Resident-driven Quality Improvement Pre-post Intervention Targeting Reduction of Emergency Department Decision to Admit Time

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Abstract

Long Emergency Department (ED) wait times represent a key point for quality improvement in many healthcare systems. A delayed ED disposition decision may lead to increased length of hospital stay, healthcare cost, and mortality. The objective of this resident-driven quality improvement (QI) intervention was to determine if a standardized resident admission protocol could reduce the ‘decision-to-admit’ (DTA) time of patients being assessed for admission to internal medicine (IM) at 3 tertiary care teaching hospitals.

A standardized admission protocol was developed by a focus group of senior IM residents. DTA time data were tracked over a 6-month period, following implementation of the intervention. Residents identified potential barriers to timely DTA. A regular electronic newsletter summarized DTA time trends and reinforced the admission protocol. All data were extracted in aggregate form from a regional health authority database.

There was an overall decline in DTA times for Medical Teaching Unit (MTU) admissions with our intervention. Over a 6-month period, when adjusted for junior learner numbers and admission volumes, DTA times at all 3 sites decreased by an average of 1.3 hours. Cost effectiveness analysis using a case mix group model yielded an average cost savings of $36.63 per admitted patient across the 3 sites. Reported barriers to admission included unclear patient disposition, high consult volume and unstable patient status.

We have shown that a resident-driven QI intervention can be effective in reducing DTA times, and is cost saving to the healthcare system.

Keywords: Emergency department, hospital medicine, hospital quality improvement, cost effectiveness
Résumé
Les longs délais d’attente observés dans les services des urgences représentent un grand défi relatif à l’amélioration de la qualité pour de nombreux systèmes de soins de santé. Dans un service des urgences, une décision retardée peut accroître la durée du séjour hospitalier, les coûts de soins de santé et le taux de mortalité. L’objectif de cette initiative conduite par les résidents et visant une amélioration de la qualité était de déterminer si un protocole d’admission normalisé et appliqué par un résident pouvait réduire le temps de prise de décision relative à l’admission pour des patients en évaluation en médecine interne (MI), et ce, dans trois hôpitaux de soins tertiaires et d’enseignement.

Un protocole d’admission de décision relative à l’admission pour les admissions au sein des unités d’enseignement médical. Sur une période de six mois, en tenant compte du nombre d’apprenants et des volumes d’admission, le temps de prise de décision a diminué en moyenne de 1,3 heure dans les trois sites. L’analyse coût-efficacité réalisée à l’aide d’un modèle de groupe de cas a révélé une économie moyenne de 36,63 $ par patient admis dans l’ensemble des trois sites. Les obstacles à l’admission recensés comprenaient, entre autres, l’inclination ambiguë du patient à cet égard, le volume élevé des demandes de consultations et l’instabilité de l’état de mal du patient.

Nous avons démontré qu’une initiative d’amélioration de la qualité mise de l’avant par des résidents peut s’avérer efficace pour réduire les temps de prise de décision relative à l’admission et diminuer les coûts du système de soins de santé.

Introduction
Wait times have become a central public policy issue and a focus of both national and international healthcare reform.\textsuperscript{1,2} Timely access to care has been identified as an indicator of healthcare quality, leading to the development of wait time benchmarks by many health authorities.\textsuperscript{3} Delays in access to care occur for many reasons across the spectrum of healthcare services.

The emergency department provides essential healthcare services to a large volume of patients and serves as the primary point of access to hospital-based care. In Canada alone there are close to 16 million ED visits each year with over 1 million resulting in hospital admission.\textsuperscript{4} A patient’s length of stay in the emergency department is comprised of 5 major stages: registration, triage, physician assessment, determination of disposition, and discharge or transport from the ED. In this setting, ‘length of stay’ (LOS) is meant to be an inclusive metric encompassing both the time a patient spends waiting for care and the time required to provide care.

Increases in ED LOS have been shown to have a negative impact on both the patient and healthcare system. Patients waiting longer in the ED are more likely to experience pain and suffering, express dissatisfaction with care, and leave without receiving treatment.\textsuperscript{6} For those requiring hospital admission, prolonged ED LOS may result in ED overcrowding, which has been associated with an increase in short term mortality.\textsuperscript{5} At a healthcare system level, increases in ED LOS for those requiring admission to hospital is associated with significantly increased in-patient length of stay and cost.\textsuperscript{6}

The aim of this intervention was to reduce ED LOS through targeting reduction in the decision to admit (DTA) time for patients being admitted to Medical Teaching Units (MTU) at 3 urban teaching hospitals. DTA time was defined as the time from initial internal medicine consultation to the electronic entry of admission orders. A 2-hour DTA time target was chosen based on an established provincial target within a national 8-hour total ED length of stay benchmark.\textsuperscript{6} The primary improvement-related question was to determine if the creation of a standardized admission protocol by senior internal medicine residents and regular distribution of average DTA times to residents would decrease ED LOS. Our secondary improvement-related objectives were to identify barriers to a timely DTA, and to identify potential cost savings.

Methods
A prospective pre-post QI experimental study was conducted at 3 academic teaching hospitals from July 2012 to February 2013. All 3 hospitals are academic centres. Two of these hospitals have 3 MTUs. At these sites, senior residents (postgraduate year [PGY]-2 and PGY-3) are responsible for ED admissions 24 hours a day. The third hospital has 2 MTUs, with a senior resident responsible for ED admissions from 8pm until 8am, and a staff physician at all other times. All MTUs have junior trainees (either PGY-1 residents or senior medical students).
Planning the intervention
During the study period there were 55 senior internal medicine residents (PGY-2 and PGY-3) enrolled in the Royal College of Physicians and Surgeons (RCPSC)-accredited Internal Medicine Residency Training program. All 27 PGY-3 residents were invited to participate in a focus group, facilitated by the internal medicine chief residents, in which the following 4 questions were discussed:

1. What are the current barriers to making admission decisions within a 2-hour time period?
2. How might patient care be affected if time to admission was shorter?
3. What patient situations may be exceptions to the rule of early admission decisions?
4. What strategies might reduce time to admission decisions?

Responses to these questions informed the creation of a standardized admission protocol (Appendix 1) that was approved by the 4 internal medicine chief residents and the department of medicine division heads. We also created a feedback form that enabled senior residents to anonymously report types of admission barriers, estimated associated time delays and outcome of admission barriers (Appendix 2).

Evaluation and Analysis
The average DTA times (in fractional hours) for MTU admissions by site were calculated for every training block. To adjust values for junior learner number and admission volumes, the average DTA time per junior learner was divided by the number of admissions. P-values and confidence intervals on the raw DTA times by site could not be reliably determined because there were not enough observations per site.

Cost effectiveness was calculated using a case mix group model, with groupers and resource intensity weights as developed by the Canadian Institute of Health Information (CIHI). The percent of admissions classified under each grouper and the average length of stay per site in hours were obtained from Tableau. Provincial data were used for average admission cost. Cost savings were based on the decrease in time to admission.

Given this was a QI project and no identifying data were collected, a letter of comfort was obtained from the Conjoint Health Research Ethics Board at our institution. No potential author conflicts of interest were identified.

Results
Over the 6-month intervention period, there were an average of 2.84 admissions at site 1, 3.57 at site 2, and 3.62 at site 3, per 24 hours. The unadjusted DTA times at 2 of our 3 sites decreased from an average of 4.3 and 4.2 hours to 3.2 and 3.3 hours, respectively. The third site experienced a slight increase from 3.1 to 3.2 hours. However, when accounting for number of junior trainees and admission volume, all 3 sites experienced a decrease in DTA times (4.8, 4.0, and 1.8 hours to 2.4, 2.6, and 1.7 hours, respectively), as shown in Figure 1. Overall, across all 3 sites, adjusted DTA times were reduced by an average of 1.3 hours. Cost effectiveness analysis yielded approximate healthcare cost savings of $59.18 per admission at site 1, $43.29 at site 2, and an increase in cost of $5.29 at site 3. Overall, this is an average cost savings of $36.63 per admitted patient across the 3 sites.

A total of 28 barrier-to-admission feedback forms were returned. The 3 most common reasons for prolonged DTA were unclear patient disposition, high consult volume, and unstable patient status. The estimated delay to admission as a result of these barriers ranged from 1.3 to 8.0 hours.
Discussion

In our study, we demonstrated that a resident-driven intervention to reduce DTA time of patients admitted to medical teaching units was effective across 3 teaching hospitals. This finding is similar to a previously published Canadian QI study involving internal medicine trainees at one academic teaching hospital. However, this study differed in the extent of resident involvement in design and implementation of the intervention. Although electronic dissemination of performance metrics has previously been shown to decrease overall ED LOS in the surgical literature, the focus has been on decreasing time to consultation and not DTA times.

Although all 3 sites demonstrated a decrease in DTA times, site 3 was noticeably different showing a smaller decrease in adjusted DTA time from 1.8 to 1.7 hours. Site 3 also had the highest average number of admissions to MTU. Rathlev et al. found that the number of ED admissions is positively associated with increased ED LOS, and this may account for a portion of our results. However, the MTU structure is also different at site 3 as a staff physician is responsible for admissions between 8am and 8pm, with a senior resident covering from 8pm until 8am. Perhaps the efficiency of staff admissions explains the consistently low average DTA times at this site, which was already below the 2-hour target at baseline.

We demonstrated an overall cost savings with this intervention. This builds on previous findings from Foley et al. that demonstrated increasing ED LOS by 11.7% increased the costs at a university facility by $3.9 million per year. The costs associated with developing and implementing our intervention were minimal, primarily reflected in human resources required for data analysis and the creation and dissemination of a regular electronic newsletter, thereby strengthening the cost efficacy benefits.

Another valuable outcome of this study was insight into barriers to achieving the targeted 2-hour DTA time. The barriers identified may be useful in developing future models to reduce DTA times. However, it is likely not a comprehensive account of the barriers, as resident reporting of barriers was voluntary.

This intervention also demonstrates the importance of involving relevant stakeholders in QI initiatives. Within many academic hospitals, residents are often the individuals making admission decisions and have comprehensive understanding of ED admission processes. Therefore, it is not surprising that involving residents in this QI intervention resulted in positive change.

There are some potential limitations to this study. Although a multi-centre study, our 3 sites were located within the same city and involved only one residency-training program. This may limit the generalizability of our findings. Additionally, the impact of our intervention on the trend in DTA time reduction could be overestimated by concurrent improvement in senior resident efficiency at clinical assessment over the study period, as it coincided with progression in training. Finally, we do not have data on what proportion of residents actually read the electronic newsletter and standardized admission protocol. A simple survey conducted at the end of the intervention may have provided more insight into the uptake of the intervention among residents thereby allowing a more informed interpretation of the data.

In conclusion, this relatively simple and low-cost QI intervention, aimed at reducing DTA times, resulted in decreased DTA times and related cost savings. The identified barriers to residents’ DTA may serve as targets for future site- or system-wide interventions.
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Competing Interests
Dr. Holroyd-Leduc receives salary support as the Scientific Director of Alberta Health Services

References
Appendix 1

Department of Medicine In-patient Services
Process for Emergency Department Admissions

Preamble:
The intent of this protocol is to enhance patient care and shorten the emergency department admission process. The following outlines general principles for emergency department consultations to Department of Medicine (DOM) in-patient services.

General Principles:
For each consultation received from an emergency physician within any of the Calgary Emergency Departments:

1) The senior resident/fellow (or staff physician when appropriate) assigned to cover emergency department consultations will conduct an initial triage of the patient and make a decision around admission, before assigning the consult to a junior trainee to complete. This should be done within two hours of the initial request for consultation. The senior resident/fellow may speak to the attending staff physician before making this decision; however this should be done in a timely manner so as not to unduly increase the time it takes to make a decision around admission. A decision to admit may be delayed until it is clear that admission to a DOM in-patient service is appropriate if another consulting service is also assessing or should be consulted to assess the patient for possible admission.

2) The senior resident/fellow (or staff physician) should enter initial admission orders into Sunrise Clinical Manager (SCM), including all essential orders that would be needed if the patient were to be transferred to the medical unit before the junior trainee finishes their assessment. These orders should include any qualifiers around delaying transfer out of emergency department when appropriate, such as but not limited to the clinical scenarios listed below:
   a) Severe DKA (e.g. pH < 7.1)
   b) Required/recent hemodynamic or ventilatory support (e.g. BiPAP; vasopressors; recently extubated)
   c) Active unstable upper GI bleeds
   d) Drug overdoses with altered level of consciousness
   e) Severe sepsis/septic shock with no signs of improvement after adequate resuscitation

3) When entering these initial admission orders, the senior resident/fellow is encouraged to include an MD to nurse communication: “ED nurse or unit clerk to please page Senior Medicine/Fellow pager (pager #____) leaving a text message when patient is about to be transferred to a unit”

4) When available, a junior trainee should be assigned to complete the full admission assessment, which will be reviewed with the senior resident/fellow (or staff physician) when completed. If stable, the patient can be moved to a medical bed before the junior trainee has completed their assessment, as the assessment can be completed on the medical unit. The trainee should be encouraged to complete their assessment in a timely manner.
## Appendix 2: Barriers to Admission Feedback Form

<table>
<thead>
<tr>
<th>Specific barrier to admission</th>
<th>Number of times this occurred</th>
<th>Estimated delay to admission decision for each occurrence (minutes)</th>
<th>Outcome (eg. to ward, to ICU, discharged, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient referred without initial investigations ordered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unclear disposition (MTU vs. hospitalist, etc). Specify other services:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Possible discharge from emergency</td>
<td></td>
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<tr>
<td>Worrisome lab result (eg. pH&lt;7.2, elevated lactate). Specify lab result(s):</td>
<td></td>
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<tr>
<td>Unstable patient status</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Awaiting test results. Specify test(s):</td>
<td></td>
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<tr>
<td>High volume of consults</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Managing other acutely ill patient</td>
<td></td>
<td></td>
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<tr>
<td>Difficulty completing investigations on MAU patient (RGH only)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Other (please specify):</td>
<td></td>
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</table>