



ROBOTICS APPLICATIONS FOR HEALTHCARE AND FUTURE PERSPECTIVE IN NURSING ADMINISTRATION: A NARRATIVE REVIEW

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ABSTRACT

Robotics in the healthcare system contributes to significant changes in the healthcare field particularly in nursing practice. The breakthroughs in robotic technological applications in the healthcare sector are evident and are expected to rise in the coming years. This paper presents robotic applications for healthcare and considers the future perspective in nursing administration. This narrative review collectively presented significant works of literature to support the advancement of technological tools in providing safety and improving patient outcomes. Nursing managers and leaders integrates robots powered by artificial intelligence in response to the new modernized world of technological environment. The remarkable benefits of robotic applications in the nursing field are enticing and potentially impacted patient care and safety in the nursing administration. Nursing managers and leaders should consider the challenges of integrating technological advancement in decision-making, implementing nursing actions, and delegating nursing responsibilities. This review can provide valuable insights for future research on accuracy, strategic planning, and nursing administration's readiness for full implementation of robotic applications.

KEYWORDS: Robotics applications, artificial intelligence, nursing administration.

INTRODUCTION

Robotics in nursing is evident in the clinical world and one of the most notable contributions of artificial intelligence. The significant rise of technological advancement in healthcare highly influenced the image of nursing profession. Robots in nursing enhances the delivery of nursing care and provided remarkable innovation in advancing healthcare. Robots, as an artificial intelligence, sensed its environment and can autonomously carry out useful work.^[1] A robot is an automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner.^[2] Scientists and world leaders' races to produce more robotic technologies. Government programs and research on advancement of technologies are aimed in transforming healthcare and introduce changes in nursing care with the assistance of robots.

The healthcare society have already introduced robotic technology. In nursing organizational planning, robotic technology and the use of prototype nurse robots will serve as an adjunct to scarce human resources in the

provision of health care.^[3] Nursing leaders-managers envisions nursing care with the assistance of robotic technology to respond to the increasing healthcare environment. This article is a narrative review about the future prospects of embracing robotic technology in the nursing administration.

LITERATURE REVIEW

Proliferations of research and related literatures of robotic applications in healthcare are increasingly evident. The advancement of technology and the remarkable influence of artificial intelligence in the nursing care made a historical change in the traditional way of providing and administering safe and quality patient care. Many research studies recognize the significant impact of robotic technology design in performing specific functions in healthcare. In 2009, Gerderblom et al., presented a rehabilitation robotics for healthcare and discussed the required or foreseen developments in healthcare like societal needs, innovations, and technology along a timescale running till 2025.^[4]

In another view, Garmann-Johnsen et al., presented an argument in 2014 that service robotics represents area of investigation, especially for healthcare, since current research lacks a thorough examination of socio-technical problems and contextual influencing factors.^[5] In recent times, fast evolution of technologies and remarkable influence of artificial intelligence leads to more research interest related to robotic applications in the healthcare sector. In September 2019,^[6] a paper on how the robots changes the nursing profession was published. The author presented that robotic engineers are advancing robots integration in the healthcare and stressed that nursing will respond to new AI technologies that assume some tasks carried by nurses today. Nurses and staff must prepare for these new roles as artificial intelligence is evident in-patient care. Moreover, a case study and a pilot analysis on robotics and the impact on nursing practice indicated that robots assisted nursing care delivery; and performed high-repetition, low-risk tasks, and supported quality and safety initiatives. Nurses will be in tandem with engineers.^[7] Further, a review article on the historical review of medical robotic platforms discussed that robotics is constantly advancing its technological capabilities. Despite this, the application of robots in medicine only emerged within the last three decades, and therefore remains an unexplored area. Many robotic systems are currently available and used in medical procedures, but not enough data was explored on these systems. The introduction of robotic systems to the medical field has significantly impacted the trend of the entire industry from medical instruments, and methods of medical procedures.^[8]

Recent developments of artificial intelligence such as robotics in healthcare have led to many opinions and ideas on how robots can affect nursing profession. A study on robotics and robotics in nursing emphasized that technological tools and artificial intelligence assist patients.^[9] Additionally, a scoping review of robots in healthcare found that robotic applications perform many functions in the clinical setting.^[10] In India, a review of robotics in healthcare reported that AI is beneficial in healthcare.^[11] Artificial intelligence in healthcare provides efficient assistance in surgery, hospital operations, and routine checkups for clients. Robots expanded its role by providing care of vulnerable people like elderly populations, new drug, patient medical diagnosis, research experimental studies, patient monitoring in remote areas, and investigation of disease outbreaks. Qualitative research concluded that robotic applications in healthcare provides noteworthy benefits for patient.^[12]

Undeniably, the applications of artificial intelligence with robotics in nursing have led the profession into a new modernized era of healthcare. Robots in nursing and technological advancement has transformed the nursing profession. In reality, robotic technology has become an essential component in healthcare. These robots include surgical assistants, exoskeletons for mobility assistance,

telemedicine and telepresence, medication dispensing robots, and reception robots.^[13,16] Several future benefits of robots in nursing includes achievement of patient safety and patient satisfaction, reduce healthcare cost, and increase job satisfaction for nurses.^[14] In this way, nurses can spend more time of their patients and able to do complex patient tasks.

Challenges of Robotic Applications in Healthcare

However, the revolution of technological advancement poses ethical challenges in healthcare. The American Nurses Association (ANA) provisions of the code of ethics for nurses clearly states that nurses must demonstrate and exercise authority, accountability, and responsibility for nursing practice to promote health and provide optimal care.^[15] Hence, it is the primary responsibility of nurses to verify any technologies that were used for assistance of providing care. The introduction of new technologies entails responsibility. Nurses must ask about the data used for operation and knowledge about its result.^[6] Nursing managers and leaders must protect their patients and ensures safe patient care amidst use of technology into patient care delivery and practice. Integration of robotic knowledge and skills can be a tool for social, professional, practice, and ethical implications.^[7] Robots in healthcare poses privacy and security of patient's data and system network/communication-based attacks, maintenance for proper functioning, higher planning system, and cost of the robots.^[16] Using robotics in healthcare challenge hospital costs, highly trained staff, and the mindset of people as consumers of healthcare.^[11] Healthcare robotics requires ethical frameworks for effective innovation and adoption.^[12]

Future Perspective in Nursing Administration

Nurse leaders and managers strives to achieve improved patient care through proper delegation and assignment of nursing tasks effectively. In this modern world of technological advancement, the nursing administrator's major role is to safeguard patient safety and attain excellent level of nursing care. Nurse leaders and managers ensures that adequate technological resources are available to staff to provide safe and quality nursing care.^[15] Robotics in nursing requires strategic planning for its full implementation in the nursing profession. Nurses must demonstrate inquisitiveness of the technology incorporated in nursing practice.^[7] Nursing managers and leaders' reasoning skill is important for correct planning of their actions. Accountability and responsibility of nursing actions must be taken with high considerations along with robotics applications as practice-partner in the clinical setting.

Several countries in Asia, Europe and North America reported the remarkable beneficial of robots particularly to vulnerable groups. Nurses in US and Egypt receive training regarding use of robots implemented in surgical areas. Consequently, in Korea, robots were proven to be effective in nursing care services. The use of robots in

health can perform less invasive and painful procedures in Brazil.^[17] Healthcare leaders are needed to effectively implement technological advancement into clinical practices and local communities.^[18]

A recent study on the nursing management role of artificial intelligence in specialized areas reported that AI is significant for improvement of nursing skills and practice.^[19] In 2024, research about the management nurses performs role in implementing new applications, processes, and activities.^[20] Nursing leadership self-efficacy is influenced by their level of AI readiness.

CONCLUSION

Robotics applications in the clinical setting are growing exponentially and are now considered partners in nursing practice. Nursing managers and leaders integrate robots powered by artificial intelligence in response to the new modernized world of technological environment. The remarkable benefits of robotic applications in the nursing field are enticing and potentially impact patient care and safety in the nursing administration. Regardless, nursing managers and leaders must value ethical frameworks of technological advancement integrated into nursing practice. Future research on accuracy, strategic planning, and nursing administration's readiness for full implementation of robotic applications is warranted.

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