



Nursing students' perspectives on being work-ready with electronic medical records: Intersections of rurality and health workforce capacity

Pauletta Irwin^{a,*}, Melissa Hanson^{a,1}, Simon McDonald^{b,2}, Danielle Noble^{c,3}, Lyndall Mollart^{c,4}

^a School of Nursing, Paramedicine and Health Sciences, Charles Sturt University, Australia

^b Spatial Data Analysis Network (SPAN) – Office of Research Services and Graduate Studies, Charles Sturt University, Australia

^c School of Nursing and Midwifery, University of Newcastle, Australia

ARTICLE INFO

Keywords:

Electronic medical records
Nursing education
Undergraduate

ABSTRACT

Aim: To explore nursing students' views on being prepared for using electronic medical records during clinical placement.

Background: The need for an undergraduate nursing curriculum to include electronic medical record training has been internationally recognised, however successful implementation has been inconsistent worldwide and limited in Australia. Many nursing students are unprepared to effectively provide care during clinical placement using electronic medical records and are therefore not work-ready as registered nurses.

Design: Online survey.

Methods: Third-year nursing students from two multi-campus universities were invited to complete the survey.

Results: Most students believed that learning electronic medical records during simulations would be extremely or very useful. Student confidence levels correlate with the amount and type of exposure to electronic medical records prior to clinical placement. Four themes emerged from qualitative analysis: Don't throw out the baby with the bathwater; Prepare us for practice; Mistakes – hardly any; and Universities need to catch up and put out.

Conclusion: Students receiving hospital-based education on eMR and eObs can improve student confidence in preparation for clinical practice. First-year optional eMR university education had a limited impact on students' perception of preparedness for clinical practice. Shared responsibility between both the universities and health services on eMR education would provide improved student confidence and preparedness for clinical practice. This study supports the international research that eMR education needs to be scaffolded over the three years of study with increasing complexity of real-life scenarios.

1. Introduction

The broad adoption of simulation as a pedagogical framework in undergraduate nursing programs provides the opportunity for students to learn clinical skills and reasoning in an authentic yet safe environment (Irwin et al., 2021). There is however a lag that exists where many students do not have access to a realistic electronic documentation system to prepare them for practice. From a global perspective, the integration of electronic medical records (eMR) into undergraduate programs has not occurred with the efficiency or breadth that healthcare systems have achieved. This has resulted in many undergraduate

students being unprepared to immediately and effectively deliver care during clinical placement. With a workforce that is already short staffed, there is a strong expectation that newly graduated nurses are job-ready and can 'hit the ground running' (Murray et al., 2019).

2. Background

Electronic medical records (eMR) have replaced paper-based documentation in many healthcare settings worldwide (Mollart et al., 2023). This method of digital documentation is used to record a wide range of clinical data by multiple health professionals and, with patient safety at

* Correspondence to: Charles Sturt University, Port Macquarie Campus 7 Major Innes Road, Port Macquarie, NSW 2444, Australia.

E-mail address: pirwin@csu.edu.au (P. Irwin).

¹ <https://orcid.org/0000-0002-1365-2871>

² <https://orcid.org/0009-0005-8104-3225>

³ <https://orcid.org/0000-0002-3732-3730>

⁴ <https://orcid.org/0000-0002-8390-0658>

<https://doi.org/10.1016/j.nepr.2024.103948>

Received 27 November 2023; Received in revised form 22 February 2024; Accepted 24 March 2024

Available online 6 April 2024

1471-5953/© 2024 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

the fore, are designed to be accessed by all people involved in the delivery of care (New South Wales Government, 2022; Sorensen and Campbell, 2016). Nurses are the largest users of the eMR systems in healthcare (Jedwab et al., 2022) and it is therefore not surprising that professional accrediting bodies are recommending that pre-licensure programs enable students to develop computer literacy and have access to health technology that is reflective of what they are exposed to in the clinical environment. Professional organisations in the United States such as the American Association of Colleges of Nursing (AACN) and the National League for Nursing (NLN), are pushing for the inclusion of eMR training in undergraduate nursing education. As early as 2008, the NLN charged educators to advocate for a future where all nursing students graduate with current, relevant knowledge and skills in computer literacy, information literacy and informatics. Ten years later, the push to integrate an education with technology persists, such that in 2018, the Australian Nursing and Midwifery Accreditation Council (2018) (ANMAC) stated that “it is essential that the management of information and use of digital technology should be a priority in entry-to-practice higher education nursing programs” (2018, p.19).

The need for an undergraduate nursing pedagogical framework to include eMR training has been internationally recognised, however successful implementation has been inconsistent (Mollart, 2020). A review of the literature suggests the most successful integration has occurred when partnerships between universities and the local health systems can result in the successful integration of an eMR system into a nursing curriculum. Bowers et al. (2011) described a productive relationship between the Cleveland Clinic, a world-renowned tertiary care centre and the faculties of 17 nursing programs in northeast Ohio, where they created a portal for nursing students to develop the knowledge and skills necessary to use eMR to deliver safe patient care. Lucas (2010) examined a partnership between the University of Saint Francis (USF) and Parkview Health System where students of USF could freely access Parkview’s eMR training system to enhance their confidence and competence in using eMR.

There are examples where higher education institutes have developed their own eMR programs for use during simulation education for undergraduate students, such as Asia, Europe, the Middle East, the United Kingdom, the United States and Canada (Badowski et al., 2018; Chan et al., 2020; Courtney et al., 2015; Elliott et al., 2018; George et al., 2016; Holland et al., 2021; Hong et al., 2022; Kaplan, 2022; Kowitlawakul et al., 2014). The School of Nursing at Kingston University/St George’s University London provided examples of this where faculty worked with a web and multi-media team to create their own eMR system that would meet the specific simulation learning needs of their students (Elliott et al., 2018). Comparably, Holland et al. (2018) examined an electronic documentation system that was created by the instructional design team of a Midwestern university in the United States. Simulated academic eMR products were also mentioned by several studies, including a project by George et al. (2016) that used an academic eMR program which was based on the system used by the United States Department of Veteran Affairs and the Singapore university-based study by Kowitlawakul et al. (2014) which implemented the Electronic Health Records for Nursing Education (EHRNE) software program.

Overwhelmingly, research from higher education institutes that have introduced eMR report nursing students have enough experience and exposure to eMR before they go out on placement and this also helps students to make more efficient use of digital documentation time (Hong et al., 2022). Unfortunately, there are few opportunities for Australian nursing students to practice eMR in undergraduate learning environments (Mollart et al., 2020, 2021). As such, the confidence levels and readiness of Australian nursing students to perform eMR documentation are undetermined (Peacock et al., 2022).

The purpose of this study was to compare the views and experiences on being prepared for using patient eMR in clinical placement after using only learning and using paper-based documentation in the

simulated learning environments of third-year nursing students from two universities in NSW Australia: one regional metropolitan and one rural university. This study extends previously published work that considered the experiences of one cohort and their exposure to eMR education (Mollart et al., 2021). This present research also seeks to investigate their opinion on the introduction of eMR in the university’s simulated learning environments (SLEs) and being work-ready for clinical practice.

3. Method

After receiving university ethics approval (HREC 2018–0488/H21455), an invitation email was sent to all third-year nursing students enrolled in the undergraduate nursing programs at two multi-campus universities in NSW: one regional metropolitan university (University A) that has two campuses (n=530) where students were exposed to first-year optional eMR education; and one rural university (University B) that has 5 campuses (n= 414) with no exposure of eMR education in their curriculum.

The email outlined the study and asked for voluntary participation by students completing a short, 10-minute electronic anonymous questionnaire (via SurveyMonkey). In addition to the email, two weeks after the initial invitation, reminder emails and announcements via the learning management system were sent to encourage the students’ participation in the study. As part of the invitation, an information sheet was provided to participants noting that informed consent was implied with the completion of the online survey. Prospective participants were also informed about their rights to withdraw from the study without explanation, however depending on the stage of the study, data may not be able to be withdrawn due to de-identified questionnaire results being anonymised. To protect the anonymity of student participants, the study design included measures such as disabling the collection of computer IP addresses and avoiding the use of shared accounts to maintain confidentiality. Additionally, the online first page of the participant information sheet provided contact details of the researchers, the purpose of the study and information about the participant’s right to withdraw from the study at any time by simply exiting the survey.

3.1. Description of survey

The study involved a questionnaire investigating the perceptions of third-year undergraduate nursing students regarding their preparedness for using electronic medical records (eMR) in clinical practice. There was a focus on comparing these perceptions to their current paper-based learning in the simulated learning environments (SLE). The questionnaire was based on the integrated literature review by the authors as there is no validated tool currently (Mollart et al., 2020) and was used with a previous study (Mollart et al., 2021).

The questionnaire comprised three sections. The first section included eight demographic questions and two questions on education during clinical placement. The second section aimed to gauge the students’ perceptions when initially commencing clinical placement of their confidence and skill in using both paper-based and eMR and observations charts (eObs) with five Likert-style questions. Section three aimed to explore the students’ views on learning about documenting patient care and outcomes using an academic eMR program similar to the hospital setting at their university simulation laboratories, in preparation for clinical practice with five Likert-style questions and two open-ended questions.

3.2. Data analysis

To achieve a 90 % confidence level with 10 % margin of error 64 respondents were required (sample size calculation of 944 (530- University A and 414 - University B)). The student questionnaire scores were collated and analysed using descriptive and inferential comparative

analysis. Data were analysed using non-parametric statistics. The Mann-Whitney U test was used to test for mean ranking differences for dependent variables (age group, gender and university) (Field, 2017) and Chi-squared tests were used for comparing categorical variables. Levels of significance are reported at $p < 0.05$.

A qualitative thematic approach was used to analyse the responses to the open-ended questions in the survey. To analyse the comments, the fundamental or generic qualitative description method was employed. This method aims to gain insight and understanding into the phenomenon or the perspectives of individuals by identifying themes based on cumulative counts of similar comments (Sandelowski, 2000; Merriam and Tisdell, 2015). Content analysis was conducted on the comments using this approach: Potential codes and themes were deliberated with two authors (PI and LM) based on the cumulated count of similar comments in the two open-ended questions. All authors agreed to the defining and naming of themes. To protect participants' anonymity, names were replaced with a code number.

4. Results

4.1. Demographics

A total of 143 students completed the survey with 67 from Site A (46.85 %) and 76 from Site B (53.15 %), a total of eight male (5.6 %) with 134 female (93.7 %) respondents, 1 respondent preferring not to say (0.7 %) from the two universities and all respondents were domestic students. As shown in Table 1, participants' ages ranged from 20 – 63 years of age (Median 26 years, Mean 29 years, Mode 22 years, SD9.78), full-time and part-time. Over two-thirds of the respondents (95, 66.43 %) had previously received training as Assistants in Nursing (76, 53.14 %) and 19 (13.29 %) as Enrolled Nurses (ENs). There was a statistically significant difference between qualifications and university attended ($p < 0.05$); and age group of 40–44 years of age ($p < 0.05$).

As shown in Table 2, less than half of the student participants had received preliminary hospital training in using eMR and electronic adult observations (eObs) charts during their clinical placement. There was a significant difference between student's universities for eMR training ($p < 0.01$) and eObs training ($p < 0.05$) (Table 2). Sub-analysis found there was no significant difference for hospital eMR training and study load ($p = 0.569$) or age ($p = 0.942$). Also, no significant difference for hospital eObs training and study load ($p = 0.282$) or age ($p = 0.809$).

When combining very/extremely prepared, only 15 (10.86 %) respondents felt very/extremely prepared to use the eMR system for the first time with a significant difference with study load ($p = 0.0049$) but not student's university ($p = 0.580$) or age ($p = 0.889$). Also, only 16 (11.59 %) respondents felt very/extremely prepared to use the

Table 1
Respondents demographics (n=143).

Characteristics	University A Frequencies n (%)	University B Frequencies n (%)	TOTAL 143 Frequencies n (%)	P value	
Age (years)	20–24	25 (37.31)	39 (51.32)	64 (44.76)	0.132
	25–29	9 (13.43)	9 (11.84)	18 (12.59)	0.973
	30–34	13 (19.4)	9 (11.84)	22 (15.38)	0.309
	35–39	4 (5.97)	10 (13.16)	14 (9.79)	0.246
	40–44	12 (17.91)	2 (2.63)	14 (9.79)	0.005
	45–49	2 (2.99)	1 (1.32)	3 (2.1)	0.912
	50–54	1 (1.49)	4 (5.26)	5 (3.5)	0.442
	55 and over	1 (1.49)	2 (2.63)	3 (2.1)	1
	Total	67 (46.85)	76 (53.15)	143 (100)	
	Gender	Female	65 (48.25)	69 (45.45)	134 (93.7)
Male		2 (1.39)	6 (4.19)	8 (5.6)	
Prefer not to say		0	1 (0.67)	1 (0.7)	
Other qualifications	Assistant in Nursing (AIN)	38 (40.0)	38 (40.0)	76 (53.14)	0.045
	Enrolled Nurse (EN)	4 (4.21)	15 (17.78)	19 (13.29)	
Study load	Full time	57 (39.86)	62 (43.35)	119 (83.22)	0.666
	Part time	10 (6.99)	14 (9.79)	24 (16.78)	

Table 2
Training received whilst on hospitals clinical placement.

Trained during clinical placement at NSW hospital/s	University A Frequencies n (%)	University B Frequencies n (%)	P value
eMR - Yes	42 (29.37)	63 (44.05)	p < 0.01
eObs chart- Yes	43 (30.07)	62 (43.35)	p < 0.05

electronic observation charts for the first time with a significant difference for student's universities ($p = 0.0366$), but not for study load ($p = 0.228$) or age ($p = 0.748$).

Reflecting on their level of confidence in accessing and documenting using electronic notes, few respondents felt very/excellent confident (6, 11.59 %) and accessing patient eMR the first time in clinical placement and documenting in patient's eMR (16, 12.32 %) (Table 3).

On sub-analysis, when combining very/extremely confident in accessing eMR, there is a significant difference between the student's university ($p = 0.037$) and study load ($p = 0.009$) but not age ($p = 0.7569$); and a significant difference in documenting in patient's eMR for the first time and students' university (0.0228) and study load ($p = 0.015$) but not age ($p = 0.408$).

Reflecting on their confidence in skill documenting in the electronic observation charts, 21 (25.2 %) respondents felt very/excellent confident documenting observations in e-observation charts for the first time (Table 3). On sub-analysis, there was no significant difference when combining very /extremely prepared in documenting in e-observation chart for the first time for students' university ($p = 0.124$), study load ($p = 0.248$) or age ($p = 0.436$).

Student participants were requested for their opinion on how useful it would be to familiarise themselves with using eMR and learning to use e-obs charts in the university SLEs in preparation for their clinical placement experience. Most respondents (104, 90.43 %) believed that learning eMR in the simulation environment would be extremely (63.48 %), or very useful (26.96 %) (Table 4). On sub-analysis, there was no significant difference when combining very/extremely useful for student's universities ($p = 0.0699$), study load ($p = 0.749$) or age ($p = 0.942$).

Most participants (97, 84.35 %) believed learning e-observations charts would be extremely useful (58.26 %) or very useful (26.09 %) (Table 4). There was no significant difference when combining very/extremely useful for student's universities ($p = 1.000$), study load ($p = 0.491$) or age (0.399).

Student participants were requested to reflect on their undergraduate nursing education program and their opinion of if they would have been more confident accessing patient's eMR for the first time when on

Table 3
Feeling of preparedness and confidence.

	University	1. n (%)	2. n (%)	3. n (%)	4. n (%)	5. n (%)	Combing 4 & 5
Prepared to use patient eMR system	Combined Total	60 (43.48)	24 (17.39)	39 (28.26)	10 (7.25)	5 (3.62)	P<0.05
	Site A	Mean score 1.94					
	Site B	Mean score: 2.24					
Prepared -to use eObs chart	Combined TOTAL	38 (27.54)	37 (26.81)	47 (34.06)	9 (6.52)	7 (5.07)	P < 0.05
	Site A	Mean score = 2.19					
	Site B	Mean score= 2.49					
Confidence- accessing patient eMR	Combined TOTAL	52 (37.68)	35 (25.36)	35 (25.36)	11 (7.97)	5 (3.62)	p< 0.05
	Site A	mean score = 2.00					
	Site B	mean score = 2.27					
Confidence- skill documenting in patient eMR	Combined TOTAL	41 (29.71)	41 (29.71)	39 (28.26)	11 (7.97)	6 (4.35)	P < 0.05
	Site A	Mean score = 2.42					
	Site B	Mean score = 2.11					
Confidence-skill documenting in eObs chart	Combined TOTAL	25 (18.12)	45 (32.61)	47 (34.06)	13 (9.42)	8 (5.79)	P=0.1237
	Site A	Mean score=2.33					
	Site B	Mean score=2.69					

1=not confident at all, 2=not so confident, 3=somewhat confident, 4= very confident, 5= extremely confident

Table 4
Useful to learn using eMR and eObs chart in university SLEs in preparing for clinical placement experience.

	University	1. n (%)	2. n (%)	3. n (%)	4. n (%)	5. n (%)	Combing 4 & 5 P value
Useful to learn eMR in University SLEs	Combined Total	0	2 (1.7)	9 (7.83)	31 (26.96)	73 (63.48)	P=0.07
	Site A	Means score=4.63					
	Site B	Mean score = 4.42					
Useful using e-obs charts in University SLEs	Combined TOTAL	1 (0.87)	3 (2.61)	14 (12.17)	30 (26.09)	67 (58.26)	P=1.00
	Site A	Mean score = 4.38					
	Site B	Mean score = 4.39					

1=not useful at all, 2=not so useful, 3=somewhat useful, 4= very useful, 5= extremely useful

placement, if they had learnt eMR and e-obs charts in university’s SLEs. Most respondents believed they would have been more confident accessing eMR (93.91 %) and e-observations charts (91.3 %) if they had been able to use the electronic documentation options in SLEs. For learning eMR in SLEs, there was no significant difference between student’s university (p=0.1364), student load (p=0.2497) or age (p=0.4711). For learning e-observation charts, there was no significant difference with student’s university (p=0.3645), study load (p= 0.6214) or age (p= 0.2194).

5. Themes

Most participants provided their views by responding to the open-ended question on what they perceived was the *impact of only learning to use paper-based documentation in university SLEs for student preparedness to use EMR in their first clinical placement*. Four themes emerged from the qualitative data: 1) Don’t throw out the baby with the bathwater; 2) Prepare us for practice; 3) Mistakes – hardly any!; and 4) Universities need to catch up and put out.

Don’t throw out the baby with the bathwater: As the theme name suggests, many of the participants felt a strong need to learn both paper and eMR. Despite the presence of technology in health services, some participants concluded that: “it’s important to be skilled at documenting in both paper and electronic” (M24) particularly “if you are working in older hospitals” (M21) that are still using paper-based documentation. It is clear though that the participants believed that learning to navigate “electronic documentation should be incorporated to allow maximum experience on clinical placement” (R35). Learning both styles of documentation was linked to achieving “positive learning outcomes” (M26) perhaps because regardless of the platform for documentation, “the principles remain the same.” (M12)

Prepare us for practice: This theme accentuates the participants’ view of the pressing need to align healthcare education with realistic learning opportunities that help to prepare for practice. Their written reflections emphasise that they understand paper-based records to be an outdated system of documentation citing that it: “negatively impacted my preparedness to use e-documentation whilst on first clinical placement.” (R21). Adding to this, another participant suggested that: “the paper-based documentation we use in the labs are hard to understand, messy and outdated and don’t reflect what is used in the real WPL [workplace learning] clinical setting.” (M26).

With such a strong sense that they were learning impractical content, it is not surprising that some of the participants expressed feeling “incompetent at times and uncomfortable” (M27) when attempting to enter data electronically in the clinical environment. One participant offered that time spent learning the platform prior to clinical placement was required because “eMR is more in depth and requires more knowledge and skill to navigate.” (C32). Participants shared that they either had “to practically teach yourself how to use electronic records” or the Registered Nurses they were working with would have to make up for the shortfall in learning at university and had to help and teach them “on the fly” during clinical placement.” (R39).

Mistakes – hardly any! The participants recognise that eMR is a method of documentation that decreases the likelihood of errors with a participant surmising that: “More mistakes can occur with paper-based documentation”. (M42) The relationship to the transition to eMR and patient safety was tangible with the following comment an example of the participants’ perspective about paper-based documentation being “hard to read handwriting and medication chart errors are common.” (R22) Interestingly, making errors induced polarising responses from the participants. There were comments that suggested errors were not an issue because “changes can be rectified within seconds” (R21). An

alternative view of the negative effects of an eMR documentation error were captured also where a participant expressed being “worried I would enter data inaccurately which could impact patient care.” (M13)

Universities need to catch up and put out: Participants expressed concern that they would not be ready for clinical practice after they have graduated if their education continued to be devoid of eMR. Indeed, many shared feelings of being underprepared for the clinical placements as student nurses and blamed this on the university not providing them with realistic opportunities to practice using eMR. There was a consensus that “paper based is a good way of introducing documentation, but it needs to progress to a more life-like simulated eMR.” (R28). M58 highlights the impact of this lack of exposure on campus:

“It is difficult when a student hasn’t used eMR before. In other words, without prior exposure to eMR, it takes much longer to navigate around it and mistakes are more likely to be made. I believe it is the responsibility of the university to train students in SLE [simulation] or tutorials. Hospital staff are too busy and the student gets blamed for not having prior knowledge/skills of eMR.” (M58)

Although the participants had varied experience with using eMR during clinical placement, with sentiments that: “electronic documentation is the future” (M22), there was clear agreement that: “it felt like the university is lagging behind” (R60) in offering access to this learning resource. Being able to rehearse using eMR in the simulated learning environment may reduce the burden of clinical placement where there is much to learn and do:

“On every single one of my placements, I have used online software for things such as SAGO observation, progress note writing and nursing assessments. Further training on ... an eMR-like system, as well as how to correctly fill them out... would be immensely beneficial for students undertaking their placements as these were all things that I had to either ask about or teach myself whilst on my placements.” (M26).

6. Discussion

This research aimed to determine third year nursing students’ preparedness for clinical placement using eMR. A clear finding is that students from both universities believe they would have been more confident using the eMR and e-observations charts in clinical placement if they learnt to use these in the university SLE. Overwhelmingly, they consider it would be extremely beneficial to learn in an authentic environment drawing parallels with patient safety and efficient work practices. Indeed, 90 % of the students in this research believed it would be useful to implement eMR into their SLEs. The integration of eMR into education helps students develop essential clinical skills, such as documentation and provision of care (Solarte and Könings, 2017). Albeit dated research, Donahue and Thiede (2008) examined student confidence levels as part of their study and found that students increased clinical readiness and confidence by having the opportunity to practice many times with eMR prior to clinical placement. Interestingly and more recent, Lokmic-Tomkins et al. (2022) shared that over 50 % of their students reported they would like training on eMR before attending clinical placement. This is despite most students using technology since before they were 10 years old and having a relatively high confidence with and being more adaptable to using new forms of technology.

An additional finding from this study is that students felt generally unprepared for eMR use in clinical placement and related this to a lack of exposure to electronic documentation from the university. There were no significant differences between the sites and/or ages of the students that used the eMR program, but there was a significant difference ($p < 0.01$) between the training provided to the rural site as the regional site was given no training. Students from the rural university who received hospital-based eMR education as part of their preparation for clinical placement felt significantly more confident accessing and using

eMR in the hospital than their metropolitan counterparts who received minimal pre-training. With this finding, an assumption that rural health services offer greater support for undergraduate students with a pre-training module/s is outside of the scope of this research though should be investigated further. Examples of international nursing schools that offer students access to authentic electronic health records supports this finding. Bowers et al. (2011) for example, reported that pre-education coupled with broad access to an authentic eMR program enabled students to have a greater understanding of multidisciplinary health care delivery and was valuable in preparing students for clinical placement.

Although the regional-metro students were exposed to eMR and eObs as part of optional tutorial activities in first year, it appears that having eMR education only in the first year had limited impact on their perception of preparedness for clinical placement. This learning opportunity was not captured in the qualitative and quantitative aspect of this research but supported the concept of limited impact and value for learning. Solarte and Könings (2017) reported that students require ongoing exposure to the use of eMR throughout their studies as otherwise they are limited in their learning and confidence in the use of the program. Changes in time spent in various eMR activities before and after learning about the eMR program compared with previous research has shown that students want to be offered more in their simulated learning environment (SLE). Students want to be able to practice the skills in a supported environment before going out on clinical placement (Mollart et al., 2020, 2023). Practice in a supported learning environment is paramount in the student’s journey of learning and follow up/ongoing education is needed. Scaffolding the use of eMR over the three years of study would be beneficial to the students learning. More research is needed in relation to students’ confidence levels over the course of their degree to track changes or improvements as there is no research on this topic.

7. Limitations

Despite a multi-media approach over a specified time, a significant number of third-year students did not participate in this study. Low response rates for online surveys are not uncommon and have been observed in other undergraduate nursing studies (Kent-Wilkinson et al., 2015, Sweet and Broadbent, 2017). This study has a small sample size and although complied from existing literature, the use of an opinion-based questionnaire is an additional limitation. When completing certain sections of the survey, all participants were prompted to reflect on their first-year clinical placement experiences and their use of eMR. It should be noted that recall bias may have influenced their responses. Recall bias is a type of systematic error that occurs when participants in a study inaccurately recall or report a past event or experience. This can happen when there is a significant time lag between the event and when it is reported (Mollart et al., 2021) as is the case in this study and an identified limitation. The combined data analysis supports the integration of eMR, along with supplemental paper-based patient records across an undergraduate nursing curriculum.

8. Conclusion

This research highlights the critical issue of preparing undergraduate nursing students adequately for the use of eMR for clinical practice and emphasises the need to adopt a scaffolded approach to eMR education that is delivered in realistic simulated learning environments. Collaboration between universities and health care facilities is an approach that has delivered positive results internationally for student learning. There is potential in Australia to broaden existing approaches to offer undergraduate students access to existing eMR training platforms prior to clinical placement.

Ethics Approval

University of Newcastle HREC: 2018–0488; Charles Sturt University HREC H21455.

CRedit authorship contribution statement

Lyndall Mollart: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization.
Danielle Noble: Writing – review & editing, Writing – original draft.
Simon McDonald: Methodology, Formal analysis, Conceptualization.
Melissa Hanson: Writing – review & editing, Writing – original draft.
Pauletta Irwin: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization.

Declaration of Competing Interest

The article is the authors' original work and that the article has not received prior publication and is not under consideration for publication elsewhere. All authors meet the criteria for authorship, have approved the final manuscript being submitted and all those entitled to authorship are listed as authors. All authors abide by the copyright terms and conditions of Elsevier. No conflict of interest identified by any authors: in employment, products or distribution of products, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or funding, equipment and drugs.

Acknowledgements

Spatial Data Analysis Network (SPAN) Charles Sturt University.

References

- Australian Nursing and Midwifery Accreditation Council. (2018). Review of registered nurse accreditation standards: Consultation paper 2. (<https://www.anmac.org.au/sites/default/files/documents/rnasconsultationpaper2.pdf>).
- Badowski, D., Horsley, T.L., Rossler, K.L., Mariani, B., Gonzalez, L., 2018. Electronic charting during simulation: a descriptive study. *Comput. Inform. Nurs.* 36 (9), 430–437. <https://doi.org/10.1097/CIN.0000000000000457>.
- Bowers, A.M., Kavanagh, J., Gregorich, T.O.M., Shumway, J., Campbell, Y., Stafford, S., 2011. Student nurses and the electronic medical record: a partnership of academia and healthcare. *Comput. Inform. Nurs.* 29 (12), 692–697. <https://doi.org/10.1097/CIN.0b013e31822b8a8f>.
- Chan, K.G., Pawi, S., Ong, M.F., Kowitlawakul, Y., Goy, S.C., 2020. Simulated electronic health documentation: a cross-sectional exploration of factors influencing nursing students' intention to use. *Nurse Educ. Pract.* 48 <https://doi.org/10.1016/j.nepr.2020.102864>, 102864–102864.
- Courtney, K.L., Kuo, A., & Shabestari, O. (2015). *Driving quality in informatics: Fulfilling the promise*. IOS Press, Incorporated.
- Donahue, B., Thiede, K., 2008. Innovative strategies for nursing education: enhancing curriculum with the electronic health record. *Clin. Simul. Nurs. Educ.* 4, e29–e34. <https://doi.org/10.1016/j.ecns.2009.05.053>.
- Elliott, K., Marks-Maran, D., Bach, R., 2018. Teaching student nurses how to use electronic patient records through simulation: a case study. *Nurse Educ. Pract.* 30, 7–12. <https://doi.org/10.1016/j.nepr.2018.02.003>.
- George, N.M., Drahnak, D.M., Schroeder, D.L., Katranca, E.D., 2016. Enhancing precicensure nursing students' use of an electronic health record. *Clin. Simul. Nurs.* 12 (5), 152–158. <https://doi.org/10.1016/j.ecns.2015.11.006>.
- Holland, C., Stuber, M., Mellon, M., 2021. Integrating an innovative, cost-effective electronic documentation system for undergraduate nursing students. *Comput. Inform. Nurs.* 39 (11), 736–740. <https://doi.org/10.1097/CIN.0000000000000714>.
- Hong, S., Cho, I., Park, M., Lee, J.Y., Lee, J., Choi, M., 2022. Simulation education incorporating academic electronic medical records for undergraduate nursing students: a pilot study. *Healthc. Inform. Res.* 28 (4), 376–386. <https://doi.org/10.4258/hir.2022.28.4.376>.
- Irwin, P.M., Brown, R.A., Butler, S., 2021. The undergraduate simulation framework: standardising design and delivery. *High. Educ. Skills Work-Based Learn.* 11 (2), 576–586. <https://doi.org/10.1108/HESWBL-04-2020-0070>.
- Jedwab, R.M., Hutchinson, A.M., Manias, E., Calvo, R.A., Dobroff, N., Redley, B., 2022. Change in nurses' psychosocial characteristics pre- and post-electronic medical record system implementation coinciding with the SARS-CoV-2 pandemic: pre- and post-cross-sectional surveys. *Int. J. Med. Inform.* 163, 104783 <https://doi.org/10.1016/j.ijmedinf.2022.104783>.
- Kaplan, E., Korkmaz, F., 2022. Nurse educators' and students' experiences on electronic patient records: A multiple-methods study. *Nurse Educ. Today* 121. <https://doi.org/10.1016/j.nedt.2022.105684>, 105684–105684.
- Kent-Wilkinson, A., Leurer, M.D., Luimes, J., Ferguson, L., Murray, L., 2015. Studying abroad: exploring factors influencing nursing students' decisions to apply for clinical placements in international settings. *Nurse Educ. Today* 35 (8), 941–947.
- Kowitlawakul, Y., Chan, S.W.C., Wang, L., Wang, W., 2014. Exploring faculty perceptions towards electronic health records for nursing education. *Int. Nurs. Rev.* 61 (4), 499–506. <https://doi.org/10.1111/inr.12141>.
- Lokmic-Tomkins, Z., Choo, D., Foley, P., Dix, S., Wong, P., Brand, G., 2022. Pre-registration nursing students' perceptions of their baseline digital literacy and what it means for education: a prospective COHORT survey study. *Nurse Educ. Today* 111, 105308. <https://doi.org/10.1016/j.nedt.2022.105308>.
- Lucas, L., 2010. Partnering to enhance the nursing curriculum: electronic medical record accessibility. *Clin. Simul. Nurs.* 6 (3), e97–e102. <https://doi.org/10.1016/j.ecns.2009.07.006>.
- Merriam, S.B., & Tisdell, E.J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- Mollart, L., Newell, R., Geale, S.K., Noble, D., Norton, C., O'Brien, A.P., 2020. Introduction of patient electronic medical records (eMR) into undergraduate nursing education: an integrated literature review. *Nurse Educ. Today* 94. <https://doi.org/10.1016/j.nedt.2020.104517>, 104517–104517.
- Mollart, L., Newell, R., Noble, D., Geale, S., Norton, C., O'Brien, A., 2021. Nursing undergraduates' perception of preparedness using patient electronic medical records in clinical practice. *Aust. J. Adv. Nurs.* 38 (2), 44–51. (<https://doi.org/10.37464/2020.382.282>).
- Mollart, L., Irwin, P., Noble, D., Kinsman, L., 2023. Promoting patient safety using electronic medical records in nursing/midwifery undergraduate curricula: discussion paper. *Nurse Educ. Pract.* 70, 103653 <https://doi.org/10.1016/j.nepr.2023.103653>.
- Murray, M., Sundin, D., Cope, V., 2019. New graduate nurses' clinical safety knowledge by the numbers. *J. Nurs. Manag.* 27 (7), 1384–1390. <https://doi.org/10.1111/jonm.12819>.
- New South Wales Government. (2022). *Electronic medical record (eMR)*. New South Wales Government. (<https://ehealth.nsw.gov.au/solutions/clinical-care/electronic-medical-records/emr>).
- Peacock, A., Slade, C., Brown Wilson, C., 2022. Nursing and midwifery students' perspectives of using digital systems on placement: a qualitative study. *J. Adv. Nurs.* 78 (4), 1128–1139. <https://doi.org/10.1111/jan.15091>.
- Sandelowski, M., 2000. Whatever happened to qualitative description? *Res. Nurs. Health* 23, 334–340. [https://doi.org/10.1002/1098-240X\(200008\)23:4<334::AID-NUR9>3.0.CO;2-G](https://doi.org/10.1002/1098-240X(200008)23:4<334::AID-NUR9>3.0.CO;2-G).
- Solarte, I., Könings, K.D., 2017. Discrepancies between perceptions of students and deans regarding the consequences of restricting students' use of electronic medical records on quality of medical education. *BMC Med Educ.* 17, 55. <https://doi.org/10.1186/s12909-017-0887-2>.
- Sorensen, J., Campbell, L., 2016. Curricular path to value: Integrating an academic electronic health record. *J. Nurs. Educ.* 55 (12), 716–719. <https://doi.org/10.3928/01484834-20161114-10>.
- Sweet, L., Broadbent, J., 2017. Nursing students' perceptions of the qualities of a clinical facilitator that enhance learning. *Nurse Educ. Pract.* 22, 30–36.