




ORIGINAL RESEARCH

Comparison of emergency department time performance between a Canadian and an Australian academic tertiary hospital

Ivy CHENG ^{1,2} David TAYLOR ³ Michael J SCHULL ⁴ Merrick ZWARENSTEIN,⁵ Alex KISS,⁴ Maaret CASTREN,⁶ Mats BROMMELS,⁷ Michael YEOH⁸ and Fergus KERR⁹

¹Department of Medicine, University of Toronto, Sunnybrook Health Sciences Center, Toronto, Ontario, Canada, ²Department of Clinical Science and Education, Sodersjukhuset-Karolinska Institutet, Stockholm, Sweden, ³Emergency Medicine Research, Austin Health, Melbourne, Victoria, Australia, ⁴Institute for Clinical Evaluative Sciences, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada, ⁵Department of Family Medicine, Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada, ⁶Emergency Medicine, Helsinki University, Helsinki, Finland, ⁷Medical Management Center, Department of Learning, Informatics, Management and Ethics, Karolinska Institute, Stockholm, Sweden, ⁸Emergency Department, Austin Health, Melbourne, Victoria, Australia, and ⁹Austin Health, Melbourne, Victoria, Australia

Abstract

Objective: To compare performance and factors predicting failure to reach Ontario and Australian government time targets between a Canadian (Sunnybrook Hospital) and an Australian (Austin Health) academic tertiary-level hospitals in 2012, and to assess for change of factors and performance in 2016 between the same hospitals.

Methods: This was a retrospective, observational study of patient administrative data in two calendar years. The main outcome measure was reaching Ontario and Australian ED time targets for admissions, high and low urgency discharges. Secondary outcomes were factors predicting failure to reach these targets.

Results: Between 2012 and 2016, Sunnybrook and Austin experienced increased patient volume of 10.2% and 19.2%, respectively. Bed capacity decreased at Sunnybrook (−10.8%) but increased at the Austin (+30.3%). For both

years, Austin failed to achieve the Australian time target, but succeeded for all Ontario targets except for low urgency discharges. Sunnybrook failed all targets irrespective of year. The top factors for failing Ontario ED length-of-stay targets for both hospitals in 2012 and 2016 were bed request greater than 6 h, access block greater than 1 h, use of cross-sectional imaging, consultation and waiting for the emergency physician greater than 2 h.

Conclusion: Austin outperformed Sunnybrook for Ontario and Australian government time targets. Both hospitals failed the Australian targets. Factors predicting failure to achieve targets were different between hospitals, but were mainly clinical resources. Sunnybrook focussed on increasing human resources. Austin focussed on increasing human resources, observation unit and hospital beds. Intrinsic hospital characteristics and infrastructure influenced target success.

Key findings

- The Australian outperformed the Canadian hospital for government wait-time targets.
- For both hospitals, factors predicting target failure were mainly clinical resources.
- Increasing output resources made a greater impact on shortening EDLOS than input-throughput interventions.
- Intrinsic hospital patient population and system infrastructure influence EDLOS and target success.

Key words: emergency department crowding, health services research, pay for performance.

Introduction

ED crowding is an international problem.¹ One approach to crowding has been pay for performance, which has been implemented in multiple countries² – including Ontario and Australia. By comparing a Canadian and an Australian hospital's approach to time targets, what can be learned?

Ontario started 'Pay for Results' (P4R) in 2008. The programme allocates 90 million dollars of funding per year to 73 designated Ontario hospitals (ED volumes >30 000).

Correspondence: Dr Ivy Cheng, Department of Medicine, University of Toronto, Sunnybrook Health Sciences Center, Toronto, ON M4N 3M5, Canada. Email: ivy.cheng@sunnybrook.ca

Ivy Cheng, MD, MSc, PhD, Assistant Professor; David Taylor, MD, MPH, Director; Michael J Schull, MSc, MD, FRCPC, Emergency Physician, Professor, CEO; Merrick Zwarenstein, MD, MSc, PhD, Professor; Alex Kiss, PhD, Adjunct Scientist; Maaret Castren, MD, PhD, Medical Director; Mats Brommels, MD, PhD, Professor; Michael Yeoh, DA, FACEM, Director of Quality and Audit; Fergus Kerr, MBBS, FACEM, MPH, Chief Medical Officer, Executive.

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Hospitals are measured by relative target achievement. Funding is divided 70:30 by current performance and improvement from the initial P4R year, with an additional adjustment for ED volume. The programme was designed to be part of a toolkit and not a solution. It encouraged hospitals to perform a root cause analysis for its overcrowding and to use the funding for internal solutions. If a hospital could not improve despite internal changes, the programme acknowledged a capacity problem and more funding support for external system issues would be required.³ Currently, Ontario's healthcare policy is not to add more hospital beds, but to have existing beds used more effectively^{4,5} and this has shaped its approach to crowding.

In 2009, Australia established the National Emergency Access Target (NEAT),⁶ which included facilitation and reward funding⁷ to reach a 4 h target.⁸ Facilitation funding included ED capital (observation units, pathology, diagnostic equipment, facilities for alternative services), new subacute beds (hospital or community rehabilitation, palliative, mental health, psycho-geriatric beds) and recurrent projects (equipment, infrastructure, information technology, staffing). There was no evidence supporting the time target of 4 h, but it had been introduced in UK earlier.⁹

Ontario has continued its programme despite slow improvement.^{10,11} Australia stopped funding NEAT because of federal budget cuts¹² and modest gains in target achievement.^{13,14} Instead of funding for 10 years, it only lasted for 5 years. However, the Australasian College for Emergency Medicine continues to support time targets as a strategy to decrease crowding.¹⁵

Australia's healthcare system is two-tiered with public and private (both profit and not-for-profit) hospitals.¹⁶ Public hospitals receive state and federal funding and are managed by the state. Canada has a universal healthcare system managed by provincial governments and funded through federal taxation.¹⁷

The primary goal of this paper is to compare achievement of Ontario ED and Australian NEAT between Sunnybrook Health Sciences Center (Sunnybrook, Canada) and Austin Health (Melbourne, Australia) during two separate time periods. The secondary goals were to identify factors associated with failure to meet targets within the ED and between 2012 and 2016.

Methods

This was a retrospective, observational study of Sunnybrook and Austin ED patients for the 2012 and 2016 calendar years. Since 2007, the principal investigator worked at both hospitals and observed similarities between the two systems, benchmarks and achievements. It was felt that Sunnybrook could adopt some of Austin's crowding interventions. Because the hospitals were not identical, they would likely implement different crowding interventions. The investigators chose 2012 because change strategies would have been established. Follow-up duration of 4 years allowed an adequate time period for effectiveness evaluation. The Austin Health Human Research Ethics Committee and Sunnybrook Research Ethics Board approved the study.

Sunnybrook is an adult academic tertiary-level hospital in Toronto, Canada. It is a regional trauma, cancer, high-risk maternal, neonatal, neurosurgical, interventional cardiology and stroke centre. It has a 'direct' population where approximately 5–7% of patients bypass the emergency physician to be seen directly by the specialty service, such as trauma. The goal is to stream patients such that they see the specialties quickly. Although the non-ED physicians see the patients, they have priority for emergency resources, such as stretchers, hospital beds, nursing, diagnostic imaging and resuscitation services. This does impact regular emergency patients as they compete for the same resources. Sunnybrook does not have an observation unit or after-hours general practitioner clinic. Austin Hospital is an academic tertiary-level hospital in

Melbourne, Australia, with a paediatric-adult population. It is an oncology, liver transplant, spinal cord, mental health and rehabilitation centre. The Mercy Hospital, specialising in women's health is co-located with the Austin and draws gynaecology patients. There is no 'direct' population. Austin ED has an observation unit and an after-hours general practitioner clinic.

Sunnybrook data sources were the Electronic Patient Registry, Emergency Department Information Systems, Emergency Department Stretcher and Hospital Occupancy Tables. Emergency registration, physicians and nurses input patient encounter data. Sunnybrook's data management department provided hospital occupancy tables. Austin sources were Medtrak, Cerner and Hospital Occupancy Tables. Emergency registration, physicians and nurses enter data for each patient encounter. All patient visits were included, including multiple visits by the same patient at different times. For both institutions, hospital occupancy included only ED accessible beds.

STATA (version 13.1; StataCorp, College Station, TX, USA) identified missing time points, duplicated registrations and erroneous durations (e.g. negative). Duplicated registrations of the same patient visit were removed. For missing and discrepant data points, chart reviews were performed (IC). If the information was found, the data point was corrected manually. If the data was still missing post chart review, it was excluded. All other data entries were included. Descriptive statistics were determined for demographics, urgency, disposition and factors.

Ontario government time targets are grouped by the dispositions of admissions, high and low urgency discharges. The Canadian Triage Acuity Scale¹⁸ and Australasian Triage Score¹⁹ define urgency and provide recommendations for physician initial time to assessment. Both scores are similar, define 1 as highest urgency (requiring immediate physician management) and 5 as the lowest. Patients were categorised as: 1 – low urgency discharges; 2 – high

urgency discharges; 3 – observation unit admission; 4 – hospital admission; 5 – left without being seen; 6 – redirect to general practitioner clinic; and 7 – death.

Durations were ED length of stay (EDLOS), time to physician initial assessment (TPIA), time to bed request (TBR) and time to ward bed (TWB). TPIA, TBR and EDLOS were the durations between triage time and physician initial assessment, bed request and discharge time, respectively. TWB was the duration between EDLOS and TBR. Consultation rate was the total number of patients requiring one (or more) consultation(s) by an inpatient unit during their ED visit divided by the total number of patient registrations.

For the analysis model, factors associated with EDLOS were selected if supported by the literature, expert clinical consensus^{3,20–22} and availability in the electronic registry. Clinical factors were hospital resources, such as diagnostics, physician initial assessment time, consultation or hospital occupancy. Non-clinical factors were patient demographics, urgency, ambulance arrival, shift, weekday/weekend, hourly or daily volume.

Ontario²³ and Australian²⁴ government targets were used. In Ontario, P4R was $\geq 90\%$ of patients meeting their respective total EDLOS target (≤ 4 h for low urgency discharged patients, ≤ 8 h for high urgency discharged patients and ≤ 2.5 h [ideal target ≤ 8 h] for admitted patients). The 90th percentile TPIA was 3.6 h.²³ In Victoria (Australia), NEAT was for 75% of all ED patients to have an EDLOS ≤ 4 h.

The primary outcome was time target achievements of Sunnybrook and Austin Hospitals. The secondary outcomes were variables associated with failure to meet Ontario targets.

Data were stratified by high and low urgency discharges and admissions. The 90th percentile EDLOS target was determined for both hospitals by descriptive statistics. Factors were analysed with two-by-two odds ratio tables with Woolf approximation for 95% confidence intervals. Significant factors

($P < 0.05$) were chosen for multivariable regression analyses with binary targets of ≤ 4 or ≤ 8 and ≤ 8 h for low urgency discharges, high urgency discharges and hospital admissions, respectively. The modelling process used a forced entry, stepwise, backwards method. The model with significant factors ($P < 0.05$) and the lowest Akaike's information criterion was chosen. To control for heteroskedasticity, models were run robust. All statistical analyses were performed with STATA.

Results

Table 1 compares the hospitals demographics and characteristics. For both years, less than 0.70% and 0.01% of Sunnybrook and Austin data points were missing, duplicated or discrepant, respectively. By 2016, Sunnybrook and Austin annual censuses increased by 10.2% and 19.2%, respectively.

Compared to Sunnybrook, Austin had higher volume, more male, younger patients with lower urgency. The Austin re-directed more than 2% of patients to the co-located general practitioner. Sunnybrook and Austin increased manpower hours over 4 years. Austin had a dedicated radiologist, greater allied health worker hours and more consulting-admitting services than Sunnybrook. Computed tomography (CT), ultrasound (US), magnetic resonance imaging (MRI) and troponin I rates were lower at the Austin.

In 2012, Austin had double the hospital beds for acute admissions than Sunnybrook (714 *vs* 341) with lower hospital occupancy (87.6% *vs* 97.6%). By 2016, Austin increased observation unit beds with higher patient throughput. By 2016, Austin increased hospital bed capacity by 30.3% (+216). Sunnybrook decreased by 10.8% (–38). Compared to Sunnybrook, Austin's ward admission rate was slightly higher in 2012 but similar in 2016. Sunnybrook had admissions discharged from the ED while waiting for a ward bed. Austin had a higher number of low urgency discharges and fewer high urgency discharges.

In both years, Sunnybrook failed Ontario targets for TPIA and EDLOS with minimal change over time. Austin met all the Ontario targets except for low urgency discharges. Austin improved for all EDLOS, but not TPIA in 2016 compared to 2012.

Sunnybrook failed NEAT in 2012 (36.4%) without improvement in 2016. The Austin failed NEAT for both years, with 10% improvement from 2012 to 2016 (55.0% to 65.2%).

For low urgency discharges, Sunnybrook's 2012 top three factors strongly associated with 4 h target failure were MRI, consultation and CT. There was no change for 2016. Compared to Sunnybrook, Austin's 2012 top factors were TPIA > 2 h, CT and consultation. Ranking changed in 2016 to CT, TPIA > 2 h and US (Table 2). The crude odds ratio (95% CI) for the Austin's low urgency discharges reaching targets over Sunnybrook was not significant (1.0 [0.9–1.0]) in 2012, but significant in 2016 (1.65 [1.54–1.76]).

For high urgency discharges, Sunnybrook's top three 2012 factors predicting failure of the 8 h time target were MRI, consultation and TPIA > 2 h. The factors changed to consultation, MRI and CT in 2016. Austin's top three factors were consultation, MRI and TPIA > 2 h in 2012 and CT, US and TPIA > 2 h in 2016 (Table 3). The crude odds ratio for Austin's high urgency discharges reaching targets over Sunnybrook was 3.5 (3.3–3.8) in 2012 and 5.5 (5.1–6.0) in 2016.

For admissions, 2012 and 2016 Sunnybrook factors strongly associated with failure to meet the 8 h target were TBR > 6 h and TWB > 1 h. Austin factors were similar (Table 4) for both years. The crude odds ratio for the Austin's admissions reaching targets over Sunnybrook was 7.8 (7.4–8.1) in 2012 and 8.9 (8.4–9.4) in 2016.

Discussion

Sunnybrook failed all targets with minimal to no improvement over 4 years. Austin was successful in reaching all Ontario targets except

TABLE 1. Emergency patients from Sunnybrook Hospital and Austin Health: demographics, urgency, resource consumption and disposition

Descriptor	2012 Sunnybrook Canada	2012 Austin Health Australia	2016 Sunnybrook Canada	2016 Austin Health Australia
Visits	57 208	71 747	63 020	85 546
Age	53 (IQR 34–72)	44 (IQR 22–68)	55 (IQR 35–72)	44 (IQR 21–67)
Women	54.8% (31 346)	48.4% (34 746)	54.6% (34 377)	49.3% (42 192)
CTAS/ATS 1–3	87.7% (50 183)	56.3% (40 380)	88.6% (55 826)	55.6% (47 546)
CTAS/ATS 4–5	12.3% (7025)	43.7% (313 667)	11.4% (7194)	44.4% (37 995)
Direct to consult service	5.5% (3168)	NA	7.0% (4434)	NA
Arrive by ambulance	23.0% (13 140)	29.2% (20 948)	22.8% (14 387)	27.6% (23 603)
ED stretchers	36	32	36	25–38*
Observation unit stretchers	None	8	None	14
Paediatric ED unit	No	Yes	No	Yes
Emergency consultant staffing	72 h/day	60 h/day	80 h/day for Monday; 72 h/day for rest	88 h/day
Postgraduate trainees	32–72 h/day	194 h/day	32–72 h/day	187 h/day
Mid-level practitioners	16 h/day	10 h/day	16–32 h/day	17 h/day
Physiotherapists	No	0 h	No	8 h/day
Allied health	8 h/day; 1–2 workers; variable on weekend	15 h/day; team of 4–5; 7 days/week	Unchanged	Unchanged
Pharmacist	8 h/day; no script fills	17 h/day; script fills	Unchanged	Unchanged
Dedicated radiologist	No	Yes	No	Yes
Diagnostic imaging				
Total number of XR patients	40.7% (23 294)	40.1% (28 761)	37.5% (23 664)	31.2% (26 697)
Total number of CT patients	20.4% (11 644)	12.5% (8974)	22.1% (13 902)	12.6% (10 738)
Total number of US patients	7.2% (4147)	2.8% (1992)	6.2% (3927)	3.4% (2906)
Total number of MRI patients	1.0% (591)	0.2% (147)	1.3% (796)	0.6% (497)
Patients with troponin ordered	30.7% (17 553)	4.4% (3185)	25.3% (15 939)	3.0% (2559)
Consultation rate	26.5% (15 169)	39.2% (28 128)	25.5% (16 095)	36.2% (31 007)
Number of admitting services	29	45	28	47
All-comers admission rate	22.3% (12 757/57 208)	35.0% (25 100)	21.9% (13 785/63 020)	37.0% (31 629)
Admissions discharged from ED	1.8% (224/12 757)	NA	3.8% (525/13 785)	NA
Admissions observation unit	NA	10.8% (7730)	NA	15.9% (13 586)
Admissions hospital	21.9% (12 533/57 208)	24.2% (17 370)	21.0% (13 260/63 014)	21.1% (18 043)
Discharges	73.8% (42 239)	56.0% (40 175)	75.8% (47 769)	55.9% (47 793)
Deaths	0.2% (131)	0.1% (83)	0.2% (114)	0.1% (59)
Left without being seen	3.6% (2081)	6.3% (4481)	3.0% (1871)	5.0% (4309)
Redirect to GP clinic	NA	2.7% (1908)	NA	2.1% (1756)
Number of hospital beds	341	714	313	930
Hospital occupancy				
Average	97.6%	87.6%	99.6%	89.7%
Maximum	113.4%	100%	114.3%	100%
Number of ICU beds	58	20	54	22
Private hospitals	No	Yes	No	Yes

*Renovations. ATS, Australasian Triage Scale; CT, computed tomography; CTAS, Canadian Triage Acuity Scale; GP, general practitioner; IQR, interquartile range; MRI, magnetic resonance imaging; US, ultrasound; XR, X-ray radiograph.

TABLE 2. Emergency patients from Sunnybrook Hospital and Austin Health – multivariate analysis: top factors' odds ratios (ORs) of reaching ED length-of-stay (EDLOS) time targets for discharged low urgency patients

Variables	Sunnybrook 2012 discharged CTAS45 (n = 6573)	Austin Health 2012 discharged ATS45 (n = 20 786)	Sunnybrook 2016 discharged CTAS45 (n = 6801)	Austin Health 2016 discharged ATS45 (n = 25 405)
	OR, EDLOS >4 h vs EDLOS ≤4 h (95% CI)	OR, EDLOS >4 h vs EDLOS ≤4 h (95% CI)	OR, EDLOS >4 h vs EDLOS ≤4 h (95% CI)	OR, EDLOS >4 h vs EDLOS ≤4 h (95% CI)
MRI (yes vs no)	31.68 (6.03–166.54)	4.71 (2.22–10.00)	40.68 (7.03–235.30)	3.99 (2.34–6.78)
Consultation (yes vs no)	20.98 (14.10–31.22)	6.99 (5.83–8.38)	20.43 (14.19–29.42)	2.06 (1.22–3.49)
CT (yes vs no)	16.48 (10.07–26.98)	7.16 (5.92–8.66)	21.65 (14.63–32.03)	10.96 (9.30–12.92)
TPIA >2 h (yes vs no)	15.80 (13.35–18.71)	11.62 (10.40–12.99)	9.66 (8.32–11.21)	10.94 (10.00–11.96)
Troponin (yes vs no)	13.37 (6.30–28.37)	2.93 (1.98–4.34)	9.23 (5.03–16.93)	3.31 (2.20–4.97)
US (yes vs no)	7.61 (5.25–11.04)	4.51 (3.55–5.74)	7.03 (4.76–10.40)	4.30 (3.48–5.33)

ATS, Australasian Triage Scale; CI, confidence interval; CT, computed tomography; CTAS, Canadian Triage Acuity Scale; MRI, magnetic resonance imaging; TPIA, time to physician initial assessment; US, ultrasound.

TABLE 3. Emergency patients from Sunnybrook Hospital and Austin Health – multivariate analysis: top factors' odds ratios (ORs) of reaching ED length-of-stay (EDLOS) time targets for discharged high urgency patients

Variables	Sunnybrook 2012 discharged CTAS13 (n = 35 890)	Austin Health 2012 discharged ATS13 (n = 19 389)	Sunnybrook 2016 discharged CTAS13 (n = 40 793)	Austin Health 2016 discharged ATS13 (n = 22 387)
	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)
MRI (yes vs no)	19.33 (12.94–28.87)	8.16 (3.07–21.70)	10.47 (7.55–14.51)	–
Consultation (yes vs no)	10.23 (9.38–11.14)	8.82 (7.62–10.21)	12.78 (11.82–13.81)	2.96 (1.78–4.91)
TPIA >2 h (yes vs no)	5.63 (5.22–6.06)	3.89 (3.13–4.85)	4.29 (4.00–4.60)	3.37 (2.88–3.94)
CT (yes vs no)	4.24 (3.92–4.59)	3.01 (2.52–3.59)	5.22 (4.84–5.63)	5.54 (4.72–6.50)
US (yes vs no)	3.47 (3.13–3.83)	3.87 (2.77–5.42)	3.11 (2.79–3.46)	3.38 (2.43–4.72)
Shift: Day	Reference	Reference	Reference	Reference
Evening	1.23 (1.14–1.32)	4.09 (3.40–4.93)	1.05 (0.97–1.14)	2.26 (1.87–2.73)
Night	2.15 (1.96–2.35)	3.44 (2.62–4.51)	1.74 (1.54–1.96)	2.27 (1.68–3.05)

–, not part of regression model; ATS, Australasian Triage Scale; CI, confidence interval; CT, computed tomography; CTAS, Canadian Triage Acuity Scale; MRI, magnetic resonance imaging; TPIA, time to physician initial assessment; US, ultrasound.

low urgency discharges. It failed the Australian target in both years, but improved performance.

A hospital's patient population, programmes and health delivery infrastructure can put it at a disadvantage for reaching time targets. Sunnybrook is a regional trauma and oncology centre. Compared to

Austin, it has a population that requires more complex investigations, such as cross-sectional imaging. Sunnybrook does not have co-located services to divert some female, low urgency and private patients. There are smaller numbers of independent physicians, consulting-admitting services, allied

health and no dedicated radiologist at Sunnybrook. Austin allows admitted patients to be transferred to the ward before being assessed by the consulting service. In contrast, Sunnybrook requires the consulting services to assess and admit the patients in the ED. Secondary to high Sunnybrook occupancy, some patients

TABLE 4. Emergency patients from Sunnybrook Hospital and Austin Health – multivariate analysis: top factors' odds ratios (ORs) of reaching ED length-of-stay (EDLOS) time targets for ward admissions

Variables	Sunnybrook 2012 ward admissions (<i>n</i> = 12 509)†	Austin Health 2012 ward admissions (<i>n</i> = 16 901)†	Sunnybrook 2016 ward admissions (<i>n</i> = 13 127)†	Austin Health 2016 ward admissions (<i>n</i> = 16 425)†
	OR, EDLOS ≥8 h vs EDLOS ≤8 h (95% CI)	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)	OR, EDLOS >8 h vs EDLOS ≤8 h (95% CI)
Time to bed request >6 h	45.30 (37.75–54.36)	46.07 (33.23–63.88)	53.56 (44.49–64.67)	42.57 (31.98–56.67)
Time to ward bed >1 h	22.39 (18.67–26.87)	57.35 (39.31–83.67)	18.49 (15.68–21.80)	27.08 (19.87–36.90)

†Dayshift reference omitted – so sample size is smaller than admission volume. CI, confidence interval.

awaiting admission wait so long that they are eventually discharged. The Ontario P4R programme does not adjust for its hospitals' environment and patient characteristics nor does it provide specific funding for system capacity. Consequently, funding can be withheld for a hospital that deserves funding for crowding factors that are beyond its control.^{2,3} This may be one of the reasons why Sunnybrook failed to improve.

Despite the performance differences between the hospitals, the high impact factors influencing EDLOS were similar. For discharges, physician initial assessment time, consultation and diagnostics, such as cross-sectional imaging and troponin, were top factors. For admissions, high impact factors were TBR and TWB. ED operations must integrate with hospital consulting services, diagnostics and operations in order to increase efficiency. At the Austin, the evening and nightshift were found to be a higher impact factor for prolonged EDLOS compared to Sunnybrook. Further investigation is recommended.

The Austin used NEAT funding on the high impact output factor of ward bed time. It created assessment units, increased the number of observation unit, subacute, hospital beds and residential outreach services. The result was improved admission and high urgency EDLOS. The Austin also redesigned the front of the ED by streaming for rapid assessment. Although, the 90th percentile TPIA worsened, EDLOS for discharges

improved. Sunnybrook mainly used P4R for input-throughput factors. It funded an ambulance offload ED nurse, ED physician assistant, outpatient internal medicine clinic, push alert technology, electronic bed management system and operational costs for internal medicine short stay beds. However, overall governmental funding restrictions led to a net decrease in hospital beds. There was little impact on EDLOS or reaching performance targets. Given this study's odds ratio findings and Austin's improvement, health systems should prioritise output over input-throughput solutions.

By 2016, Austin's observation unit admissions increased with a greater overall admission rate than Sunnybrook. Further evaluation could include cost-effectiveness of these admissions. Did the observation unit prevent low urgency admissions or did it delay diagnosis management for an admission that was more appropriate for hospitalisation?^{2,5} Further analysis can determine which population suffers from the longest ward bed time. Using this data, adjustments to the programme can be made.

Limitations

It could be argued that comparing the two hospitals could not be made because of population and infrastructure differences. However, both hospitals were striving for the same end-point: to decrease ED wait times

under a pay-for-performance strategy. By comparing differences in improvement within the same hospital, hospital characteristics and strategies associated with target improvement can be determined and prioritised. A qualitative study on why tests are ordered, or how decisions are made, would be useful.

Sunnybrook triage scoring may be different from the Austin, affecting the high and low urgency discharge volume. Finally, other input factors could have been considered in the model, such as medical student supervision or physician-patient ratios; however, this data was not available.

Conclusion

Hospital characteristics can be barriers to time target achievement. By determining the factors in reaching time targets, through its own administrative database, a hospital can determine and prioritise interventions to shorten EDLOS. Despite the healthcare system or type of hospital, important factors are mainly clinical resources. Increasing output resources made a greater impact on shortening EDLOS than input-throughput interventions.

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Competing interests

None declared.

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