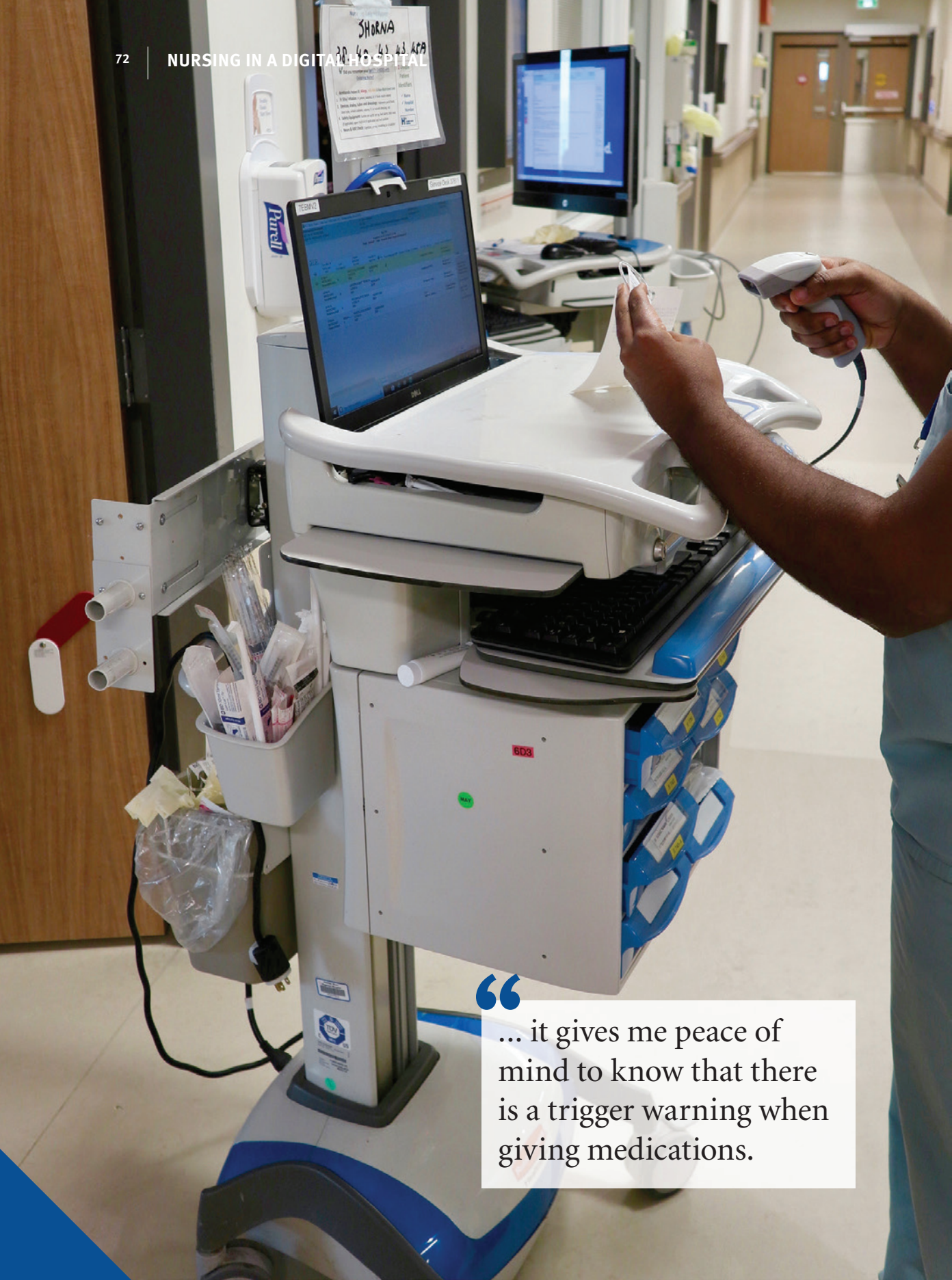

> “... it gives me peace of mind to know that there is a trigger warning when giving medications.

HUMBER RIVER HOSPITAL is one of Canada's largest community acute care hospitals, serving a population of more than 850,000 people in the northwest Greater Toronto Area.

The multi-site hospital currently operates out of its Wilson Avenue acute care site and Finch and Church Street reactivation care centres with a total of 722 beds, just over 3,800 employees, approximately 700 physicians and over 1,000 volunteers.

Affiliated with the University of Toronto and Queen's University, Humber River Hospital is North America's first fully digital hospital. Part of Humber River Hospital's digital infrastructure includes completely automated laboratory services, robots sorting and mixing medications, electronic health records, tracking systems for patients undergoing surgery that update families through their cellphones and patient computer bedside terminals – all varieties of technologies that automate information, eliminate paper and provide a connected experience for patients, staff and families.

Humber River Hospital was awarded Accreditation with Exemplary Standing in 2018 and since its opening in 2015 has received numerous awards and accolades for technological advancements and innovation (www.hrh.ca).

Experiences of Nurses Working in a Fully Digital Hospital: A Phenomenological Study

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WHAT WE LEARNED:

1. To our surprise, the study results indicate that in combination with previous exposure to many of the technologies at HRH, longer duration of employment at HRH was associated with a higher technology competency skills score. Generational cohort did not play a role in the perception of nurses' technology competency at HRH.

2. Not only should nurse leaders plan for sufficient time and exposure to technology, but they also need to ascertain the meaning of technology with respect to nurses' values to develop appropriate educational programs that support maximum adoption, regardless of the generational cohort.

3. Although the literature suggests that Generation X and Generation Y are technologically skilled, our findings did not concur with previous studies that baby boomers were less technologically skilled. At HRH, nurses in the baby boomer generation were no less technologically skilled and just as proficient with the technology as other generations.

Abstract

Background: With the increasing development and integration of information and communication technology (ICT) into hospitals, there remains a lack of understanding of the impact of these technologies on the hospital's largest core users: nurses. Humber River Hospital (HRH), one of the first hospitals to completely integrate technology across all hospital systems and workflows, has sought to understand how ICTs have transformed the clinical working environment.

Objective: The aim of the study was to achieve a deeper understanding of the lived experiences of nurses practising in North America's first digital hospital.

Methods: The methodological approach was informed by van Manen's hermeneutic phenomenological methodology. Data were gathered through in-depth semi-structured interviews with eight nurses at HRH. Thematic analysis was conducted using the van Manen and Colaizzi methods of data analysis.

Results: Six thematic categories that formed the nurses' lived experiences of working in a digital environment were identified: safety, time, teamwork, technology failures, patient responses and adapting.

Conclusion: Nurses at HRH identified six themes regarding their lived experiences working in a fully digital hospital that provide an insight into nurses' values and cause us to reflect on how we might use this information to further support nursing practice in the fully digital environment. Nurses at HRH seem to have normalized the nursing process within the fully digital environment. Technology appears to be viewed by nurses at HRH within the premise of nursing as an art, allowing patient responses to be acknowledged and incorporated into nursing workflows, and as a science, permitting safe care delivery. Overall, nurses perceived technology as being essential for patient safety and facilitating nursing practice. These findings offer insight into nurses' perception of ICTs, and as technological advancements continue to emerge, these findings will inform education, practice and policy.

The profession of nursing has had an ongoing relationship with technology, from telephones and typewriters in the 1900s to cardiac monitors and renal dialysis machines in the mid-20th century (Sandelowski 2000). Major technological advancements in the last decade have been credited with improving patient monitoring (Silow-Carroll et al. 2012), decreasing medication errors (Shah et al. 2016) and enhancing workflow efficiency (Gellert et al. 2015). With the increasing development and integration of information and communication technology (ICT) into hospitals, there remains a lack of understanding of the impact of these technologies on the hospital's largest core users: nurses. Humber River Hospital (HRH), one of the first hospitals in North America to completely integrate technology across all hospital systems and workflows, has sought to understand how ICTs have transformed the clinical practice environment for nurses.

There is a paucity of research that provides comprehensive data regarding the manner in which ICTs impact nursing care. Although several studies exist on the topic, most of the current literature has focused on physicians (Catan et al. 2015) or solely on critical care nurses working in intensive care units (Laerkner et al. 2015; Tunlind et al. 2015). Previous studies have revealed that nurses perceive ICTs positively because of improvements in accuracy, patient safety and ease of access (Rouleau et al. 2017). Studies have also suggested that nurses perceive technology as enhancing communication and collaboration (Burns et al. 2018) and facilitating everyday practice (Wikström et al. 2007). Conversely, various studies have reported negative perceptions of the impacts of technology. Tunlind et al. (2015) reported that nurses often found themselves prioritizing the troubleshooting of equipment due to device malfunctions that interrupted nursing care. Kiekkas et al. (2006) reported that nurses sometimes felt that technology increased stress and moved the focal point away from patients. The existing research has only provided a preliminary understanding of the impact of ICTs on nursing practice, and there is a lack of qualitative research examining nurses' experiences specifically in a high-technology environment.

The aim of this study was to examine the lived experiences of nurses practising in North America's first fully digital hospital by applying phenomenological research methods. Knowledge gained from the current research study will provide healthcare leaders with insight into how ICTs affect nursing practice and meanings that resonate with nurses in terms of integrating technology into their daily professional practice.

Methods

Design

This research is grounded in Heidegger's interpretive hermeneutic phenomenological philosophy drawn from van Manen (1990). Phenomenological inquiry is a systematic attempt to understand and describe a phenomenon in depth and arrive at the essence of participants' lived experience of a given phenomenon (Moustakas 1994), which makes it a highly suitable approach for this study. Interpretive hermeneutic phenomenology focuses on the subjective experience (van Manen 1990). The aim of this methodology is to gain a deeper understanding of the human experience through description and interpretation. Through a hermeneutic approach of analysis, the tenets of Heidegger's phenomenological philosophy provided the opportunity to explore nurses' emic perspective of their experience practising in North America's first fully digital hospital.

Participants and setting

Eight female and male nurses from all units of the organization volunteered to participate in the research study. Selection criteria included the requirement that nurses used ICTs in their nursing practice on a daily basis and were direct care providers. All nurses were required to have been previously employed at another acute care hospital, for the purposes of comparing their experiences to those in a non-fully digital acute care hospital setting. The participants had to have been employed at HRH for a minimum of three months to ensure sufficient experience with ICTs. The identity of the participants was concealed with a pseudonym so that no data could be tracked back to them.

Data collection

Van Manen's (1990) methodology was implemented by interviewing participants in depth and encouraging them to reflect on their experiences. A private room within the hospital was used to conduct the semi-structured interviews. Interviews took place in October and November of 2018, and open-ended interviewing was used to allow participants to provide information unique to their experiences. Each interview lasted from 30 to 60 minutes and was digitally recorded. Observation notes were recorded by the interviewer to document participant expressions and body language. Probing questions were asked by the interviewer to further explore points of interest. Based on the principles of phenomenology, prejudgments were acknowledged and set aside for the purpose of truly understanding the experiences of the participants (Valle et al. 1989).

Data analysis

The data analysis process drew on van Manen's (1997) and Colaizzi's (1978) phenomenological methodology. The method involved listening to all recordings to familiarize researchers so they acquired a sense of participants' experiences and then transcribing all digital recordings word for word (Colaizzi 1978). Following

transcription, extraction of thematic statements that contributed to participants' experiences that were of direct relevance to the phenomenon was undertaken using van Manen's (1997) highlighting approach. Meanings were derived from the statements, which were then organized into themes that were common across all participants. All themes were then integrated into an exhaustive description of the phenomenon (Colaizzi 1978). Finally, the validity of the phenomenological analyses was confirmed by asking participants to review the content to ensure that the interpretations accurately captured their experiences (Colaizzi 1978). Any new relevant data from the participants were then added to the analysis.

Rigour of the study

To ensure that rigour was achieved, Lincoln and Guba's (1985) criteria for creditability, transferability, dependability and confirmability were evaluated in the qualitative process. Credibility was addressed by recruiting diverse individuals, taking into consideration age, years of experience and hospital unit. To ensure transferability, in-depth descriptions of nurses' lived experiences were sampled across several hospital units. Dependability was ensured by closely following data analysis procedures of the in-depth descriptions and transcription of nurses' lived experiences. Lastly, confirmability was achieved by ensuring that the research team's biases were not introduced (to maintain openness to the information provided by the participants) and by putting them aside throughout the research process.

Ethical considerations

Institutional review board (IRB) approval was obtained from the IRB committee of HRH. All participants were provided with detailed written and verbal information about the study prior to their participation. Assurances were given that participation was voluntary and that the participants would be able to withdraw at any time, without prejudice. Anonymity was emphasized, and the participants' identities were not used in data storage. All participants signed and received a copy of the informed consent.

Findings

Six themes provided the basis for describing the experiences of nurses working in a digital hospital: safety net, time, teamwork, technology failures, patient responses and adapting to a new environment. The themes are described and illustrated with comments from the participants.

Safety net

Safety was perceived as a highly valued impact of technology. In particular, nurses viewed the technological interventions for preventing medication errors, smartphone devices that provide call bell notifications and bed exit alarms as extremely important to their practice. All research participants had positive reactions to the role of safety in technological interventions:

> Safety is huge. To know that we have the technology in place to help support the care that we are providing – it acts like a safety net.
>
> Say, for example, we have a patient that is high risk for falls. We do have the capability of putting on a bed alarm, and if that patient is trying to get out of bed, it will ring an alarm and it will also go to our phones. So it allows us time to get to that patient versus the patient is already on the ground, we have no idea that that patient was even attempting to get up out of bed and it's kind of too late. So safety has been huge with the implementation of technology.
>
> Sometimes if you are in a hurry and you accidentally scan the wrong medication, then it will prompt you. You can
>
> identify your errors.
>
> … it gives me peace of mind to know that there is a trigger warning when giving medications.

One participant stated that safety may be compromised with automation from technology,

> … sometimes because [data from the vital signs machine is] automatically transferred to the [electronic medical record], some nurses might bypass the interpretation [of the data] because it's just numbers on a screen.

Time

Nurses described conflicting feelings about technology with regard to time. Participants commented on receiving call bell alerts on their smartphone, as well as on time spent documenting care delivery in the electronic medical record. Participants viewed technology as both time saving and time consuming:

> It does help us to prioritize; we are not having to run back and forth between the main nursing station and the patient [be]cause everything is at hand. So it does save a lot of time. And I think … the biggest thing that's improved our patient care is time.
>
> If I am doing something in a patient's room and another patient is ringing the call bell, I don't have to leave and run to the nursing station to find out what they are requesting [and] then go back to my patient's room. I can manage my time.
>
> I've seen other people struggle between managing time with technology and taking care of patients.
>
> You do have to find time between patient care and documentation … Things can easily pile up with all the documentation.

Teamwork

One of the more unexpected themes to emerge from the study participants' experiences was the promotion of collaboration with other nurses through technology. Participants described receiving support from other nurses when they experienced issues or problems with technology:

> My colleagues are usually the best people to ask if I am having any issues.

> My colleagues and managers are always willing to help ... Whenever we have new technology, there's always good training that is provided.

Technology failures

System glitches and planned downtimes were described by nurses as one of the disadvantages of working in a fully digital hospital:

> It's technology, so sometimes it fails or it has glitches. So we have to learn how to work with it …, like when we have downtimes … It's hard to remember what it's like to work without [technology], so that has actually been a struggle.

> Anytime that there is a breakdown with one of the devices, you also have to solve the technical issues on top of your regular nursing duties.

Participants also stated that some technology was difficult for older patients to learn:

> … the phones don't look like a phone, they look like a remote, so patients don't really know that it's a phone.

> It sort of puts on the nurses the need to help support patients [to use the technology], so if the patient needs to make a phone call, the nurse has to be in [the patient's room] to dial the number.

Patient response to nurses using technology

Nurses stated that most patients who came into the hospital appreciated that the nurses were using advanced technology to deliver care:

> The patients really appreciate it; they know that we are providing them with safe care.

One nurse also explained that having all the information about patients at their fingertips helped to build a better relationship with their patients:

> With technology, I don't have to leave the room to get an answer to a patient's question. If I leave the room, I might be stuck somewhere with something important. But it's hard to explain that to the patients, so technology has helped us a lot.

However, many nurses also stated that there were generational differences in patients that influenced their level of comfort with the digitalization of hospital processes:

> 98% of patients are good with the technology. Everybody has a smartphone or iPad and computer, so they love it. But there are some seniors who have not used technology, so there is a little bit of a challenge, like a generational gap.

> I think it allows us more time with our patients because we are not having to be running back and forth to get things for our patients. But also I find with the older population, they tend to get a little bit frustrated because they don't understand how technology works; it's just not part of their era. So we do spend a little more time with them to explain to them how the call bell works.

Adapting to a new environment

When asked about the challenges associated with adjusting to a fully digital environment, all nurses stated that adjustment was rapid. Most nurses stated that they learned to use the technology within two to three weeks:

> Because I come from a generation where I've always sort of had technology at hand and I've grown as technology improved over the years, it wasn't a huge impact for me personally … I just sort of picked it up and I figured it out.

> It wasn't a huge impact on me personally.

> As time went on and we were using it every day, we just sort of got used to it.

One nurse said that she had become so comfortable using technology that they were unwilling to consider other employment opportunities:

> I love [working with technology]; that's why I don't want to leave Humber.

Discussion

The aim of the current study was to examine the lived experiences of nurses practising in North America's first fully digital hospital by applying Heidegger's interpretive hermeneutic phenomenological philosophy. The concept of *Dasein* portrays a living being through the activity of *being there* and in the context of *being with others*, as well as lived experience and everyday ordinariness. Based on these tenets, the meaning of nurses' everyday existence, practising in a fully digital hospital, was explored (Horrigan-Kelly et al. 2016). There is a paucity of research regarding nurses' experiences of practising in a fully digital hospital, and to date, this is the first study of its kind.

Several themes emerged from the study: safety, time, teamwork, technology failures, patient responses and adapting. Participants of the study commented positively about technology in relation to safety. Nurses predominantly viewed the

fully digital practice environment as a safety net, thereby supporting nurses and providing them with safeguards in care delivery. Safety is at the core of nursing practice. Nurses' perception of a work environment with protections in place to maximize safe care delivery is an essential component of maintaining and sustaining professional practice and achieving consistently positive patient outcomes.

As noted earlier, one interesting interpretation involved a study participant's caution regarding the automation function of technology and the potential for safety to be compromised. A potential safety concern was articulated in relation to data from the vital signs machine that is automatically transferred to the electronic medical record. The experience of the study participant was that the interpretation of the vital signs data might be bypassed by nurses "because it's just numbers on a screen" in its tabular format. Technology does not replace the fundamental nursing process by which patients are assessed, assessment data are interpreted and monitored and therapeutic interventions are implemented. We reflect on how this acute observation highlights the interface and interconnection between nursing clinical reasoning and technology. Our interpretation is that this nurse perceives that the technology can provide time and technical efficiencies in the collection and documentation of patient vital signs but does not replace the kind of pathic knowledge nurses must constantly reflect upon to reframe their cognitive picture of patients and generate a sense of something being wrong (Errasti-Ibarrondo et al. 2019; van Manen 2007). For nurse leaders, reflexivity is required to understand the real impact on nurses when implementing technology. Although designed to save lives, technology may, in fact, overwhelm staff, for example, with alarm fatigue (Jones 2014).

Participants of the study perceived technology as both time saving and time consuming. The efficiency of delivering nursing care and ability to prioritize patient care needs were regarded as time saving. Timely access to information, enabled through technology, was experienced by nurses as contributing to efficient and effective time management and leading to improved care delivery. Nurses stated that the time-consuming aspect of technology was related to electronic documentation, which could "easily pile up." Balancing the time spent taking care of patients and documenting nursing actions was experienced as a possible "struggle" by some study participants. The distribution of time spent caring for patients versus time spent documenting care has long been a challenge for nurses in the paper world and continues to be acknowledged as such in the electronic environment. As key nursing processes transition to the electronic world (e.g., medication barcode scanning instead of signing medication administration records, independent double check of high-alert medications, electronic documentation), nurse leaders should consider whether true opportunities for efficiencies can be found. For example, implementation of the barcode medication

scanning technology at HRH represented a safety net for nurses and patients (to prevent errors), but it may also have represented an efficiency gained for nurses as they no longer needed to sign off individual medications in a paper chart; the scans are automatically populated into the electronic medical record with dates, times and patient and nurse data.

Participants in the study stated that support and collaboration from peers and management at HRH are widely available for problem solving technical issues and that training is robust and ongoing. Teamwork, fostered by the shared goal of overcoming encounters with technological difficulties, was a positive outcome of nurses experiencing technology issues or problems in the fully digital practice environment. From a change management perspective, this is a very encouraging by-product, which highlights the organizational culture that is receptive to change. We did not anticipate this positive outcome related to interprofessional collaboration. Upon reflection, the culture at HRH demonstrates resiliency, which allows for the continuous improvements that are essential in an environment where evidence-based practice is valued and technology is fully integrated.

Nurses described "system glitches and planned downtimes" as the singular hindrance of practising in a fully digital hospital. However, nurses said that regardless of the disadvantage of experiencing technical glitches and scheduled downtimes, the fully digital practice environment brought opportunities for learning and enhanced resilience. Nurses also experienced the burden of needing to remove themselves from direct nursing care to assist elderly patients with customer services such as making a telephone call because "… the phones don't look like a phone; they look like a [television] remote [control]." What we can draw from this observation is that nurses may need to be vigilant about assessing how new technologies may impact patients as much as they impact staff. As organizations transition to become increasingly digital and technologically advanced, these reflections remind nurse leaders that in addition to nursing clinical assessments, patient technology orientation must be incorporated into workflows. Nurse leaders must recognize that for technology to serve the purpose for which it was intended, direct care nurses need the time and space to interact with patients and families. That interaction needs to be built into the workflow process for nurses. Technology is not a substitute for therapeutic communication and patient education.

Nurses stated that the use of technology was appreciated by most patients and represents to them the provision of safe care. The formation of stronger therapeutic relationships with patients, as a result of the fully digital practice environment, was also shared by one study participant. As expressed by the research participant,

technological resources allow nurses to stay with patients in their room to answer questions, thereby avoiding being sidetracked with other matters, as often occurs when required to leave the room to obtain information in response to patient questions (e.g., searching for a paper chart). The need to both assist patients with the technology in their room and provide patient health information using the inpatient room technology was described by nurses as fostering the potential for nurses to have more time at the bedside.

Most of the research participants described adjusting to a fully digital practice environment at HRH as swift, with limited negative impact. Everyday use and the passage of time were considered the primary factors that permitted ease of technology integration into nursing practice. One nurse stated that the level of comfort achieved with using technology in the clinical environment makes it impossible to consider employment in a hospital that is not fully digital. We can appreciate that this reluctance to leave HRH may represent how deeply the digital environment and multiple technologies have become interwoven into nursing practice to provide safe, high-quality care. We parallel this experience with the seamlessness of smartphone technology in today's world, which has made information so accessible that for some it is impossible to return to the world of printed encyclopaedias.

Overall, the research participants reflected positively on ICTs in this technology-enriched environment. With the identified themes of safety net, time, teamwork, technology failures, patient responses and adapting as part of the nurses' lived experience, we continue to reflect on how these themes provide an insight into nurses' values and how we might use this information to further support nursing practice in the fully digital environment. The themes identified in this study led us to believe that nurses view technology within the premise of nursing as an art and a science. The science permits safe care delivery, and the art allows patient responses to be acknowledged and incorporated into nursing workflows. Nurses at HRH seem to have normalized the nursing process within the fully digital environment. In fact, no study participant identified bypassing technology use in their daily work, and some nurses perceived the inability to practise in a healthcare environment where clinical practice is not completely electronically integrated.

We thought about how HRH introduces technology using a system of criteria based on the strategic priorities of the hospital. At HRH, the highest safety and quality are top priorities, and the introduction of enhanced or new technology is based on meeting this criterion first. It appears to us that this approach must resonate with nurses at HRH given the high value they place on safety, as identified in this study.

Limitations

A limitation of the study was that the participants' ages were mainly between the early twenties and the late thirties. To gain a full understanding of nurses' experiences in the digital hospital environment, further study is required with older participants. Another potential limitation when using face-to-face interviews was social desirability bias. Attempts were made to minimize this bias by having an interviewer who was unfamiliar with the nursing staff and creating an environment that respected the respondents' privacy.

Conclusion

The current study permitted examination of the lived experiences of nurses practising in North America's first fully digital hospital. Using tenets from Heidegger's hermeneutic phenomenological philosophy, the meaning of nurses' everyday existence, practising in a fully digital hospital, was explored. Unveiling the lived experiences of nurses practising in a fully digital clinical environment can contribute to enhancements in training, education, knowledge and the practice of nursing as it relates to technical competency. Similar to previous studies, nurses perceived technology positively because of improvements in accuracy, patient safety, ease of access, communication and collaboration (Burns et al. 2018; Rouleau et al. 2017). The current study found that nurses' negative perception of technology was in relation to glitches and scheduled downtimes. However, nurses in the fully digital practice environment found opportunities for learning and enhanced resilience. In opposition to the findings from Kiekkas et al. (2006), whereby nurses reported that they sometimes felt that technology increased stress and moved the focal point away from patients, the current study found that technology was experienced as fostering the potential for nurses to have more time at the bedside with patients. An additional finding from the current study was the perception of teamwork that was generated by overcoming encounters with technological difficulties through the collaboration and support of peers and management.

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References

Burns, K.A., T. Reber, K. Theodore, B. Welch, D. Roy and S.L. Siedlecki. 2018. "Enhanced Early Warning System Impact on Nursing Practice: A Phenomenological Study." *Journal of Advanced Nursing* 74(5): 1150–56.

Catan, G., R. Espanha, R. Veloso Mendes, O. Toren and D. Chinitz.. 2015. "The Impact of eHealth and mHealth on Doctor Behavior and Patient Involvement: An Israeli and Portuguese Comparative Approach." *Studies in Health Technology and Informatics* 210: 813–17.

Colaizzi, P. 1978. "Psychological Research as the Phenomenologist Views It." In Valle, R.S. and M. King, eds., *Existential-Phenomenological Alternatives for Psychology* (pp. 48–71). New York, NY: Oxford University Press.

Errasti-Ibarrondo, B., J.A. Jordan, M. Diez-Del-Corral and M. Arantzamendi. 2019. "Van Manen's Phenomenology of Practice: How Can It Contribute to Nursing?" *Nursing Inquiry* 26(1): e12259.

Gellert, G.A., V. Hill, K. Bruner, G. Maciaz, L. Saucedo, L. Catzoela et al. 2015. "Successful Implementation of Clinical Information Technology." *Applied Clinical Informatics* 6(4): 698–715.

Horrigan-Kelly, M., M. Millar and M. Dowling. 2016. "Understanding the Key Tenets of Heidegger's Philosophy for Interpretive Phenomenological Research." *International Journal of Qualitative Methods* 15(1). doi:10.1177/1609406916680634.

Jones, K. 2014. "Alarm Fatigue a Top Patient Safety Hazard." *CMAJ* 186(3): 178. doi:10.1503/cmaj.109–4696.

Kiekkas, P., M. Karga, M. Poulopoulou, I. Karpouhtsi, V. Papadoulas and C. Koutsojannis. 2006. "Use of Technological Equipment in Critical Care Units: Nurses' Perceptions in Greece." *Journal of Clinical Nursing* 15(2): 178–87.

Laerkner, E., I. Egerod and H.P. Hansen. 2015. "Nurses' Experiences of Caring for Critically Ill, Non-Sedated, Mechanically Ventilated Patients in the Intensive Care Unit: A Qualitative Study." *Intensive and Critical Care Nursing* 31(4): 196–204.

Lincoln, Y.S. and E.G. Guba. 1985. *Naturalistic Inquiry*. Newbury Park, CA: Sage.

Moustakas, C. 1994. *Phenomenological Research Methods*. Thousand Oaks, CA: Sage.

Rouleau, G., M.-P. Gagnon, J. Côté, J. Payne-Gagnon, E. Hudson and C.-A. Dubois. 2017. "Impact of Information and Communication Technologies on Nursing Care: Results of an Overview of Systematic Reviews." *Journal of Medical Internet Research* 19(4): e122. doi:10.2196/jmir.6686.

Sandelowski, M. 2000. "CE Credit: Thermometers & Telephones: A Century of Nursing and Technology." *American Journal of Nursing* 100(10): 82–86.

Shah, K., C. Lo, M. Babich, N.W. Tsao and N.J. Bansback. 2016. "Bar Code Medication Administration Technology: A Systematic Review of Impact on Patient Safety When Used with Computerized Prescriber Order Entry and Automated Dispensing Devices." *Canadian Journal of Hospital Pharmacy* 69(5): 394–402.

Silow-Carroll, S., J.N. Edwards and D. Rodin. 2012. "Using Electronic Health Records to Improve Quality and Efficiency: The Experiences of Leading Hospitals." *Issue Brief (The Commonwealth Fund)* 17(1): 1–40.

Tunlind, A., J. Granström and Å Engström. 2015. "Nursing Care in a High-Technological Environment: Experiences of Critical Care Nurses." *Intensive & Critical Care Nursing* 31(2): 116–23. doi:10.1016/j.iccn.2014.07.005.

Valle, R.S., M. King and S. Halling. 1989. "An Introduction to Existential-Phenomenological Thought in Psychology." In Valle, R.S. and S. Halling, eds., *Existential-Phenomenological Perspectives in Psychology: Exploring the Breadth of Human Experience* (pp. 3–16). New York, NY: Plenum Press.

van Manen, M. 1990. *Researching Lived Experience: Human Science for an Action Sensitive Pedagogy*. Ontario, Canada: Althouse Press.

van Manen, M. 1997. *Researching Lived Experience, Second Edition: Human Science for an Action Sensitive Pedagogy* (2nd ed.). Ontario, Canada: Althouse Press.

van Manen, M. 2007. "Phenomenology of Practice." *Phenomenology & Practice* 1(1): 11–30.

Wikström, A.C., A.C. Cederborg and M. Johanson. 2007. "The Meaning of Technology in an Intensive Care Unit – An Interview Study." *Intensive & Critical Care Nursing* 23(4): 187–95.

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