

# Informatics and Nursing in a *Post-Nursing Informatics World: Future Directions for Nurses in an Automated, Artificially Intelligent, Social-Networked Healthcare Environment*

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## **Abstract**

The increased adoption and use of technology within healthcare and society has influenced the nursing informatics specialty in a multitude of fashions. Namely, the nursing informatics specialty currently faces a range of important decisions related to its knowledge base, established values and future directions – all of which are in need of development and future-proofing. In light of the increased use of automation, artificial intelligence and big data in healthcare, the specialty must also reconceptualize the roles of both nurses and informaticians to ensure that the nursing profession is ready to operate within future digitalized healthcare ecosystems. To explore these goals, the author of this manuscript outlines an examination of technological advancements currently taking place within healthcare, and also proposes implications for the nursing role and the nursing informatics specialty. Finally, recommendations and insights towards how the roles of nurses and informaticians might evolve or be shaped in the growing *post-nursing* informatics era are presented.

**The remarkable growth of** nursing informatics over the last three decades has been an important and notable achievement worthy of celebration by the profession. It would seem that the topic of nursing informatics has graduated into an entity of increasing importance within most nursing practice and education settings (Canadian Association of Schools of Nursing/Canada Health Infoway 2012; Canadian Nurses Association/Canada Health Infoway 2014; Sensmeier 2012). Through a combination of wide-scale societal adoption of Internet and mobile technologies and the increasing prevalence of health technology within practice settings,

the informatics specialty seems to be building the “critical mass” of proponents sought by practitioners and researchers in years past (Effken 2003; Feeg 2004; Nagle 2007; Saba 2001; Simpson 1998). For instance, the healthcare system has witnessed massive amounts of technological change over the last 10 years, including the increased implementation of electronic records, medication administration technology, mobile devices, patient portals, wearables and a repertoire of other Internet-enabled technologies. From a societal perspective, it is now almost impossible to identify any element of Canadian society that has not been influenced either directly or indirectly by the rapid adoption of Internet and mobile technologies.

Regardless, viewing *technology* as a primary driver of change in healthcare and society only recognizes half the story. The users of information and communication technology across all demographics (e.g., clinicians, patients, families and people) have grown in abilities, size and receptivity. If statistics from the Canadian Internet Registration Authority (2014) are any indication, it is fair to suggest that significant cross-sections of the Canadian healthcare workforce (including nurses) now possess and use some type of mobile Internet connected device in their everyday lives. Many consumer and patient populations have also embraced these digital tools to communicate, share and explore elements of their own health(care) (Pew Internet & American Life Project 2014). The rise of the ePatient movement (deBronkart 2013; Leonard and Wiljer 2007; Meskó 2013) and access to an unlimited reservoir of health information on the Internet has shifted the dynamic of the nurse–patient relationship. Clinicians can no longer be conceptualized as the gatekeepers to all relevant and timely health and medical information (Eysenbach 2008). With access to an Internet connection, a consumer can search, explore, network and collaborate with others in their pursuit of health information – with both positive and negative outcomes (Cole et al. 2016). Suffice to say, the primary mechanism of this consumer evolution was not the mere presence of technology; it was the latent desire of people to discuss and interact with their own health(care) (Sarasohn-Kahn 2008). The increases in usable and functional technology made this latent desire *possible* on a much large scale than was ever possible before. So, what will be required by the nursing informatics specialty to remain relevant in light of the groundswell of human–technology synergy occurring at patient and consumer levels? What classical or established topics within the nursing informatics specialty should be reviewed for the potential of emergent obsolescence? Have some *classical* nursing informatics topics and ideals become obsolete perspectives from which to view and operationalize the topics of patient care, nursing knowledge and the management of information?

In 1978, it was theorized by Birckhead that the influence of technology on/within the nursing profession would be significant: “[I am] left with the belief that

indeed a new era has begun and that there are innumerable ways in which nursing practice is affected, at times without one's awareness" (p. 19). Written nearly 40 years ago, Birckhead's comments still resonate in 2016 with validity and relevance. The innumerable ways that technology has influenced nursing practice have only been eclipsed by the subtleness of these remarkable changes. The domain of nursing informatics first coined in 1980 (Scholes and Barber 1980) has also grown significantly since that time period. Since the early 1980s, researchers and practitioners have continued to evolve and refine the science of nursing informatics, aligning around the tenets of data, information, knowledge and wisdom (Bakken et al 2008; Carrington 2012; Effken 2003; Goossen 2000; Graves and Corcoran 1989; Hannah et al. 1994; Matney et al. 2011; Staggers et al. 2001; Staggers and Parks 1993; Thompson et al. 1999; Turley 1996). Similarly, a number of common topics were established as important themes within the nursing informatics specialty (including but not limited to): advocating for standardized languages/data standards, seeking to embed nursing work and knowledge into health technologies like electronic records and the generation of informatics theory to support practice and education (Nagle 2015). It would be dismissive to suggest that these aforementioned informatics topics are no longer of importance in 2016; regardless, their positioning, currency and specificity do warrant reflection in light of the rapid technological advances occurring at patient and consumer levels. Inasmuch, I contend that the nursing informatics specialty has done a remarkable job of examining classical topics of interest and importance over the last few decades (e.g., data standards, electronic records and embedding nursing knowledge). These topics have been (and currently still are) of utmost importance to nursing, especially as a mechanism to justify and evidence the value of the profession to the healthcare system. Unfortunately, many of these commonly explored nursing informatics directions have remained just that: *relevant to nursing and patients of a healthcare system where the clinician was still the gatekeeper to health information and patients possessed limited opportunities to seamlessly connect with each other*. The last decade of technological diffusion at all levels of society has challenged both the value and sustainability of how we conceptualize nursing informatics in a broader sense. In many ways, we have fallen victim to Birckhead's second reflection of not being fully aware or appreciating the subtlety of changes that technology can both enable and facilitate. Our stoic focus on refining, improving and further refining traditional elements of nursing informatics has passively minimized the influence of extraneous societal variables, including how the evolved consumer role now has the potential to operate in new and different ways within all elements of health(care). We have unknowingly entered a new era of nursing informatics – one that is now primarily driven by the consumer, not nursing (or the healthcare system for that matter) – and that might not be a bad thing.

### **Post-Nursing Informatics**

Like other disciplines and domains that were evolved (or made obsolete) by advances in society or technology, the nursing informatics specialty needs to deeply consider its value and role within the not-too-distant healthcare system. As human decision-making, physical presence and human labour are all being supplanted or replaced in different areas of society (including healthcare) by artificial intelligence and automation, nursing will need to readdress its value proposition to health(care) if it wishes to retain some level of control in this evolution. Unlike 10–15 years ago where nursing informaticians were voicing concerns related to nurses being replaced by other businesses and health providers if they continued resisting technology (Feeg 2004; Simpson 1998), it is now a concern that elements of nursing can be partially (if not fully) mediated by elements of artificial intelligence and automation. The concern of being replaced by a *machine* is not new within the nursing discourse. There is a sizable lineage of scholarship exploring whether machines and technology benefit the profession, or actively displace elements like caring, touch and interpersonal relationships (Barnard 2002; Locsin 1995; Marck 2000; O’Keefe-McCarthy 2009; Sandelowski 1997; Yeo 2014). Regardless, the collective consensus has always remained that the act, value and role brought to healthcare by nurses cannot be replaced by technology, per se. I agree with the assessment that technology will not *replace* nurses in a direct sense in the immediate future. That said, I do foresee sizable amounts of displacement and role evolution of various nursing elements, enabled and driven by technology. In the past, I have found that when tabling this sort of prediction to nurses, the reaction of discomfort and concern was common. It would seem that the realization that elements of the nursing role currently occupied by humans can and will be replaced by non-human entities has a tendency to engender emotional and existentialist ruminations about what the future may hold. Some may see this sort of outlook for the future of nursing as being extremely dystopian – I do not. I view this human partnering with automation and artificial intelligence as an opportunity for the nursing profession; an opportunity that is laden with potential and ability to generate new nursing roles to claim uncontested space within future health(care) systems that utilize the best parts of both human and non-human abilities.

### **Planning for a Post-Nursing Informatics Specialty**

Although it is difficult to say what elements of nursing roles will be “up for grabs” by non-human entities, a number of predictions can be made by exploring other disciplines where automation and the use of artificial intelligence has become a reality. Most recently, advances in autonomous driving vehicles have demonstrated that complex tasks like driving can be accomplished with little or no human involvement (Google 2015). Cognitive computing has begun to start outcompeting humans, especially in the areas of large data analytics and complex decision-making (Greenemeier 2013). For instance, IBM’s Watson supercomputer is able to combine the latest research evidence *with* subject matter experts and human

language context to generate predictions related to complex questions posed by humans (Frey and Osborne 2013). The power of this system was showcased in 2011 when Watson handily defeated two human Jeopardy champions. Most recently, Watson is currently using 600,000 medical evidence reports, 1.5 million patient records and millions of pages from medical journals to detect patterns and generate recommendations for oncology patients (Frey and Osborne 2013). Service bots and other autonomous robots have also been given significant attention in the media over the last few years, including robots purported to support or adjunct various nursing roles (The Guardian 2015; UT Arlington 2015). Regardless, given the complexity of many nursing roles/tasks and the relative clunkiness of most service robots currently planned or in existence, it is unlikely that nurses will be supplanted by automation in the *direct* sense (in the immediate future at least). Finally, the caring and tacit knowledge(s) brought by nurses to the nurse–client relationship has been historically used as a retort towards any suggestion that the nursing role could be automated. Although on face value, this may be true, the ontological perspective from which this claim originates is largely based in a reality where people existed in a physical sense – not digital. Caring through/with technology has never really been an active concern among informatics proponents, as it has largely been assumed that caring can and does occur. Regardless, as future nursing roles become displaced or evolved by technology, we will require revisions to our theoretical perspectives of how, what and where nurses in digitized healthcare systems can exist. For instance, there are currently care delivery models in place where nurses never physically see or meet their clients, and all required interventions are delegated through third-party healthcare providers (e.g., Personal Support Workers) via mobile cellular devices (MOHLTC 2014). This type of amplification of the nursing role into a case and information navigator role is only the beginning of role changes for nurses – one whereby the physical presence of a nurse may not be requisite, or, even a sought after attribute.

Although the nursing role is due to experience a number of significant changes in the coming decades, nursing as a profession is probably not going away anytime soon. Evidence supporting the long-term survivability of the profession in the face of automation can be found in a 2013 report generated by two economists who attempted to predict which professions were susceptible to automation (Frey and Osborne 2013). Not surprisingly, nursing was predicted to possess an extremely low probability of being fully *computerizable*. Regardless, the algorithm and data used to generate these predictions (based on expert consensus, employment data and a range of profession characteristics) were not refined enough to develop predictions towards how professions might be evolved or shaped by automation. Therefore, although cognitive computing, artificial intelligence and automation might not directly replace all or parts of the nursing role, the impact of disintermediation enabled by these sorts of technology will shape our future understanding of nursing and how we serve our patients.

### How to Future Proof Nursing Informatics?

I contend that future proofing ourselves within nursing informatics may be as simple as becoming more cognizant towards Birckhead's (1978) recognition of the subtle change that can occur when interacting with technology. First, it would benefit the nursing informatics specialty to reflect upon the currency and relevancy of its established domains of knowledge and their current forms (e.g., data standards, electronic health records and informatics competencies). Granted, although work in these *classical* informatics topics will always be required to some degree moving into the future, these legacy topics will only be of importance in a *post*-nursing informatics context if they are appropriately embedded and evolved to respond to a hyper-connected world where human–technology convergence is the norm. Second, increasing cohorts of consumer populations can be found actively outsourcing elements of their primary healthcare to virtual communities like PatientsLikeMe, conducting do-it-yourself genomic testing with companies like 23andMe or using wearable devices like Fitbits to track personal biometrics. A common denominator underpinning these sorts of future health technologies and processes will be the seamless ability to connect people – not merely information – together. As eloquently stated by Susannah Fox (2014): “The most exciting innovation of our era is not access to medical information, but access to each other.” Nursing informatics has spent the majority of its 30 years of existence attempting to connect information to other disparate information. Given this past experience managing and translating various forms of information, the nursing informatics specialty possesses a prime opportunity to take a greater role towards developing the future linkages of people, their information and technology in relation to safe and effective health(care).

Our emerging role in this *post*-nursing informatics era will also require the specialty to become experts in all forms of new health technology, and possess the ability to insert classical nursing informatics knowledge into these systems and the processes they enable. Given that the future healthcare system will be a multi-dimensional ecosystem filled with social networking, personalized healthcare, genomics, nanotechnologies, cognitive computing and big data analytics (Murray 2015), nursing informaticans should be at the forefront of developing and evaluating new care delivery models that leverage the best elements of both human (nurse, patient, etc.) and non-human capabilities. This sort of future-forward presence will allow the profession to claim distinct nursing roles in the untested space generated by/within the new care modalities enabled by technology.

Future nursing informaticans will also need to infuse their knowledge, skills and tacit experience into the analysis of massive databases and repositories of data. A by-product of increased digitization of healthcare has been the explosion in the volume, velocity and variety (i.e., big data) of all types of healthcare data being generated.

Nursing informatics has a long history of data science in its knowledge base and definitions; drawing from this established foundation, further development of this skill set within the context of emerging healthcare practices and technologies will be important. This embedding of our classical data standards, knowledge, and values into new systems will ensure that the nursing role is recognized and represented in all future healthcare decision-making arising from the use of large-scale data analytics.

The final and most important role of future nursing informaticians in a *post-nursing informatics* world will be the continued advocacy of the profession and healthcare consumers in all discussions related to health technology. Nursing informaticians must ensure the valued elements of nursing care are sustained in light of future technological advancements, while cautiously allowing traditional elements of the nursing role to be imprinted upon technology. Although likely a contentious proposition, unless we critically examine which elements of the nursing role can benefit from automation, artificial intelligence and other forms of technological amplification, we will lose our competitive edge as healthcare providers. This role of the future nursing informaticians will inherently operate within the grey space separating humans and technology – and is likely to draw both criticism and praise from a variety of healthcare-related stakeholders. Regardless, success in this role is necessary if we wish to evolve the nursing role within the future healthcare system. Success at this new role will also ensure our past knowledge and work in the nursing informatics specialty will be sustained – if we fail, our past knowledge and work will likely evaporate along with the importance of nursing informatics. It will be up to the specialty to ensure that nursing informatics remains a leading force within the profession, so when reflections of the current-day healthcare system arise 30 years from now, late career nurses of that time period will recount to their younger colleagues about the subtlety of technological change, citing examples from the bygone era when personalized healthcare was experimental, digitally enabled nursing care models were primordial and fax machines and pagers still prevailed.

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### References

- Bakken, S., P. Stone and E.L. Larson. 2008. "A Nursing Informatics Research Agenda for 2008–18: Contextual Influences and Key Components." *Nursing Outlook* 56(5): 206–14. doi:10.1016/j.outlook.2008.06.007.
- Barnard, A. 2002. "Philosophy of Technology and Nursing." *Nursing Philosophy* 3(1): 15–26.

- Birckhead, L. 1978. "Nursing and the Technetronic Age." *Journal of Nursing Administration* 8(2): 16–19.
- Carrington, J.M. 2012. "Development of a Conceptual Framework to Guide a Program of Research Exploring Nurse-to-Nurse Communication." *Computers, Informatics, Nursing: CIN* 30(6): 293–99. doi:10.1097/NXN.0b013e31824af809.
- Canadian Association of Schools of Nursing / Canada Health Infoway. 2012. *Nursing Informatics Entry-to-Practice Competencies for Registered Nurses*. Ottawa: Author.
- Canadian Nurses Association /Canada Health Infoway. 2014. *National Survey of Canadian Nurses: Use of Digital Health Technologies in Practice*. Retrieved December 29, 2015.<[www.infoway-inforoute.ca/en/component/edocman/resources/reports/clinical-adoption/1913-national-survey-of-canadian-nurses-use-of-digital-health-technologies-in-practice](http://www.infoway-inforoute.ca/en/component/edocman/resources/reports/clinical-adoption/1913-national-survey-of-canadian-nurses-use-of-digital-health-technologies-in-practice)>.
- Cole, J., C. Watkins and D. Kleine. 2016. "Health Advice from Internet Discussion Forums: How Bad Is Dangerous?" *Journal of Medical Internet Research* 18(1): e4. doi:10.2196/jmir.5051.
- deBronkart, D. 2013. "How the E-Patient Community Helped Save my Life: An Essay by Dave deBronkart." *BMJ* 346: f1990. doi:10.1136/bmj.f1990.
- Effken, J. 2003. "An Organizing Framework for Nursing Informatics Research." *Computers, Informatics, Nursing: CIN* 21(6): 316–23; quiz 324–25. doi:10.1097/00024665-200311000-00010.
- Eysenbach, G. 2008. "Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness." *Journal of Medical Internet Research* 10(3): e22. doi:10.2196/jmir.1030.
- Feeg, V. 2004. "Campaign for Nursing Curriculum Reform in Information Technology: Got it?" *Dean's Notes* 26(2): 1–3.
- Fox, S. [susannahfox]. 24 May 2014. "The Most Exciting Innovation of our Era is not Access to Medical Information, but Access to Each Other" [Tweet]. Retrieved January 3, 2016. <<https://twitter.com/susannahfox/status/470200502450655232>>.
- Frey, C.B. and M.A. Osborne. 2013. "The Future of Employment: How Susceptible are Jobs to Automation?" Retrieved January 1, 2016.<[www.oxfordmartin.ox.ac.uk/downloads/academic/The\\_Future\\_of\\_Employment.pdf](http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)>.
- Google. 2015. "Google Self-Driving Car Project." Retrieved January 3, 2016. <[www.google.com/selfdrivingcar/reports/](http://www.google.com/selfdrivingcar/reports/)>.
- Goossen, W. 2000. "Nursing informatics research." *Nurse Researcher* 8(2): 42–54.
- Graves, J.R. and S. Corcoran. 1989. "The Study of Nursing Informatics." *Image--the Journal of Nursing Scholarship* 21(4): 227–31.
- Greenemeier, L. (2013). "Will IBM's Watson Usher in a New Era of Cognitive Computing?" *Scientific American*. Retrieved January 3, 2016. <[www.scientificamerican.com/article/will-ibms-watson-usher-in-cognitive-computing/](http://www.scientificamerican.com/article/will-ibms-watson-usher-in-cognitive-computing/)>.
- Hannah, K., M. Ball and M. Edwards. 1994. *Introduction to Nursing Informatics*. New York: Springer Verlag.
- Leonard, K. and D.Wiljer. 2007. "Patients are Destined to Manage their Care." *Healthcare Quarterly* 10(3): 76–78.
- Locsin, R.C. (1995). "Machine Technologies and Caring in Nursing." *Image--the Journal of Nursing Scholarship* 27(3): 201–03.
- Marck, P.B. 2000. "Recovering Ethics after "Technics": Developing Critical Text on Technology." *Nursing Ethics* 7(1): 5–14. doi:10.1177/096973300000700103.
- Matney, S., P.J. Brewster, K.A. Sward, K.G. Cloyes and N. Staggers. 2011. "Philosophical Approaches to the Nursing Informatics Data-Information-Knowledge-Wisdom Framework." *ANS. Advances in Nursing Science* 34(1): 6–18. doi:10.1097/ANS.0b013e3182071813.
- Meskó, B. 2013. *Social Media in Clinical Practice*. London: Springer London.
- MOHLTC. 2014. Excellent Care for All - eShift – Using Technology to Improve Access to Care." Retrieved January 1, 2016. <[www.health.gov.on.ca/en/pro/programs/ecfa/action/community/com\\_eshift\\_tool.aspx](http://www.health.gov.on.ca/en/pro/programs/ecfa/action/community/com_eshift_tool.aspx)>.

- Murray, S. 2015. "The Future is a Sharp 90° Turn." In K. Hannah, P. Hussey, M. Kennedy and M. Ball, eds., *Introduction to Nursing Informatics* (pp. 371–412). New York: Springer Verlag.
- Nagle, L.M. 2015. "The Role of the Informatics Nurse." *Introduction to Nursing Informatics* (pp. 251–72). New York: Springer Verlag.
- Nagle, L.M. 2007. "Everything I know about Informatics, I Didn't Learn in Nursing School." *Journal of Nursing Leadership* 20(3): 22–25.
- O'Keefe-McCarthy, S. 2009. "Technologically-Mediated Nursing Care: The Impact on Moral Agency." *Nursing Ethics* 16(6): 786–96. doi:10.1177/0969733009343249.
- Pew Internet & American Life Project. 2014. "Health Fact Sheet." Retrieved January 3, 2016. <[www.pewinternet.org/fact-sheets/health-fact-sheet/](http://www.pewinternet.org/fact-sheets/health-fact-sheet/)>.
- Saba, V. 2001. "Nursing informatics: Yesterday, Today and Tomorrow." *International Nursing Review* 48(3): 177–87.
- Sandelowski, M. 1997. "(Ir) Reconcilable Differences? The Debate Concerning Nursing and Technology." *Journal of Nursing Scholarship* 29(2): 169–74. doi:10.1111/j.1547-5069.1997.tb01552.x.
- Sarasohn-Kahn, J. 2008. "The Wisdom of Patients: Health Care Meets Online Social Media." *California HealthCare Foundation*. Retrieved January 3, 2016. <[www.chcf.org/publications/2008/04/the-wisdom-of-patients-health-care-meets-online-social-media](http://www.chcf.org/publications/2008/04/the-wisdom-of-patients-health-care-meets-online-social-media)>.
- Scholes, M. and B. Barber. 1980. "Towards Nursing Informatics." In *MEDINFO: 1980* (pp. 7–73). Amsterdam, The Netherlands.
- Sensmeier, J. 2012. "These are Boom Times for Nursing Informatics." Retrieved January 1, 2016. <<http://blog.himss.org/2012/02/10/these-are-boom-times-for-nursing-informatics/>>.
- Simpson, R. 1998. "The Technologic Imperative: A New Agenda for Nursing Education and Practice, part 1." *Nursing Management* 29(9): 22–24.
- Staggers, N. and P. Parks. 1993. "Description and Initial Applications of the Staggers & Parks Nurse-Computer Interaction Framework." *Computers in Nursing* 11(6): 282–90.
- Staggers, N., C.A. Gassert and C. Curran. 2001. "Informatics Competencies for Nurses at Four Levels of Practice." *The Journal of Nursing Education* 40(7): 303–16.
- The Guardian. 2015. "Robear: the Bear-Shaped Nursing Robot who'll Look After you When you get Old." *The Guardian*. Retrieved January 3, 2016. <[www.theguardian.com/technology/2015/feb/27/robear-bear-shaped-nursing-care-robot](http://www.theguardian.com/technology/2015/feb/27/robear-bear-shaped-nursing-care-robot)>.
- Thompson, C., R. Snyder-Halpern and N. Staggers. 1999. "Analysis, Processes, and Techniques: Case Study." *Computers in Nursing* 17(3): 203–06.
- Turley, J.P. 1996. "Toward a Model for Nursing Informatics." *Image--the Journal of Nursing Scholarship* 28(4): 309–13.
- UT Arlington. 2015. "New UT Arlington Nursing Robot to Allow Nurses Time for more Important Duties." *EurekaAlert!*
- Yeo, M.T. 2014. "Implications of 21st Century Science for Nursing Care: interpretations and Issues." *Nursing Philosophy* 15(4): 238–49. doi:10.1111/nup.12066.

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