

# Specialist nurses' experiences of using 'The Viewer', a consolidated electronic medical records system: a pre-post implementation survey

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## KEYWORDS

computerised medical records system; computerised patient medical records; electronic medical records; evaluation; nurses; pre-post tests

## ABSTRACT

### Objective

Evaluate changes in specialty areas nurses' knowledge and perceptions of a consolidated electronic medical record (EMR) system before and after implementation.

### Design

A survey deployed pre- and six months post-implementation of 'The Viewer'.

### Setting

Regional Hospital and Health Service, Queensland.

### Subjects

Nurses working in specialist areas including community health, palliative care, discharge planning, wound and stoma care, diabetes education and renal dialysis satellite services (n=110) were invited to participate in the study. Response rate of the pre-implementation survey (n=42, 38%) was much higher than the post-implementation subset (n=10, 24%). A major health service restructure that included losses of nursing positions in specialist areas significantly affected post-implementation results.

### Intervention

An EMR system called 'The Viewer' to access consolidated electronic medical records of patient information produced by different parts of the organisation.

### Main Outcome Measures

Changes in participants' knowledge and perceptions of 'The Viewer', and their satisfaction with the quality, ease of use and access to patient information.

### Results

Pre-implementation, specialist nurses reported dissatisfaction with most aspects of the current patient information system but high confidence and comfort in using electronic systems. Post implementation satisfaction scores either remained the same or increased. Satisfaction with ease of access to consolidated patient data ( $U = 125.0$ ,  $p = 0.038$ ,  $r = 0.29$ ) and usefulness of electronic systems ( $U = 115.0$ ,  $p = 0.031$ ,  $r = 0.30$ ) increased significantly post-implementation of 'The Viewer'.

### Conclusion

Specialist nurses are positive about the possibilities EMRs offer to centralise, consolidate and improve access to patient data.

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## INTRODUCTION AND LITERATURE REVIEW

The implementation of new information and communication systems into health services and hospitals is inevitable; millions of nurses will experience such technology changes in their workplace during their careers (Huryk 2010). EMRs are being used widely in hospitals and healthcare services throughout the world to improve communication, centralise and consolidate patient data, and improve efficiency (Lee et al 2013; Rothman et al 2013; Creswick et al 2011). Introducing a records and communication system is complex and can lead to a significant shift in the way a nurse works. This workplace shift can affect outlook and attitudes and might lead to changes in the very culture of the workplace (Westbrook et al 2009).

These technology-driven changes to the health workplace have led researchers and managers to focus more attention on nursing informatics (Mills et al 2013). Two topics dominate the research literature into nursing informatics: nurses' attitudes and/or perceptions of new information technology (Eley et al 2009; Edirippulige 2005; Axford and Carter 1995), and measurements of the impact of EMRs on workflow and healthcare service delivery (Perry et al 2013; Furukawa et al 2010; Wu et al 2006; Simpson 2005).

## STUDY BACKGROUND

This study sought to address a gap in the literature about the experience of nurses employed in specialty areas, whose role requires them to work with multidisciplinary teams across different settings, and their adoption of a new EMR resource. The study was set in a regional hospital and health service that was introducing a new EMR technology called 'The Viewer' - a read-only web-based consolidated patient information system that allows clinicians to access summarised patient information in the form of a single electronic medical record (Queensland Health 2013) from six separate clinical information systems. 'The Viewer' enables clinicians to gain a comprehensive picture of a patient's clinical history and provides clinicians with more information essential to clinical decision making. It includes a view of patients' admissions, emergency presentations, pathology, radiology reports, medications, alerts and adverse reactions and procedure reports. Anecdotal evidence suggested specialist nurses working off-site from the regional hospital previously had variable access to patient information, constraining effective clinical decision-making. Therefore the aim of this study was to evaluate changes in specialty areas nurses' knowledge and perceptions of 'The Viewer', and their satisfaction with access to, use and quality of patient information before and after implementation.

## METHOD

### Setting

Before 2012 Queensland Health, which services the public health needs of the north-eastern Australian state of Queensland, utilised more than seven different EMR systems to manage patient data (e.g., pathology results, diagnostic imaging results, discharge summaries, and patient admissions). In 2011-2012, Queensland Health introduced 'The Viewer', which is a consolidated EMR system. The new information technology aimed to provide clinicians with faster, easier access to patient information and reduce time spent searching different electronic databases or locating paper records stored at various sites (Queensland Health 2013). This pre-post implementation survey took place in 2012 in one northern Queensland Health Hospital and Health Service with a catchment population of approximately 250,000 people (Internal Medicine Society of Australia and New Zealand 2013).

## Participants

The population for this study was nurses working in specialist areas in the health service (n=110). Stage 1, pre-implementation participants were 42 registered nurses working in a specialty area, including community health, sexual health, the diabetes and the early years centres. The mean number of years since participant registration as a nurse was 26.25 years (SD  $\pm$  9.34). Length of time since registration as a nurse ranged from five years to 42 years. Overall, 40% of participants held a Bachelor degree in nursing and 17% held Masters degrees. Fifty-two percent of participants had been employed in their current setting for more than six years. Stage 2, post-implementation participants were a subset of stage 1 participants (n = 10, rate of return = 24%). In this matched subsample, 50% of participants worked at the regional hospital and 30% worked at the diabetes centre. The remainder worked at various other sites. Mean number of years since registration as a nurse was 30.9 years (SD  $\pm$  8.9). Length of time since registration as a nurse ranged from 12 years to 41 years. Thirty-seven percent of stage 2 participants held a nursing diploma and 37% held a Masters degree. Ninety percent of participants had been employed at their current setting for over six years.

## Data collection

Data were collected in two stages. Stage 1 data collection occurred prior to training and implementation of 'The Viewer'. Stage 2 data collection occurred six months after implementation of 'The Viewer'. Stage 1 survey packages were mailed to nurses identified as working in a variety of specialist areas using a Queensland Health mailing list. Participants were excluded if the questionnaire was returned without a signed consent form, or respondents did not work in a nursing specialty area.

The survey instrument was adapted from the Queensland Health Information Division (nd) 'The Viewer Project – Clinician Survey'. The first section of the survey instrument included demographic questions about current role, first year of registration as an RN, highest tertiary nursing qualification, and current workplace. The second section asked about current access and use of patient information, and knowledge and perceptions of 'The Viewer' project. The third section asked participants to rate their level of satisfaction with current access, use and quality of patient information on a 5-point Likert scale ranging from 1 = very dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, to 5 = very satisfied. The questionnaire also included two open-ended questions asking how electronic systems helped participants perform their role better, and any additional comments. Stage 2 survey packages were mailed to all stage 1 participants, and included the same questionnaire as used in stage 1.

## Data Analysis

SPSS version 20 software package (IBM SPSS Inc., Chicago IL, USA) was used for data entry and analysis. Descriptive statistics, means, medians, standard deviations, and ranges for the variables were calculated and presented. Mann Whitney U tests and Spearman's rank order correlations were used to compare demographic variables with satisfaction scores. Wilcoxon signed rank test was used to compare pre and post-implementation satisfaction scores. Alpha values of less than 0.05 were considered statistically significant.

Textual data from the two open-ended questions were analysed using content analysis, a systematic method of describing and quantifying phenomena (Elo and Kyngäs 2008). This method of text data analysis counts frequency of words and content and also includes latent content analysis or interpretation of the content (Hsieh and Shannon 2005). The aim is to create a condensed and broad description of the phenomena using concepts or categories (Elo and Kyngäs 2008).

## Ethics Approval

The Hospital and Health Service District Human Research Ethics Committee (HREC) approved all materials and protocols used in this study.

## RESULTS

### Survey data

#### **Use of patient information in work**

A majority of specialist nurses (64%) were entirely dependent on access to patient information to fulfil their nursing role and 90 per cent of participants reported they would access patient records more frequently if access was easier. Ninety-five per cent of participants reported their position involved reporting patient information, and 54% reported accessing patient information on a daily basis.

#### **Knowledge and perceptions of 'The Viewer'**

Pre-implementation of 'The Viewer', a majority of participants (54%) reported moderate or good knowledge of Queensland Health information technology (IT) initiatives in general, but 81% reported poor or very poor knowledge of 'The Viewer'. Despite poor knowledge of the new resource, 71% of participants said they believed adopting 'The Viewer' would be beneficial or highly beneficial.

Post-implementation, 30% of participants reported moderate knowledge of 'The Viewer' project, and 50% of participants reported they had good or very good knowledge of 'The Viewer' project. Post-implementation median knowledge score ( $Med = 3.5$ ,  $IQR = 2.8, 4.0$ ) increased significantly compared with pre-implementation knowledge score ( $Med = 2.0$ ,  $IQR = 1.0, 2.0$ ,  $p = 0.001$ ).  $U = 77.0$ ,  $p = 0.001$ ,  $r = 0.45$ .

#### **Satisfaction with current electronic patient medical record databases**

Pre-implementation, specialist nurses reported dissatisfaction with access to current patient information and ease of access to consolidated patient information (table 1), particularly with the need to rely on paper based charts, and the number of electronic systems they were required to access for patient information. Participants reported difficulty with identifying the appropriate electronic system, and low satisfaction with ease of logging into electronic patient databases. Participants reported they felt neutral about the ease of locating patient information but were dissatisfied with the ease of accessing outside patient information. Overall, participants were neutral about reliability of access to patient information and quality of data. Dissatisfaction was high with time spent transcribing and accessing patient data. On average, participants were neutral about the usefulness of electronic systems, however confidence and comfort using electronic systems was high. Satisfaction with the usefulness of electronic systems was positively correlated with confidence ( $r = 0.33$ ,  $p = 0.04$ ) and comfort ( $r = 0.44$ ,  $p = 0.005$ ) using electronic patient information systems (moderate effect size). Participant demographics were not associated with satisfaction scores.

Post-implementation, median satisfaction scores either remained the same or increased, indicating greater satisfaction. The areas in which satisfaction increased were: access to patient information, ease of access to consolidated patient information, ease of identifying appropriate electronic system, ease of locating patient information, quality of data, and usefulness of electronic systems. Satisfaction with ease of access to consolidated patient data ( $p = 0.038$ ) ( $U = 125.0$ ,  $p = 0.038$ ,  $r = 0.29$ ) and usefulness of electronic systems increased significantly ( $p = 0.03$ ) ( $U = 115.0$ ,  $p = 0.031$ ,  $r = 0.03$ ) post-implementation of 'The Viewer' (see table 1). However, due to the small number of participants post-implementation, this finding should be interpreted with caution.

**Table 1: Satisfaction scores pre- and post-implementation of ‘The Viewer’**

Satisfaction scores	Pre-implementation Mdn (IQR)	Post-implementation Mdn (IQR)	P value
Access to patient information	2 (2, 3)	3.5 (2, 4)	0.072
Ease of access to consolidated patient information	2 (2, 3)	3.5 (2, 4)	0.038
Need to use paper-based charts	2 (2, 3)	2 (1, 3)	0.178
Number of electronic systems	2 (2, 3)	2 (2, 3)	0.890
Ease of identifying appropriate electronic system	2 (2, 3)	3.5 (2, 4)	0.157
Signing in to electronic systems	2 (2, 4)	2 (2, 4)	0.951
Ease of locating patient information	3 (2, 4)	3.5 (2, 4)	0.351
Ease of accessing outside patient information	2 (1, 2)	2 (1, 3)	0.645
Reliability of access to patient information	3 (2, 4)	3 (2, 4)	0.437
Quality of data	3 (2, 4)	3.5 (3, 4)	0.115
Time spent transcribing patient data	2 (2, 3)	2 (1, 2)	0.494
Time spent accessing patient data	2 (1, 3)	2 (2, 4)	0.223
Usefulness of electronic systems	3 (2, 4)	4 (4, 4)	0.031
Confidence using electronic patient information systems	4 (3, 4)	4 (4, 4)	0.484
Comfort using patient information systems	4 (2, 4)	4 (4, 4)	0.335

Note: *Mdn* = Median; *IQR* = Interquartile range

### Stage 1 - textual data

Three main themes were identified from the open-ended question: *How do electronic systems help you perform your role better?* and from the *Additional comments* section. These themes were: time/speed, access and consolidated patient information. Some participant responses were relevant to more than one theme.

#### Time/speed

Seventeen participants commented on time and speed in relation to the use of EMRs. A majority of responses were positive ( $n = 13$ ) and pertained to the use of EMRs saving time compared to the retrieval and use of paper files. Participants reported the time saved by having all information in one place could be used more efficiently to improve patient care, continuity of care and patient flow. Negative responses included the following: too few computers which slowed down ward rounds, duplication entering information, and lack of functionality in the current system that slowed retrieval of information.

#### Access

Twenty-one participants mentioned access of EMRs. Positive responses ( $n = 13$ ) were that easier, immediate access to current information would help with decision making, referral time, enhance phone/telehealth consults, improve patient care and improve time management. Access to patient information from a central database was perceived as beneficial. Negative comments about the existing system included lack of access to electronic medical records, the need to travel to different sites to access patient information, and information not being current.

#### Consolidated patient information

Fifteen participants commented on consolidated patient information in relation to the use of electronic systems. It was perceived that linked information from all health providers would allow a holistic approach, enable comprehensive assessments of patients, and enhance patient management and referral. Two participants voiced concerns that databases they currently used would not be included in ‘The Viewer’, and one participant

expressed concern about patient confidentiality if all clinicians could access sensitive information such as HIV diagnosis.

### **Stage 2 - textual data**

Participant comments post-implementation generally followed the same themes as pre-implementation comments. Responses outside of these themes included: participants would like to access 'The Viewer' via a wireless network using a tablet so they can access patient information when they are in a client's home or GP surgery, or during ward rounds to mitigate the limited availability of computers on wards. Participants also reported 'The Viewer' had not negated the need to access other information sources and criticised the slowness of data input and update, and poor display of pathology results.

## **DISCUSSION**

Nurses in the present study, and elsewhere throughout the world, have been generally hopeful and positive about the potential of new information technology, even when they reported having little knowledge of the actual system proposed (O'Mahony et al 2014; Huryk 2010; Eley et al 2009). This positive attitude represents a shift away from a resistance to new technology noted by some researchers in the early 2000s (Ash and Bates 2005; Timmons 2003). This resistance was attributed, in part, to a lack of trust and limited collaboration between clinicians and administrators (Ash and Bates 2005). Collaboration appears to remain an area in which improvements can be made as evidenced by a lack of knowledge of proposed systems in some studies (Planitz et al 2012), including the present study.

In the present study, nurses surveyed before the introduction of the Viewer perceived that one of the key benefits of EMRs was that they would spend less time on documentation and more time on patient care, thereby improving patient flow and continuity of care. Post-'The Viewer', time-saving was dependent largely upon access and availability of computers, a point highlighted by Poissant et al (2005), who found nurses who used bedside terminals and a central station cut the time they spent working on documentation by as much as a quarter. Qualitative data from the present study highlighted the use of tablets and wireless networks could improve efficiency of 'The Viewer' system. Nurses noted a continuing need to access multiple sources for patient data after the introduction of 'The Viewer' and criticised slow data input. The immediacy of access, however, and consolidation of most patient data was a positive feature of the post 'Viewer' workplace. Nurses said they could more efficiently make decisions and referrals, and more effectively manage their time, a finding reflected in an emergency department setting in Creswick et al (2011).

Technology transitions can be difficult to manage (O'Mahony et al 2014; Stevenson et al. 2010; Timmons 2003), and are rarely without glitches (Planitz et al 2012), particularly in the healthcare sector (Callen et al 2007). The successful implementation of EMRs is largely dependent on the people who use them and the organisational culture in which they work (Huryk 2010). Some researchers suggest using a socio-technical lens to better understand the way technology can change the way nurses work and to improve implementation processes (Casella et al 2014; Creswick et al 2011; Westbrook et al 2009). An inclusive, collaborative, constructive culture will better-facilitate the adoption of new technology-related work practices (Callen et al 2007), as can careful consideration of the principles of change management (Simpson 2005).

## **LIMITATIONS**

The health service in which the study was carried out was restructured and nursing positions were cut, including those in specialist areas, during the research period. Post-implementation return rates reflect these cuts and make it difficult to compare pre and post results and to generalise the data.

## RECOMMENDATIONS

Gains in efficiency through the use of an integrated EMR are affected by the extent of consolidation of patient data; health services and hospitals should carefully consider how they will achieve true consolidation of records for maximum effect.

Open communication, consultation with nurses and effective change management should be primary considerations when implementing EMRs to capitalise on nurses' positive attitudes towards new records technology.

## CONCLUSION

Specialist nurses are positive about the possibilities a consolidated EMR system offers to centralise, consolidate and improve access to patient data. Nurses who work across sites, teams and disciplines also see time-saving potential in a consolidated EMR system. Effective implementation of new technology will capitalise on nurses' willingness to learn by employing effective communication, constructive workplace practices, and on-going consultation to iron out inevitable problems.

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