Emerging Professionals' Observations of Opportunities and Challenges in Nursing Informatics

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Abstract

The importance of nursing informatics (NI) is highlighted because of changing healthcare landscapes in response to rising digital health and technology integration and use. However, NI education, competency requirements and roles are not standardized across the world, and the potential of NI is modestly understood internationally. This paper explores opportunities and challenges in NI discussed in a panel at the 14th International Congress on Nursing and Allied Health Informatics. The panel was organized by the International Medical Informatics Association's – Nursing Informatics Working Group's Student and Emerging Professionals group. Discussions during the panel session were synthesized and analyzed using content analysis. Results indicate that challenges in NI education, career opportunities and roles continue to exist across healthcare settings and regions. Findings suggest that the following issues need attention: (1) collaboration to build stronger infrastructure to guide NI education, research and practice; (2) improved visibility and

appreciation of NI; and (3) greater dissemination of evidence of NI in various health settings. This paper offers recommendations for nurse leaders on strategies to address these issues in NI at the local, regional and global levels.

Introduction

The importance of nursing informatics (NI) is highlighted in healthcare because of changing healthcare landscapes in response to rising digital health and technology integration and use. NI is seen as a specialty combining "nursing science with multiple information and analytical sciences" to "identify, define, manage and communicate data, information, knowledge and wisdom" in the field of nursing (American Nurses Association [ANA] 2015: 1–2). An "informatics nurse" is a registered nurse with informatics experience, whereas an "informatics nurse specialist" has graduate or postgraduate education in informatics or a related field (ANA 2015). This specialist functions as a bridge between information system users and developers as well as ensures efficiency, effectiveness, quality and usability and aspects of systems in use (Bowman-Hayes 2009). However, international agreement on the definition and roles of NI remains disparate.

In the past two decades, there has been an increase in NI-related scholarly work on the development of NI competencies; for example, the Technology Informatics Guiding Education Reform initiative from the United States. Another example is the effort to elevate the level of NI competency by implementing NI education at the nursing undergraduate (bachelor), graduate (master) and postgraduate (doctoral) levels and during professional development for registered nurses, specifically in countries where NI is more established (Darvish et al. 2014).

Currently, NI are suggested to be core competencies instead of an isolated set of skills in nursing (Abdrbo 2015; Kleib and Nagle 2018; Sipes et al. 2017). Informatics competency requirements are set for different roles and all levels of nurses (nurse administrators, nurse researchers, nurse teachers and practicing nurses) (Collins et al. 2017; Egbert et al. 2018; Grobe 1989; Kannry et al. 2016; Skiba 2016; Strudwick et al. 2019) and across different levels in health systems, ranging from service providers to national-level strategic decision makers (Whittaker et al. 2015). However, a systematic and formal approach to the implementation of NI in nursing education is still lacking in some countries (Cummings et al. 2015; Egbert et al. 2018), and research has shown that graduate nurses are inadequately prepared in NI when entering practice (Shin et al. 2018) and that more NI training is needed at postgraduate levels in nursing (Choi et al. 2013; Kupferschmid et al. 2017). NI education started at the graduate level in the 1980s and at the postgraduate level in 2003 in the United States (Hannah

et al. 2006), and NI certification is available in the United States (Cummings et al. 2016). However, NI education at graduate and postgraduate levels is not available across the world (Peltonen et al. 2019).

Presently, the state of NI varies at organizational, national and regional levels, despite the work that NI communities have done during the past decades to support NI development (Cummins et al. 2016; Greenwood 2010; Mantas and Hasman 2017; Ozbolt and Saba 2008). Ongoing challenges include leaders having limited awareness of the potential of NI to improve care and patient outcomes, educators experiencing complexities in NI education and competency development and clinicians with limited interorganizational and international support integrating increasingly complex technologies throughout clinical practice settings (Ozbolt and Saba 2008).

There is a growing need to understand how to advance NI and better support the development of NI education, practice and research worldwide. Exploring the field through students' and emerging professionals' experiences with limited educational program opportunities in NI offers a unique perspective on the status of NI development internationally. The purpose of this paper is to summarize a panel discussion of the International Medical Informatics Association – Nursing Informatics Student and Emerging Professionals (IMIA-NI SEP) group (Lewis et al. 2018) on how to advance NI at local, regional and global levels.

Methods
Discussions were synthesized from a panel held at the International Conference on Nursing Informatics entitled "ICT to Improve Quality and Safety at the Point of Care" held in Guadalajara, Mexico, in June 2018. This panel was organized by the IMIA-NI SEP group (Lewis et al. 2018). The international panellists included:

• Lorraine Block, MSN, RN, IMIA-NI SEP secretary, PhD student, School of Nursing, University of British Columbia, Canada (Panel Moderator);
• Adrienne Lewis, MNSc, MS, RN, IMIA-NI SEP Communications Officer, Project Lead for the First Nations Meditech Access Program, Canada;
• Laura-Maria Peltonen, PhD, MNSc, RN, IMIA-NI SEP Chair, Clinical lecturer, Department of Nursing Science, University of Turku, Finland;
• Maxim Topaz PhD, MA, RN, IMIA-NI SEP Advisory Member, Associate Professor, School of Nursing, Columbia University, United States;
• Lisiane Pruinelli, PhD, MS, RN, IMIA-NI SEP Advisory Member, Assistant Professor, School of Nursing, University of Minnesota, United States; and
• Erika Lozada Perezmitre, MPH, RN, IMIA-NI SEP Board Member, Professor, School of Nursing, Facultad de Enfermería de la Benemerita, Universidad Autonoma de Puebla, México.

The 90-minute session included short presentations by the panellists about their education, career pathways and opportunities at the national and international levels, and these presentations were aligned with recommendations for advancing NI in five areas, namely, education, research, practice, visibility and collaboration (Topaz et al. 2016). After the short presentations, an open discussion was held about opportunities and challenges in NI. The panel members made notes of the discussion. All panellists' notes were collected, synthesized and analyzed using content analysis (Bengtsson 2016; Vaismoradi et al. 2013). Related issues were categorized and grouped into major themes by the first author. These themes were discussed by the listed co-authors until consensus was reached.

Results

The following three salient themes were identified: (1) collaboration to build stronger infrastructure to guide NI education, research and practice; (2) improved visibility and appreciation of NI; and (3) greater dissemination of evidence of NI in various health settings. All three themes had one characteristic in common – challenges related to these had existed for decades.

Table 1.	Summary of findings on how to advance NI

Issues related to the advancement of NI at local, regional and global levels		
Collaboration to build stronger infrastructure to guide NI education, research and practice • Availability of formal NI education • Structures to enable secondary use of health information • Informatics roles in academia and practice	Improved visibility and appreciation of NI • Understanding of the potential of NI • NI visibility in social media • Link between health organizations, educational institutions and the NI community	Greater dissemination of evidence of NI in various health settings • High-quality NI research and international approaches for strong evidence • Means of disseminating NI research

NI = nursing informatics

NI infrastructure in education, research and practice

During the panel session, one of the themes identified related to the disparate opportunities for formal NI education, research and practice roles. In discussing education examples, panellists from Canada and the United States stated various opportunities to take graduate- and postgraduate-level programs related to NI, whereas those from Europe and Mexico noted limited to no opportunities for such degrees in this domain. This difference in NI infrastructure, such as formal degrees and roles, internationally was also seen to impede research collaboration. For example, whereas some of the panellists were able to operationalize and fund research evaluating patient outcomes (e.g., secondary use of data), others had

difficulties finding opportunities for this in their countries/organizations. Finally, related to practice, variation between countries was noted, as panellists explained that formal NI professional roles (e.g., informatics nurse specialists, chief nursing officers) were limited or lacking in many healthcare organizations. Variation existed also within health systems where the informatics nurse specialist role existed, and members noted a paradox – on the one hand, emerging NI professionals were challenged to find suitable positions, whereas on the other hand, they met organizational leaders who expressed difficulties in finding qualified NI professionals.

Visibility and appreciation of NI

The panel discussion identified the need to advocate and disseminate an understanding of NI and how NI impacts patient care. The need to display the positive patient outcomes related to NI stems out of dismissive attitudes from areas across academia, research and practice that do not fully understand the scope and influence of clinicians with advanced informatics knowledge, skills and attitudes. There needs to be a global shift in the thinking around NI as a practice and speciality to advance the development of the field and promote the development and positive attitudes toward NI.

Panellists considered the use of various communication techniques such as social media through which public awareness and understanding of NI could be developed. However, choosing a single "best" social media platform for communications was challenging, as access, availability and popularity varied globally. Furthermore, a lack of current presence of NI organizations and experts on social media and other digital platforms was noted. The panellists encouraged increased activity on various forms of communication platforms by NI community members so that they could engage with the different professional and public groups.

Enhanced communication between health organizations, educational institutions and the NI community was also suggested. For example, there exists an opportunity to (internationally) develop white papers on NI education, research and practice topics. Other international initiatives, such as NI newsletters, webinars and symposia, were also suggested. Finally, it was noted that a single solution may not exist to address and improve the understanding of NI globally, but a combined effort with multiple targeted approaches may produce better results in addressing the disparate need of knowledge regarding NI potential.

Evidence of the impact of NI

Panellists acknowledged that NI research is on the rise, but evidence of the impact of NI on care and patient outcomes is still limited. Also, a need for larger international research projects with generalizable findings about the impact of NI on

health outcomes, clinical workflows and care delivery was suggested, as much of the existing evidence is limited to specific organizations or regions. Dissemination of recent research in NI was also explained as an important activity to share the evidence on the impacts of NI on health systems and clinical practice. Traditional methods of information sharing through national and international conferences were thought to be important, although these methods presented various inherent challenges.

First, language barriers need to be overcome as a first step in disseminating scientific NI knowledge. For example, many international conferences are conducted in English, but the use of translation services (which would better serve and engage international audiences) is limited. Another stated barrier was the accessibility of international delegates to larger international conferences, which are typically held in areas where NI is already more established. One solution to this barrier raised by the panellists is the NI "Lite" conferences recently developed by the IMIA-NI group to specifically target areas where NI development is emergent. This approach to conference planning may limit barriers in accessing knowledge shared in this scientific medium while building the capacity of the local host organizations. Finally, participants recognized a need for increased efforts targeted at nursing leaders to disseminate scientific knowledge to support investment decision-making (e.g., buying new information systems) and at nursing professionals to support information technology adoption in clinical practice.

Discussion

The major issues to be addressed to advance NI are a need for (1) collaboration to build stronger infrastructure to guide NI education, research and practice; (2) improved visibility and appreciation of NI; and (3) greater dissemination of scientific evidence of NI in various health settings. It seems that these challenges have remained unsolved for several decades, as these are in line with previously reported challenges (Ozbolt and Saba 2008).

Our findings regarding the idea that NI education should be implemented from undergraduate to postgraduate levels, as well as in professional development for practicing nurses, are supported by others (Darvish et al. 2014). Masters-level education in NI is still not available in many countries, although it has existed for three decades in the United States (Cummins et al. 2016). Our findings support previous literature showing that NI education, certification and informatics nurse specialist roles are also not well adopted globally (Cummings et al. 2016; Egbert et al. 2018; Peltonen et al. 2019).

The panel highlighted the point that graduate students wishing to pursue a career in NI are still facing many of the challenges expressed over the field's decades of development (Bakken 2001; Chang 1985). Enhanced infrastructure with clearly

defined roles and NI positions at different levels in health organizations (strategic, tactical and operational) is warranted to improve the situation. To get to a point of national and international standardized NI education, integrated channels of research and defined NI professional roles, supportive infrastructure is necessary. Without infrastructure, such as networks, policy and funding, issues raised will continue to persist and hamper the advancement of NI.

Translating NI competency statements into action items at policy and education levels is key to ensuring that nurses are competent users and informed consumers of health information technology. International guidelines on NI roles, education and certification would standardize competencies and assist in ensuring the position of NI in environments where the discipline is only now emerging. Developing such international guidelines is difficult, as these will need to apply to different countries and educational systems. Even when developed, such standardized competencies will require dissemination and implementation, which are challenging.

Based on the results, there seems to be a lack of recognition of the importance of NI, and NI expertise is not utilized to its full potential from an international perspective. NI expertise is needed to steer adoption of information technology in healthcare (Greenwood 2010), but the informatics nurse specialist role and the importance of NI are not yet well recognized in all countries. This is in line with mediocre expressed support toward NI (Peltonen et al. 2019). A lack of recognition and role development possibilities has similarly characterized advanced nursing roles in the past (Kilpatrick et al. 2013). As such, it may be beneficial to turn to and learn from efforts and resources that moved advanced nursing roles and expertise forward.

Communicating the value of NI is essential to increase the appreciation of NI expertise on all levels in health organizations (e.g., hospitals, outpatient care facilities) to ensure systematic and sustainable information technology adoption to better support nursing. Nurse leaders are in key positions in assessing the organizational need for NI expertise and developing an NI infrastructure to support nursing, including creating specific NI roles. Currently, it may be difficult to find individuals with the right qualifications for NI roles in health organizations. Supporting education and networking efforts will help nurse leaders to find the needed resources.

A new finding of this work is the urgent need for a stronger NI infrastructure to systematically enhance the use of information technology in healthcare on a variety of levels to support nursing and patient outcomes. Including NI expertise helps to ensure that the nursing perspective is taken into consideration in

developmental work at organizational, local and national levels in nursing education, practice and research. Additionally, more international collaboration starting at early-career stages is necessary to build a stronger NI community globally. Better organization of NI experts at international levels, such as the IMIA-NI SEP group that aims to foster growth and build relationships within a global NI community of students and emerging professionals, will enable systematic and goal-oriented working to produce incentives to promote NI and learn from each other at a global level.

Similar to the nursing field as a whole, NI research has its challenges; more PhD-prepared nurses are needed to produce evidence of the impact of NI on health outcomes and organizational factors, as well as the means on how to best make use of findings to improve decision-making. Increasing the number of PhD-prepared nurses in NI in practice is a crucial goal, as the field is moving to a more data-driven practice with a high demand for analytics and clinical decision-making based on evidence. This is also in line with recommendations from the Institute of Medicine (2010) to double the number of doctoral-prepared nurses by 2020. These nurses are needed to lead both educational reforms as well as initiatives in healthcare delivery to improve patient outcomes (Broome 2012).

Organizational and collegial support promotes a positive atmosphere to improve the response to technology (Konttila et al. 2018). Nurse leaders in clinical care should evaluate current practices and envisage development needs, targeting the use of NI expertise as an addition to current practices. Therefore, it is important that nurse leaders not only steer attitudes and development at organizational levels but also take part in the discussions at regional and national levels to support the development, implementation and use of technologies to better support nursing. Finally, developing NI competencies for nurse leaders is important, as these can equip high-level decision makers with essential and foundational skills to provide an important representation of NI health system needs without necessarily being NI experts themselves (Collins et al. 2017).

Recommendations for nursing leadership are as follows:

- Nurses of all educational levels should have sufficient NI competencies and systematic professional development in NI to stay up to date with the changing environment.
- NI roles and competency requirements should be defined at all organizational levels to support systematic and sustainable information technology adoption in health organizations.
- Validated competency requirements should be implemented into practice.

- Positive attitudes toward information technology to improve its adoption should be promoted.
- National and international networking at all career stages should be organized to enhance the generation of evidence and knowledge sharing.
- Discussions about NI within the organization and the community should be active to enable educators, researchers and policy makers to understand the needs of clinical practice.
- International efforts should be supported for NI curriculum development at undergraduate, graduate, postgraduate levels as well as in professional development.

Conclusions

Currently, NI is not utilized to its full potential in nursing in many countries across the world, as education content and availability vary, nurses seem insufficiently prepared with NI skills and informatics nurse specialist roles are limited or lacking in health organizations. Collaboration and a stronger infrastructure to guide NI education, practice and research; an increased visibility of the potential of NI; and an increase in research of the impact of NI are needed to support healthcare technology adoption. We believe that these recommendations can inform nurse leaders on strategies to advance NI at the local, regional and global levels.

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