the acuity of presentations. We also found some statistically significant socio-economic differences across jurisdictions, which may explain some of the trends over time, but these were beyond the scope of the study. Rates of short-stay admission increased above previous trends although overall admission rates only increased in QLD. ED re-attendance rates remained unchanged, while LAOR rates decreased in all three jurisdictions. Our general findings are consistent with our study in Western Australia and the study conducted in New Zealand.

This study confirmed that time targets can drive process change that addresses ED overcrowding and access block. The changes in access block were large in NSW and QLD, suggesting significant improvements in access to inpatient beds. Such changes are likely to improve ED flow and patients’ access to care dramatically. This reflects the value of investigating in ED and hospital resources. However, we cannot make inferences about quality of care at the patient level. A time target is a process indicator and does not take into consideration other aspects of system or clinical performance.

Our data also suggests that concerns about unintended consequences such as increased ED flow or efficiency driving large increases in ED attendances or rapid discharges leading to increased ED re-attendances were not realised. Additionally, LAOR rates reduced in all jurisdictions suggesting improved access to early care, although time to see a doctor did not improve significantly.

There were some changes in admission rates with significantly more short-stay admissions in all jurisdictions, which in ACT and NSW were offset by reduced >24 h admissions so overall admissions did not increase. It is evident that the NEAT implementation coincided with greater use of SSUs, which appear to have substituted for longer hospital stays. As indicated in the literature, greater use of SSUs in some hospitals has resulted from major expansion of the EDs with more beds. Whether greater use of short-stay admissions is better for patients and hospital bed management will require more detailed analysis in the future.

Strength and limitations

This is a large data linkage study, with population-wide information and long-time series, coupled with
rigorous trends analysis that enabled a more accurate depiction of the impact of the NEAT intervention, compared to similar studies.\textsuperscript{28} As most of the sites were major referral hospitals affected by access block, the intervention was expected to have the most impact on those hospitals.\textsuperscript{5}

Another strength is the wide coverage of the three jurisdictions with rather different features in terms of socio-economic status, geography, population size and diversity.

With administrative data collections, it is likely that individual hospitals’ quality of data recording may vary. For example, identification of unplanned re-attendance is affected by accuracy in the recording of ED separation status (i.e., transfer to another hospital) and purpose or type of visit (i.e., planned return visit). Not all admissions could be identified from matching and not all SSU admissions could be accurately determined due to inconsistencies in

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**Figure 2.** Observed and estimated trend in other ED outcomes (presentations, admissions, reattendances and left at their own risk) by jurisdiction. (––), NSW; (–•–), ACT; (–△–), QLD; (––•–), NSW estimated trend; (––−–), ACT estimated trend; (––−•–), QLD estimated trend.
ward allocations across hospitals and/or over time. Hence, we used admissions lasting ≤24 h as a proxy for SSU admissions, but some of these may have been type change separations and inpatient admissions. Regardless, the relatively stable rates of admission lasting ≥24 h indicated that the misclassifications would only have minimal impact on trend (i.e. changes) in short-stay admissions. Also, the observed proportion of EDLOS ≤4 h was very similar to publicly available online data except for two hospitals among the three jurisdictions, confirming that our findings were consistent with publicly available information.

As indicated in the methods, we only had limited number of years available. We have only studied the relatively short-term impact of NEAT and continued changes may have had happened in the ED-hospital system at that time. For example, one hospital upgraded to a larger Emergency Medical Unit (that facilitated the streaming of patients to improve efficiency) in the last quarter of 2013 just when our study ended. As such, we are unable to conclude whether the intervention had a lasting longer-term impact.

Conclusions

Attendances to EDs increased continually and at similar rates before and after NEAT implementation. However, ED flow markers showed decreasing trends for both %EDLOS ≤4 h and access block in NSW and QLD. Rates of short-stay admissions increased post-NEAT although overall admission rates did not. Stable rates of unplanned ED re-attendance and improved LAOR rates suggest that some patient outcome measures were not adversely affected or improved in association with NEAT implementation.

Competing interests

SM is a section editor for Emergency Medicine Australasia. GF is a member of the editorial board of Emergency Medicine Australasia.

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Supporting information
Additional supporting information may be found in the online version of this article at the publisher’s web site:

Appendix S1. Methodology.
Appendix S2. Supplementary results table.