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Student nurses digital literacy levels: Lessons for curricula

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Abstract

The rapid uptake of technology is changing the way health professionals provide care to patients and communities. While this presents opportunities to improve, enhance and positively transform care and treatment, graduates must have the requisite knowledge, skills and attitudes to make effective use of the technology and data available to them. This research explored nursing students' self-reported digital literacy levels. We undertook a student survey at one university in Australia, utilising the validated Self-Assessment Nursing Informatics Competencies Scale - SF30 instrument. Overall, 90% of students rated their basic computer knowledge and skills as at least "competent" including performing basic trouble shooting, using the internet and conducting online literature searches. However, only 55% of students considered their overall applied computer skills as at least "competent", which included using applications for diagnostic coding and to extract data from clinical datasets. Students have digital literacy in everyday settings however their ability to translate this into the practice is limited, restricting their access to and use of digital tools in the workplace. Our findings provide the opportunity to address practice issues related to digital literacy and to embed appropriate content in curricula to enable the delivery of improved patient care and the appropriate use of data in various settings.

Key Words

Digital literacy; students, nursing; curriculum; attitudes; computers; nursing informatics

Introduction

Increasingly our everyday life and interactions are enhanced by technology. The healthcare environment is a beneficiary of technological advances that are designed to improve safety and increase the quality of patient care. However to effectively use technology in the clinical environment a level of digital literacy is required. Digital literacy (DL) is defined as “competence on the use of digital technology for searching, organizing, understanding, and creating information with digital devices”[1]. Digitally literate nurses are better able to use their skills in a variety of ways in their workplace. The electronic medical record (EMRs) or elements of EMRs, such as electronic charts, are examples of digital technology that are increasingly being used at the bedside and are associated with increases in the quality of patient care[2-5]. Utilisation of technology in this way improves communication between nurses and patients and between health professionals themselves[2,4,6,7] , decreases clinical errors (e.g medication errors)[2] and staff workload[2,6] while improving nurses’ time management[2]. Nurses also have real time access to evidence based information at the point of care to guide their decision making through the utilisation of policies[6,8] and published research[3] and can rapidly share this information with their colleagues[6,9].

To effectively use the technology available at the bedside nurses require a degree of digital literacy, which can be gained through education, continuing professional development and onsite technical support[10-13]. Evidence has shown that nurses with digital literacy skills are more likely to embrace and use technology at the bedside [14-16]. Therefore it is important that pre-registration education for student nurses incorporates and scaffolds theoretical content as well as opportunities for practical application of digital literacy capabilities.

While professional associations and organisations such as the Australian Nursing and Midwifery Federation[17] and the Nursing Informatics Australia[18] recognise the need for preregistration and continuing education, the adoption of relevant content into curricula has been slow and piecemeal. This is in part because there is a lack of direction from accrediting bodies despite a requirement for this content in curricula [19,20].

In this paper we focus on reporting the current digital literacy of students in The Master of Nursing Practice program, an entry to practice nursing degree at a university in Perth, Western Australia. These results form part of a larger study that aims to improve digital literacy in nursing students as an enabler to delivering safe, high quality care. The integration and synthesis of the complete data sets, comprising the results presented in this paper, along with qualitative data from students and industry partners, will ultimately lead to the development of a framework to embed digital literacy across the curriculum.

Methods

Design

This observational study used a descriptive, cross sectional design. A self-report survey was used to explore nursing students perceived digital literacy levels.

Survey Instrument

The survey utilised the Self-Assessment Nursing Informatics Competencies Scale - SF30 (SANICS) instrument, a five-factor, 30-item, self-report instrument for measuring informatics competency among nurses. This scale has undergone extensive psychometric analysis to explore factor structure, internal consistency reliability and responsiveness over time[21]. Additional and more recent refinement of the scale has further increased its reliability[22]. The five factors measured by the scale

are clinical informatics role, basic computer knowledge and skills, applied computing skills, clinical informatics attitudes and wireless device skills. The survey asks respondents to indicate their current level of competency on a 5-point Likert scale (1=Not competent, 2=Somewhat competent, 3= Competent, 4=Proficient, 5=Expert).

Data Collection

Purposive sampling was used to gather data from nursing students currently enrolled in the Master of Nursing Practice at Curtin University. The paper survey was distributed during class time to students in the commencing cohort, students mid-way through the degree and students in the graduating cohort completed. Data were collected from May to August 2018.

Ethical Considerations

The study was approved by the Curtin University Human Research Ethics Committee (HRE2018_0240). Students were provided with a participant information statement and informed their participation was voluntary[23]. Student consent to participate in the study was indicated through return of the competed questionnaire.

Data Analysis

Data were analysed using the SPSS Version 25.0 software[24]. Student responses were grouped according to the five factors presented in the SANICS instrument. Responses that were missing or doubled, were treated as missing for the purposes of analysis. Survey responses are summarised using descriptive statistics such as frequencies, percentages, means and 95% confidence intervals for the mean. Aggregated mean scores were calculated from the mean score of each variable within the subset. Associations in the data have been described by comparing mean competency scores and by comparing proportions between age, course progress and electronic medical record use and the survey results. Because of the small

sample size and small numbers of students in each sub group, further statistical analyses were not considered appropriate.

Results

Survey Respondents

There were eighty-four survey respondents from a total of ninety-six enrolled students, a response rate of 87.5%. The demographic information for students who did not complete a survey are not available. As shown in Table 1, respondents were represented by commencing, (39.3%), mid-way (32.1%) and graduating cohorts (28.6%). Most survey respondents were female (89.3%) aged 20-45 (98.8%). Over half (65.5%) of the respondents had used an electronic medical record on practicum placement and almost half (46.4%) had used an electronic medical record in paid employment.

SANICS subscale and item scores

Basic Computer Knowledge and Skills

The aggregated mean score for basic computer knowledge and skills competency was 3.98 which suggests overall competency in basic computer skills. As shown in Table 2, each item in the subscale ranged from competent ($\overline{x}$3.46) to proficient ($\overline{x}$4.43) on the five-point scale. Ninety percent of students rated their basic computer knowledge and skills to be at least competent, with almost all students (97.6%) able to use the internet to locate and download items of interest with competency. Being at least proficient in basic computer knowledge and skills was reported by two thirds of the students. Across the 15 items surveyed, there was an average proportion of 2.3% of students who felt they were not competent in their basic computer skills and knowledge, where the highest proportion, 9.5% of students, felt they were not

competent in using a database management program to develop a simple database or table.

Wireless Device Skills

The aggregated mean score for wireless device skills was 3.90. Most students n= 81 (90.6%) rated their ability to use a wireless device to locate and download resources, and enter data, as at least competent.

Clinical informatics role

The aggregated mean score for student responses to the clinical informatics role was 2.81. As shown in Table 3, the mean student competency scores for each variable of the clinical informatics role ranged from somewhat competent ($\overline{x}$2.43), in participating in the design, implementation and evaluation of systems as a nurse, to competent ($\overline{x}$3.24) in seeking available resources to help formulate ethical decisions in computing. Over half of students (58.3%) rated themselves as at least competent with the clinical informatics role, however this proportion reduced to 30% for students who rated as at least proficient. An average of 13.5% of students rated themselves as not competent in the clinical informatics role, while 23% indicated they were not competent participating in the selection process, design, implementation and evaluation of systems as a nurse.

Applied computer skills: Clinical informatics

The aggregated mean score for applied computer skills was 2.69 indicating students are less than competent with applied clinical informatics computer skills overall. As shown in Table 4, student competency scores for each item in the subscale were less than 3.0 ($\overline{x}$2.61 -2.79) indicating students report being less than competent with accessing shared datasets, extracting data from clinical datasets, and using applications for diagnostic coding and to develop testing materials. Only 55% of

students considered their general applied computer skills to be at least competent. Overall, 27.7% of students rated their applied computer skills as at least proficient and 21% of students rated themselves as not competent.

Clinical informatics attitudes

The aggregated mean score for clinical informatics attitudes was 3.8. As shown in Table 5, student competency scores for each item of clinical informatics attitudes subscale rated as competent ($\bar{x}$3.92-3.61). Most students (91%) felt at least competent with recognising the importance of clinical informatics in nursing. Only 4.2% of students felt they were not competent in their clinical informatics attitudes.

Electronic medical record use

The mean competency scores (range 0 – 5) for students who had used an electronic medical record during their practicum placement was consistently higher than the mean competency scores of students who had not, on all survey items, except for the basic computer skill of word processing. However, the difference in these scores was negligible (0.06). The greatest increase in competency score (0.80) was demonstrated in the basic computer skill of using a database management program to develop a simple database or table, although there was minimal increase in the other basic computing skills (0.01 – 0.56). Moderate increases were demonstrated in the clinical informatics role (0.42 - 0.69), clinical informatics attitudes (0.26 – 0.50) and wireless device skills (0.43 – 0.50).

The mean competency scores (range 0 – 5) for students who had used an electronic medical record in paid employment were consistently higher than the mean competency scores for those students who had not, on all survey items except for the basic computer skill of operating systems use, however the difference in these scores was negligible (0.01). The greatest increases in mean occurred within the

clinical informatics role, (0.37 – 0.80) and applied computer skills (0.24 – 0.88). Basic computer skills demonstrated a minimal increase (0.07 – 0.51), as did clinical informatics attitudes (0.08 - 0.21) and wireless device skills (0.020 -0.150).

Across both electronic medical record (EMR) use on practicum placement and in paid employment, there is a trend of higher proportions of students having lower competency scores when they had not used an EMR, and higher proportions of students having higher competency scores when they had used an EMR. This trend was consistent across the clinical informatics role, applied computing skills and clinical informatics attitudes.

Age and Survey Results

The 20-25 age group had higher mean competency scores ($\bar{x}$2.77-4.92) for over half (n=19) of the survey items which were pooled in the basic computing skills, clinical informatics attitudes and wireless device skills subscales. The 26-35 age group had lowest mean competency scores ($\bar{x}$3.18 - 4.32) for the majority of the basic computing skills items (13 of 15 items). Students who rated themselves as not competent in the clinical informatics role, applied computing skills and clinical informatics attitudes were more likely to be from the 36-45 age group. Students who were more likely to perceive themselves as experts in applied computing skills and clinical informatics attitudes, were consistently found in the 20-25 age group. This group was also more likely to self-rate as expert in the clinical informatics role.

Course Progress and Survey Results

The mean competency scores for students in the graduating cohort were consistently higher ($\bar{x}$3.13 -4.75) than the mean scores of students in the commencing ($\bar{x}$2.21 – 3.94) and mid-way ($\bar{x}$2.15-3.96) cohorts across all survey

items. The starting and mid-way cohorts experienced similar rates of lowest mean competency scores in the survey, with 16 and 14 items respectively.

There was a trend of increasing competence with progression through the course, with the completing cohort, on average, more likely to rate themselves as proficient in the clinical informatics role (40.8%), compared to the starting (17.9%) and midway (15.7%) cohorts. The mid-way cohort were on average, more likely to rate themselves as not competent in their applied computing skills (31.5%). Starting cohort students were the only cohort to rate themselves as not competent in their clinical informatics attitudes (10.7%). The completing cohort had the highest proportions of students who perceived themselves as experts in the clinical informatics role (10%), applied computing skills (11.5%) and clinical informatics attitudes (47.5%).

Discussion

The aim of this research was to understand current digital literacy levels of students enrolled in a pre-registration graduate entry masters nursing program to inform the development of content in the curriculum. Our results indicate that students report high levels of basic, everyday digital literacy however, when it comes to translating this to clinical context competence falls. Despite this, students recognise the importance of digital literacy in the clinical practice setting. In addition, results showed that younger students, those further through their course and those with exposure to the EMRs on practicum placements or in paid employment report higher competency scores.

Students reported competence in basic computer skills including using wireless devices. This is not surprising given the prevalence of mobile devices and the normalisation of internet usage in the wider community[25]. This finding is consistent

with the findings of Hwang and Park, who also reported that informatics competency is positively associated with basic computer skill[14]. We found though, that this proficiency is not necessarily transferable to the clinical environment, with students reporting a decrease in competence when applying basic computer skills to their health care work places or practical experiences. Despite this, respondents clearly indicated a positive attitude towards the use of technologies in health care and the need for digital literacy as an enabler to maximising the use of technology at the bedside, a finding in keeping with previous research in the area[3,5,10,14,15]. Our results highlight the opportunity for curriculum developers to address the digital skills gap among nursing students by embedding digital literacy content in nursing curricula. Importantly, students also need to be supported to transfer these skills to the workplace. Similar findings have also been reported elsewhere, with other university graduates[26].

While almost all students in our study indicated competence in everyday, basic computer use, there were specific demographic profiles associated with a more positive transition of this competence to the workplace. We found that younger students were more likely to report higher competence in the basics and applied informatics knowledge and skills. This is a widely described phenomenon, reported around the world[2,14,16,27,28] and has been linked to the fact that most students under the age of 25 are digital natives[29]. Similarly our results indicated that students who had been exposed to an electronic medical record system while on a clinical placement or in paid employment, also reported higher competence in applying basic computer skills to the workplace as well as a more positive attitude to technology use at the bedside. Student access to electronic medical records while on practicum placement is often limited, due to the logistics of assigning student access to the

system. As a result, developing competence through exposure, is not reported in the literature. However, hands on experience in paid employment has been reported to be positively correlated to the development of competence[2,14,27,28]. Although there is no concrete direction regarding nursing informatics content or digital literacy development in pre-registration degrees in Australia, we were pleased to find that competence increased as students progressed through our degree. This may be as a result of the extent to which students are required to use online and flipped approaches to their learning, as well as their exposure to nursing informatics while undertaking clinical placements. This finding supports others who have reported the importance of formal qualifications (generally and in ICT) as a factor associated with proficiency and competence in basic and applied technology use[2,14,27,28].

Limitations

The participants in this study were enrolled in a graduate entry masters program, a degree that provides an opportunity for students with an undergraduate in any discipline to complete the requirements for registration as a nurse. As such there is likely to have been a wide variation in their previous study, work and life experience using information technology prior to commencing their degree that limits the generalisability of the results. We recommend that data of this nature is collected with the existing demographic data and SANICS responses.

Recommendations

As part of a larger study, this research into student informatics competence aims to identify barriers, and propose a framework to embed digital literacy in a structured way across the curriculum. With this in mind we recommend that content specific to nursing informatics and the development of digital literacy are embedded in curricula and mapped horizontally and vertically. In our context, this forms the next stage of

the research project and we intend to complete this in time for the reaccreditation application. Strategies to assist in the meaningful inclusion of this content may include ensuring students are using and developing their everyday basic skills as they progress through their pre-registration education. We recommend the use of peer teaching, where younger students assist older students, and where students who are in later stages of their studies assist those lacking in confidence. Similarly, students who have pre-existing knowledge and skills in using information technology at the bedside should be identified early in the degree and can act as mentors for other students. In this way there is active engagement of all students, regardless of their previous experience. Practicum placement coordinators should actively target a broad range of clinical placement sites that are using different technologies at the bedside and replicate this in clinical laboratories and simulation. The involvement of nurse informatics specialists in the pre-registration education of students will provide expertise as well as role models for students.

Conclusion

Students currently undertaking pre-registration nursing degrees will be required to use technology at the bedside during their career. While this may occur immediately for some graduates and be later for others, it will happen. It is imperative that curricula are developed and implemented so that students pre-existing and everyday digital literacy can be further developed, enhanced and transposed to the bedside. The results from this study have illustrated how students can help us to understand how we can scaffold learning opportunities horizontally and vertically into the curriculum to enable the delivery of safe, high quality patient care.

Table 1

Respondent Demographics

Table 2

Basic Computer Knowledge and Skills

Table 3

Clinical Informatics Role

Table 4

Applied Computer Skills: Clinical Informatics

Table 5

Clinical Informatics Attitudes

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