

Case-Based Learning in a Simulated Electronic Medical Record: Digital Health Education for Nursing Students

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Abstract: Nursing graduates require competence in the use of digital health technologies. The Department of Nursing at the University of Melbourne has integrated an Electronic Medical Record (EMR) training platform into the entry-to-practice curriculum to enhance students' digital literacy. The Case Based Learning (CBL) software, developed by CSIRO and the University of Queensland, presents students with custom-built simulated cases in an EMR. Over 300 entry-to-practice students have used the CBL in 2022. Student experience, acceptability and usability of this software is reported. Data was collected via Qualtrics XM© survey. Student feedback suggests the software was easy to use and has the potential to enhance their understanding of digital health. Students suggested adjustments to the software to maximise their opportunities for clinical decision-making and improve fidelity.

Keywords: Nursing students, case based learning; electronic medical record, clinical decision making

1. Introduction

The Department of Nursing at the University of Melbourne has embedded digital health in the Master of Nursing Science (MNSc) entry-to-practice curriculum. The curricula has been designed to simultaneously meet the Nursing and Midwifery Board of Australia Standards of Practice for Registered Nurses and the domains of the National Nursing and Midwifery Digital Health Capability Framework [1-3]. To facilitate such engagement with digital health technologies, the department purchased twenty mobile computers (workstations on wheels) in 2021 to use during simulated learning sessions. The Department of Nursing has now integrated an Electronic

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Medical Record (EMR) training platform into the MNSc. The Case Based Learning (CBL) EMR software is a teaching tool developed in a collaboration between the Australian eHealth Research Centre of CSIRO and The University of Queensland [4]. The software supports case based learning via “patient cases” that have been custom built in an EMR.

During clinical simulated skills sessions, students are presented with clinical cases in the CBL EMR, where they are expected to assess clinical information and respond to changes occurring during the cases’ simulated hospital admission. Throughout the cases, students are expected to develop their digital and critical thinking skills as they use the software to review and enter data, make clinical judgements, then document or communicate findings and/or explain their decision-making. Students work through triggers containing information and results about the virtual patient, with one or more questions to answer at each trigger. Patient data is presented in the simulated EMR with the functions menu on the left and patient information along the top [4]. This approach is intended to support the development of digital health and informatics literacy via engagement with an EMR and to enhance the pedagogy of case based learning by providing opportunities for clinical decision-making. A study was conducted aiming to assess the usability, utility, acceptability of the CBL EMR software for entry-to-practice nursing students and assess student experience using the CBL EMR platform. Here we report the preliminary findings of the study.

2. Methods

Data for the cases were authored in the CBL EMR by two academics in preparation for the weekly sessions. Cases were designed to reflect the syllabus of the clinical subject, using a body systems approach. Data entered in the CBL EMR is coded according to SNOMED CT terminology [4]. University ethics approval was obtained (ID2022-23738-32229-3). A survey was developed in Qualtrics XM[©] using the Systems Usability Scale [5,6] to assess students experience of using the CBL EMR software. The Systems Usability Scale has 10 Likert scale (5 point) questions and three Likert scale questions were added to ask students about their perception of whether the CBL EMR enhanced their understanding of digital health and their clinical decision-making skills. Six open-ended questions asked how the CBL EMR software influenced students’ experience on clinical placement. No demographics were collected but students were asked to identify their current year in the MNSc. Descriptive analysis was performed for the categorical data from the Likert scale questions. Qualitative data from the open-ended questions underwent content analysis.

3. Results

Over 300 entry-to-practice students have used the CBL EMR software in 2022, engaging with 23 unique patient cases. The first session was dedicated to instructing the students how to log on, navigate the system to locate patient information and how to proceed through the triggers. First year MNSc student completed 1-2 cases per week

for 10 weeks in semester 1 and 6 weeks in semester 2. Second year MNSc students engaged with two cases in one week of semester 1. A modest number of students (n=16) have responded to the survey about the usability of the CBL EMR so far. Thirteen of the 16 students who completed the survey were first year students. The results of the Likert scale questions from the survey are presented in Table 1. The majority of respondents reported the software was easy to use and that they felt confident using the software.

Table 1: Survey responses from Likert scale questions.

Question	N (%) agree/ strongly agree
I think that I would like to use this system frequently.	8 (50)
I found the system unnecessarily complex.	2 (12.5)
I thought the system was easy to use.	9 (56.3)
I think that I would need the support of a technical person to be able to use this system.	0
I found the various functions in this system were well integrated.	5 (31.3)
I thought there was too much inconsistency in this system.	4 (25)
I would imagine that most people would learn to use this system very quickly.	11 (68.8)
I found the system very cumbersome to use.	4 (25)
I felt very confident using the system.	9 (56.3)
I needed to learn a lot of things before I could get going with this system.	2 (12.5)
I think that this teaching tool has potential to enhance my understanding of digital health.	11 (68.8)
I think that this teaching tool has potential to enhance my clinical decision-making skills.	8 (50)
This teaching tool was useful in preparing me to use an EMR on professional experience placement.	7 (43.8)

Qualitative data collected via the open-ended questions gave insight into students experience of using the CBL EMR. Data was coded into categories related to how the CBL EMR influenced students learning, experiences and communication on clinical placement (Table 2). The majority of students agreed that the CBL EMR was useful in preparing them for clinical placement. Some students reported the software to be “*a bit clunky*”. Other comments on the CBL EMR included:

“It was great to have a step-by-step case scenario which evolved in an electronic platform.”

“The main benefit was familiarising myself with an EMR system”

“[The best part was] the ability to pretend that you had a real patient and how close it was to the EMR that I used on PEP [clinical placement]”

Table 2: Student reflections of the influence of the CBL EMR during a nursing clinical placement.

Category	Corresponding quotes
Influence on clinical placement experience	<p>“It meant that I was already confident using an EMR, so the learning curve to use another EMR was less”</p> <p>“It did not. It was unlike any systems I experienced on PEP. It would have been good to enter vital signs/ obs in the CBL for practice.”</p> <p>“It did not influence my PEP since they used a different platform”</p> <p>“I think the CBL EMR set a baseline expectation of what is going to be used in PEP. For example, the CBL EMR always provided us with vital signs, medication list...It was similar during placement, where I would know to look out for ISBAR, look at the obs chart, medication list. I think that the CBL system has made it easier to navigate the hospital systems as we know what are the most fundamental things we need to look for when encountering any EMR...”</p>
Influence on	<p>“The main benefit was familiarising myself with an EMR system”</p>

clinical placement learning	<p>“Gave me the idea of how to use EMR”</p> <p>“Not in my most recent but I did work within a health provider that had an established EMR and it was far more complex to learn to navigate than the rudimentary level we were exposed to in simulation”.</p> <p>“I think the CBL EMR helps consolidate a lot of information into structured pages, which is helpful in looking at the bigger picture of what's happening with the patients.”</p> <p>“Then it was helpful in the simulation labs when the educators would prompt us by asking us what are our nursing problems and priority interventions. I find that helpful in prompting us to look at the EMR as a big picture effect on placement and help me form my nursing plan.”</p>
Influence on communication	<p>“Able to remember ISBAR from following the EMR layouts”</p> <p>“It didn't?”</p> <p>“I don't think it did sorry. It would be great to have a chat feature to mock message others in the multidisciplinary team. some AI in the farther future perhaps could be really cool?”</p> <p>“Influence as to position yourself in front of the computer without obstructing the accessibility.”</p> <p>“However, it was slightly confusing as a new learner trying to use ISBAR with the EMR when the case study shows a further deterioration event, and it became slightly difficult to toggle between pages and show the different events that occur with different vitals / different issues”</p>

4. Discussion

The preliminary results of this study indicate that students thought the CBL EMR software provided a valuable learning experience by exposing them to an EMR before clinical placement and engaging them in novice-level clinical decision-making. Although the response rate was low, the majority of survey respondents agreed that the CBL EMR was easy to use and enhanced their understanding of digital health technologies. Students identified that exposure to a simulated EMR and using the workstations on wheels assisted them to consider how to manage technology whilst still maintain clear communication with a patient or colleagues.

The accurate and competent use of digital health information is central to the delivery of high-quality healthcare and the improvement of patient outcomes [1]. Pontefract and Wilson assert that the appropriate use of digital technologies such as EMRs, relies on healthcare professionals having information technology skills, familiarity, competence and knowledge of system data [7]. The curricula developed in the MNSc has been designed to meet the Nursing and Midwifery Board of Australia Standards of Practice for Registered Nurses with consideration of the National Nursing and Midwifery Digital Health Capability Framework [2]. Importantly, the aim is for MNSc graduates to possess a competent level of digital health literacy and the required digital capabilities to be registered nurses.

Embedding digital health in the MNSc curriculum involved the creation of a Interprofessional EMR subject with content suitable for entry-practice nursing students (previously reported) and the integration of a simulated EMR [8]. This study has focussed on the student experience of engaging with the CBL EMR in real-time and given insight into how the students perceive the teaching tool to have influenced their knowledge of digital health, their clinical decision-making skills and their communication in a digital environment. The results are promising in that students recognise the integral role of EMRs in clinical practice and students welcome the exposure to a simulated EMR in a safe learning space.

More work needs to be done to improve fidelity, enhance student experience and to give students the opportunity to generate complex patient data and engage in advanced clinical decision-making. However, for first year nursing students, new to

clinical practice and with varying levels of digital literacy, the CBL EMR was easily adapted to suit the existing MNSc curriculum and cases could be built to increase in complexity over time. Students were able to begin the journey to meet the domains of competence identified by Pontefract and Wilson (2019) for healthcare graduates, by gaining knowledge in the role of digital health in delivering patient-centred care, how to access data and how to communicate with other healthcare professionals and patients in a digital environment. Ongoing evaluation of the student experience of the CBL EMR software is required and future evaluations should include educator perspectives. Future work will also aim to ascertain generalisability for integration of this learning tool into other health professional degrees.

5. Conclusions

Preliminary data exploring nursing students' experience of using a simulated EMR indicates that students found the CBL EMR was easy to use and prepared them for encountering an EMR during clinical placement. This data will be used to guide the future development of patient cases in the CBL EMR for MNSc students. The Department of Nursing will support nursing students to continue their digital health learning journey so that the competence of nursing graduates to practice in a digitally enabled and complex healthcare system is maximised.

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