

Past, Present and Future: The Outlook from Mid-Career Nurse Informaticians

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Abstract

Nursing informatics (NI), as a specialty of nursing, can trace its origins back as far as the 1960s. While difficult to find empirical evidence to pinpoint exactly when NI moved from the fringes of nursing to more mainstream recognition, the late 1990s to early 2000s was a period of significant growth in the desire to leverage information technology as a means of collecting more robust and reliable healthcare information. This, in turn, has led to a significant increase in the number of nurses working as NI specialists.

Those who have remained in NI roles since this time are now reaching the “mid-career” point. This paper will examine the current NI landscape and the experience of a number of early and mid-career nurses who chose to focus on NI by exploring how and why they chose this career path, the opportunities and challenges they have faced to date and their predictions for the future of NI.

Nursing informatics (NI), as a specialty of nursing, can trace its origins back as far as the 1960s; however, the first widely cited definition, by Scholes and Barber (1980), appeared in the literature in 1980. While difficult to find empirical evidence to identify exactly when and why NI moved from the fringes of nursing to mainstream recognition, few would disagree that the mid- to late 1990s were an important time for the specialty. Interest in the development of minimum data sets, nursing classifications systems, adoption of electronic systems and the

collection of workload data, coupled with broader technology trends such as more widespread availability of Internet and the decreasing cost of computers, no doubt helped to influence growth in the number of professionals employed as informaticians.

This paper examines NI as a career using a combination of published literature, information collected from informal interviews of 10 Canadian nurse informaticians and the authors' own experience to present a view on the past, present and future of NI from the perspective of mid-career nurse informaticians.

Informatics Past

When looking to those who started their careers 10–20 years ago, it is probably fair to generalize that most nurse informaticians did not consciously choose to enter the specialty but instead the specialty chose them. Again, empirical data to support this claim do not readily exist, but spend any amount of time speaking with veteran informatics nurses and it is a safe bet that eight or nine out of 10 were likely seconded, chosen or asked to work on a clinical information technology (IT) project because of their business knowledge and/or skill with computers. Only one of the 10 nurses we interviewed stated they had actively sought to pursue an informatics career.

For everyone involved, the '90s were a very exciting time in NI. The widespread availability and adoption of the Internet was causing a paradigm shift in communication and information sharing in all aspects of life. With this shift came a focus on investments in tools to improve data collection, increase efficiency and improve patient safety. NI nurses quickly developed the requisite skills and knowledge required to facilitate discussion between IT and clinical providers. NI practitioners played, and continue to play a key role in improving workflow, increasing user acceptance and highlighting practice considerations as systems are being deployed.

For early adopter organizations, nurse informaticians were also crucial for the development and adoption of advanced clinical systems. A 2015 study completed by the Healthcare Information Management System Society (HIMSS) examined the impact of NI and found that NI nurses had the greatest impact on workflow, patient safety and user acceptance. However, widespread conversion to electronically enabled health delivery is far from complete. As of the first quarter of 2015, only 36.4% of acute care hospitals in Canada reported using electronic clinical documentation and a little over 5% have implemented computerized provider order entry (HIMSS Analytics 2015). In comparison, these numbers are respectively 90% and 70.3% in US hospitals. Outside of acute and primary care, the adoption of electronic systems to support patient care is harder to quantify but

anecdotally there is little to suggest that there has been widespread adoption of electronic tools beyond the requirements for standardized data collection set forth by provincial health ministries.

Informatics Present

As we look back at changes over the last 15 years, it is clear there have been some significant changes in the sector with respect to training, professional development and recruitment that are beginning to have an impact on NI professionals. In the past, lack of resources with requisite training and experience in NI necessitated the hiring of individuals with no formal NI training. However, since at least 2009 much of that has changed and individuals with training from specialized health informatics and health information management programs have significantly increased (Canada Health Infoway et al. 2014). Furthermore, entry-to-practice competencies have been jointly developed by the Canadian Association of Schools of Nursing (CASN) and Canada Health Infoway (CHI) (CASN 2012). Students are much more adept at using technology than those in years past, and nursing programs are beginning to expose students to informatics as part of their undergraduate training. Additionally, the proliferation of electronic clinical documentation and order entry systems has increased early introduction to the use of IT in healthcare organizations used for clinical placements. This undoubtedly has led some new nurses to seeking an informatics role directly upon graduation or shortly thereafter.

If data from the US-based HIMSS NI workforce study are any indication, this change is likely already underway. The 2014 NI workforce study conducted by HIMSS Analytics found that informaticians with clinical experience at the bedside of five years or less rose from 12% in 2011 to 20% in 2014. In addition, nurse informaticians with postgraduate education in informatics rose by 24% and those looking to pursue additional informatics education rose by 43% compared with three years prior.

This trend aligns with the survey feedback we received from veteran NI nurses from across the country. All the nurses interviewed stated they had started with no informatics background, and they identified education and training as the number one challenge they faced when starting out. Most had been recruited for their years of nursing experience and aptitude for using computers, but few had previous experience working with IT or project stakeholders. In fact, most nurses new to the specialty were likely to seek out additional certification and training to help them adjust to the new role. Some recommended training in Lean Methodology (Lean Enterprise Institute) or project management, in addition to specific vendor applications and foundational information systems training such as HITS.

Reliable sources of data with respect to the number of nurses working in informatics are not readily available; however, some rough estimates are available to provide a general guide. The results of a 2014 Canada's Health Informatics Organization (COACH) human resources survey, provided an estimate of the number of individuals employed in a "clinical informatics" role at approximately 2,200 ($\pm 10\%$) with more than half having a professional background in at least one clinical discipline (Canada Health Infoway et al. 2014). The College of Nurses of Ontario (CNO 2016) reported that, in 2014, there were 623 nurses in the province who reported their primary employment responsibility as informatics. If this figure is applied against the overall Canadian population, of which Ontario comprises 38.5%, one can estimate the number of informatics nurses at approximately 1,600 across the country. Even more importantly the CNO numbers show that the number of informatics nurses grew by 16% between 2012 and 2014, which outpaced growth in CNO membership by nearly 10% (CNO, 2016).

There is a significant gap in our knowledge about the availability of professional development and advancement opportunities for nurse informaticians. From a professional development perspective, we know that there is significant variability in the role informatics nurses play throughout the health system. Many are involved in either the implementation or management of electronic health records components typically in specialist or consultant roles. However, the role of NI specialists will tend to evolve based on organizational priorities and the availability of resources.

We spoke with three recently graduated nurses who expressed some frustration with the lack of entry-level opportunities available within the specialty. Competition for entry-level positions, predominantly found in large urban centres, is much different from those of 20 years ago. Nurses wanting to specialize in informatics now need to compete with graduates from health informatics credentialing programs (certificate, diploma, undergraduate and graduate). Furthermore, it is very difficult to find opportunities to gain valuable clinical experience while specializing in informatics. These circumstances leave new nurses with the choice of having to put their informatics aspirations on hold while they gain clinical experience or return to school for specific informatics education. For those looking for opportunities outside urban centres, positions are much less abundant and typically put less value on clinical background or knowledge.

Anecdotally, we know that standalone senior nursing or clinical informatics positions in Canada are relatively rare and typically only found in large health organizations, private industry or in provincial health regions. More commonly, the responsibility for informatics is an adjunct to professional practice or clinical delivery portfolios or in many cases continues to report through to the IT

Department with little senior-level clinical leadership and direction. In contrast, the US-based HIMSS Nursing impact survey (2015) found that 61% of respondent organizations had hired at least one senior informatics executive. Chief Medical Information Officers were the most prevalent at 48%, followed by Chief Nursing Informatics Officers at 20% and Chief Clinical Informatics Officers at 10% (HIMSS 2015). The greater prevalence of these senior roles is likely a direct result of widespread adoption of advanced clinical systems coupled with the regional health system approach typically found in US care delivery.

The requirement for senior clinical informatics leadership positions within Canadian healthcare is expected to intensify as organizations look to advance their adoption and optimization of electronic systems that extend to the bedside. Depending on the amount of system investment, COACH predicts the risk of a skills shortage for these roles will be moderate to high over the next 3–4 years (Canada Health Infoway et al. 2014). Canada Health Infoway's identification of hospital electronic health records (EHR) infrastructure as a key funding priority will likely help to intensify the implementation of advanced clinical systems and the need for clinically knowledgeable health information leaders (Canada Health Infoway 2015). In light of this development will NI continue to grow and develop to fully take advantage of these opportunities?

Informatics Future

It is not just the implementation of EHR clinical modules that will prompt organizations to seek out skilled informatics leaders, but it will likely influence the process. There are a number of significant changes underway in the technology landscape that are likely to put pressure on organizations to evolve and change their structures and processes in the future. Knowledge of clinical process and change management will need to be combined with an understanding of complex clinical decision support algorithms and IT system design and functionality to maximize the benefit of adopting clinical systems. The next generation of EHR systems will support better clinical decision-making and better patient outcomes through increased automation and data mining. These advances are likely to fundamentally change how the health providers work and the value add they bring to patient care. The three groups of trends we think will have the biggest impact on the future of healthcare are: (1) mobile and cloud computing, (2) data analytics (DA) and artificial intelligence (AI) and (3) automation and robotics.

Mobile and cloud computing

Cloud computing refers to storing electronic data and information in remote servers rather than on a local server or on a personal computer on premises. Mobile computing refers to the use of wireless connections and devices that are able to access data and applications independent of the location of the user (Griffiths 2015).

Although mobile and cloud computing represent two different technological trends, it is difficult to address them separately as each is critical to the success of the other. Ubiquitous Internet connectivity for mobile device use is currently used by a large proportion of Canadians. It is estimated that two out of every three Canadians own a smartphone and at least 83% of the population have home access to the Internet (CRTC 2015; Statistics Canada 2013). Meanwhile, consumer cloud services, such as web-based email, file sharing, video and music streaming and social networking, have given users universal access to any communication, knowledge or entertainment resource imaginable. Furthermore, 69% of businesses report having applications or infrastructure running in the cloud (Columbus 2014a, 2014b). A key advantage of these services is their ability to quickly evolve and scale depending on the needs of end-users. Upgrades and improvements are typically added in small, regular and largely seamless updates and cloud services have been estimated to be 65–85% less expensive (Columbus 2014a, 2014b) than services hosted on premises. With significant cost savings, reduced maintenance requirements, agility and access benefits, cloud-based services are likely to become the predominant method for hosting and accessing clinical applications and data in years ahead. A HIMSS Analytics (2014) survey found that 48% of US institutions were already leveraging cloud services for their applications and data (Columbus 2014a, 2014b). In Canada, this number is likely much lower but will undoubtedly begin to rise as health technology leaders become more comfortable with the benefits and privacy protections.

NI leaders will need to take a proactive role in the evaluation, deployment and understanding of how this new paradigm will impact clinical end-users, patients and their families. They will need to build “change ready” cultures within their organizations to ensure users are able to adapt to a regular stream of micro-innovations and work to integrate those into practice while ensuring patient safety. NI leaders will also need to understand the associated risks and return on investment these cloud-based health information systems will provide. In many cases, this will challenge historical thinking around privacy, data security, information sharing and the circle of care. Leaders who are able to evaluate and articulate the merits of these technologies for healthcare delivery will be better equipped to make the types of visionary decisions required for significant advances within the Canadian health environment.

Data analytics and artificial intelligence

DA is the science of examining raw data with the purpose of drawing conclusions about the resultant information. Access and analysis of data available from “electronic health records and other health care information systems provides opportunity[sic] to develop actionable predictive models that can increase the confidence in nursing leaders’ decisions to improve patient outcomes and safety and control costs” (Westra et al. 2015).

AI is the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages (Wikipedia, 2016).

The rise of cloud and mobile technology will provide the scales of economy and volume of data required to make significant strides in the use of DA and AI in clinical information systems. These technological advances are already heavily used by technology heavyweights such as Google™, Amazon™ and Apple™ and have made significant inroads into banking and retail industries. Anyone who has used their voice to control a smartphone, has been contacted by their credit card fraud department because of a privacy breach, shopped or watched videos online have seen DA in action. The seemingly magical “people have also bought,” “you might also like” and “did you mean?” recommendations are simply the result of analyzing huge volumes of available data along with user-specific criteria in an attempt to assist end-users achieve a desired goal. While some of this information is served up to us as recommendations, much of the analyses output stays hidden from view behind the scenes.

Currently, clinical systems are capable of guiding practice through use of pre-defined data sources (i.e., drug interaction checking) or simple real-time rules (if A is true, then perform B); however, the use of advanced real-time analytics has yet to be incorporated into most clinical systems available today. While there are still challenges that need to be addressed, it is clear that we are not far from a future where systems are linked to repositories of knowledge enabling advanced decision support algorithms and capability to significantly influence practice decisions. Other potential uses for DA includes: “assisting researchers to find causation and optimal treatments for diseases; actively monitoring patients so clinicians are alerted to the potential for an adverse event before it occurs; and personalizing care so resources associated with a treatment are not administered to a patient who will not benefit from the intervention” (Canada Health Infoway 2013).

As EHRs rapidly evolve and improve, organizations will be challenged with learning how to appropriately leverage their data to make significant positive impacts on practice without endangering patients in the process. Experienced nurse informaticians with understanding of clinical workflow, organizational needs and data collection requirements can play a lead role in appropriate use of analytics and clinical decision support across the healthcare system. Clinical decision support algorithms will need to be regularly evaluated and improved based on availability of new evidence and incorporate changes to data collection and healthcare innovations such as new interventions.

Automation and robotics

Automation refers to the use of largely automatic equipment in a system of manufacturing or other production process. Robotics deals with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior, and/or cognition (Wikipedia, 2016).

The continued advancement of IT solutions will lead to further developments and use of automation and robotics in the delivery of healthcare. Falls prevention monitoring devices, robotic pharmacy systems, infant tracking bracelets, remote surgery and automated insulin infusion pumps are just a few examples of technologies currently being integrated into practice. Consumer technology aimed at improving health and wellness is also taking off and is innovating at a much quicker pace than the technologies found in a typical hospital. Wirelessly enabled activity trackers, scales, thermometers, heart rate and blood pressure monitors are all readily available to consumers along with health and wellness smartphone apps and websites that help people to track almost any aspect of their health.

This trend is not limited to just health- and wellness-related devices. The market for devices with embedded electronics, sensors and networking capabilities, collectively grouped under the broad term Internet of Things, is expected to grow from nine billion devices in 2013 to 28 billion by 2020 (IDC 2014). Nurse informaticians can play a key role in the evaluation and adoption of these technologies. As the availability of such devices continues to grow, it will be crucial for NI leaders to understand the benefits, capabilities, applicability and return on investment generated by adopting these new technologies. Furthermore, given the fast pace of development, continuous regular evaluation will be paramount to ensure that current devices continue to serve their intended purpose.

Conclusion

We see NI as being at a crossroad in its evolution. While past approaches to recruiting and educating nurse informaticians served our historical needs, future NI professionals must be better equipped and supported to ensure that they continue to play a critical role within the health system. Collection of data to support our understanding of the profession will be crucial for measuring the impact and value nurse informaticians provide to healthcare organizations. In addition, this information can be leveraged for talent management and educational development purposes with the goal of building a robust and sustainable NI workforce. We feel that nurse leaders need to acknowledge the value NI professionals bring to the table and invest in both entry-level and senior leadership opportunities with the goal of building a stronger, more educated and visionary NI workforce. We also challenge our mid-career peers to look at expanding their networks and increasing

their involvement in professional organizations such as the Canadian Nursing Informatics Association and COACH. Health technologies will continue to play an ever increasing role in the future of health delivery, and nurse informaticians are key to ensuring that nursing plays a leadership role in its development.

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