An exploratory study to identify factors that influence the use of Electronic Patient Journey Boards in Queensland Health

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ABSTRACT

This research paper provides preliminary findings on views expressed by users regarding the use of Electronic Patient Journey Boards (EPJBs) in Queensland Health. Initial data were collected through a qualitative approach in order to understand the views of health professionals regarding EPJBs. This was achieved through interviews, brainstorming sessions and focus groups held with healthcare professionals who have used the EPJB and those who will be using EPJBs in the future. These qualitative data were analysed through the lens of three key critical variables, namely people, processes and technology. The preliminary findings show that these three variables are critical for the success of the use and implementation of EPJBs in the healthcare domain. Furthermore, this research paper was also able to identify factors that will have a significant influence on the implementation of a technology in a healthcare setting. This study is limited to Queensland Health and needs further research to test the findings of the study, in order to apply the findings more generally. The analysis of data provides an initial blueprint for the implementation of EPJBs more widely.

KEYWORDS: Electronic Patient Journey Board, Patient Scheduling, Patient Information Flow

Council for Innovative Research

1. INTRODUCTION

Management and administration of patients and the associated logistics involved in a busy multi-layer hospital are quite complex processes [1, 2]. For example, it is essential to be able to provide timely answers to critical queries regarding care services, and the ability to identify patient details at any point of time is crucial. Identification of appropriate consultants, identification of processes that a patient need to go through, the ability to carry out initial assessments on incoming patients based on given conditions, and the identification-appropriate process required for discharge and subsequent follow-up are just some activities which fall in this sphere. An essential element of all these activities is the 'care' aspect. Nurses and allied health staff, in addition to physicians, play a key role. Therefore, the idea of EPJB was initiated and pursued by healthcare professionals and academic researchers, in order to present a uniform view of patient data to all healthcare staff actively involved in patient care.

Electronic Patient Journey Boards are not new. The original concept was conceived at Flinder's University in Australia and many installations of this concept are found in Australia and in the UK. The primary aim of the EPJB is to provide pertinent patient information in addition to a 'whole of ward status', at a glance. The users of EPJB can access computing facilities located in central points in a ward, with a provision to update patient care information as and when care is provided, through a set of drop-down boxes and self-explanatory data entry fields. The unique feature of the EPJB discussed in this paper is the installation in multiple locations within a public service, and integration of patient data arising from many other external systems. This makes the EPJB discussed in this paper a unique system, as this provides an organizational view rather than a ward view.

To facilitate the development of the system, and to allow it to be properly understood, some critical questions were raised. These questions included:

- Where is the patient? The EPJB informs all stakeholders involved in the care of patients, the location of each individual. It also conveys any information concerning planned transfers or discharge.

- What is next for the patient? The EPJB displays the current investigation and management plan for each patient. Also, if there are any risks identified, such as 'infection, aggression or malnourishment', these will be displayed.

- Which consultant is looking after the patient? Each patient is assigned to a particular Consultant or team. These are clearly identified.

- When will the patient be medically fit for discharge? One of the greatest benefits provided by the EPJB is the visibility of the planned discharge date. The whole team of medical, nursing, allied health and administrative staff are focused on having all assessments and planning done by this date, in preparation for the patient's departure.

- Has the patient been reviewed by allied health? Is allied health review continuing or is the patient ready for discharge? One unique feature of the EPJB is its ability to track allied health referrals and display their status in a clear and concise 'traffic light' manner.

- What else does the patient need before discharge? The EPJB allows for a list of specific tasks that need to be completed before a patient departs. Discharge summaries, contacting families and obtaining scripts are a few examples of the list provided.

Identification of complex processes and understanding workflow will help to improve the quality of care in a healthcare environment [3, 4]. In essence, the Electronic Patient Journey Board is a one-stop shop for all staff involved in care; available information can be provided in a form that is easy to comprehend, as well as easy to update in an effective and efficient manner [5]. Thus, the primary objective is to provide a visual clue, through the available information, so that details pertaining to a patient's journey can be made available in a form that is easily understood, and presented in a form that is easy to manage.

Prior to the start of the EPJB project, it was essential to understand certain processes involved in patient care provided in public health agencies, as said care is varied and quite complex. For example, in many wards that we visited, current and updated information was not readily available to all stakeholders, owing to other time-critical operations in the ward. The information was often presented on a manual whiteboard that was not updated regularly for lack of time or a champion. Therefore, it was essential to understand said processes in various wards, such as maternity, cardiology, emergency and so on, in order to consolidate the critical information flow in a form that can be presented on a single unified screen using computing technologies. Through this understanding, certain benefits can be achieved, such as making data entry simple so that care information can be updated regularly, leading to effective currency of information, and encouraging staff to use the EPJB so that team interaction can be improved. These were some of the major objectives of the EPJB project. The following diagram provides a view of a traditional patient whiteboard that was manually updated in many Queensland Health wards.

2. ELECTRONIC PATIENT JOURNEY BOARD

As stated above, the primary objective of the initial EPJB project was to present the patient care information process in an electronic format. It was decided to follow a structure similar to a spreadsheet format, as many users were familiar with this type of structure. This choice resulted in the information being presented in rows and columns, where rows represent patient data and columns represent a range of care activities. A major challenge encountered by the development team

was prioritising the various activities that take place in a ward, accommodating all these in rows and columns, and presenting them in a one-screen format so that scrolling can be avoided.
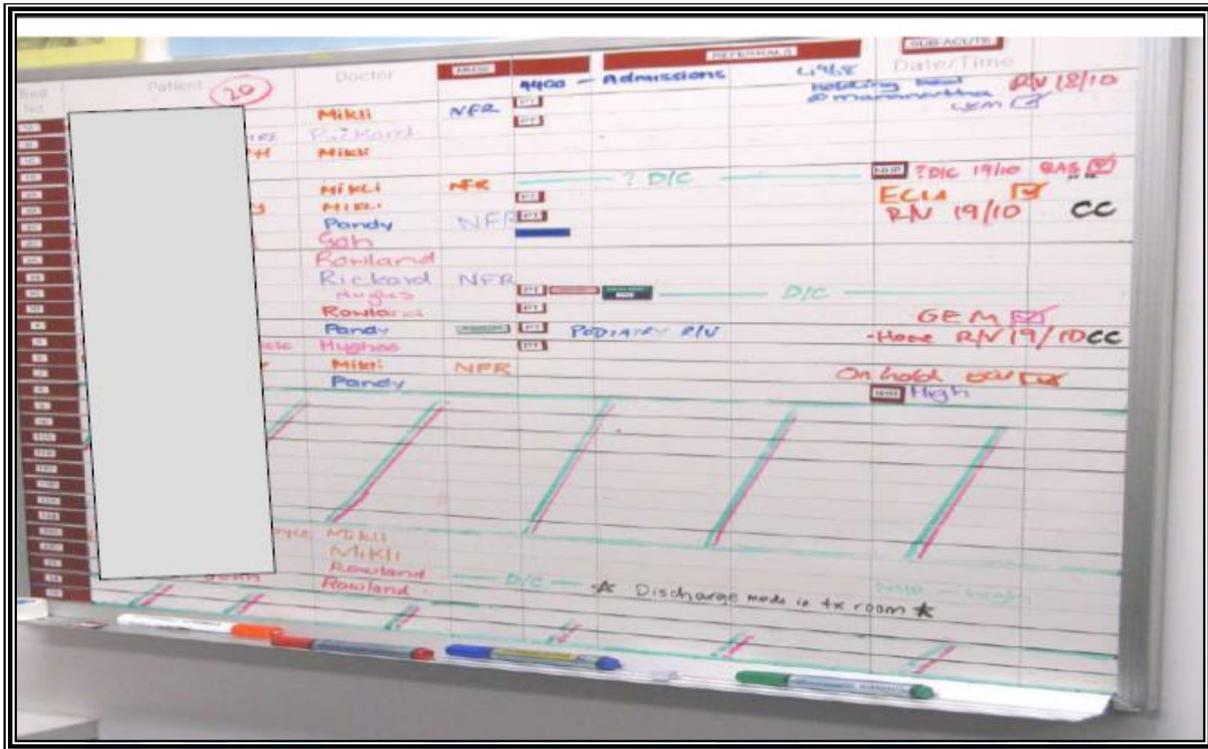
Figure 1: Traditional journey board planner.

This resulted in a conceptual visual provision of 'traffic light' type colour allocation, with a readily recognisable system consisting of red, amber and green colours, used to display the status of various referrals and the immanency of an expected date of discharge. This concept helped to consolidate a vast amount of data in a visual format, with the ability to provide an overall picture of various patients in the ward. The data architecture was developed in such a way that healthcare staff were able to 'drill down' patient information to explore details about individual patients. This model was then presented in a simple electronic format as shown in figure 2.
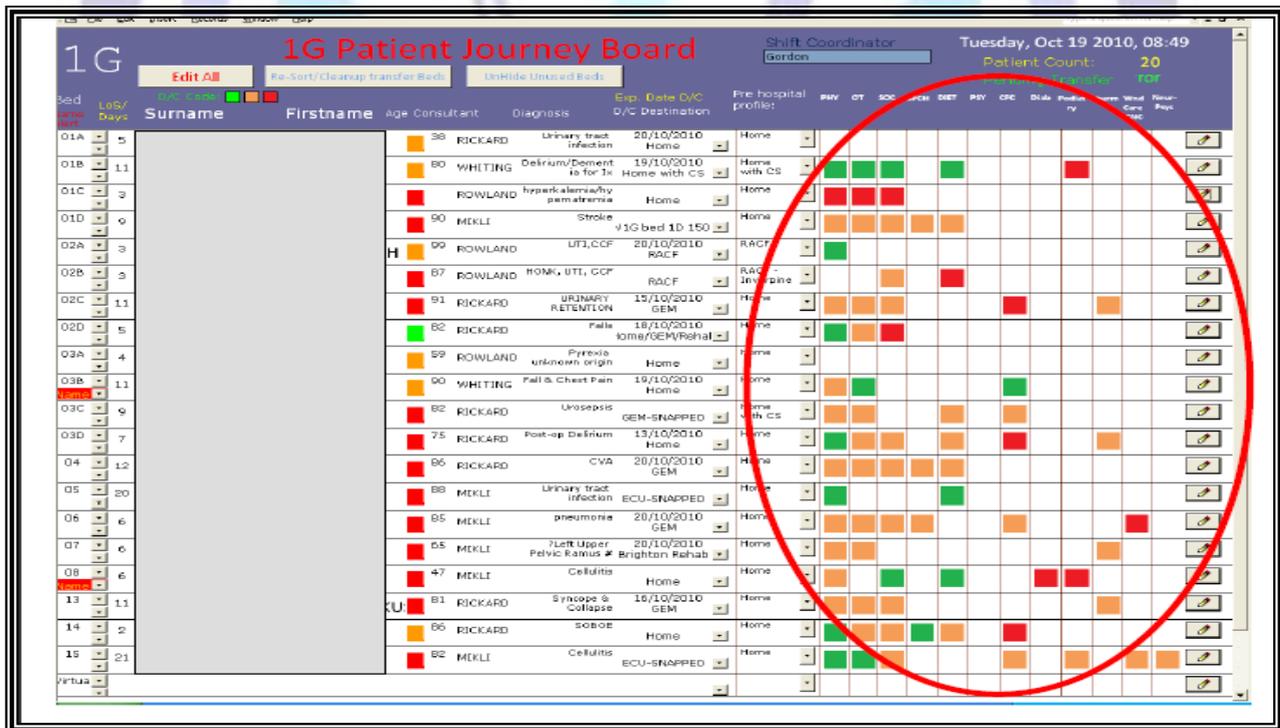
Figure 2: Computerized journey board planner.

This model was tested with pilot wards in Queensland Health and the feedback received was very encouraging. In essence, the pilot users indicated that the EPJB is effective in streamlining the workflow in a ward setting. For example, pilot users believe that the EPJB would provide visual clues to the care team so that timely action can be taken based on the information available. Furthermore, it appears that one of the advantages of the EPJB is to provide a unified view of patient data, including any action taken by staff on ward.

The initial trial was encouraging and the team started implementing the EPJB in multiple sites in Queensland Health. In order to understand the individual ward needs, a pre-interview session was conducted. The main purpose of this interview was to gauge individual feelings, needs and perceptions so that these can be accommodated in the system's development, subject to technology constraints. This prompted the development team to pose the following question for the interview:

What are the benefits of, and issues involved in, implementing and using an Electronic Patient Journey Board in your hospital?

3. METHODOLOGY

With limited information currently available on the use of EPJBs, the exploratory and qualitative research method is appropriate [6-8]. Exploratory research is suitable for the theory-building stage, and aims at formulating more precise questions that future research can answer [2, 9, 10]. Further, case study is suitable for learning more about a little-known, or poorly understood situation [11]. To improve the quality of data and research findings, a multiple-case study with focus group interviews was employed in this study to obtain the primary data from health professionals [12, 13]. Users' experiences, requirements and feedback on using current patient journey boards are also incorporated in this study.

The methodology involved a mixed method approach involving qualitative techniques. A number of brainstroming sessions, focus group interviews and individual interviews were conducted to formalize data collection. Initially, a high level brainstorming session was conducted to understand the technical and user issues. The purpose of this approach was to understand the context. The brainstorming session culminated in developing a user data collection strategy. This was essential to recruit users as they were busy in the wards, and need to be backfilled for the interviews. The individual interviews were mainly with senior administrators to understand the management views, and these were correlated with user views. The focus groups were the main approach for data collection. The size of the focus groups was not uniform and varied between 5 and 10, depending on the site and availability of staff on the day of the focus group interview. The staffs were recruited through ward managers, and a Queensland Health project officer organized the recruitment. The criteria for participation were that the user should have participated either in the manual patient journey board system or in the electronic patient journey board system. Participants recruited for the study were employed at Queensland Health hospital wards, and were well aware of the operational procedures employed in the wards. The focus group questions were almost similar in the sense that the technical questions were identical, and there was a variation in ward specific questions. For example, every wars was provided with a standard view, but ward specific information was populated to cater to specific needs. Therefore, the questions included generic as well as ward specific questions.

There were a total of fourteen focus group interviews conducted with staff of Queensland Health. The users of current EPJBs such as doctors, nurses, administrators and other medical professionals were contacted for their voluntary participation in this study. Each focus group normally took 45 minutes to one hour. The interview protocol was developed before the interviews, as well as pilot tested and refined by the feedback of practitioners and researchers. Each focus group consisted of five to ten participants. All interviewees were encouraged to provide personal experiences and valuable feedback on using and managing the EPJBs. The structure of the interview protocol is provided in Table 1. The protocol was developed based on previous users' experiences and literature.

No.	Topic
1	Introduction of this research and interview
2	Brief explanation of personal background and expertise
3	Brief explanation of previous experience of using PJBs
4	Users' feedback regarding patient aspect
5	Users' feedback regarding working process aspect
6	Users' feedback regarding technology aspect
7	Following up for unclear points
8	Open discussion
9	Summary and acknowledgement

Table 1: Interview protocol used in this study.

After the documentation of each interview on a digital recording device, the recordings were transcribed by an independent staff member working with Queensland Health. These transcripts were then analysed by the authors aiming to answer the research question mentioned above in this research study. The data were analysed in five steps. The first

step in preparation of the analysis is to screen and format the transcripts. The second step is to screen the transcripts by Leximancer™ as a preview for noteworthy terms and ideas. The third and principal step is to analyse the transcripts, and filter out or underline any ideas or factors that are relevant to the research question. The fourth step is to go through each factor to avoid duplications in the meaning. The fifth and last step is to group these factors into three main aspects: People (P), Process (Pr), and Technology (T). In addition, further analysis was done to place all the factors into two categories, dependent on them having a positive or negative influence on the use of computerised journey boards. It is anticipated that factors will be identified in terms of "benefits" and "issues to consider" in implementing and using EPJBs. The process and the procedure adopted in this research enabled the identification of such factors, and these are further illustrated in the next section.

4. Discussions and Data Analysis

As a result of initial data analysis, a series of key terms were identified from the focus group interviews and these are arbitrarily grouped into factors. Among the factors, some are considered as user-orientated benefits, or issues as identified by the participants. The factors identified resulted from users' exposure to manual Patient Journey Board that is currently available in Queensland Health wards as well as their awareness about the Electronic Patient Journey Board system that is planned for implementation. For example, EPJB may be seen as being "useful" for its users, and helps medical professionals "focus" on those patients who may need more attention. Therefore, the EPJB can bring better "convenience" and "coordination" for Allied Health staff or other areas. Similarly, some factors are related to work processes, and the rest are technology-orientated. For example, an EPJB could streamline the work process by reducing the amount of time nurses spent in maintaining a manual whiteboard and a separate handover sheet. These were identified through the analysis and are listed in Table 2.

Table 2: Initial items identified in data analysis.

No.	Item	Description
1	Usefulness	A EPJB is functional in providing necessary information to its users
2	Better Patient Tracking	A EPJB provides better tracking of a patient's progress (discharge)
3	High User Acceptance	A EPJB has been widely accepted in the organisation
4	Better Team Work	A EPJB can make teamwork easier by improving communication
5	Help to Focus	A EPJB can help to focus on those who need more attention
6	Convenience	A EPJB can help users to have a quick look at a patient's progress
7	Better Coordination	A EPJB can help allied health (e.g. handover process between wards)
8	Progress Monitor	A EPJB can provide better monitoring on patients' progress
9	Better Cross-Sectional Information Flow	Cross-sectional information exchange and integrity of information between the units can be reached
10	Streamline Working Process	Saving time for users to sit down and re-type data from memory or papers
11	Better Bed Tracking	The number of available beds can be traced up-to-date
12	Better Work Efficiency	A PJB* can improve working efficiency
13	Better Information Management	A PJB can provide complete and integrated information for patient journey management
14	Discharge Prediction	A PJB can facilitate better prediction of the discharge time
15	Time Saving	A PJB can save users' time by reducing redundant data entry
16	Reduce Mistake	An EPJB can reduce mistakes by discharging patients before they see the referral doctor
17	Reduce Information Loss	A PJB can reduce the information getting lost between units
18	Rich Information	A PJB can encompass all information that is necessary in monitoring the patients' progress and needs
19	User-friendly Interface	A well-designed EPJB can provide a user-friendly interface
20	Flexibility	An EPJB can provide technological flexibility for different needs
21	Pre-use Training	Formal training (1~2 hours) is necessary for using a EPJB
22	Colour Confusing	The implication of colour could confuse users

23	Team Cooperation	Every user needs to help keeping the EPJB up-to-date
24	Instant Updating	A PJB needs to be maintained in an efficient manner
25	Various Requirement	Users may have various needs for the sequence of information presented on a EPJB
26	Difficulty of Switching	(Junior) users may have problem learning to switch to a new EPJB
27	Time Consuming	To keep a EPJB updated could be time consuming
28	Error Prevention	A good EPJB should be able to reduce entry error
29	Difficulty to Read	The print could be too small for some users to read
30	Change of Routine	A PJB may change the previous working routine
31	United Standard/Procedure	Procedures and standards may need to be united before using a EPJB
32	Duplicate Data Entry	Using both an EPJB and the bedside computers (HBCIS) may need duplicate data entry
33	Technology Dependency	If an EPJB has a glitch or blackout, it might influence the functionality of the ward
34	Computer Literacy	Difficulty may be encountered for users with less technological knowledge
35	Supporting Model	Technological supports normally stop after working hours
36	System Security	Users may be unaware of EPJB security protocols
37	System Maintenance	The requirement of system maintenance of a EPJB might be time consuming
38	Screen Space	More details are required in some fields than can be shown on a EPJB
39	Energy Consumption	An EPJB will consume electricity and release heat (LCD is better)
40	Information Consistency	Whiteboards do not always match the printing documents
41	Messy Presentation	Whiteboards provide information in a messy way
42	Office Space	Whiteboards/EPJBs take a lot of space
43	Access to PJB	To enable everyone write their information in peak time
44	Easier Way to Update	How to update the EPJB information in an easier way
45	Non-Integrated System	Some EPJBs are not integrated with the current mobile-systems
46	Information Overwhelming	A EPJB provides too much information and could make new users confused
47	High Cost	EPJB could be too costly for the hospitals
48	Lack of Information	People may not hear or know much about EPJBs

*PJB refers to the manual patient journey board, maintained in the form of a white board

The forty eight items identified in table 2 were further analysed in detail. The analysis resulted in two dimensions of factors for further analysis - namely, positive and negative influences on the use of EPJB. These constructs include people, process, and technology as these were the focus for the Heath Department with respect to this implementation. The other aspect is to classify the factors into benefits or issues. A benefit refers to a driving factor that motivates potential users to use or implement it in the workplace. An issue is a factor that users or administrators need to consider when planning to install an EPJB. These are shown in Table 3.

Table 3: Factors classified by constructs.

Construct	Factors (benefits/Issues)	Explanation
People	Usefulness Better Patient Tracking High User Acceptance Better Team Work Help to Focus	Seven factors were classified as being the drivers of using EPJBs in hospitals. These drivers are related to people such as employees and patients.

	Convenience Better Coordination	
	Pre-use Training Colour Confusing Team Cooperation Instant Updating Various Requirement Difficulty of Learning/Switching Time Consuming Error Prevention Difficulty to Read	Nine factors were classified as being issues involved in implementing or using EPJBs in hospitals. These are people-related issues.
Process	Progress Monitor Cross-Sectional Information Flow Streamline Working Process Better Bed Tracking Better Work Efficiency Better Information Management Discharge Prediction Time Saving Reduce Mistake Reduce Information Loss	Ten factors were classified as being the drivers of using EPJBs in hospitals. These drivers are related to working process benefits.
	Change of Routine United Standard/Procedure Duplicate Data Entry	Three factors were classified as being the issues in using or implementing EPJBs, which are related to process aspect.
Technology	Rich Information User-friendly Interface Flexibility	Three factors were classified as being the drivers of using EPJBs. The factors are technology-oriented.
	Technology Dependency Computer Literacy Supporting Model System Security System Maintenance Screen Space Energy Consumption Information Consistency Messy Presentation Office Space Access to PJB Easier Way to Update Non-Integrated System Information Overwhelming High Cost Lack of Information	Sixteen factors were classified as being issues for consideration in implementing or using EPJBs in hospitals. These issues are directly or indirectly related to information and communication technology (ICT).

The data analysis clearly indicated that the three elements – People, Process and Technology – are crucial in technology implementation. The team conducted pre- and post-implementation discussions with stakeholders who were implementing the technology, and users who would be using the technology. This exercise was useful in many ways. Firstly, the implementation team got to know users and technical teams. Secondly, The independent discussions with users revealed various deviations in procedural aspects between wards in a number of Queensland Health sites. For example, different systems were used to gather patient information and the discussion revealed subtle aspects that are required for integration, access and so on. Thirdly, user requirements varied from site to site, and this knowledge was essential in

providing a uniform system with limited customization to suit individual wards. The observation also helped to understand how users use the system, as well as data in their own settings, and these were built into the development. The discussions and visits brought the users and the development team closer together. This, coupled with a telephone line to answer user queries before and after implementation, eliminated unnecessary angst on both sides. The strict project management schedule also helped in terms of procurement and installation activities.

A major deviation from the agreed framework was as a result of the Queensland floods. Despite this, the steps listed above ensured that users were constantly reminded of the significance of the project, and the support received from users assured successful implementation and uptake of the technology. This was very important in the health context as the system was introduced by involving busy users on the ward, who found little time to get involved in system implementation process because of their commitment to providing care to patients. Thus the 'People' element was significant in realising success, in terms of the uptake of the technology.

The findings of this study include identifying the factors, and grouping them by the constructs. The result indicates that in the aspect of "people", both driving factors and implementation issues are major concerns. In fact, it has been discussed significantly that the success of an EPJB is highly dependent on the users' working habit and team culture. While the technology enables real-time information transmission, instant updating is still essential to keep the information up-to-date. In terms of "Process", the benefits are significant, especially in achieving a streamlined process in wards. This helped various teams caring for patients to understand the steps involved in providing effective care, and complying with these in a seamless manner. This involved adjustment to teamwork and working routines in order to guarantee EPJB success. For the "Technology" construct, it is obvious that the implementation issues are significant. The EPJB does not change the content itself; rather the efficiency with which it is presented provides unified patient care information to all team members.

5. CONCLUSION

This study is unique because a number of techniques and methods were used in implementing a technology that is handled by care givers in a public health environment. This has a wide range of implications in the healthcare domain, as the lessons learned will be useful in implementing other technology in the healthcare domain. This study used a qualitative approach to explore the drivers and issues in implementing and using EPJBs in public health. 14 focus group interviews were conducted with doctors, nurses, and other medical professionals from Queensland Health. The users' experiences were analysed and 48 factors were identified in regard to three main constructs: People, Process, and Technology. Factors were further classified into two groups—benefits and issues—in implementing and using EPJBs. The findings of this study provide an overall understanding of the strengths and weaknesses of the method of implementing a technology in public health that is user orientated, and manages patient care information in order to facilitate efficient processes. The preliminary results are useful for future studies in successfully implementing technologies that have a user focus rather than a data focus.

6. LIMITATIONS AND FUTURE IMPLICATIONS

It is understood that this study is the first study of its kind, and its findings are limited to a single facility - the use and implementation of electronic journey boards to manage patients in a healthcare facility. This study has provided valuable information for further research, and provides new directions as to how stakeholders can be involved in an effective and efficient way. The findings of this study cannot yet be generalised as they refer to healthcare in Queensland alone; this has provided a narrow data set. Further data collection is required in similar instances in order to discover the applicability of the methods and techniques used so that a generic framework for user orientated technology implementation can be achieved.

ACKNOWLEDGEMENTS

CONFLICT OF INTERESTS

To best of our knowledge there are no conflicts of interest.

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