Editorial: Knowledge management and e-learning: Improving the safety of technologies and devices

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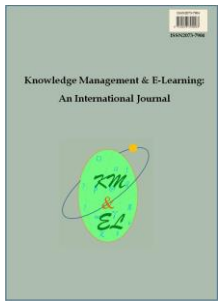

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Editorial: Knowledge management and e-learning: Improving the safety of technologies and devices

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Abstract: Technology and device safety has emerged as an important area of research across many disciplines. In this issue of *Knowledge Management and e-Learning* there is as exploration of some of the key issues and considerations surrounding safety. The issue has a range of papers that can be organized into several themes around safety including the design of systems, their implementation, user perceptions, emerging roles and education. A number of methods and approaches are described that can improve safety. Such research is critical to advancing the evidence base and knowledge in safety science and is an essential aspect of foundational and iterative improvement of technology safety over time.

Keywords: Technology; Software; Device; Safety; Methods; Approaches; Research

Biographical notes: Dr. Elizabeth Borycki (RN, PhD, FACMI, FCAHS, FIAHSI) is a Professor in the School of Health Information Science at the University of Victoria, Canada, and a Michael Smith Foundation Health Research BC Health Professional Investigator. She directs the Global Laboratory for Digital Health Innovation where she leads a team of researchers who focus on health technology and safety. Dr. Borycki health informatics research is in the areas of human factors, implementation science and strategy involving health, technology, and safety.

Dr. Andre Kushniruk is Professor and Director of the School of Health Information Science at the University of Victoria, British Columbia, Canada. He has published widely in health informatics and is known for his work in the usability of healthcare information systems. Dr. Kushniruk conducts research in a number of areas, and he focuses on developing new methods for the evaluation of information technology in healthcare. Dr. Kushniruk has been a key researcher on several national and international collaborative projects. His work includes evaluation of systems for use by healthcare providers, patients, and citizens.

1. Introduction

Over the past 50 years information technologies and devices have been associated with improved individual and societal safety. For example, in healthcare, ePrescribing systems are used to support physician decision making, when prescribing medications (Kivekäs et al., 2016; Motulsky et al., 2019). ePrescribing systems check for drug-allergy and drug-drug interactions during the prescribing process so that patients do not experience an allergic reaction to their medications or two or more medications interacting together are not rendered in effective or become hazardous to a patient's health if prescribed (Classen et al., 2011). ePrescribing systems have been used to successfully reduce the number of medication errors made by physicians and have significantly improved patient safety (Furuya et al., 2013). The field of aviation has also seen significant improvements in safety. Aviation systems have prevented plane crashes during significant weather events. Information supports and sensors in the cockpit of a plane enhance a pilot's ability to avoid potential hazardous weather events (Mahapatra & Zrnic, 1991; Mahapatra et al., 1999). Lastly, with the introduction of new automobiles there has emerged new ways of improving automobile safety. The introduction of the latest innovations in artificial intelligence and sensing technology has improved automobile safety. Engineers are developing automobile safety systems that can detect pedestrians and cyclists to prevent injuries arising from collisions (Mukhtar et al., 2015; Stilgoe, 2021). Even as these technologies improve safety across industries new research is emerging that technology tools can improve as well as detract from safety. This research points towards the need for developing an understanding of how technologies support human activity and how the technology can be made safer over time (Borycki & Keay, 2010; Davy & Borycki, 2021; Joseph et al., 2021).

2. Focus of the special issue

With the evolution of new technologies, safety has emerged at the forefront of many fields of technology study (i.e., healthcare, aviation and automobile manufacturing). Knowledge management surrounding new technologies focused on the research area of safety are critical to learning within and across industries as researchers find solutions to new and emerging safety issues associated with software and device use that can be used by researchers in other domains of study (e.g., Farghali et al., 2021; Hosseini et al., 2021; Li et al., 2021). It is with this focus that in this issue of *Knowledge Management and e-Learning*, that we consider safety research in the areas of knowledge creation, translation and mobilization of modern information technologies and devices.

3. Emergent themes, perspectives, and research directions

The journal issue begins with a paper describing a framework that supports patient safety and technology use (i.e., The Patient Safety and Health Information Technology Conceptual Framework). The framework can be used to enhance safe technology use and represents an advance in conceptualizing and viewing technology within the context of safety in healthcare settings (Opoku-Agyemang et al., 2021). This is followed by a focus on methods used to enhance safety, which are critical to the continuous improvement of the safety of technologies (Borycki & Keay, 2010). Machine learning, text mining (i.e., Li et al., 2021) and process mining demonstrate the importance of emerging analytic techniques and their role in improving safety (Leandro et al., 2021). In this issue, Li and colleagues (2021) describe an automated approach to thematic analysis of incident

reports in healthcare using machine learning and text mining techniques. Safety incident reports are critical to identifying the underlying reasons for safety events and learning from them. New machine learning and text mining approaches hold significant promise for helping those who work directly in the patient safety area to identify potential safety issues and to respond to them quickly (Li et al., 2021). Leandro and colleagues (2021) describe and apply process mining to stroke assistance in the context of patient safety. Through their research, the investigators help us to understand stroke assistance in the context of the COVID-19 pandemic and timely access to healthcare for patients to improve patient safety. Such knowledge and understanding are critical to making healthcare system level changes to improve patient care and safety (Leandro et al., 2021).

Technology design has an important role in safety (Carvalho et al., 2009). In an article in this issue by Adams and colleagues (2021), the researchers describe how new electronic health record systems' features were designed and implemented in order to enhance the response to the COVID-19 pandemic. Such actions supported by electronic health records are critical to patient safety, as they enable immediate intervention by health professionals during healthcare crises emerging from contracting COVID-19. Other research published in this issue attempts to distil out key knowledge surrounding technologies used by industry to enhance safety; for example, Keenan's group (2021) conducted a scoping review to obtain an in-depth understanding of how computerized order entry influences safety. The research points to the importance of considering a technology, how it is designed and how it is implemented to enhance its effectiveness as a safety tool.

In keeping with idea that systems can support enhanced decision making that will lead to enhanced patient perceptions of safety, Stringer and Kushniruk (2021) examine the utility of decision support tools in head and neck cancer patients. Joseph et al's (2021) research takes this in another direction. Joseph examines the relationship between technology driven alerts, fatigue and error, examining the relationships between a technology function (i.e., alerting) and its impact on user fatigue leading to errors in decision making. Along these lines, Davy and Borycki (2021) examine how one strategy involving "copying and pasting" notes can improve productivity while at the same time introducing opportunities for introducing errors. The article defines "copying and pasting" notes and identifies methods that can be used monitor and manage "copy and paste" activities by technology users. Users of technologies have an important role. In some cases, the ability of a technology to improve safety is critical to its adoption and widespread use (Kivekäs et al., 2016). Farghali et al. (2021) have investigated pharmacists' perceptions of electronic prescribing systems. The researcher examined pharmacist perceptions as they relate to the use of the technology and its impacts on productivity and medication errors. In this issue Shah et al. (2021) delve into the literature surrounding the effects of introducing medical scribes into healthcare settings upon patients, physicians and safety when using electronic health records. She describes the issues and considerations of introducing a new type of role aimed at managing a technology typically used in the physician's office. Lastly, Hosseini et al. (2021) examine the role of pedagogical content design upon transforming knowledge into practice with a focus on how the approach can improve safety.

4. Conclusion

In this issue of *Knowledge Management and e-Learning* the published articles focus on varying aspects of knowledge creation, translation, and mobilization in the area of technology safety. Critical to this work is an understanding of how discoveries in the area

of safety research and methods can enhance system safety and are translated into practice. As new technologies emerge, we will continue to improve the safety of varying industries and it is essential to understand how technologies improve safety and can be implemented to advance existing safety practices.

Author Statement

The authors declare that there is no conflict of interest.

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