The ED-inpatient dashboard: Uniting emergency and inpatient clinicians to improve the efficiency and quality of care for patients requiring emergency admission to hospital

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Abstract

Patients who require emergency admission to hospital require complex care that can be fragmented, occurring in the ED, across the ED-inpatient interface (EDii) and subsequently, in their destination inpatient ward. Our hospital had poor process efficiency with slow transit times for patients requiring emergency care. ED clinicians alone were able to improve the processes and length of stay for the patients discharged directly from the ED. However, improving the efficiency of care for patients requiring emergency admission to true inpatient wards required collaboration with reluctant inpatient clinicians. The inpatient teams were uninterested in improving time-based measures of care in isolation, but they were motivated by improving patient outcomes. We developed a dashboard showing process measures such as 4 h rule compliance rate coupled with clinically important outcome measures such as inpatient mortality. The EDii dashboard helped unite both ED and inpatient teams in clinical redesign to improve both efficiencies of care and patient outcomes.

Introduction

Access to emergency care in hospitals is critical for our sickest and most complex patients and attracts extensive community and political interest as evidenced by the 4 h rule or the National Emergency Access Targets (NEAT).

The cohorts of patients who are discharged home from the ED are a relatively low acuity and low cost group to treat. EDs alone can streamline and improve the care of this group without having to engage with inpatient clinicians and complicated whole of hospital processes.

However, the groups of ED patients who require admission to an inpatient unit have to negotiate the ED-inpatient interface (EDii). The EDii is the complex interplay that occurs between the ED and inpatient hospital services as a patient transfers from emergency to inpatient care. This group of patients is typically at high risk for harm, has significant clinical complexity and has a high mortality rate when compared to patients admitted electively.[1-3](#)

Despite a relative lack of robust, peer-reviewed research in this area, the EDii is one of the very few areas where governments have imposed time targets for clinical care. The NEAT introduced by the

Australian government in 2011 directed that 90% of patients presenting to EDs were admitted, discharged or transferred within 4 h of presentation. However, there was no accompanying robust policy for monitoring patient outcomes.[4-6](#) The national partnership agreement underpinning the NEAT has recently been dissolved and considerable uncertainty exists as to whether time targets for emergency care should continue.[5](#) Recent work has provided strengthened evidence of an inverse association between 4 h target compliance rates and in-hospital mortality.[7](#)

Princess Alexandra Hospital (PAH) is a large tertiary hospital that previously recorded one of the worst NEAT performances nationally. Although the hospital executive was committed to improving NEAT compliance, there was a lack of engagement from clinicians, particularly inpatient teams.

This lack of engagement was underpinned by concerns that rushing patients out of the ED may cause harm and a lack of confidence to undertake process change as patient outcomes were unable to be easily tracked. There were no readily available data sources on outcomes for patients requiring emergency admission to hospital. There was existing evidence from the literature that efficient ED processes were associated with better patient outcomes and reduced inpatient mortality.[8](#)

As part of a multi-faceted clinical redesign effort, which is described elsewhere,[3](#) agreement was reached between the ED and the Division of Medicine (DOM) clinicians to develop a dashboard to monitor the efficiency and quality of care at our ED. The DOM includes general medicine and all medical specialties and receives the majority of emergency admissions. This divisional arrangement meant that engagement of individual medical inpatient units was undertaken by the DOM clinical leaders rather than emergency physicians. The Divisions of Surgery and Cancer Services were similarly engaged. An easily accessible dashboard amalgamating ED and inpatient data sources and process and quality of care measurements was built to give confidence to clinical redesign efforts.

The outcome measures chosen for the dashboard were:

- Emergency Admission Mortality Rate: defined as the percentage of acute patients who were admitted via the ED and who died in any hospital ward, including the ED short stay ward.
- Emergency Hospital Standardised Mortality Ratio (eHSMR): The standardised mortality ratio as calculated by the Health Roundtable using validated methodology[9](#), [10](#) for patients admitted into hospital via the ED.
- Cardiac arrest within 24 h of admission: the total number of cardiac arrests, as defined by Jacobs,[11](#) per 1000 admissions within 24 h of admission to a ward for patients admitted via the ED.
- Rapid Response Team (RRT) activations within 24 h of admission: the total number of RRT activations initiated for deteriorating patients (excluding cardiac arrests) per 1000 admissions. This excluded same-day patients, statistical admissions and same-day patients to 'day only' wards.
- ED representation rate within 48 h: was defined as the percentage of patients who re-presented to the ED within 48 h of the index attendance.

Results

Concerted cultural change and more than 25 clinical redesign interventions supported by the dashboard display of outcome and process measures culminated in a near halving of ED length of stay (from 7.2 to 3.8 h) and a near halving of the mortality (from 2.3% to 1.0%) for patients requiring emergency admission to PAH.[3](#) No clinically significant adverse safety signals were seen following

the implementation of these reforms as assessed by numbers of RRT activations within the first 24 h of admission or ED representation within 48 h.³

The EDii dashboard is shown in Figure 1. The dashboard was implemented at PAH in early 2014, and is now being utilised or implemented in several Australian hospitals (J-J Jacques, Qld Department of Health, pers. comm., 2016). The innovative nature and utility of the dashboard was independently recognised by the awarding of a merit certificate to the project team at the iAwards.¹²

Figure 1- Princess Alexandra Hospital Emergency Department-Inpatient Interface (EDii) Dashboard.

Discussion

The development and implementation of the EDii dashboard has provided clinicians and hospital executives with a visual platform to ensure that time-based emergency access measures are always nested in a standardised, near real-time matrix of quality indicators. Data are now displayed in meaningful formats that assist clinical decision-making. The EDii dashboard gave clinicians considerable confidence to undertake significant clinical redesign of the ED inpatient interface. An example case study is provided in Box 1.

BOX 1. Case Study

The changes in our processes for a representative patient before and after our clinical redesign are detailed below. The EDii dashboard has allowed us to link efficiency of care in the ED and patient outcomes, and this new knowledge has changed the way inpatient teams react to emergency admissions.

Case

Mrs GL is 80 years old with a history of diabetes and poor mobility who had a fall at home and was found to be mildly hypotensive and febrile by the ambulance team. She arrived at our ED and responded well to resuscitation with fluids and antibiotics. She was found to have a urinary tract infection and mild delirium.

Clinical process before EDii Clinical Redesign

The medical registrar on call for emergency admissions that afternoon was a good clinician but had a strong reputation for being 'a wall'. There were several difficult phone conversations between him and ED staff regarding admission for Mrs GL, as he refused admission until all investigation results were returned and documented, and he had had the opportunity to review the patient after finishing his outpatient clinic. Mrs GL was eventually admitted to the general medical ward after an 8 h stay in the ED.

Clinical process after EDii Clinical Redesign

The medical registrar on call for emergency admissions that afternoon was a good clinician and knew that short stays in the ED were associated with better mortality outcomes for patients like Mrs GL. He had flagged her as a potential admission on the regular-combined inpatient-ED ward round and had her admitted to the general medical ward for definitive management of her urosepsis and delirium. Mrs GL spent only 3.5 h in the ED.

The introduction of clinical and quality dashboards has been reported to have a positive effect on care outcomes and processes of care.[13](#), [14](#)

The success of this dashboard is attributable to several factors:

1. The dashboard was developed in response to a clearly defined, important clinical problem; limited clinical engagement because of concern that pursuit of isolated process measures might be harmful to patients.
2. The project was led by clinicians with operational roles that allowed the effective implementation and dissemination of the dashboard into everyday clinical practice across the organisation. The clinicians were able to utilise the expertly presented data to undertake health service improvement, which in turn was able to be tracked using the dashboard.
3. The dashboard was constructed in a way that encouraged easy replication in other facilities. It was designed as a local quality improvement tool and specifically not as a tool for benchmarking across sites.
4. The dashboard formed an integral part of a coordinated whole of hospital cultural change focusing on improving patient outcomes rather than process measures in isolation.

The EDii safety dashboard, and the system reforms that it facilitated, has supported a significant culture change within PAH. We have seen patient outcomes become the centre of the decision-making process. Improved patient outcomes (rather than isolated process measures) are key drivers for united clinical engagement with reform. In addition, the ability to rapidly identify any potential adverse patient safety signals has increased the appetite for innovation and a willingness to try new processes.

Interrogating ED data systems (such as Emergency Department Information Systems (EDIS), Computer Sciences Corporation) can inform clinical redesign and improve overall patient throughput

and turnaround times.¹⁵ Baumlín *et al.* noted that the major limitation in their EDIS implementation was the system's inability to be fully integrated into existing hospital applications.¹⁵

A data warehouse enables data integration from ED and inpatient sources and information exchange across the enterprise, supporting clinical and operational decision-making by breaking down traditional clinical silos.¹⁶

Future iterations of the EDii dashboard will include access to more granular data, including more accurate time stamping of clinical events across EDii, and more detailed coded clinical information. Fortunately, these are primary benefits of an integrated electronic medical record (EMR), which PAH has recently implemented. An EMR will allow more real-time presentation of tailored information to allow clinicians to make immediate decisions about current and future service provision to maximise benefit to patients.

Limitations

There are several limitations to this work. The data remain retrospective and are reflections of past performance rather than a real-time indication of factors that can be modified to improve current performance. The outcome measures in use are important but very gross reflections of quality of care.⁹ The process changes and delivery of quality care remain the responsibility of the clinical teams, and the inspiration and motivation for change comes from them.

Conclusion

The EDii dashboard has supported health system reform in this important area by bringing into clearer focus the important link between key process measures and their impact on patient outcomes.

The linking of patient outcome measures to routinely collected process measures has increased clinical engagement, focused decision-making on the patient and contributed a culture where system innovation is fostered and tested to maximise the efficiency, quality and safety of the care delivered to our patients.

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Competing interests

None declared.

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