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Literature Review

Artificial Intelligence (AI) and the Future of the Nursing Profession

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Abstract

Artificial Intelligence (AI) and Machine learning (ML) have asserted themselves into the healthcare field as a standard of innovation. The perception of this increased use of technology is controversial amid the nursing profession. There is a large percentage that feels that this technology's aim is eventually replace the profession at the bedside, and other areas of care [1]. After an extensive literature review, it is apparent that advanced technology is a valuable resource to innovate, care, while often the nursing profession displays blatant hesitation towards embracing its capacity to increase scope of practice, and improve patient care [2]. Nurse leaders need to emerge and find solutions in a rapidly changing environment.

Keywords: *Leadership; Artificial Intelligence; Machine Learning; Technology; Nursing*

Introduction

Nurses are commonly voted the most trusted profession. Nursing is an ever-evolving field, and as times change, nurses must adapt to how healthcare evolves around them [3]. Modern times for clinicians have never been more challenging. The time for the nurse to claim stakes in the growing field of healthcare innovation is now [2]. Technologies like Artificial Intelligence (AI) and Machine Learning (ML) have assertively implanted into healthcare at an exponential rate [4]. Artificial intelligence is the overall appearance of being smart as where machine learning is where machines are taking in data. AI and ML are terms that are being used today and are "hot" topics. By utilizing and embracing this process it is allowing for improved business discussions and improving patient outcomes. Another way to think about this, is that AI are computers and robots that can behave in ways that mimic and go beyond human capabilities, such as nurse leaders. Machine learning is like a network that functions like human brains, it analyzes data.

Health care organizations use a great deal of data and rely on informatics and analytics to provide accurate, efficient, and hopefully safe health care services. AI tools can assist to improve patient outcomes, safe precious time, and maybe even decrease fatigue in the staff and nurse burnout. Examples include: analyzing data from patients HER through ML to provide clinical support and automated insights, or record nurses to patient interaction in exams, education sessions, and tele health appointments, or it can predict outcomes of health care organizations visits to prevent readmissions and or shorten LOS (length of stay).

The potential for increased scope and a more autonomous practice is presenting itself in all functions of nursing, on both the payer and provider side (Harmon., *et al.,* 2020). Identifying, and interpreting nurse perception and awareness of AI and ML is crucial to the development of scope and autonomy for the profession [5].

Problem statement

Establishing the perspective of nurse belief, attitude and knowledge towards this technology is necessary to foster the relationship that currently exists between the profession and AI/ML. By reviewing literature, and current research on the topic might persuade nursing leaders to embrace the technology and to empower the nursing profession to lead the utilization of advanced technology to improve our healthcare system. Due to the ongoing pandemic, higher patient/member acuity, staffing shortages, and continued vaccine distribution challenges, the need for fostering a positive relationship with this technology is imperative to the profession's growth and place in the healthcare system moving forward [1].

Roger's diffusion of innovation theory

Roger's Theory has been a fundamental framework in the science of Nurse driven informatics and the development of innovative technologies within the profession (Dearing and Cox, 2018). This theory refers to the processes that are utilized to adopt, and embrace a new idea [6]. The theory categorizes innovation adoption periods into five potential designations based on job, sociological behavior, and receptiveness to change. The five categories are as follows: innovators, early adopters, early majority, late majority, and laggards [6].

The Diffusion of Innovation theory is a very important theory that can serve administrators, information technologists, nursing informatics experts… The theory also benefits the targets of change, since respect and consideration for all involved stakeholders is intertwined with robust strategies for implementing change" [6].

The theory's ability to fit in with the principals of nursing metaparadigm elements of nursing, environment, person and health are imperative to establish to relay relevance to the profession. Roger's perception of *nursing* vastly fits into the informatics portion of the profession. His work suggests that nurses can be innovators and are capable of brining innovation to the forefront of their practice (Balas and Chapman, 2018). The relevance to *environment* relates to the approach of the leader to facilitate awareness of varying opinions and values about innovative changes to facilitate a streamlined introduction [7]. *Patient/Person* are addressed through the focus being on the bigger picture, the key to focus on why the innovation is needed and being able to present how it will have a positive in their outcome. An example would be the CMS guidelines that have been directed for 2024 for providers and payers to incorporate AI into their preauthorization process [1]. *Health* is achieved when the innovation is accepted and put in place, and the re-invention process has edited the use of the technology to optimize outcomes for the patient/member, and ultimately contributing to an organization's success [6].

Maintaining an understanding based on attitudes, perceptions, and knowledge can guide leaders to find the piece of the proposed AI to make the nurse's job safer, easier, and how the outcome for the patient/member can be optimized (Dearing and Cox, 2018). Providing clear rationale to nurses and patients of the use of AI will facilitate understanding and ultimately compliance in its implementation [8]. Utilizing Roger's theory of diffusion assists in achieving buy in, and success through the stages of development and implementation of innovative technologies in the healthcare setting (Dearing and Cox, 2018).

Mini review of the literature

A review of nursing and health related literature was conducted to explore how AI/ML is currently benefitting the nursing profession. Criteria for literature included a publishing time frame limited to the years 2016 - 2022. Databases utilized include CINAHL and Google Scholar to ensure current evidence-based literature is reviewed and summarized for this mini review.

How AI/ML is currently being utilized by the profession

According to Griner, Thompson and Buckles [9], AI is utilized at Cedar Sanai Los Angeles to predict census utilizing a technique called long term short memory (LTSM). The AI, named ALEx was able to incorporate current capacity and census throughout the facility and provide a forecast for 24 hours, and 5 days later that resulted in study recommendations for more facilities to consider this technology to be able to prepare for algorithm induced fluctuations in census.

Bosque [10] provided a study in utilizing algorithm-based learning, through IV Pump sensors to incorporate known IV injury influences such as pressure, pH, and oxygen levels to provide alarms alerting the nurse of intravenous infusion failure probability in the neonatal demographic. Findings showed that the algorithm resulted in earlier intervention and ultimately reduced occurrences of interruption of fluid resuscitation and tissue injury from extravasation.

Optimizing patient outcomes

Utilization of AI to form algorithms that are synonymous with fall risk and ultimately resulted that the technology had nearly 200% reduction in fall risk when technology was used to streamline the Morse Fall Assessment [11]. In a similar study conducted by Duke University found that hospital systems that utilized Artificial Intelligence to optimize nurse assessment capability found functional predictability in flu outbreak, data analysis, diagnosis confirmation, target drug therapies that are conducive with genomics, outbreak detection, tumor staging, early sepsis, and disease prediction [12].

One author found that when algorithms were formulated from DAISY award nominee's behavior, that policies were able to be better adapted towards improving patient satisfaction in acute care settings (Nair., *et al.,* 2021). A study conducted by Kay and Childress (2020) showed that AI was able to decrease the time frame of lung nodule to cancer diagnosis to 7 days from 34 days.A Kaiser Permanente facility in California was able to optimize reduction of hospital acquired events that are associated with grave compromise of patient safety (Linnen, Javed, and D'Alfonso, 2019). Yale New Haven Hospital (YNHH) utilized AI/ML to formulate the Rothman Index which was found to accurately predict acuity risks amongst patients in acute care settings based on EMR, diagnoses, and vital signs [5]. Anthony Chang of Children's Hospital of Orange County discovered AI was able to interpret patient data that allowed for more physician time to be utilized on identified trends that were suggestive of potentially dangerous patient events. (Chang, 2020). The University of Kentucky completed a focused study on utilizing AI to enhance the nurse's ability to provide education to patients in pain management (Harmon., *et al.,* 2020).

Does advanced technology stand to make nurses obsolete?

Sensmeir [13] found that AI has been beneficial in hemodynamic monitoring and enhanced nurse awareness regarding patient condition, in real time, which allowed for anticipation of adverse events. McGrow [2] discovered that facilities that invest in AI could reach overall savings of 150 billion dollars by 2025, half of which representing savings from a clinical perspective, which could allow for allocation of funds to be diverted to patient safety intervention (IE staffing).

Thomas Clancy (2020) found that when chief nurse executives utilize AI a correlation of improved production, nurse retention, and patient satisfaction accompany. A study by Jed Duff (2020) revealed that, currently, in the OR environment, robotic surgery assistance only advanced nursing practice, and resulted in improvement of patient outcomes, and shorter hospital stays. An international study showed that while hesitation to technology was present, the root of the hesitation is in knowledge deficit. Despite this, ultimately the result is a improved scope of the nurse, and their ability to provide meaningful care [14].

The argument for potential challenge is acknowledged, however the literature establishes that the need for nurses is not in danger. It is objectively true that robotics technology capabilities are beginning to suggest the potential for Robots to live amid human beings [15]. While the ability to doubt the existence of potentially threatening AI abilities, the intervention proposal to the nursing profession remains unchanged. Nurses should give credence to evolving technology and use it to redefine the role of nurse clinicians (McAllister., *et al.,* 2021). Literature suggests there will always be a need to ensure that advanced technology is truly identifying true data and interpreting if suggested interventions are appropriate (Linnen., *et al.,* 2019). Finally, a study by McAllister, Kellenbourn, and Wood (2021) found that that the field of nursing is being transformed by advanced technology, and that the need to redefine our practice is fundamental to the profession's sustainability.

Inevitability of increased AI/ML involvement

The Centers for Medicaid and Medicare services issued a directive in 2019 for all hospital and payers to incorporate use of Fast Healthcare Interoperability Resources (FHIR) AI technologies by 2024 to optimize the pre-authorization process [1]. A study conducted by Fuller, and Hansen [16] showed, that while broadened AI use is disruptive at the training, stage, it ultimately increases the nurse's scope, and that because of patient outcome improvements, and fiscal savings, that the profession should consider AI use inevitable. According to Reinking [17] work done by health organizations such as El Camino Health have brought predictive analytics to the forefront of the healthcare system, making nurse cooperation imperative to successful introduction. When implemented ultimately the technology was viewed as a valuable tool in providing quality care.

Conclusion

Findings from the literature review revealed that a lack of knowledge exists in nurses regarding the broadening incorporation of Artificial Intelligence (AI) and Machine Learning (ML). The imminent rollout of these measures is made clear based on the 2024 rollout of AI driven software to help data exchange occur in real time between Hospital systems and payers [1]. Aside from Federally mandated incorporation, the healthcare system is utilizing AI and ML to optimize patient safety, improve outcomes, and ultimately improve the ease of practice amid healthcare professionals [14].

Currently the profession has a population that feels advanced technology is a means of replacing nurses [18]. The hesitation has begun to draw attention to the topic, however minimal research exists exploring this topic in its entirety. The literature that is focused on this topic urges the profession to embrace advanced technology to enhance current practice, and as an ally to optimizing patient outcomes [19-23].

The time is now for nurse leaders, nurses, and others to empower themselves, engage, and change their environment. Nursing education along with nurse leaders the goal should be to accept, encourage, and educate our healthcare organizations. It is time to innovate and become part of the AI/ML conversation.

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