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Digital Health in Canadian Schools of Nursing Part A: Nurse Educators' Perspectives

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Digital Health in Canadian Schools of Nursing Part A: Nurse Educators' Perspectives

Cover Page Footnote

On behalf of the Canadian nursing community, we would like to express our thanks and appreciation for the funding and support provided by Canada Health Infoway in completing this study. In addition, the support received from the Canadian Association of Schools of Nursing (CASN) was invaluable in the dissemination of surveys, qualitative data collection and translation of both surveys and this final report. We would also like to thank all the nursing informatics experts, educators and researchers who provided input and review of the study proposal and survey designs. Finally, a special note of appreciation to participants, your obvious commitment to preparing future nurses for practice is truly inspirational.

Background

While much progress has been achieved in advancing nursing informatics capacity in Canada, more work is needed to keep pace with the 21st century technological revolution. Nursing education programs and nurse educators are at the forefront of this change, and are key to ensuring successful integration of digital health technologies in future nursing practice.

According to Nagle (2016):

> "the time has come to stridently move past the misconception of nursing informatics as: *nurses using computers*… to an age of "clinical intelligence" (Harrington, 2011); one in which the tools are merely facilitative and practice informs the evidence. Getting there will require some work by our leadership including the development of informatics savvy nurse leaders and educators and the integration of informatics entry-to-practice competencies into undergraduate nursing education" (p. 3).

Over the last 2 decades, nurse educators in many countries have led initiatives focused on identifying needed informatics competencies and approaches for integrating related learning into undergraduate nursing education. The continuation of these efforts remains an imperative for the profession as digitally enabled health care environments, physical and virtual, are now commonplace throughout the world.

Nursing informatics refers to the "science and practice [that] integrates nursing, its information and knowledge, with the management of information and communication technologies to promote the health of the people, families, and communities worldwide (International Medical Informatics Association, 2009, para 2). On the other hand, digital health, a term more commonly used in Canada, refers to "the use of information technology/electronic communication tools, services, and processes to deliver health care services or to facilitate better health" (Canada Health Infoway, n.d).

In 2003, a Canadian study found that less than 30% of schools of nursing reported having digital health content integrated into their basic entry to practice programs, either theoretical or applied (Nagle & Clarke, 2004). Additionally, a limited number of nurse educators reported having the requisite knowledge, skills, and confidence to address students' learning needs associated with digital health. Moreover, there were no defined core nursing informatics competencies to guide Canadian educators and nursing programs with informatics integration efforts (Nagle & Clarke, 2004). The findings from this study were not surprising given the timing and context; the use of digital health technology in clinical practice settings was limited in Canada at that time.

In 2011, with the support of the Canadian Association of Schools of Nursing (CASN) and funding from Canada Health Infoway (Infoway), the development of digital health/informatics competencies for entry-level registered nurses was initiated. This work was undertaken to address a number of known challenges impacting nursing informatics education in Canada including: 1) the limited integration of informatics content in existing nursing curricula, 2) the need for entry-to-practice indicators reflecting skills and knowledge needed to work in technologically enabled practice environments, 3) the lack of shared understanding and consensus among educators on required informatics competencies for entry-level practice, and 4) the need to better prepare registered nurses to safely practice in technology rich environments (Nagle & Clarke, 2004). This work was completed in 2012 with the CASN publication of national, consensus-based entry to practice informatics competencies for registered nurses (CASN, 2012). Additional details of the

competency development activities have been described elsewhere (Nagle et al, 2014). Recognizing the operationalization of these competencies might present a challenge for nurse educators, a Nursing Informatics Teaching Toolkit was also developed to support the integration of entry-to-practice informatics competencies into nursing curricula across Canada (CASN, 2013).

Efforts to disseminate and integrate the digital health / informatics competencies into the undergraduate curricula of Canadian schools of nursing are ongoing. An initiative launched in the winter of 2015 included a mentorship and networking program whereby designated digital health faculty peer leaders supported colleagues' digital health knowledge and skill development from coast to coast (CASN, 2015). This Digital Health Faculty Peer Network was designed to engage nurse educators in learning activities to develop their capacity to integrate informatics content into undergraduate nursing curricula. This network supported approximately 90 nursing faculty from 49 schools across the country. Within their local regions, peer leaders engaged in a wide variety of activities with their colleagues including: workshops, seminars, faculty meetings, webinars and the provision of more than 130 hours of mentoring. Peer leaders also developed resources intended to support integration such as whiteboard animations on the use of social media in practice and the value of clinical data standards; these and others are available on the CASN YouTube Channel. Peer leaders also developed a reference document specifically focused on strategies for the inclusion of content related to Consumer Health Solutions into nursing curricula (CASN, 2016).

In 2019, CASN launched an online Digital Health eResource for use by nurse educators and student nurses alike (CASN, 2019). Comprised of five modules, the eResource builds upon the previously developed CASN resources, is aligned with the entry-to-practice informatics competencies, and also provides content related to ePrescribing. These online modules are designed to support faculty and student learning but may also be used to support classroom discussions, student assignments or independent study.[*]

The digital health knowledge of nurse educators and the extent of content integration into undergraduate nursing education in Canada remains poorly understood. But there is some evidence to suggest that nurse educators have yet to respond to a call to reframe nursing competence relative to digital health advances in practice settings. A 2017 national survey of Canadian nurses (Canada Health Infoway, 2017) found a minority of respondents were familiar with the CASN entry-to-practice informatics competencies for registered nurses and the Faculty Informatics Teaching Toolkit. Survey findings indicated a lack of understanding about the importance of common terminologies and data standards (e.g., ICNP and C-HOBIC). Findings also suggested ongoing difficulties in offering student nurses opportunities to develop basic entry-level informatics competencies. Current or planned use of the entry-to-practice digital health / informatics competencies in curricula was reported as largely unknown (Canada Health Infoway, 2017). These findings require additional exploration as this survey was primarily directed to nurses in clinical practice settings with only 10% of the respondents representing nurse educators, but it is unknown how many were based in academic settings.

In 2018, the authors conducted a mixed methods study to understand the current state of digital health and informatics content integration in nursing curricula from the perspectives of nurse administrators and nurse educators within Canadian Schools of Nursing. In this paper (Part A), the study approach and the findings relative to the nurse educator respondents are presented.

[*] Note: All of these CASN sponsored initiatives have been made possible with the support of Canada Health Infoway

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Specifically, this component of the research aimed to: (1) describe the current state of Canadian nurse educator integration of digital health in nursing education and the current state of digital health content integration into nursing curricula, (2) understand nurse educators' knowledge, experiences and needs in promoting/enhancing their development of digital health capacity now and in the future, (3) identify teaching and learning exemplars of digital health integration in nursing curricula, and (4) identify recommendations for advancing development of informatics and digital health in nursing education. For the purposes of this study, the terms "informatics" and "digital health" were used together to denote the knowledge and skills associated with the understanding and use of *clinical* information and communication technologies in nursing education and practice. Tools used to support course delivery such as learning management systems were not a focus in this study. Findings relative to nurse administrators will be reported in a future publication (Part B).

Methods

Sample, Data Collection, & Study Procedures

Ethics approval was received from the University of Alberta, Research Ethics Board. A mixed method approach [Quan + qual] was used in which quantitative survey design was applied and qualitative data were concurrently collected through one-on-one telephone interviews and the conduct of a focus group (Driessnack et al., 2007). Methodological triangulation enabled the collection of rich data to inform our understanding of the current state of informatics curricular integration and related factors; below each component is described in detail.

(1) Survey: An anonymous survey comprised of 43 questions was used to generate data on the following: 1) demographic characteristics, 2) self-reported use of the CASN resources; 3) self-reported informatics/digital health knowledge; 4) current informatics/digital health teaching and curricular integration; 5) self-reported confidence in requisite ability to teach basic digital health/informatics content; 6) perceived administrative leadership support for continuing education in informatics/digital health; 7) perceived value of informatics/digital health curricular integration; and 8) suggestions of future strategies to increase educator capacity and curricular integration within schools of nursing. The majority of survey questions were quantitative; however, in some circumstances respondents were asked to provide additional information. For example, if participants answered yes to a question about participation in continuing education, they were asked to describe these digital health learning experiences.

A panel of 10 digital health experts (researchers and educators) was asked to test the survey face validity with regard to readability, clarity, comprehensiveness, and length. Feedback received from experts included minor editorial suggestions to enhance the clarity of the survey questions and the order in which the questions were presented. These suggestions were collated and incorporated into the survey before hosting it electronically using the Lime Survey™ platform provided by Canada Health Infoway. CASN assumed responsibility for disseminating the survey through an email invitation that included embedded links to both French and English versions of the survey. Completed surveys were stored on a secure server with access limited to Infoway support staff who provided periodic data downloads to the research team to monitor response rates and support ongoing data analysis.

Based on a population of 13,894 educators, at a confidence level of 95% and a margin of error of 5% it was determined that a total of 374 respondents would be a representative sample. Using a combination of convenience and snowball sampling approaches, an existing CASN

educator database (n=2925) was used to invite individual nurse educators working in permanent full-time and contract full-time and part-time positions in Canadian schools of nursing to participate in the study. In order to encourage participation more broadly, Canadian nurse educators were encouraged to share survey links with their colleagues and members of the research team also circulated the survey links to their networks of nurse educators within Canada. Survey data collection occurred between June-October 2018, with periodic reminders sent by CASN to achieve the desired sample size. Consent was implied upon completion and submission of the survey. At the end of the survey, we extended another invitation to respondents to participate in a one-on-one telephone interview, a focus group or both, and provide their contact information accordingly. Completed surveys were anonymous with responses stored on a secure server with access limited to Infoway staff. The research team was provided with weekly updates on the number of survey respondents, the names and contact information of those interested in an interview opportunity, and data file downloads in support of ongoing data analysis.

(2) Focus Group Interview: Further to the launch of the online survey, two focus groups (French and English) were scheduled in conjunction with the May 29-30, 2018 CASN Educator conference in Montreal. The focus group interviews were designed to gain in-depth insights to the current state and provide recommendations for the future development of nurse educators' capacity for integrating digital health into nursing curricula. Sample questions included: "Could you describe informatics/digital health integration in your undergraduate nursing program(s)? What would you recommend to advance the development of digital health/informatics in undergraduate nursing education?" Only one focus group was held in English due to a lack of French participants. Participants provided consent for participation in the focus group. The focus group was facilitated by an educator with extensive informatics experience, supported by a note taker from CASN, and the discussion was recorded for subsequent transcription. Questions guiding the discussion were primarily focused on 1) identifying exemplars of digital health curricular integration and 2) identifying strategies and approaches to support nurse educators to develop their digital health knowledge and skills and curricular integration of digital health theory and practice.

(3) One-on-One Telephone Interviews: The purpose of the telephone interviews was to further describe factors (i.e., barriers and facilitators) that influence digital health content integration within nursing school curricula and those that support the development of educator capacity and confidence in the delivery of same. Two members of the research team conducted the interviews using a secured telephone line provided by CASN. Sample interview questions included: "What factors influence integration/utilization of informatics and digital health in your teaching, curriculum, or program? What resources and supports are needed to help you integrate digital health and informatics in your teaching practices/curriculum? Interviews lasted between 25-30 minutes and included participants from across Canada. Transcriptions were used for the purposes of analysis with no individual attribution of participants' comments. Interviews were offered in both English and French languages, but all were completed in English. Interviewees provided consent prior to participating in these interviews.

Data Analysis

Descriptive statistical analysis of quantitative survey data (i.e., counts/percentages) was completed using SPSS V. 25.0. Qualitative survey responses were summarized and examined, assisting researchers to understand quantitative responses and furthering insights. This analysis supported the refinement of questions posed during one-on-one interviews. Data from telephone interviews and the one focus group were transcribed and analyzed by two independent researchers

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capturing themes across cases. Using a thematic analysis approach, researchers identified common perceptions of educators within the realm of digital health integration. Overall, there was clear alignment between the qualitative and quantitative findings.

Results

Response rate was lower than the projected sample size of 374 individuals. Survey respondents (n=360) were mainly from the Western region (40%), followed by the Eastern region (32%), Atlantic region (15%), and Quebec region (8%). The other (5%) category included those from northern jurisdictions (e.g., Nunavut). Sixty-six percent reported having more than 21 years of nursing experience and 57% reported having more than 11 years of teaching experience (See Table 1 for further details about the respondents' positions and educational preparation). A majority reported being in a professorial position with a degree at the master's level. Only 8.6% reported membership in a provincial nursing informatics group in Canada, yet 32% indicated their interest in joining a national or provincial informatics group. Twenty-four percent indicated membership in a team/committee planning for the integration of informatics/digital health into the curriculum.

Table 1

Educators' Positions and Educational Preparation (n=360)

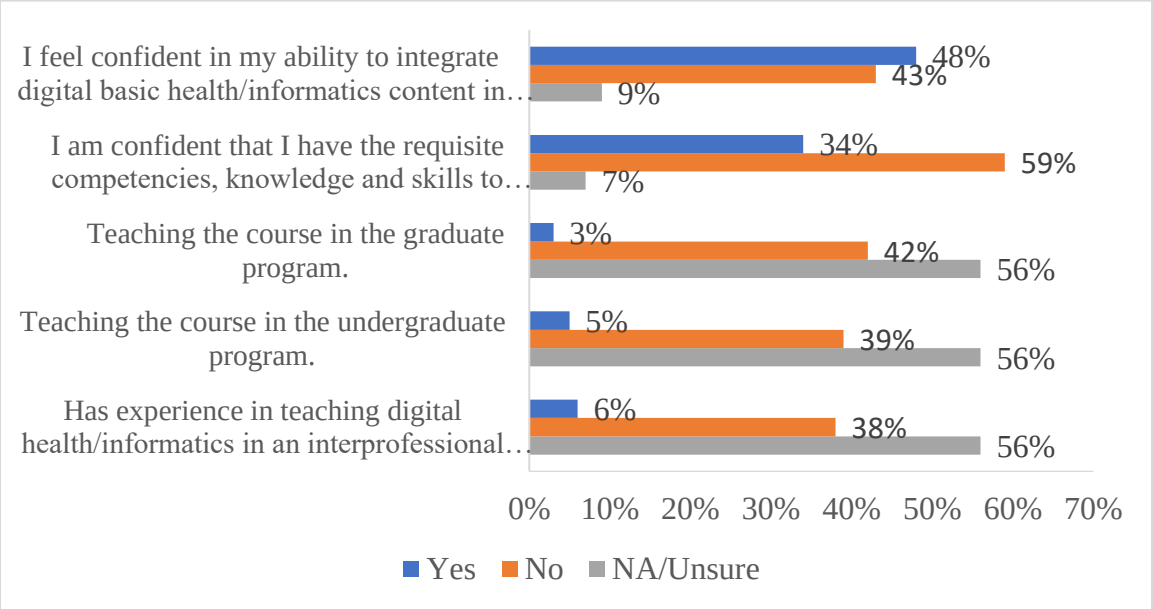
Characteristics		Count	Percent
Educator Position	Professor	69	19.4
	Associate Professor	49	13.8
	Assistant Professor	53	14.9
	Lecturer	31	8.7
	Full-Time Instructor	68	19.2
	Full-Time Term Instructor	10	2.8
	Other	75	21.1
Highest Completed Degree	Baccalaureate in Nursing	95	26.4
	Masters in Nursing	167	46.4
	Masters in other	52	14.4
	Doctorate in Nursing	68	18.9
	Doctorate in other	53	14.7

Informatics/Digital Health Teaching & Self-reported Perception of Confidence

A majority (79%) reported that they teach in the classroom, 54% in clinical, 37% in the simulation lab and 30% online at the undergraduate level. While only 4.7% reported currently teaching a digital health/informatics course in the undergraduate program, 44% reported teaching aspects of same within another course and 17% reported inviting a guest lecturer to provide related content in their course(s). A small number (n=20) identified as someone who helps colleagues by guest lecturing on topics of digital health/informatics. Less than 20% of educators reported using a simulated electronic health record in conjunction with the teaching of clinical skills in a simulation laboratory. Educator comments indicate some schools use a hospital vendor solution for this purpose while others are using a locally developed solution. Self-ratings of competency in digital health/informatics were mostly at the beginner level (54%). Despite involvement in digital health teaching, self-reported confidence in teaching this content is relatively low (Figure 1).

Figure 1

Perceptions of Confidence to Teach Digital Health Content



Continuing Education in Digital Health/Informatics/Involvement in Research

With regard to continuing education, twenty percent (n=71) reported having completed an education program and/or course work in digital health/nursing or health informatics while only 5 people reported having specialty education or certification (e.g., Certified Professional in Health Information & Management Systems) in the field. Thirty-six percent indicated they had participated in continuing education workshops or programs in digital health/informatics including the CASN Digital Faculty Peer Network offerings of seminars and workshops. If made available in their region, 52% indicated they would participate in informatics learning opportunities. Forty percent indicated their administrative leadership provided support for continuing education (e.g., workshops) in digital health/informatics. Only 12% of respondents indicated they are currently involved in research related to digital health/informatics; (Table 2) identifies those areas of research.

Table 2

Faculty Involvement in Research Related to Digital Health/Informatics

- Impact of mobile technology (students' critical reasoning, teaching and learning);
- Electronic Health Record (EHR) adoption and use;
- Electronic charting;
- National nursing data standards
- Impact of digital health environments (clinical reasoning);
- Data science and big data;
- Online consumer health tools;
- Health information appraisal (social media);
- Interprofessional education using simulation technologies;
- Gamification (medication administration competency development, anatomy);
- Patient empowerment;
- Remote service delivery;
- Workforce preparedness;
- E-Professionalism;
- Smartphone apps (use in practice, cardiac pain in women);
- Augmented reality with academic EHR; and
- Technology supporting patient education.

Use of CASN Resources

Only 31% (moderately to extensively) of the respondents indicated the CASN entry-to-practice competencies are used to support student learning in their program while the Faculty Teaching Toolkit was identified as having moderate to extensive use by 21% of educators. The Consumer Health Solution resource and white board animations on social media and clinical data standards were reported to have minimal to no use by the majority of participants. (Table 3 and Table 4 provide additional details on educators' use of the CASN resources and current teaching towards informatics competency indicators.

Table 3

Educators' Use of CASN Resources (n=360)

	Not at all	Minimal	Moderate	Extensive	Unknown
Entry-to-practice informatics competencies	28%	33%	19%	12%	8%
Faculty Teaching Toolkit	48%	26%	18%	3%	5%
Consumer Health Solutions Resource	67%	17%	6%	1%	9%
Social Media whiteboard animation	74%	14%	5%	1%	6%
Clinical Data Standards whiteboard animation	79%	10%	3%	2%	6%

Table 4

Assisting Students with Informatics Competency Indicators

More than 50% of the respondents indicated they provide *minimal* to *no support* to students for the following:	**More than 50% of the educators indicated they *moderately* to *extensively* support students to:**
• use of mobile devices and apps; • social networking applications; • understanding standardized nursing and other terminologies; • use of consumer health solutions; • use of specific electronic health record applications; • use of electronic records across the continuum of care; • use of ICTs to collect, document and retrieve data; • understanding the role of nurses in the design, selection, implementation and evaluation of ICTs; • understanding how digital health/informatics may improve the health system and overall quality and safety of patient care; and, • Responsibilities to report system process and functional errors.	• identify credible and relevant websites and internet resources to support learning and practice; • use ICTs to support nursing practice and knowledge development; • understand how digital health/informatics knowledge applies to the practice of all nurses in all roles; • use decision support tools (e.g., clinical alerts, practice guidelines) to support clinical decision-making and safe patient care; and, • use legal and regulatory requirements, ethical standards and organizational policies and procedures.

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Value of Informatics/Digital Health Curricular Integration & Leadership Support

There was 68% agreement (somewhat to strongly agreed) that informatics competencies are essential. As for the importance of digital health/informatics to nursing practice and quality of care, 73% of respondents agreed (somewhat to strongly agreed) with this statement. Similarly, there was 71% agreement (somewhat agreed to strongly agreed) that educators valued the importance of integrating digital health/informatics content in undergraduate nursing education. Finally, 59% agreed there is clear and consistent leadership support for the integration of digital health/informatics into their curriculum, while 30% disagreed or strongly disagreed and 12% did not know.

Respondents highlighted that many health care organizations are not currently using a fully functional EHR hence teaching students about these tools is problematic when there is no opportunity to observe them in practice settings. Moreover, settings that do have EHRs with relevant nursing functionality do not always permit students to access/use these tools. Several respondents also commented on the need to have an affordable EHR "sandbox" which could be used in the simulation lab to teach students how to integrate these tools as they learn other clinical skills.

Interview Findings

Interview participants (n=10) mainly discussed undergraduate nursing curricula rather than graduate or interprofessional education. A number of educators expressed a sense of urgency to support educators in building their capacity to teach core digital health content within undergraduate nursing education. But further suggested this mindset might not be shared by other nurse educators who either do not see it as a priority or within the purview of their specific teaching responsibilities. The following themes emerged from these interviews:

- Digital health content integration is **not** a priority area for nurse educators and there are many unknowns, such as: where does this content fit and who is responsible for digital health integration? It seems many nursing programs rely on champions rather than seeking to engage all faculty to build capacity in this core area of nursing competence. There is also a tendency for educators to depend on health care organizations to teach students how to use an EHR;
- Digital health content integration is **not** wholly intentional, yet there is evidence of work being done to map CASN entry level competencies to core undergraduate curricula; and,
- Digital health content integration is **not** consistent as there are differences in awareness and understanding of competency requirements among nurse educators.

Participants also discussed the challenges of inconsistent student access to clinical information systems in the practice and academic settings. For example, not all settings used for clinical practice experiences allow student nurses partial or full access to the clinical system functionality. And there is commonly a lack of consistency between academic and practice setting ICT use. While few academic settings have access to a proprietary clinical information system (e.g., Allscripts, Meditech) training environment, others may use a generic simulated electronic health record in their simulation lab, and others none at all.

Interviewees emphasized the need for additional administrative support in order for them to acquire digital health competency and achieve effective curricular integration. A clear directive and plan for digital health integration into the curriculum was seen by some to be lacking. Consequently, motivation for nurse educators to develop their own informatics competency and address theory and practice gaps in the curriculum is lacking.

Strategies for Building Educators' Capacity

Educators offered the following suggestions for building the digital health capacity of nurse educators:

1. Focus on comprehensive informatics and digital health education in theory and practice as opposed to mastery of technical skills;
2. Share the findings of this study with professional associations such as COUPN (Council of Ontario University Programs in Nursing) to increase awareness of the current gaps in digital health teaching in nursing curricula;
3. Create workshop opportunities tailored to schools of nursing needs;
4. Expand educator awareness of the availability of digital health teaching resources;
5. Make nursing informatics entry-to-practice competencies explicit in CASN accreditation requirements;
6. Expand educators' knowledge beyond basic informatics competencies to include a focus on the future of health care and impact of technology on practice roles (e.g., robotics, big data, artificial intelligence)
7. Leverage digital health savvy nurse educators to support their peers;
8. Provide educators with incentives and motivators (e.g., scholarship, bursary for professional development in digital health).

Focus Group Findings

Ten nurse educators and deans/directors from Canadian schools of nursing participated in the focus group. A single one-hour focus group was held in conjunction with the CASN May 2018 educator conference. Themes arising from the focus group discussion included:

- Lack of awareness of CASN resources
- Need for student and faculty digital health champions
- Need to partner with clinical settings
- Need for a cultural shift in clinical settings (e.g., accepting nurses' use of smartphones)
- ICT use is setting dependent – clinical information systems are varied, making it difficult to know what to teach nursing students
- Clinical information systems do not effectively support nursing practice. Hence, we need nurses at the decision-making tables to advocate for inclusion of nursing data and functionality that facilitates their integration with clinical workflow.
- Need to teach students how to use information in the context of patient care and health system management rather than computer literacy

Exemplars of Digital Health / Informatics Integration

There is limited qualitative survey data outlining teaching and learning exemplars. This may be linked to narrowly defined views of what it means to have informatics competency and the existence of integration barriers, such as the cost affiliated with the use of simulated EHRs. To illustrate: when asked to provide relevant comments about the integration of digital health in nursing program(s), one survey respondent replied "Students are educated in this area - students come with those knowledge and skills to my course and therefore I do not spend specific time on this topic." There was evidence to support educators are interested in building their capacity, "Not an area I know extensively, but do value its importance. Something I have to improve in my

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learning." Some respondents offered their experiences in delivering a single course on informatics or inviting a guest lecturer to speak on issues related to digital health. Overall efforts at curricular integration would appear to be sporadic and largely driven by individual faculty members. Comprehensive integration examples were not provided.

Discussion

The purpose of this study was to understand the current state of digital health and informatics content integration in nursing curricula from the perspectives of nurse administrators and nurse educators within Canadian Schools of Nursing. In this paper, the self-reported views of nurse educators were presented with a focus on: (1) current state of Canadian nurse educator integration of digital health in nursing education and the current state of digital health content integration into nursing curricula, (2) nurse educators' knowledge, experiences and needs in promoting/enhancing their development of digital health capacity now and in the future, (3) teaching and learning exemplars of digital health integration in nursing curricula, and (4) recommendations for advancing development of informatics and digital health in nursing education.

Findings arising from the nurse educator respondents in this study are congruent with the general literature, and the challenges for nurse educators to realize informatics integration in nursing curricula would appear to be universal. According to Fetter (2009a), "nursing programs have embraced distance learning and added informatics content, courses, and specific technologies; however, undergraduates' and educators' skills are still considered inadequate" (p. 78). A 2005 survey of Deans and Directors (n=226) of baccalaureate and higher nursing education programs in the United States showed approximately 50% teach computer and information literacy skills with less emphasis on informatics content pertinent to nurses' roles in using information technology in practice such as system life cycle and standards. Moreover, almost 50% of respondents perceived their faculty as novice and advanced beginners in teaching and using informatics applications, with 75% of the programs surveyed reporting having an informatics champion (McNeil et al, 2005). Analysis of qualitative data further affirmed that "overall, there is a lack of clarity among nursing faculty about essential informatics content and how to effectively integrate this content into nursing curriculum" (McNeil, et al., 2006, p. 58). Although this study is dated, the present study also found that almost half of respondents rated their informatics competency at the beginner level, and reported challenges in teaching informatics content. Faculty reliance on individual champions remains the primary approach used to support curriculum integration initiatives.

The results of this study affirmed a developing awareness of CASN's entry to practice informatics competencies and a strong interest and desire among nurse educators to respond to current demands for advancing the digital health learning needs of future nurses. However, visible gaps and challenges in current approaches to digital health content integration prevail within a majority of Canadian schools of nursing. It remains unclear whether the limited digital health integration is due to a lack of understanding about the rapidly evolving use of digital health solutions in practice settings and the impact on nursing practice, a lack of leadership and/or administrative support, or assumptions about the digital health learning needs of students, (e.g., equating computer proficiency with informatics competency). In general, educators identify administrative support as essential to their ability to build their own digital health capacity. Additionally, respondent comments reflect an ongoing confluence of views about the use of technology for teaching and learning as opposed to the technologies used specifically in the

delivery and management of health care services. In particular, the interview and focus group participants shared mostly their experiences of technology mediated pedagogy. Alarmingly, many educators continue to view undergraduate nursing students of today as highly computer literate and assume this is sufficient for them to function effectively and safely within digital health enabled health care settings. Given that computer literacy is an expectation and a pre-requisite to university education, more emphasis is needed to promote information and knowledge management competencies within the context of clinical practice. A competency focus is vitally important given that practicing nurses, who typically function as preceptors for nursing students, also report inadequate informatics competency. Findings to date suggest that inadequate competency exists in relation to information and knowledge management and ICT use to support patient care (Kleib & Nagle, 2018; Canada Health Infoway, 2017).

Administrators of nursing education programs are encouraged to view educators' knowledge gaps as a starting place for future discussions. Addressing faculty learning needs and setting expectations for digital health integration will hopefully result in a majority of nurse educators taking action in response to this urgent call rather than relying upon champions to fulfill these core learning requirements within schools of nursing across Canada. When digital health/informatics entry-to-practice competencies are within the purview of all undergraduate educators, the mindset of designating champions to assume responsibility to teach future nurses these core competencies or lead curriculum integration efforts will likely become obsolete.

Several researchers have articulated a need for defining core nursing informatics competencies for nurse educators (Booth, 2006; Kinnunenm et al., 2017), and for more clarity over the definition and core content of informatics to be taught at the undergraduate and graduate levels (Dixon & Newlon, 2010). Researchers have also recommended increasing educators' motivation and ability to meaningfully integrate informatics content into curricula and teaching practices in order to prepare future nurses for digital health practice (Booth, 2006; Fetter, 2009a&b). Administrative leadership support for increasing educators' access to continuing education opportunities, as part of standard professional development requirements, could help accelerate this process (Booth, 2006; Kinnunenm et al., 2017). Additionally, nurse educators are encouraged to self-assess their informatics competency and participate in developmental learning opportunities such as workshops and conferences and to continually reflect on their pedagogical practices and their ever-evolving roles as educators (Risling, 2017; Fetter, 2008; Fetter, 2009a&b; Booth, 2006).

Clinical settings within regions and jurisdictions across Canada utilize an array of solutions to support the management of health records electronically. This variability creates challenges for nurse educators to identify what should be taught to prepare students for their use. Additionally, views vary as to who should be responsible for preparing students to use specific EHRs within organizations. Findings suggest that EHR training continues to be delivered to a large extent by the clinical practice settings rather than schools of nursing. Nonetheless, educators envision value to be derived from having simulated EHR education for student learning.

Obstacles to effective EHR training identified in this study are consistent with those found in previous studies including: a) the variability in the functionality and quality of clinical information systems in the practice realm, b) limited and inconsistent access to ICT for both students and educators, c) a lack of clear policies to guide students' use of these systems and 4) the time and effort required by faculty to teach EHR skills (Fetter, 2008; Fetter, 2009a; Fetter, 2009b; Hern et al., 2015; Jetté et al., 2010; Mahon et al., 2010; Shin et al., 2017). Other challenges pertain to limited opportunities for partnership with clinical agencies and limited funding to

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alleviate installation and maintenance costs associated with integrating academic or simulated EHRs within schools of nursing (Brooks & Erikson, 2012; Fetter, 2008; Fetter, 2009b; McNeil, 2005). Pedagogically, simulated experiences provide students opportunities to develop competence in relevant skills and clinical reasoning (Aebersold, 2018). By investing in simulated EHRs nurse educators could provide students with opportunities to build their competence in information and knowledge management and use of digital health technology. Benefits of simulated EHRs are grounded in the need to develop core nursing informatics competencies within a safe laboratory environment.

Realizing the vision of an adequately prepared nursing workforce for digital health requires a shift in thinking about the role of informatics in nursing education and practice, as well as concerted efforts by all stakeholders (Fetter, 2009b; Canadian Nurses Association [CNA], 2006). The Canadian Nurses Association (CNA) published an e-Strategy for Nursing in 2006 suggesting all nursing stakeholder groups including professional associations, regulators, unions, employers, educators and researchers have an important role to play in advancing nursing's position relative to digital health. Additionally, the strategy identified 3 key strategic directions for nurses to advance digital health through: 1) increased access to ICT to support evidence-based decision-making, 2) increased participation at ICT decision-making tables, and 3) the development of ICT competencies (CNA, 2006). Continuing to advance informatics capacity in Canadian nursing is imperative.

Limitations

The findings of the study represent the views of the survey, focus group and interview participants and may not represent all instances of digital health integration into undergraduate nursing programs in Canada. Despite an extended data collection period and use of convenience and snowball sampling, the response rate to the survey was a little lower than the projected sample size. Additionally, there may also have been response bias in relation to those who chose to participate in the surveys and interviews; individuals interested in the topic of digital health might have been more inclined to participate in the study. Although there were respondents to the French version of the surveys, all interviews and the focus group were conducted in English. Hence the sample may not provide a comparable representation of perspectives from the French schools of nursing.

Conclusions and Recommendations

Educators' engagement and leadership support are vital for overcoming barriers and advancing informatics capacity in undergraduate education. Although there may be champions to lead the work of integration, all educators have a responsibility for teaching core digital-health related content and for contributing to informatics integration initiatives within their schools. Awareness and use of the CASN resources should be increased with encouragement to utilize same where appropriate within curricula. Support can also be channeled for continuing education (e.g., conferences and workshops) and other knowledge development activities (e.g., courses, certification). Educators should also be encouraged to participate in nursing informatics activities including engagement in local and national specialty groups. Most importantly, all nurse educators are encouraged to reflect upon their courses and other teaching responsibilities and identify possibilities for curricular integration of digital health content. The evolution of relevant future curriculum and course design will be contingent on the development of each educator's competency in digital health/informatics. Educators need to be cognizant of the difference between

digital health/informatics competency and basic computer proficiency and the fact that nursing students do not inherently have **the former** just because of their computer literacy. Further, educators need to be aware of the distinct difference between issues related to the use of digital health in clinical practice and the use of technology to deliver course content. All educators are encouraged to continue to seek out learning opportunities wherever and whenever possible and to advocate for the necessary investments in resources to support core competency development in nursing informatics. The sharing of experiences and digital health teaching strategies with other faculty through publications, presentations, and faculty networking. In addition, students should be encouraged to elevate and advance digital health discussions in classroom and clinical settings. Nurse administrators play an important role in supporting faculty in the acquisition, development, and dissemination of digital health knowledge. Increasing educators' capacity in informatics is key for ensuring future generations of nurses are adequately prepared for competent and safe practice in digitally rich workplaces.

As stated by Risling (2017), "nurse educators, both in practice and education, will be essential in leading a successful technological evolution for nursing" (p. 91). In view of the current technological revolution impacting all sectors of society including health care, nurse educators are in a unique position to shape the future of nursing practice. Educator engagement and administrative leader support within every Canadian school of nursing are vital for overcoming barriers and advancing the informatics capacity of all future nurses.

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