EDITORIAL

Now more than ever, nurses need to be involved in technology design: lessons from the COVID-19 pandemic

The global and urgent response to the COVID-19 pandemic has forced healthcare systems to broadly adopt technologies that allow care and services to shift virtually. This includes video conferencing, wearables and telemedicine applications (King, 2020; Morris, 2020; Weiss et al., 2020) lower the number of patients entering hospitals and care facilities and reduce risks of COVID-19 transmission. While reports of below normal patient capacities at many hospitals earlier on in the pandemic suggested that these technological innovations were successful in supporting healthcare institutions to meet this goal (Financial Accountability Ontario, 2018), there remains large groups of patients who require medical treatment and must be admitted to receive care from Registered Nurses during this historical pandemic. Within the context of COVID-19, clinical nurses are confronted with dire circumstances regarding rationing personal protective equipment (PPE) (World Health Organization, 2020a), staffing shortages (Fraser, 2019), burnout (Benyon, 2020) and higher risks of infection as 'more than 230,000 healthcare workers have been infected worldwide' (International Council of Nurses, 2020). Additionally, nurses are challenged with using new technologies in unique ways to provide care—such as using iPads to provide palliative care and baby monitors to safely communicate and maintain distance during a Protected Code Blue. While considerable attention is paid to the emerging health technologies being used during the crisis, utter disregard has been shown to the 'usual' poorly designed technologies that nurses used every day preceding the pandemic and will continue to use during and after the fact. The COVID-19 pandemic highlights the urgent need for nurses to become involved in technology design, acquisition and implementation, and to provide considerations for the complexities of technology use within all levels—micro, meso and macro—of the healthcare system. This editorial depicts how poorly designed technology negatively impacted patient care and nursing workflow before the pandemic and reveals how these insufficiencies have been amplified during the COVID-19 pandemic. We conclude with a call to action for change in the organisational cultures of healthcare institutions that excludes nurses from technological decision-making and increased integration of technology and informatics into current and future nursing curricula.

1 | POOR TECHNOLOGY DESIGN IMPACTS PATIENT CARE AT THE FRONTLINES OF COVID-19

The perspective of nurses in technology development has traditionally been absent for a number of reasons: the prioritisation of cost over functionality, an ill-conceived understanding that nurses are resistant to change, and a lack of encouragement from organisational leaders (Hamer & Cipriano, 2013). This has led to downstream effects, such as significant interruptions in provider workflow and the subsequent necessity for workarounds (Brown et al., 2020; Koppel et al., 2008). A relevant example of the impact of poor technological design on patient care is the use of barcode medication administration (BCMA), which purports to reduce medication errors and improve patient safety. By scanning the barcode on a patient's armband followed by scanning the barcode on the prescribed medication, the technology enables clinical nurses to confirm the patient is receiving the right drug, at the right dose, at the right time and through the right route (Koppel et al., 2008). However, a nurse who administers medications throughout their shift may frequently encounter unreadable barcodes or malfunctioning scanners and, as a result, may implement workarounds to ensure timely patient care and to meet the demands of the unit. Imagine this scenario before COVID-19: you are a nurse on a busy inpatient medicine ward. The unit is short-staffed this morning, and assignments are stretched. As you log into the bedside computer and begin morning medication administration for Patient A, your pager alarms and you must immediately go see Patient B because their oxygen level is desaturating. Ten minutes later, you return to Patient A. You log into the bedside computer and you scan Patient A's armband. It does not work. You try again. Nothing. You troubleshoot by going to print a new armband and return to Patient A. You scan the new armband and still the armband does not scan. So, you go find a computer on wheels (COW), bring it into the room and log in. Finally, the armband scans successfully. You scan the medication and administer it to Patient A. One patient down, five more to go.

Now, imagine the above scenario during the COVID-19 pandemic, which has exponentially increased unit demands. The

unprecedented spread of the virus has you feeling emotionally and mentally fatigued even before you start your shift. Assignments are heavier, there are daily changes to infection control practices and it is exhausting to breathe through one mask all day long. You are asked to cluster care to conserve PPE as there are known shortages worldwide (World Health Organization, 2020a). Patient A is being tested for COVID-19, so you are in full PPE—every inch of skin is covered, and the patient's door must always remain closed. Now when the barcode scanner fails and the nurse is forced to troubleshoot a solution, this will require changing PPE and likely risk contamination of shared equipment. Nurses are constantly finding themselves in positions where they must use a workaround to overcome the poor usability of an implemented system. Increasing patient acuity, staffing shortages, malfunctioning scanners and interruptions are just four of the 31 reasons found by Koppel et al. (2008) for nursing workarounds to BCMA technology. Nurses enact workarounds not as an act of defiance but as a means of ensuring timely patient care within a flawed system hampered by work flow issues related to by BCMA design, implementation and integration (Koppel et al., 2008). Moreover, while such workarounds do temporarily fix workflow issues, they often negate the safety benefits of BCMA technology and put patients at increased risk (Koppel et al., 2008).

Consider another pre-COVID-19 scenario: A nurse enters a patient's room in the intensive care unit (ICU) to complete her morning assessment. Technology is heavily embedded in the ICU setting, and the monitor assists her assessment by displaying the patient's heart rate, oxygen saturation, blood pressure and respirations. Yet despite the display on the bedside monitor, the information must still be charted into the electronic medical record (EMR). The nurse logs into the EMR, clicks on the patient's chart and must use six, separate flowsheets to document the entire assessment. Completing each flowsheet requires multiple mouse clicks, navigating dropdown menus and filling text boxes to input assessment data. While nurses maintain that electronic documentation positively impacts patient safety, it also reduces interdisciplinary communication, compromises critical thinking and requires excessive amounts of time such that a nurse may have to access 23 screens to chart one morning patient assessment (Kossman & Scheidenhelm, 2008). Given that nurses must simultaneously cope with overcrowding in hospitals (Health Quality Ontario, 2018), increasing patient complexity (Health Quality Ontario, 2018), shortages of nursing personnel (Fraser, 2019) and, now, the COVID-19 pandemic, the impact of poor technology design on patient care is considerable.

COVID-19 underscores the poor usability of healthcare technology across the care continuum. No place is this more evident than in hospital settings that were already fast-paced, high stress and increasingly complex. Nurses aim to provide compassionate care and want the best for their patient. While they appreciate the benefits of BCMA technology (Baiden, 2018), design improvements to healthcare technology are needed to support nursing care and care processes. Decision makers at healthcare institutions need to understand that implementing technologies in a top-down fashion, without input from clinical nurses, will not improve patient safety nor adequately support nurses.

2 | A CALL TO ACTION: ACTIVE ENGAGEMENT OF CLINICAL STAFF NURSES IS NEEDED

Technology developers and those who implement the technology within hospitals need a deep understanding of the complexity of the care processes within an acute environment. Establishing the means to develop a shared understanding between developers and end-users has become increasingly important considering that COVID-19 may have permanently shifted many aspects of care to a virtual setting, which will likely usher in the use of more technology (Weiss et al., 2020). The nursing profession is not opposed to the implementation of technologies (Godshall & Riehl, 2018; Hamer & Cipriano, 2013; Kossman & Scheidenhelm, 2008), and their perspectives should be included to maximise the potential of healthcare technologies. Involving nurses enables developers to meet the needs of their products' end-users and to ensure that institutional goals are met without sacrificing the efficiency of nursing care processes. Nurses understand the demands that are being placed on healthcare staff on the frontlines of the COVID-19 pandemic, as well as the intricacies of patient populations, infection control practices, and the organisational structure of hospital units; all of which are important considerations that should inform the innovation process of technological systems from idea generation and mobilisation, to diffusion and implementation (Eley et al., 2009; Mariello, 2007).

COVID-19 is rapidly increasing our reliance on technology in health care (King, 2020; Morris, 2020; Weiss et al., 2020) and strong nursing leadership is needed to shift the organisational culture of healthcare institutions to ensure that nurses are provided opportunities to share their perspectives on the functionality and interoperability of all implemented technologies (Brown et al., 2020; Hamer & Cipriano, 2013; Kelly et al., 2016). Nursing leaders within institutions can create structured opportunities that allow for collaboration between technology developers and nursing staff through product development and user testing to increase the usability of healthcare technologies. These formalised opportunities will allow nurses to not only provide feedback on technology but also to externalise their knowledge and experience, ensuring a well-matched fit between technology, user and environment throughout the lifecycle of technology (i.e. from development to implementation). At minimum, initiating a transparent feedback mechanism between clinical nurses and technology developers, such as a built-in chat box or dedicated phone number, is necessary to ensure that nurses' concerns are heard. Moreover, a feedback loop would broadly facilitate collaboration between clinical nurses, organisational leaders and technology specialists to determine feasible solutions to shortcomings in technology being used as part of patient care (Kelly et al., 2016).

Information and communication technology (ICT) has the potential to solve a variety of challenges faced by the healthcare system: the rising older adult population, growing incidence of chronic disease, emergence and management of a worldwide pandemic, and associated burden on limited resources (Weiss, 2020; While & Dewsbury, 2011). As nursing practice and clinical institutions embrace digital health technologies, nursing education and curriculum should be updated to reflect contemporary nursing practice. Despite efforts to embed ICT into undergraduate nursing curriculum (Canadian Association Schools of Nursing, 2014), a recent study reported nurses' self-perceived informatics competency only slightly above the mark of competent (Kleib & Nagle, 2018). Nurses perceived a lack of competency related to ICT as contributing to feeling like technology development and design is 'no place for nurses', and to feeling dismissive of own expertise (Kleib & Nagle, 2018). Further, graduate curricula also lack content about informatics and digital technologies thus ill-preparing nurses to keep up with the data evolution (Foster & Tasnim, 2020; Gonen, Sharon, & Lev-Ari, 2016). Consequently, important decisions concerning the development, acquisition and implementation of healthcare technology, which nurses use daily in healthcare institutions, are often made without any input from nurses. Their absence from these discussions results in technologies that lack functionality, interoperability and can lead to workarounds (Blijleven et al., 2017; Koppel et al., 2008). To ensure nursing staff contribute to shaping future technological care systems, the nature and direction of nursing education must shift to ensure that students are exposed to areas of technology design, selection, implementation and evaluation. With an exposure to technology, data and a stronger understanding of critical challenges such as privacy, security and equity, future nurses will learn that they do not have to accept healthcare technologies and systems as they are and that they have the potential to improve them for the betterment of themselves and their patients (While & Dewsbury, 2011).

3 | CONCLUSION

The power of technology in healthcare settings can only be amplified by incorporating clinical nurses' experiences within the lifecycle of technological innovation. As end-users, nurses have extensive expertise that is vital to the success of future technologies. Their participation can ensure that healthcare technologies are properly adapted to the environment in which they are implemented and meet the needs of both patients and clinicians. Nurses are well positioned to identify potential solutions to workflow and usability issues; however, support of nursing leaders throughout healthcare institutions and educational institutions is required to advocate for their inclusion in technological innovation which can significantly improve technology usability, reduce workflow issues and improve patient outcomes (Kelly et al., 2016). The COVID-19 pandemic has shown the need for technology and innovation in health care. The World Health Organization (2020b) has declared 2020 'The Year of the Nurse and the Midwife.' Now is the time for nurses to get up off the sidelines, use the spotlight to highlight their expertise and help lead the technology revolution in health care during and after this pandemic.

CONFLICT OF INTEREST

We have no conflict of interests to declare.

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