

Adopting Digital Innovations in Nursing: Impact, Barriers and Future Direction for Transformation in Saudi Arabia

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Abstract:

The integration of digital technologies into nursing practice has enhanced healthcare delivery, especially amid the challenges posed by the COVID-19 pandemic. Digital technologies such as artificial intelligence, robotics, telemedicine, and mobile health solutions have improved patient outcomes by improving diagnostic accuracy, monitoring chronic conditions, and facilitating remote consultations. However, widespread adoption of these technologies faces several challenges, including resistance to change, limited digital literacy among nurses, and concerns about losing the human element in patient care. In Saudi Arabia, the healthcare system's transition toward digitalization is aligned with the National Vision 2030, which emphasizes the need for a digitally competent workforce. Despite these advances, significant barriers in infrastructure, training, and cultural perceptions hinder the effective use of these technologies in nursing. This research explores the benefits, challenges, and future implications of digital technologies in nursing practice, with a focus on Saudi Arabia. It proposes strategies to overcome these challenges and advance the digitally enabled nursing profession to improve patient outcomes and contribute to the efficiency of the healthcare system.

Keywords:Digital technologies, Artificial intelligence, Nursing practice, Patient outcomes, Saudi Arabia Vision 2030.

Introduction

Digital technologies have had a positive impact on nursing practices in healthcare systems. This is evident in the trend towards adopting artificial intelligence tools, robots, the Internet, mobile phones, telemedicine, and many virtual care models [1]. This trend towards adopting digital technologies in healthcare and nursing comes after the Covid-19 crisis, which imposed restrictions on healthcare systems and nurses in dealing with patients and improving patient outcomes and public health [1,2].

Many healthcare systems, including the Saudi Ministry of Health, have adopted digital technologies in health and nursing practices, which have enhanced the ability of nurses to improve healthcare outcomes for patients, especially for patients with chronic diseases [3]. However, there are many challenges related to the use of digital technologies in nursing, which are represented by the weak adoption of modern and accelerating digital technologies by nurses, limited knowledge of their positive impact on healthcare, and fear of losing the profession and replacing it with digital technologies [4,5]. This imposes challenges that require immediate intervention and addressing them to enhance the use of digital technologies in nursing practices and patient care [6]. To respond to these challenges and prepare for the future, nursing must begin an immediate transformation into a digitally supported profession that can respond to the complex global challenges facing health systems and society [7].

Digital-based nursing practices have a positive impact on health systems and patient outcomes. Telemedicine enhances nurses' ability to monitor and follow up on patients and facilitates patients' access to ongoing consultations and advice that improve their health, especially for patients with chronic diseases [8]. Chatbots, digital health platforms, and mobile phones also enable nurses to provide health consultations and psychological and emotional support to patients remotely [9]. Despite the challenges of cost, privacy, and ethics [7,8].

Digital technologies also play an important role in enhancing education, training, and scientific research for nurses, keeping up with the latest practices and research in the field of nursing, and training for emergency cases through virtual reality and simulation [10]. Therefore, nurses must have knowledge and skills about digital technologies in nursing care and use them to enhance patient outcomes and improve healthcare outcomes.

Challenges of Adopting Digital Technologies in Nursing in Saudi Arabia

In Saudi Arabia, the nursing profession faces several challenges in adopting digital technologies in healthcare [11]. Despite the significant progress in the use of technology in the Saudi healthcare sector, some nurses still feel that digital technologies can be a distraction from the essential human relationship with patients, which conflicts with the traditional values of the profession such as compassionate care and personal communication [12]. In addition, Saudi Arabia is adopting Vision 2030, which aims to improve the health of individuals, which requires nurses to adopt digital technologies and innovation in nursing care to achieve the goals and objectives of Vision 2030 related to healthcare [13]. However, several challenges exist, such as the disparity in digital infrastructure between different healthcare facilities in the Kingdom, which affects the ability of practitioners to use digital tools effectively. Despite the efforts made to enhance health information technologies, there is an urgent need to invest in training nurses in digital skills and promoting a culture of change to facilitate the integration of traditional nursing care with modern technology [14].

Digital Technologies in Nursing: Benefits, Challenges, and Potential Impacts

The literature indicates that there are many analyses that address digital technologies used to support or enhance the nursing profession. These technologies include multiple areas such as electronic health records, telemedicine, clinical decision support, task automation, virtual reality, sensors and other technologies that provide significant benefits to nursing practice [2,15]. Below is a presentation of some of these technologies, their benefits, challenges and future implications.

1. Artificial intelligence/big data

AI offer many benefits in nursing practices:

AI offers significant benefits in nursing practice, such as improving diagnostic accuracy, reducing medical errors, supporting faster medical decision-making, and reducing costs through process automation [16]. It also contributes to crisis and pandemic response through big data analytics to support contact tracing and population health response [17].

AI challenges in nursing practices:

Nursing practices face challenges in adopting AI, such as data bias in algorithms, lack of nurse involvement in the development of digital technologies, as well as ethical and liability issues related to decisions made by AI [18].

Future implications for AI technologies in nursing practices:

The future implications of AI technologies in nursing practice suggest that more research is needed on the use of AI in nursing and healthcare, as well as the development of professional liability policies. Educational and leadership competencies in AI and data analytics must also be developed to ensure that these technologies are effectively integrated into future healthcare practices [19].

2. Electronic health records (EHRs)

EHRs offer many benefits in nursing practices such as:

Electronic health records (EHRs) offer many benefits in nursing practice, such as accurate, complete, and up-to-date patient information in real time. Quick and easy access to patient data also contributes to better coordination and more efficient healthcare [20].

EHRs challenges in nursing practices such as:

Nursing practices face multiple challenges regarding electronic health records (EHRs), including the high costs associated with developing and maintaining the systems, as well as issues related to data privacy and protection [21]. There are also technical challenges associated with the design of the systems themselves, which can lead to difficulty in use and an additional burden on nurses as they perform their daily tasks [22].

Future implications for EHRs in nursing practices

AI-based clinical decision support should be integrated into electronic health records (EHRs) to facilitate decision making and track outcomes. Nursing leadership should also redesign EHRs to reduce the burden of documentation [20,22].

3. Robotics

Robotics offer many benefits in nursing practices:

Robots can support people with cognitive, sensory, and motor disabilities; assist patients and the injured; support caregivers; and contribute to increased efficiency in the clinical workforce. Robots can also be used to measure vital signs [23].

Robotics challenges in nursing practices:

Collaboration between developers, technology experts and nurses to ensure that robots perform nursing tasks efficiently and accurately [24].

Future implications for Robotics in nursing practices:

Future innovations that combine AI and robotics will bring about significant changes in nursing practices and professional culture, whether intentional or unintended. To ensure that these solutions integrate with current nursing practices, nurses must be actively involved in the design and development of these technologies. It is also essential to conduct a comprehensive cost-benefit analysis when developing complex healthcare technologies, considering their impact on environmental resources to ensure their sustainability and compatibility with the needs of the future healthcare sector [23,24].

4. Telehealth/ telemedicine

Telehealth/ telemedicine offer many benefits in nursing practices:

Telehealth (telemedicine) offers many benefits to nursing practices and is particularly useful in nursing homes during infectious disease outbreaks, such as the COVID-19 pandemic. This technology helps reduce isolation and keep residents and nursing staff safe by reducing the need for face-to-face contact, which increases safety and reduces the spread of infection [25].

Telehealth/ telemedicine challenges in nursing practices:

Nursing practices face challenges in using telehealth services (telemedicine), as nurses' technical skills and negative attitudes towards this technology may be a barrier. Nurses also face concerns about data privacy and confidentiality of information, which may affect their full reliance on this technology in providing health care [26].

Future implications for Telehealth/ telemedicine in nursing practices:

The future implications of telemedicine for nursing practice suggest that nurses should be involved in the design of telehealth systems and emerging virtual models in collaboration with patients and caregivers [27]. This involvement will ensure that these systems are integrated with patient needs and improve the quality of care provided.

5. Mobile health and social media

Mobile health and social media offer many benefits in nursing practices:

Mobile health and social media offer many benefits to nursing practice, such as improving short-term patient outcomes through the delivery of guidance via apps. They also provide a variety of health information that facilitate nursing processes and support patient and student education [28].

Mobile health and social media challenges in nursing practices:

Nursing practices face challenges in using mHealth and social media, such as the lack of affordable or reliable mobile phone applications to support clinical decision-making. There are also concerns about the image of the nursing profession when using these technologies, especially in hospital settings. Additionally, the quality and reliability of health information available online, especially on social media, varies, which can pose a risk or threat to patient safety [29].

Future implications for Mobile health and social media in nursing practices:

The future implications of the use of mobile health and social media in nursing practice suggest that policies and a professional culture should be developed that support the use of mobile devices in clinical practice, and that they should be integrated with electronic health records (EHRs) and related technologies where appropriate. Nurses should be educated about the appropriate use of social media and online health information, and patients should be supported in using these technologies to improve their self-management of their health conditions [30].

6. Virtual and augmented reality

Virtual and augmented reality offer many benefits in nursing practices:

Virtual and augmented reality technologies offer many benefits in nursing practice, such as improving knowledge through virtual reality training in nursing education. These technologies can also be used as a therapeutic tool or clinical intervention [31].

Virtual and augmented reality challenges in nursing practices:

Virtual and augmented reality technologies in nursing practice face challenges such as causing “simulation sickness,” which includes dizziness and visual disturbances, which may impact the ability of practitioners and students to use these technologies effectively [32].

Future implications for Virtual and augmented reality in nursing practices:

The future implications of VR and AR technologies in nursing practice suggest that nurses and educators need to develop low-cost hardware and software that can be integrated with existing digital technologies such as mobile devices, the internet, and other technologies [31,32]. This will contribute to more effective use of these technologies in clinical education and training.

The Nurse-Patient Relationship in the Digital Age

Nurses must reimagine how they interact with and care for patients as digital technologies enable follow-up, assessment, monitoring of vital signs, and psychological support. Traditional nursing practices based on therapeutic relationships and physical interactions must evolve to accommodate new technologies and the experience of patients who demand personalized healthcare models that fit their diverse lifestyles [33].

Nursing must therefore continue to develop virtual care models that leverage the Internet and mobile technology, building on previous experiences with telecare and telemedicine [25,31]. These models can be expanded through virtual or augmented reality technologies or integrated with life-saving systems or “smart homes,” as well as personalized healthcare solutions that rely on genetic and biometric data. Care approaches, understanding of privacy, and technological compatibility functions must be designed jointly by the multidisciplinary health team, patients, and nurses. Studies are also needed on access to

these services, costs, use or waste of electronic resources, and the effects of increasing digitalization on nursing-patient relationships in terms of equity [29,33].

Embracing Digital Technology in the Nursing Profession

The nursing profession requires a comprehensive cultural shift towards better adoption of digital systems to meet contemporary and evolving needs. Technology used in nursing is often poorly configured or not updated regularly, causing issues such as alert fatigue or burdening nurses with additional documentation [30]. There is a wide disparity in access to digital technology globally, requiring solutions tailored to healthcare practices. The COVID-19 pandemic has heightened awareness of digital healthcare technologies, providing an opportunity for change that nurses should embrace [45]. Technologies such as robotics and drones can be used to enhance nursing care rather than see it as competition [23]. Collaboration with technology developers and patients is critical to ensuring success, and the nursing profession must seize these opportunities to support new models of care [1,2].

Conclusion

The integration of digital technologies into nursing practice presents significant opportunities to improve healthcare outcomes and efficiency. However, challenges associated with this integration, including technological barriers, resistance from nursing professionals, and cultural concerns, must be addressed to fully realize the potential of these innovations. In Saudi Arabia, where Vision 2030 is driving the national healthcare transformation, investment in infrastructure, training, and cultural change is essential to foster the adoption of digital technologies in nursing.

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