

The impact of using an academic electronic medical record program on first-year nursing students' confidence and skills in using E-documentation: a quasi-experimental study

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ABSTRACT

Objective: To evaluate the impact of using an academic electronic medical record program on first-year nursing students' confidence and skill in E-documentation after their hospital clinical placement.

Background: Registered nurses are the largest user group of health information technology systems such as patient electronic medical records (eMR). As such, nurse undergraduate programs need to reflect contemporary practices and respond to emerging trends including digital technology, however integration of eMR learning has not occurred in many countries. To address this gap, a fit-for-purpose academic eMR simulation program was developed by nursing academics and a university Learning Design Department member.

Study Design and Methods: A quasi-experimental study design, with self-administered pre-test, post-test surveys, was used with a convenience sample

of all first-year nursing students at one regional university in NSW Australia in 2019 and 2021.

Results: A total of 105 students completed the surveys (9.7% pre, and 7.4% post-test survey). Only 23% of respondents received training during hospital clinical placement on eMR and electronic observation charts. There was a significant increase in participant confidence and knowledge in documenting in electronic adult observational charts and notes after using the academic eMR program and attending clinical placement. Three themes emerged from the qualitative data: *preparation for practice*; *more exposure increases confidence*; and *we can't forget the patient*.

Conclusion: Students acknowledged the need for repeated practice using an academic eMR program in university learning environments to ensure they would be work-ready. The identified challenge was the communication barrier (computer on wheels) and

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the potential negative impact on person-centred care and therapeutic communication.

Implications for research, policy and practice:

Further research is required to determine whether repeated practice with electronic documentation is best placed within a curriculum to increase learner confidence. Simulations that incorporate workstations on wheels should be tested to determine best practice for therapeutic communication.

What is already known about this topic?

- Registered nurses are the largest user group of health information technology systems.
- Nursing undergraduate program needs to reflect contemporary practices including digital technologies.

- Integration of eMR education in undergraduate nursing programs has not occurred in many countries.

What this paper adds:

- Evaluation of a fit-for-purpose academic electronic medical record program integrated into an undergraduate nursing student's curriculum.
- There was a significant increase in participant confidence and knowledge in documenting in electronic adult observational charts and notes after using the academic eMR program.
- Digital technology education tailored for students of different age groups may be required.

Keywords: Electronic medical records, nursing undergraduate curriculum, confidence and skills

OBJECTIVE

This study evaluated how an academic patient electronic medical record (AeMR) simulation program supports and impacts the development of first-year nursing student's knowledge and confidence for clinical experience.

BACKGROUND

Patient electronic medical records (eMR) and electronic medication charts are entrenched in most public health systems in countries such as the United States, United Kingdom, Canada, and Australia.¹ Health information technology systems were initially introduced with the dual purpose of patient safety and cost saving, whilst eMR has also proven effective in predicting patient outcomes.² A feature of many eMR programs, for example, is being able to 'track' a patient's progress with inbuilt processes to 'trigger' alerts and escalate care requirements.³ Registered nurses are the largest user group of health information technology systems and use programs such as eMR on a daily basis in clinical practice.⁴ Despite broad adoption in clinical practice, academic eMR integration in Australian undergraduate nursing and midwifery programs has not occurred.⁵ This delay in integration has resulted in a disconnect between higher education institutes' capacity and health services expectations of work-ready graduates.

Documentation is a key requirement of any health profession and is a skill that requires development and practice. Having exposure to the appropriate patient charts is considered a resource that can increase the authenticity of the simulation and assist students to prepare for the clinical environment.⁶ Understandably, the traditional and long-standing approach to teaching students how to record patient care and progress

is by using paper charts. These paper documents mimic or replicate those used in health facilities. Contemporary health services have moved on and no longer rely solely on paper-based documentation, so offering students rehearsal with paper-based only opportunities is limiting and does not offer a true representation of clinical practice. There is little published evidence, but it appears that Australian nursing students do not receive formal training in the use of eMR when commencing their clinical placement in hospitals but rather receive ad-hoc training by the ward nurse who is rushed and time-poor.⁷ Given eMR is viewed as a critical component to delivering quality safe patient care, to educate students without access and the opportunity to familiarise themselves with technology is inadequate.¹

Nursing undergraduate program content should align with contemporary practices in health and respond to emerging trends such as digital health technology.⁸⁽⁸⁾ Increasingly in most healthcare settings, digital technologies are utilised for their inherent links between staff education and patient safety.⁹ It is not surprising then, that contemporary nursing program accreditation standards warrant student exposure to digital health content in (Australian) undergraduate curricula.^{5,7,8}

International research has demonstrated that students who have experience using eMR in the university environment, or who have received education about their use report that the exposure provided the opportunity to realistically delivery of patient care.^{10,11} In addition to this, students report improved attitudes to learning and confidence and exhibit enhanced digital capacity to retrieve and interpret patient information.^{6,10-12} Contemporary nursing students have a distinct variability in digital literacy.¹³

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There is no published studies exploring the Australian nursing students experience in using an academic eMR program in their education program and impact on their confidence and skills in electronic documentation after their clinical placement, thus this research attempts to fill this research knowledge gap.

METHODS AND MATERIALS

STUDY DESIGN AND SAMPLE

A quasi-experimental descriptive study design with self-administered pre-test, post-test surveys were used for this study. A quasi-experiment is a study where participants self-select to be included in research comparing the real-world effectiveness of the topic being researched.¹⁴ A convenience sample of all first-year nursing students at one regional university in NSW Australia (three campuses) were invited to participate in 2019 (n=625) and 2021 (n=455). The inclusion criteria were first year nursing students enrolled in a second semester course that included a theoretical component and clinical practice placement, thus the only exclusion criteria were students not enrolled in a first-year second semester course that had a theoretical component and clinical practice placement.

The Academic eMR (AeMR) program was integrated into the first-year nursing clinical course in semester two 2019. Instructions on the AeMR commenced in week one and two tutorials with a case scenario; all students were provided with a weblink to the AeMR program. Students were instructed to use the AeMR on their own device (mobile, laptop, ipad) outside of class across the semester and as often as they wanted. Students were supplied with two links to the AeMR in their course material: 1) to access the AeMR program; and 2) a video on how to use the AeMR program. Regardless of study participation, all students were invited to use the AeMR program and practice documentation of patient care including charting vital signs (observations). The learning objectives in the course and support received were the same; the only difference was the optional use of AeMR program. All students received learning on paper-based documentation only in the compulsory simulated learning environments (SLEs).

The students were surveyed at two points during the semester: 1) at the beginning of the semester (Week Two); and 2) end of the semester- after 10 tutorials and clinical placements (Week 12). Participation had no impact on course completion or course grade. Surveys were not distributed during 2020 due to unpredictable disruption with campus learning and clinical placement due to Covid-19 pandemic. Students were not identified in the surveys, so it cannot be guaranteed that each survey had the same participants. Further information on the survey tools is in the Survey Tool section.

RECRUITMENT AND DATA COLLECTION

After receiving university ethical approval (HREC 2019-0241), all eligible first-year nursing students were invited to voluntarily participate at the beginning of semester two via their student email address with the study information sheet which clearly explained the study purpose and when pre- and post-test questionnaires were to be completed. Also, there was an announcement posted to the course learning management site with the participant information sheet and a link to online anonymous pre-test online survey (SurveyMonkey®). Posters were displayed on campus explaining the research project in classrooms, toilets and library.

Near the end of the semester, after completing at least 10 tutorials and clinical placements, all eligible students received an email explaining the post-test survey with the study information sheet. Again, announcements were posted on the course LMS site as well as at the campus with the participant information sheet and link to the online anonymous post-test survey. This allowed any student who didn't participate in the initial survey to have the opportunity to provide feedback on using AeMR and the impact on their knowledge and confidence levels on using health eMR in clinical placement.

EDUCATION INTERVENTION

In late 2018, a fit-for-purpose AeMR simulation program, was developed by a member of the university Learning Design and Teaching Innovation Department (AM). The development of the AeMR ran on an Agile/Prototype based approach cycling continuously between developer and academics. Prototype versions were used as staging points for discussion between the parties. The AeMR included three components: 1) An adult general observation chart (eObs) based on the standard adult observation charts used by most states in Australia; 2) patient medication chart; and 3) patient notes. The design and development approach of the AeMR was to create a stripped back simulation of a real work eMR software experience, whilst retaining a focus on modern user experience/user interface principles, accessibility, and on-demand learning.¹⁵ Particular focus was placed on the eObs chart portion of the application in which the user/student had the ability to input patient observation and generate a common format chart visualisation. With the idea being that the user/student could see how their digital input could reflect on the possible status of the patient and any deterioration.

The AeMR was built as a single page application using the Vue.js framework, working on top of the standard web technologies of HTML, CSS and JavaScript. With the user interface and experience being influenced by a variety of popular eMR software as well as anecdotal evidence taken within the NSW hospital environment. The idea behind the

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visual design was to create a middle ground between the potential complexity of a full eMR software and a simpler web-based application. This would potentially mitigate overwhelming the user, whilst retaining similarities between the simulated experience and real world eMR software.

SURVEY TOOL

The study surveys were developed based on the available literature,⁵ and components from our previous study as there was not a survey scale or tool that met the full requirements of this study.⁷ The pre-test questionnaire had two sections: A) demographic details (six questions); and B) 5-point likert-scale questions on the student's confidence and level of knowledge in using paper and electronic observation charts, MIMS (Monthly Index of Medical Specialties) and medical records (12 questions) and one open-ended text for any final comments.

The post-test questionnaire had four sections: A) demographic details [six questions]; B) use of AeMR and any EMR training [three closed and two open-ended questions]; C) 5-point Likert scale questions on the student's confidence and level of knowledge in using paper and electronic observation charts, MIMS and medical records [12 questions] and one open-ended question on student's views on the learning paper-based and electronic documentation; and D) 5-point likert scale face and content validity statements for the eObs chart and eMR. This paper will focus on section three: students' confidence, knowledge and views on electronic documentation and AeMR program.

DATA ANALYSIS

Electronic responses were entered directly into SurveyMonkey® by the respondents. Survey data was then imported into SAS v9.4 for statistical analysis (SAS Institute, Cary, North Carolina, USA). Descriptive statistics were created to summarise the demographic information and responses to the pre and post surveys. Any incomplete surveys were not included in the final analysis. Categorical variables were summarised through frequencies and percentages [n (%)]. Numerical variables were summarised through median and interquartile range [Median (Q₁, Q₃)].

After visual verification that population characteristics were similar between the years, 2019-pre and 2021-pre were combined, and 2019-post and 2021-post were combined to achieve a pre and post comparison of self-reported confidence/knowledge in paper and electronic medical record related tasks. Furthermore, responses to the relevant items were dichotomised (Extremely/Very, Somewhat/Not so/Not at all). Differences in the proportions of the responses for the relevant items between the two-time points was examined using the Chi-Squared test. Levels of significance will be reported as $p < 0.05$.

A qualitative thematic approach was used to analyse the

post-test open-ended question. The fundamental or generic qualitative method aims to discover and understand a phenomenon, or the perspectives of people, with themes generated from cumulative counts of like comments.¹⁶ To establish reliability, two of the authors (LM, PI) first read through students' comments and reflected on them using margin notes, highlighting keywords and then counting the number of key findings to generate initial themes to compare so that the analysis was reflexive and interactive. To reach consensus, all authors met to refine and conceptualise the themes.

RESULTS

When combining 2019 and 2021 participants, a total of 105 students participated in the pre-test survey and 80 students in the post-test survey, a response rate of 9.7% in the pre-test and 7.4% in the post-test which is reflective of low response rates surveying students with online questionnaires.¹⁷ As shown in Table 1, participant ages ranged from 21-37 years of age (median 27-28 years), most were female (90% pre-test, and 89% post-test) and undertaking full-time study (88% pre-test, 91% post-test) which is consistent with the nursing student population at the university. It is interesting to note the increased percentage of respondents having an Assistant in Nursing (AIN) qualification from 16% in the pre-test early in the 2nd semester compared to 31% in the post-test which occurred late in the semester.

Only 23% (n=17) of student respondents had received preliminary training in a hospital during clinical placement on eMR and the use of eObs chart (31%, n=23). Over half (64%, n=48) of the student respondents had accessed the AeMR program, with the use ranging from one- twenty times (average four times) during the study timeframe. A total of 27 students had not accessed the AeMR program, of which 25 had not received any training at a hospital during clinical placement.

Comparing the pre and post responses, student respondents significantly increased levels of **confidence** in documenting observations/vital signs in the AeMR program, eObs chart and finding information about medications in the MIMS online (Table 2).

Student respondents significantly increased their **knowledge level** on documenting observations/vital signs in the patient eObs chart and in the patient electronic medical record and finding information about medications in MIMS online (Table 3)

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TABLE 1: DEMOGRAPHIC INFORMATION OF PARTICIPANTS BY SURVEY

Question	Response	2019 Pre (n = 31) n (%)	2021 Pre (n = 74) n (%)	Pre (n = 105) n (%)	2019 Post (n = 44) n (%)	2021 Post (n = 36) n (%)	Post (n = 80) n (%)
What are your qualifications?	AIN	6 (19%)	11 (15%)	17 (16%)	10 (23%)	15 (42%)	25 (31%)
	Enrolled Nurse	1 (3.2%)	3 (4.1%)	4 (3.8%)	0	2 (5.6%)	2 (2.5%)
	Nil	19 (6.1%)	50 (68%)	69 (66%)	24 (55%)	13 (36%)	37 (46%)
	Other non-health related	5 (16%)	10 (14%)	15 (14%)	10 (23%)	6 (17%)	16 (20%)
What is your gender?	Female	28 (90%)	67 (91%)	95 (90%)	38 (88%)	32 (89%)	70 (89%)
	Male	3 (9.7%)	7 (9.5%)	10 (9.5%)	5 (12%)	4 (11%)	9 (11%)
	Missing	0	0	0	1	0	1
Which campus are you attending?	A	17 (55%)	51 (69%)	68 (65%)	27 (61%)	21 (60%)	48 (61%)
	B	12 (39%)	23 (31%)	35 (33%)	17 (39%)	14 (40%)	31 (39%)
	C	2 (6.5%)	0	2 (1.9%)	0	0	0
	Missing	0	0	0	0	1	1
Domestic or International status	Domestic	30 (97%)	69 (93%)	99 (94%)	43 (98%)	35 (97%)	78 (98%)
	International	1 (3.2%)	5 (6.8%)	6 (5.7%)	1 (2.3%)	1 (2.8%)	2 (2.5%)
What is your current student load?	Full-time	29 (94%)	63 (85%)	92 (88%)	41 (88%)	32 (89%)	73 (91%)
	Part-time	2 (6.5%)	11 (15%)	13 (12%)	3 (6.8%)	4 (11%)	7 (8.8%)
What is your age group (years)?	Median (Q1, Q3)	27 (21, 37)	28 (21, 36)	27 (21, 36)	28 (22, 36)	27 (21, 37)	28 (21, 37)

TABLE 2: PRE AND POST-COMPARISON – SELF REPORTED CONFIDENCE IN ELECTRONIC DOCUMENTATION

Question	Response	Pre n (%)	Post n (%)	P-value
How confident are you now documenting observations/vital signs in the patient electronic observation (eObs) chart?	Extremely/Very Confident	16 (15%)	25 (35%)	0.002
	Somewhat/not so/Not at all	88 (85%)	46 (65%)	
	Missing	1	9	
How confident are you now in finding information about medications in MIMs online?	Extremely/Very Confident	22 (21%)	32 (46%)	<0.001
	Somewhat/not so/Not at all	81 (79%)	38 (54%)	
	Missing	2	10	
How confident are you now documenting in the patient electronic medical records (EMR)?	Extremely/Very Confident	7 (6.7%)	18 (25%)	<0.001
	Somewhat/not so/Not at all	97 (93%)	53 (75%)	
	Missing	1	9	

TABLE 3: PRE AND POST TEST COMPARISON ON SELF-REPORTED KNOWLEDGE OF ELECTRONIC DOCUMENTATION

Question	Response	Pre n (%)	Post n (%)	P-value
What is your current knowledge level on documenting observations/vital signs in the patient eObs chart?	Extremely/Very knowledgeable	17 (17%)	24 (34%)	0.013
	Somewhat/not so/Not at all	86 (83%)	47 (66%)	
	Missing			
What is your current knowledge level on finding information about medications in MIMs online?	Extremely/Very knowledgeable	16 (16%)	32 (45%)	<0.001
	Somewhat/not so/Not at all	87 (84%)	39 (55%)	
	Missing	2	9	
What is your current knowledge level on documenting in the patient electronic medical records	Extremely/Very knowledgeable	7 (6.8%)	15 (21%)	0.005
	Somewhat/not so/Not at all	96 (93%)	56 (79%)	
	Missing	2	9	

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THEMES

The final open-ended question asked participants to provide comments on learning to use paper-based and electronic documentation. A total of 21 participants provided comments and were positive when reflecting on their preparation for documentation (n=14, 2019; n=7 2021). Three themes emerged from the data: preparation for practice, more exposure increases confidence, and we can't forget the patient.

1. Preparation for practice

Some students appreciated that they have been exposed to both paper and electronic versions of documentation and related this directly to being workplace ready due to this being very relevant to our industry (Student A). As one student commented the dual exposure was important

“as you will likely encounter both forms of documenting in your nursing career and that being flexible and being able to work with either paper based or electronic based systems is an invaluable skill” (Student B).

Ultimately with a preference for electronic records, another student suggested

“that it is useful to learn paper-based documentation for familiarisation of content but in reality, electronic documentation is more appropriate for being prepared for placement and career” (Student F).

2. More exposure increases confidence

Several students recommended an increase in use and thus exposure to the electronic medical records program in their university courses. There was a suggestion to provide ongoing access to the eMR program

“throughout every tutorial... using only here and there, you can forget how to use or where to find information on eMR” (Student D).

Furthering this another suggestion that if eMR was embedded into the simulated learning environment, this would be a way to “bridging the gap to build confidence” (Student G). Ultimately, Student C stated that because the eMR program “closely reflects what I used on my clinical placement in the hospital system... I was more confident.”

3. We can't forget the patient

It was recognised that healthcare services are “moving towards a paperless society and that using eMR would also be beneficial for the environment and long-term costs” (Student H). Another student however raised a potential drawback of the electronic system when used at the bedside

“A lot of the time the nurse is talking to the patient but appears to show no interest or genuine care because they are typing along at the same time and never really looking at the patient” (Student I).

In light of this potential drawback, there was a request for education that would address this

“huge communication barrier and learning how to operate it and be mindful of the nurse-patient relationship would be so incredibly beneficial” (Student I).

DISCUSSION

This is the first study undertaken using an AeMR program specifically designed for Australian nursing students. There was an increase in confidence and knowledge when accessing eObs and eMR and online MIMS across all student age groups. This is a plausible if not predictable finding – with access comes increased self-efficacy. Despite this improvement though, the overall confidence and knowledge levels across all age groups were still perceived as lacking. Whilst clinical placement provides an opportunity to utilise technology, there is a lack of assurance that student users can operate the digital platform adequately. Such that, their reported diminished confidence levels and knowledge about the digital health system may suggest they are not job ready. This aligns with conclusions in the international literature suggesting a need to improve the readiness to practice for new nursing graduates.¹⁸

A clear finding from this research is a large percentage of students had not received preliminary training during hospital clinical placement on eMR and eObs charts. This lack of education is confounded by the fact that nearly a quarter of participants (24%) had not received any hospital training, not accessed and used the AeMR program. Undergraduate nurse education is committed to educate nurses who can confidently and accurately utilise digital health systems to provide evidence-based, safe, person-centred, quality care.¹⁹ It has been identified in international literature that nursing students require time to process and assimilate all that is learnt so they can exercise judgement and clinical reasoning when undertaking clinical experiences/placements.⁵ As eMR is used in many hospitals it is imperative that health professionals, such as nurses, that are using the program need to receive education.

The question is who should provide this education? Whilst the university has the initial responsibility for preparation of student nurses there should be a shared responsibility across the tertiary education system and the healthcare sector in conjunction with professional bodies.²⁰ Healthcare organisations use specific eMR programs and healthcare staff require training/education to familiarise themselves in these programs, so it would be beneficial to the organisations to provide education/training to nursing students who will be expected to be proficient in using the eMR program. However, students upon registration may choose to travel and work in different regions and states with different health organisations and different eMR programs. For this

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reason, international studies have recommended that each university have an AeMR program for undergraduate nursing students to practice in accessing and entering data, using meaningful real-life scenarios scaffolded over the three-year program in a safe simulated environment.^{7,21,22}

The study findings revealed student's level of concern about developing a relationship with a patient whilst using a computer at the bedside. The international literature has identified that electronic documentation at the bedside can be a barrier for nurses in providing person-centred care, building positive nurse-patient relationships,²³⁻²⁵ and effective patient communication.²⁶ Some considerations proposed by nurses include being aware to balance technology, touch and caring; and recognising the triad relationship between nurse, patient and computer,²⁴ but more research is needed to develop effective strategies and focused education.

LIMITATIONS

A recognised limitation is the small number of first-year students who completed the surveys. Other studies have also shown low responses when recruiting students to online surveys.¹⁷ However, respondents' demographics are reflective of students age and gender undertaking nursing undergraduate programs and participating in an online survey.²⁷ The combined data provides insight into the importance of introducing eMR education in undergraduate nursing curriculum.

CONCLUSION AND IMPLICATIONS FOR RESEARCH, POLICY AND PRACTICE

As nursing clinical practice shifts to electronic record keeping worldwide, this study showcases the urgent need to integrate education on eMR in undergraduate nursing curriculum, supplemented with training by healthcare organisations during clinical placements. Further development and incorporation of eMR in all case-based and practice scenarios in the university simulation environment is a key recommendation as it is now considered the norm in clinical practice. Thus, students will be work-ready to enter the workforce as more confident and skilled in E-documentation.

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