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Case Study

# Electronic patient journey boards a vital piece of the puzzle in patient flow

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## Abstract

**Objective.** Internationally, there is growing interest in the applicability of visual management in healthcare, although little is known about the extent of its effectiveness. In the past 5 years technical advances have permitted the integration of all relevant data into a singular display that can improve staff efficiency, accelerate decisions, streamline workflow processes and reduce oversights and errors in clinical practice. The aim of the case study is to describe the features and application of electronic patient journey boards (EPJBs) as an enabler to accelerate patient flow that has been demonstrated and evaluated in Queensland Health hospitals.

**Methods.** In 2012 and 2013 we collected ward-specific data that was sourced from the Queensland Hospital Admitted Patient Data Collection, determining the top 10 overnight diagnostic-related groups (DRGs) for each ward participating in the pilots. The Statistical Output Unit within Queensland Health then provided data and analysis on the ALOS for each of these DRGs for the period following an EPJB installation, along with the ALOS for the same DRGs for the corresponding period in the previous year.

**Results.** Patient length of stay reduced and display of estimated discharge dates improved with the introduction of EPJBs along with improved communication and information management resulting in time savings from 20 min per staff member per shift to 2.5 h per ward a day.

**Conclusion.** Queensland and South Australian Health systems have succeeded in 'making the hospital patient journey visible' through an innovative combination of information management and prominent display of key information related to patient care portrayed on large liquid crystal display (LCD) screens in hospital wards.

**What is known about the topic?** No published studies have explored health services developing, piloting and evaluating Electronic Patient Journey Boards in a variety of clinical settings.
**What does this paper add?** Until recently, paper-based health records and scheduled meetings were the only way for healthcare staff to communicate information to one another. In practice, this means that information vital to patient care is infrequently communicated between team members, is recorded in different places and in different ways, and is heavily reliant on care providers seeking out the information they need to perform effectively in their role.
**What are the implications for practitioners?** This paper can be beneficial for managers and decision-makers of all healthcare organisations when considering streamlining a patients' journey through a hospital with the assistance of visual management tools.

**Additional keywords:** lean thinking, patient flow, visual management.

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## Introduction

Like other developed countries Australian hospitals are demonstrating that technological enablers,[1–4] such as the electronic patient journey board (EPJB), are being used successfully to improve patient flow and patient continuity of care improvements.[5,6] The ability to respond to this increased demand hinges

on establishing sustainable systems to facilitate the flow of patients through our hospitals and then safely and effectively back into the community; however, it is difficult to achieve this when the entire patient's hospital journey is largely invisible to the staff involved in their care.[7]

What makes streamlining a patient's journey through the hospital so challenging is the sheer number of people involved in the delivery of care and the need for awareness around what tasks have been completed and which ones still remain.[7–9] Until recently, paper-based systems, whiteboards and scheduled meetings were the only way for staff to communicate this information to one another.[10] In practice, this means that information vital to patient care is infrequently communicated between team members, is recorded in different places and in different ways, and is heavily reliant on care providers seeking out, in a demanding work environment, the information they need to effectively perform in their role.

The introduction of EPJBs into Queensland hospitals and South Australia in 2009–10 in combination with criteria-led discharge process improvements has transformed patient care and delivered tangible improvements in admission practices, bed management, discharge planning and care coordination.[11] Queensland and South Australian Health systems have succeeded in 'making the hospital patient journey visible' through an innovative combination of information management and prominent display of key information related to patient care on large liquid crystal display (LCD) screens in hospital wards. Although technology has been a key enabler of the change, it is by no means the crux.[12] The real catalyst for change has been the creation and continual communication via the EPJB of a plan for care based on individual patient needs, overt planning for discharge (through development and display of an 'estimated date of discharge') and continual performance monitoring (using a traffic light system to track progress against the estimated date of discharge and local or state-based average lengths of stay for patients who have previously been admitted with similar diagnoses). The end result has been the creation of a patient-centred, collaborative service improvement model with the ability to drive patient- and system-level changes to enhance patient flow.

The capability to systematically and logically link selected patient datasets into a cohesive EPJB holds tremendous potential for improving care quality, patient safety and clinical outcomes.[13] Ultimately, it is about clinicians using information technology as an accelerator of best practice workflow, although it should be remembered that this is not a substitute for first redesigning processes and systems of delivery.[14]

## What was the problem?

In healthcare, the term 'patient flow' is used to describe the progressive movement of patients, information or equipment between departments, staff groups or organisations as part of a patient's care pathway. Efficient management of patient flow has become an urgent issue for most hospitals, both nationally and internationally, as demand for healthcare services increases in line with population growth, aging and the increasing prevalence of chronic conditions.[15] Improving patient flow ensures that patients receive the right care, in the right place, at the right time, with flow-on effects in terms of the quality and safety of care being delivered.

Common problems found in Queensland hospitals before implementation of EPJBs, as described by clinicians in their everyday practice,[3] included the following.

- The traditional manual white boards did not have all the information needed to display a complete picture of the patient's care and progress.
- Patients' progress notes needed to be searched to find appropriate patient information relevant to their journey in hospital, which took time.
- There was no standard way of referring to the multidisciplinary clinicians. In addition, once referrals were made, there was no way of tracking their progress (e.g. 'in progress' or 'complete').
- Information entered onto the patient whiteboard needed to be re-entered elsewhere to create handover sheets used for clinical handover.
- Discharge planning was not standardised and evidence based.
- There was no standard way of displaying information regarding 'criteria for discharge'.
- When the patient changed wards, their information did not follow them and had to be duplicated.
- Traditional handover sheets were only 'up to date' just before the next shift commencing; therefore, in a 24-h period, they were mostly 'not current'.
- The responsibility of maintaining whiteboards, diet lists and handover sheets usually rested solely with the nursing shift coordinator.
- Any calculations, such as length of stay, days post birth and 'days until discharge', had to be updated manually every 24 h.

## Case study

### *Objectives*

The objectives of the EPJB were to develop a clinical information system that delivered the following features: (1) information for clinical teams, presented in an easy to understand format with high visual impact; (2) clinical information relevant across the multidisciplinary team provided in 'real time'; and (3) easy configuration to local requirements and comparison against state datasets (average length of stay), where available and appropriate.

### *Sequence of events*

Too often the introduction of a new technology in healthcare is done without first considering the redesign of existing workplaces and processes using known process improvement methodologies.[2,16] Using local knowledge of how multidisciplinary teams work together to achieve optimal service and patient outcomes, the EPJB was developed to support clinical and unit processes.[10,17]

The General Medicine program at The Prince Charles Hospital (TPCH; Brisbane, Qld, Australia) was the first healthcare team in Queensland to recognise the importance of improving the flow of information between staff involved in delivering care to patients. In 2009, a collaboration with Flinders Medical Centre (Adelaide, SA, Australia) led to the development of Queensland's first EPJB. The original EPJB integrated patient information from a variety of sources, including whiteboards, handover sheets,

handwritten referrals and patient charts, and used a projector-style system to prominently display information to staff involved in the patient's care. From the outset, this EPJB was successful in enhancing patient flow and multidisciplinary communication by 'making the patient journey visible' using simple colour coding to flag progress and potential delays in care. Patient information could be entered by multiple clinical and non-clinical staff simultaneously from various workstations, meaning that data were being updated in real time, allowing quicker referral-to-treatment times and more timely decision making by team members involved in care.

Following a successful local pilot at TPCH, the agile development of EPJBs was led by the Clinical Access and Redesign Unit (CARU) within Queensland Health (formerly the Access Improvement Service), who further developed the EPJB using a high-level process map for a standard in-patient journey, which consisted of three primary stages, with care coordination across all stages: (1) admission; (2) assessment and treatment; and (3) discharge. These EPJBs incorporated a variety of functions that were designed to improve the flow of information between staff involved in delivering care to patients at each stage of their journey. Standard EPJB functionalities and the associated 'best practice' work processes across each stage of the in-patient journey were documented and used to modify and contextualise the EPJB in different clinical units and hospitals. Examples of EPJB screens are given in Fig. 1.

## Results

Although preliminary evidence from TPCH and Flinders Medical Centre indicated that EPJBs had the potential to improve patient flow, there was a need for further evaluation across a much wider cohort of hospitals and specialties. To further examine this, the Queensland Health Clinical Access and Redesign Unit (CARU) funded an evaluation trial that involved the installation and customisation of screens into multiple clinical wards throughout Queensland Health hospitals.

Between February and November 2011, 50 EPJBs were installed in 14 Queensland hospitals, covering metropolitan, regional and rural sites, with specialties such as Surgical, Medical, Maternity, Sub-acute and Mental Health being included. Qualitative and quantitative evaluation of outcomes with regard to staff feedback and changes in patient average length of stay (ALOS) and the use of an estimated date of discharge (EDD) were measured to evaluate the impact of EPJBs on patient flow efficiencies and whether staff were accepting of them.

### *Quantitative outcomes*

#### *Methodology*

To evaluate the impact of EPJBs on efficiency, ward-specific data were sourced from the Queensland Hospital Admitted Patient Data Collection, determining the top 10 overnight diagnostic related groups (DRGs) for each ward participating.

The Statistical Output Unit within Queensland Health then provided data on the ALOS for each of these DRGs for the period following an EPJB installation, along with the ALOS for the same DRGs for the corresponding period in the previous year. Phased installation schedules meant that 6 months of data were available for all sites, but for some sites a 12-month period of data was available, which enabled further examination of the impact of EPJBs over a period of time.

#### *Specific DRGs across multiple wards*

*Medical ward outcomes* Data for four common overnight medical DRGs across 13 'medical ward' pilot sites were examined before and after EPJB installation to examine the impact on ALOS. Between 57% and 92% of medical wards recorded a reduction in ALOS following installation of EPJBs, indicating that the EPJBs had a positive impact on the operational efficiency of medical wards. The specific diagnostic groups that were examined were: respiratory infections/inflammations with severe or moderate complex co-morbidities (E62B); chronic obstructive airways disease (E65A and E65B); and kidney and urinary tract infections (L63B); being common to all pilot sites.

Twelve of 13 (92%) of the pilot site medical wards recorded a reduction in ALOS for the DRG E62B. Reductions in ALOS varied between 0.4 to 4.1 days across the pilot sites, with the average being 1.86 days. Trend analysis indicated that the positive effect on ALOS is magnified the longer the EPJB is implemented, with sites recording an average reduction in ALOS of 1.68 days at 6 months after installation compared with 2.05 days 12 months after implementation.

Eight of 13 (61%) of the pilot site medical wards recorded a reduction in ALOS for the DRG E65A. Reductions varied between 0.4 and 4.2 days across the pilot sites, with the average being 1.63 days. Once again, trend analysis revealed a positive correlation between the length of time the EPJBs had been installed and reductions in ALOS, with sites recording an average reduction in ALOS of 0.97 days at 5–6 months compared with 2.3 days at 12 months.

Ten of 13 (77%) of the pilot site medical wards recorded a reduction in ALOS for the DRG E65B. Reductions varied between 0.3 and 2.3 days across the pilot sites, with the average being 1.01 days.

Seven of eight (88%) of the pilot site medical wards recorded a reduction in ALOS for the DRG L63B. Reductions varied between 0.3 and 3.2 days across the pilot sites, with the average being 1.47 days. Comparative analysis indicated stable trending, with sites recording an average reduction in ALOS of 1.47 days at both 6 and 12 months.

*Surgical ward outcomes* Data for three common overnight DRGs across the seven 'surgical ward' pilot sites was examined before and after EPJB installation to examine the impact on ALOS. Between 57% and 100% of surgical wards recorded a reduction in ALOS following installation of EPJBs, indicating that the EPJBs had a positive impact on the operational efficiency of surgical wards. The specific diagnostic groups that were examined were: major small and large bowel procedures (G02B); laparoscopic cholecystectomy (HO8B); and oesophagitis, gastroenteritis and miscellaneous digestive disorders (G67B); being common diagnoses in the surgical pilot sites.

GO2B appeared in the top 10 overnight DRG extracts for only three of the seven surgical wards involved in the pilot. All three wards (100%) recorded a reduction in ALOS for the DRG GO2B. Reductions varied between 0.1 and 1.1 days across the pilot sites, with the average being 0.6 days. Once again, trend analysis appeared to indicate that the longer the EPJBs were

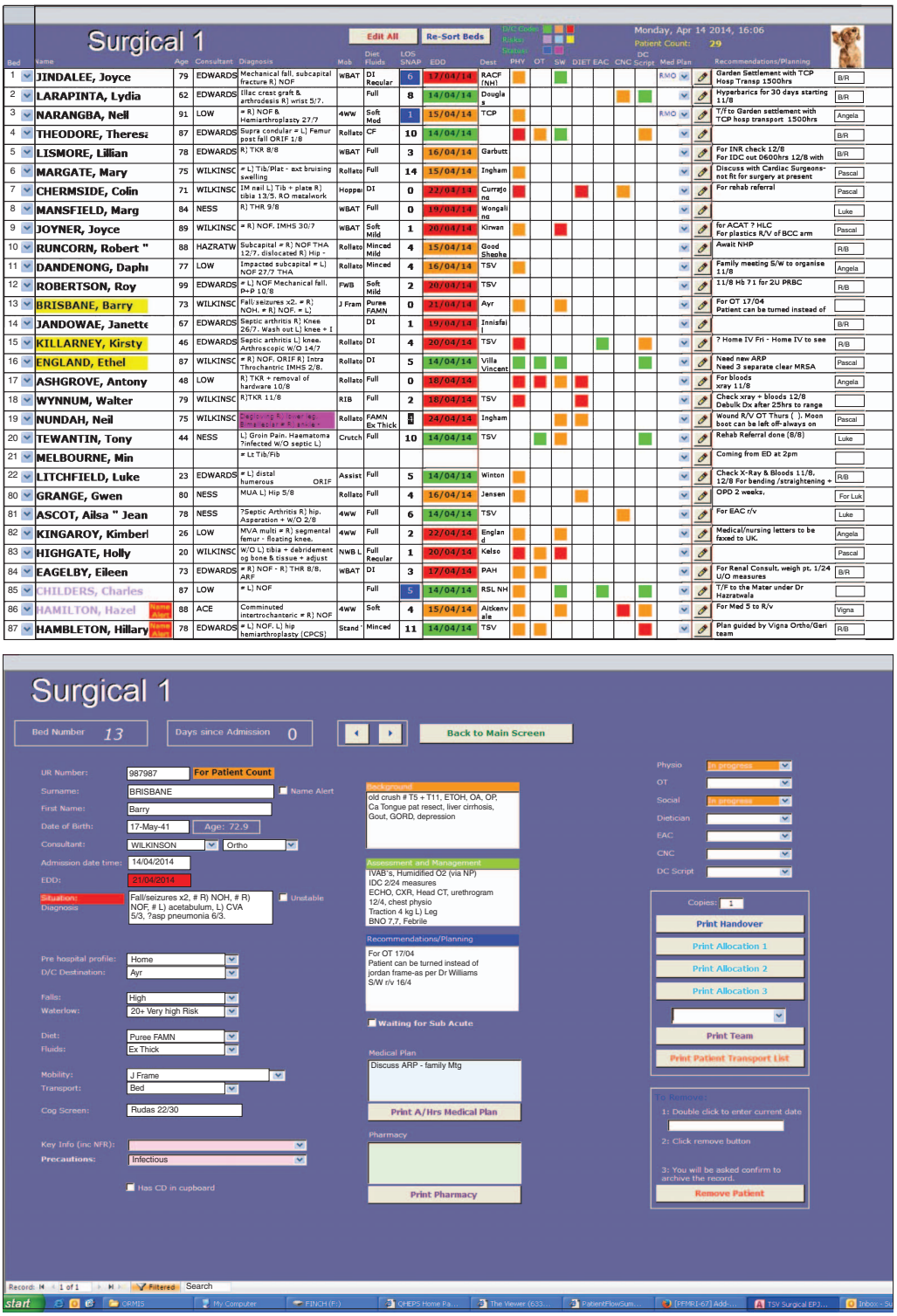


**Fig. 1.** Front screen Electronic Patient Journey Board 'Ward at a Glance' view and an individual patient screen from a Surgical ward. These examples contain fictitious details.

installed, the greater the impact on operational efficiency, with one site recording an average reduction in ALOS of 1.1 days at 12 months, compared with an average reduction of 0.35 days in the 6-month pilot sites.

Four of six (67%) of pilot site surgical wards recorded a reduction in ALOS for the DRG HO8B. Reductions varied between 0.05 and 0.86 of a day across the pilot sites, with the average being 0.47 of a day saved.

Four of seven (57%) of the pilot site surgical wards recorded a reduction in ALOS for the DRG G67B. Reductions varied between 0.3 and 1.3 days across the pilot sites, with the average being 0.7 of a day. Comparative analysis indicated stable trending, with sites recording an average reduction in ALOS of 0.7 of a day at both 6 and 12 months.

*Maternity ward outcomes* Data for three common overnight DRGs across four maternity pilot sites were examined before and after EPJB installation to examine the impact on ALOS. Between 50% and 100% of maternity wards recorded a reduction in ALOS following installation of EPJBs, indicating that the EPJBs had a positive impact on the operational efficiency of maternity wards also. The specific diagnostic groups examined were: caesarean deliveries (OO1B); and vaginal deliveries with and without severe outcomes (O6OA and O6OB).

All four (100%) of the pilot site maternity wards recorded a reduction in ALOS for the DRG 060A. Reductions varied between 0.1 and 1.2 days across the pilot sites, with the average being 0.5 of a day saved.

Fifty per cent (2/4) of the pilot site maternity wards recorded a reduction in ALOS for the DRG 001B, with the remaining two wards recording no change in ALOS after installation. Reductions varied between 0.6 and 1.2 days across the pilot sites, with the average being 0.9 of a day saved.

Three of four (75%) of the pilot site maternity wards recorded a reduction in ALOS for the DRG 060B, with the fourth site remaining static. Reductions varied between 0.04 and 0.41 of a day across the pilot sites, with the average being 0.13 of a day saved.

### *Qualitative outcomes*

Qualitative outcomes were independently collated by the University of Southern Queensland.

Across hospitals in Queensland Health, clinicians were interviewed regarding the perceived and realised benefits on the EPJB; the six outcomes listed below were the most common to all hospitals.[3]

1. Improved communication between team members caring for patients including nursing, medical, administrative and allied health staff
2. Improved efficiency via improvements in communication and information management associated with the introduction of EPJBs. Estimates on time savings varied considerably between wards and ranged from 20 min per staff member per shift to 2.5 h per ward manager per shift
3. Improved clinical handover processes enabled by a handover sheet produced from the EPJB system
4. The EPJB is intuitive and user friendly with minimal training requirements across professional disciplines
5. Improved discharge planning is enabled by incorporating the EDD as a mandatory, standard feature in software development. This uses a traffic light system to display progression towards the noted discharge date. All team members know 'at a glance' when a patient is due for discharge and to plan accordingly
6. Improved accountability by displaying information about referrals that have been completed and those that are still outstanding

### *Problems, conflicts and constraints*

A continuous flow of information from multiple sources must be consistent across all patient care settings to ensure the integrity and accuracy of information. Furthermore, positioning of the EPJBs can be problematic because some ward designs are not conducive to large screens being installed: either there is inadequate space, there are patient confidentiality concerns regarding the information displayed or the only space available does not coincide with where the clinicians congregate or meet. If there are pre-existing software systems in place, these and the EPJBs can be an issue where interfacing is not possible. Finally, lack of access to workstations (computers) will always hinder the ability to update information.

## Discussion

Effective management of discharge requires a planned and coordinated approach involving early identification of patients with complex needs and multidisciplinary involvement to formulate a plan to address these needs.[18] To maximise effectiveness, all staff involved in a patient's care need to operate with a 'shared vision' of care regarding the likely discharge date and destination for each patient, so that investigations and interventions can be implemented sequentially to ensure that the patient receives the right care, in the right place, at the right time before discharge.[19]

Gaps in discharge management practices are largely attributable to a breakdown in the flow of information between patients, carers and healthcare professionals.[20] This breakdown in communication usually happens because information about a patient's discharge is relayed verbally through a multitude of meetings and ward rounds attended by different staff at different times of the day or is recorded in a variety of places both on and off the ward. This means that information related to discharge is not easy to locate and progress in relation to a discharge plan can be difficult to determine. This situation is further compounded by the fast turnover of in-patients and an organisational impetus to reduce length of stay.

EPJBs can be structured to present data at multiple levels, from the unit, department, service, organisation to system levels, facilitating an open dialogue with senior leadership, because they can also view individual wards' EPJBs at any time. The initial success achieved from the EPJB lies in its display of timely and relevant clinical data and strong clinician engagement and acceptance. This has been supported by the implementation of changes to current practices using known process redesign principles and methods that have led to the desired, and at times unanticipated, benefits.

## Competing interests

None declared.

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