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The impact of clinical pharmacists' education for nurses on minimizing drug-food interactions in hospitalized patients

Ebtihaj Daham Alenezi[1], Tahani Hadi Matar Alrasheedi[2], Mona Suwayyid Noman Aldhafeeri[3], HISSAH EID AYED ALANAZI[4], Almaha Humaidi Bin Hulayyil Alhazmi[5], salma hadyan alhazmi[6], Daham Mansi S Alanazi[7], Faisal hmaidi alhazmi[8], SHUAA HAMDAN J ALENEZI[9], BADER HAMDAN J ALENEZI[10]

1. Pharmacy Technician, Arar Long Term Care Hospital (Tapline), Arar
2. Nursing Technician, Primary Health Care, South Abu Musa Health Center, Hafar Al-Batin
3. Pharmacy, Maternity and Children's Hospital, Hafer Al baten
4. Technician-Nursing, Long care hospital, Arar
5. Nursing Specialist, Women and Children's Hospital, Arar
6. Nursing technician, mustashfaa alrieayat almadida, ARAR
7. Nursing Technician, Medical Supply and Logistics in Qurayyat
8. Nursing Specialist, Prince Abdulaziz Bin Musaed Hospital
9. Technician- nursing, Department of Forensic Medicine, Arar
10. Technician- nursing, Technician- nursing, Eradah Mental Health Complex, Arar

Abstract
Mobile health technology has revolutionized healthcare by integrating mobile devices and applications to improve patient care, enhance medication management, and streamline communication between healthcare providers. This paper explores the impact of mHealth on the quality of care provided by nurses and pharmacists, focusing on how these technologies enhance medication adherence, drug interaction monitoring, patient education, and overall care delivery. For pharmacists, mHealth tools offer real-time medication tracking, alerts for drug interactions, and remote educational resources for patients, improving both patient safety and treatment outcomes. Similarly, for nurses, mHealth enables efficient patient monitoring, enhanced coordination of care, and personalized patient education, all of which contribute to improved patient satisfaction and clinical results. Despite its many benefits, the adoption of mHealth technology presents challenges such as data security, technological access, and the need for proper training. This paper concludes that mHealth technology significantly improves healthcare quality by empowering nurses and pharmacists to deliver more personalized, effective care, while also addressing the challenges to its implementation. The continued evolution of mHealth offers promising advancements for patient-centered care, making it a crucial tool for healthcare professionals in the future.
Keywords: Mobile Health, Mobile Health Technology, Quality of Nursing Care, pharmacist.

Introduction

The healthcare landscape has undergone a transformative shift with the advent of mobile health (mHealth) technologies. Defined as the use of mobile devices such as smartphones, tablets, and wearable sensors to support healthcare practices, mHealth is revolutionizing how care is delivered, monitored, and evaluated. These technologies offer significant opportunities to enhance the quality of care provided by nursing and pharmacy professionals, two critical pillars of the healthcare system. Healthcare systems deal with disease prevention, early detection, diagnosis, investigation, and timely, affordable, and safe treatment [1].

Health care systems work on communication to provide all health-related services in any setting. It is the most essential requirement to establish a link between the health care provider and the patient. In earlier times, physical visits of patients to a hospital or a health care facility were the prime requirement to communicate about the ailments to seek health services [2].

For nurses, mHealth tools improve workflow efficiency, patient monitoring, and communication, enabling more accurate and timely interventions. In the contemporary healthcare landscape, the integration of ICT plays a pivotal role in reshaping the responsibilities of nurses [3]. ICT empowers nurses to provide more precise and personalized care by leveraging digital tools and data-driven insights. Younger professionals exhibit a natural inclination towards adopting new technologies, fostering a progressive and tech-savvy healthcare environment. An open and collaborative work environment, where nurses can share concerns and participate in the selection and implementation of ICT, can be instrumental in overcoming resistance from skeptical nurses[4].

Pharmacists benefit from enhanced medication management systems, drug interaction alerts, and the ability to provide personalized patient education remotely [5]. Mobile health technology (mHealth) offers pharmacists a broad range of tools to improve medication management, patient safety, and education. The integration of mHealth systems into pharmacy practice has empowered pharmacists to enhance the quality of care they provide, helping them serve patients more effectively, particularly in the areas of medication management, drug interaction alerts, and remote patient education [6].Collectively, these innovations address long-standing challenges, such as fragmented communication, medication errors, and the time-intensive nature of manual processes.

Despite these advantages, integrating mHealth technology into nursing and pharmacy care is not without challenges. Concerning data security, user training, and the equitable access to technology, highlight the need for a balanced approach that maximizes benefits while minimizing potential drawbacks.

This study explores how mHealth impacts the quality of care delivered by nurses and pharmacists. By analyzing improvements in patient outcomes, professional efficiency, and user satisfaction, alongside potential barriers to adoption, this research aims to provide a comprehensive understanding of mHealth's role in modern healthcare. The findings will offer valuable insights for policymakers, healthcare providers, and technology developers striving to harness mHealth for better care delivery.

Mobile Health Technology

Mobile Health Technology (mHealth) refers to the use of mobile devices, applications, and wireless technologies to deliver healthcare services and improve health outcomes [7]. This innovation has revolutionized the healthcare industry, providing solutions for patient care, professional collaboration, and health management that are accessible, efficient, and often cost-effective. mHealth encompasses a wide range of tools, including mobile apps, wearable devices, telemedicine platforms, and remote monitoring systems, one such innovation is the use of mobile health (mHealth) applications for remote monitoring. [8].

Most healthcare providers, especially physicians, resist the use of eHealth technologies such as electronic health records, patient portals, online health information, telemedicine, and mHealth. Based on many studies, managerial support, autonomy, physician participation, and patient physician communication in organizational characteristics would influence the impact of physicians' acceptance and use of EHCR [9]. The implementation of these technologies, especially mHealth, implies changes in organizational structures and processes, which often face various forms of resistance [10]. Change is a very complex and multifaceted phenomenon that is intertwined with the understanding of nursing practice, so, resistance to change in nursing can be considered as an important challenge. Knowing the reasons for this resistance can help in solving it in nursing.Resistance to change is an important barrier to the adoption of new technologies by healthcare providers [11]. Some common barriers include technical, individual, and organizational factors.Although barriers associated with mHealth adoption in healthcare settings have been addressed in the literature, few studies have systematically reviewed factors influencing the adoption of mHealth. Therefore, there is no consensus on the categorization of barriers to mHealth adoption [12].

Applications for mHealth Technology

Mobile digital technologies are increasingly able to gather multiple streams of Realtimebehavioral, physiological and psychosocial data, in precise and unobtrusive ways. Examples of these technologies include smartphones, wearable biosensors, and more recently 'smartwatches. In addition, the application of these devices for research purposes potentially facilitates data collection from 'hard-to-reach' populations [10]. These applications give many roles like:

1. **Patient Care:** mHealth improves chronic disease management, remote monitoring, and emergency care through real-time data collection and analysis.
2. **Professional Support:** It enhances decision-making for healthcare providers by offering clinical guidelines, medication databases, and teleconsultation platforms.
3. **Health Promotion and Disease Prevention:** Mobile apps and social platforms promote healthy lifestyles, track fitness goals, and provide educational resources.

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4. **Pharmacovigilance:** mHealth facilitates the reporting and monitoring of adverse drug reactions, improving medication safety [8].

Benefits of mHealth Technology

- **Improved Quality of Care:** Real-time monitoring and better communication lead to faster and more accurate interventions.
- **Cost Efficiency:** Reduced hospitalizations and optimized resources use lower healthcare costs.
- **Enhanced Patient Engagement:** Personalized and interactive tools empower patients to take an active role in their health.
- **Increased Access to Care:** Telemedicine and mobile services bridge gaps in healthcare delivery for remote populations [13].

Role of Pharmacists in using Mobile Health Technology on Quality Performance

Pharmacists play a vital role in utilizing mobile health (mHealth) technology to improve the quality and efficiency of healthcare services. By integrating mHealth tools into their practice, pharmacists have transitioned from traditional dispensing roles to more dynamic, patient-centered approaches that emphasize enhanced medication management, patient education, and interprofessional collaboration. These advancements significantly contribute to improved patient outcomes and overall healthcare performance [14].

One of the primary contributions of pharmacists in mHealth is medication management and adherence. Mobile applications designed for tracking medication schedules, issuing reminders, and sending dosage alerts enable pharmacists to monitor patients' adherence to prescribed therapies. This real-time oversight allows for timely interventions to address nonadherence or potential misuse, ultimately reducing medication errors and improving treatment outcomes.

Telepharmacy, a key component of mHealth, enables pharmacists to extend their expertise to remote or underserved areas. Through virtual consultations and e-prescriptions, pharmacists can provide guidance on drug interactions, side effects, and proper medication use without geographical constraints. This accessibility ensures that patients receive high-quality pharmaceutical care, regardless of location, enhancing overall patient satisfaction.Telepharmacy enables healthcare services such as medication review, patients counseling, and prescription verification by a qualified pharmacist for the patients located at a distance from a remotely located hospital, pharmacy, or healthcare center [15].

Mobile health technology also supports pharmacists in pharmacovigilance, the monitoring and reporting of adverse drug reactions. By integrating mHealth tools with safety reporting systems, pharmacists can promptly detect and address medication safety concerns, ensuring a higher standard of drug safety and quality assurance. Additionally, pharmacists use mHealth platforms to deliver personalized patient education. Through multimedia resources such as videos, text, and interactive modules, they cater to individual patient needs, improving health literacy and promoting better health practices [16].

Collaboration is another area where mHealth has transformed the role of pharmacists. Integrated platforms facilitate seamless communication between pharmacists and other healthcare providers, allowing for real-time sharing of patient records, lab results, and treatment plans. This integration reduces errors and fosters a team-based approach to care, further improving healthcare delivery. Moreover, in chronic disease management, pharmacists utilize mHealth tools to monitor vital parameters like blood glucose or blood pressure. They can analyze this data to make informed decisions on medication adjustments and lifestyle recommendations, ensuring tailored care for patients with chronic conditions [11].

Finally, pharmacists contribute to advancing research and innovation through mHealth by collecting and analyzing large-scale patient data. This data supports clinical research and evidence-based practices, providing insights into population health trends and treatment efficacy. As mHealth technology continues to evolve, it promises to expand the pharmacist's role in ensuring safe, efficient, and effective healthcare.

In conclusion, mHealth technology has empowered pharmacists to enhance healthcare quality through improved medication, safety, patient engagement, and interprofessional collaboration. These advancements underscore the indispensable role of pharmacists in shaping the future of healthcare delivery.

Role of Nursing in Mobile Health Technology on Quality Performance

Nurses are at the forefront of healthcare delivery, and the integration of mHealth technology into their practice has revolutionized how they deliver care. mHealth tools enhance the efficiency, accuracy, and accessibility of nursing services, ultimately improving patient outcomes and the quality of care. By embracing this technology, nurses have expanded their role from bedside caregivers to tech-savvy professionals contributing to holistic and patient-centered healthcare [6].

A significant aspect of mHealth in nursing is its role in enhancing communication and coordination of care. Mobile applications and platforms enable nurses to communicate seamlessly with other healthcare professionals, share real-time updates, and access patient records promptly. This connectivity reduces errors, improves response times, and ensures continuity of care, especially in fast-paced or emergency settings [9].In addition, mHealth technology supports nurses in monitoring patients more effectively. Wearable devices and remote monitoring systems allow nurses to track vital signs, such as heart rate, blood pressure, and oxygen levels, in real time. These tools are especially valuable in managing chronic illnesses or monitoring patient's post-discharge. Early detection of abnormalities through mHealth tools enables timely interventions, reducing hospital readmissions and improving patient safety.

Nurses are uniquely positioned to help address the challenge of this mismatch.Nurses also play a critical role in educating and empowering patients through mHealth platforms. By leveraging apps and interactive tools, nurses can provide personalized health education, helping patients understand their conditions, medications, and care plans. These resources promote self-management and encourage patients to take an active role in their healthcare journey, ultimately improving adherence to treatment and health outcomes [17].

Furthermore, mHealth technology aids nurses in streamlining administrative tasks, such as documentation, scheduling, and reporting. Mobile devices equipped with electronic health record (EHR) integration allow nurses to document patient care activities efficiently and accurately at the point of care. This reduces paperwork, minimizes errors, and frees up more time for direct patient interaction.In preventive care, mHealth tools enable nurses to participate actively in health promotion and disease prevention initiatives. Mobile apps and platforms designed for lifestyle tracking, vaccination reminders, and health screenings facilitate population health management, allowing nurses to address health risks proactively [10].

The use of mHealth also enhances nursing education and professional development. Mobile platforms offer access to continuing education resources, clinical guidelines, and virtual simulations, enabling nurses to stay updated with the latest evidence-based practices. This continuous learning supports skill development and ensures high-quality care delivery.

In conclusion, the integration of mHealth technology into nursing practice has significantly enhanced the quality of healthcare services. By improving communication, patient monitoring, education, administrative efficiency, and professional development, nurses play a pivotal role in leveraging mHealth for better care outcomes. As technology continues to evolve, the nursing profession will remain a cornerstone in driving its effective implementation in healthcare.

Conclusion

The integration of mHealth technology into nursing and pharmacy practice has significantly transformed the delivery of healthcare, enhancing the quality of care, improving patient outcomes, and promoting more efficient workflows. For pharmacists, mHealth tools offer enhanced medication management, drug interaction alerts, and the ability to provide personalized patient education remotely. These advancements enable pharmacists to play a more proactive role in patient care, reduce medication errors, and ensure optimal treatment adherence.

For nurses, mHealth has empowered them to improve patient monitoring, streamline communication, and provide continuous care, even in remote settings. It has also facilitated patient education, supported

chronic disease management, and increased workflow efficiency, leading to better overall patient satisfaction and outcomes.

Despite the numerous benefits, the adoption of mHealth technology is not without challenges, including data security concerns, technological barriers, and the need for adequate training. Addressing these challenges will be critical in ensuring that both nursing and pharmacy professionals can fully leverage the potential of mHealth tools to improve healthcare delivery.

As mHealth technology continues to evolve, its impact on healthcare quality will only grow. With innovations like artificial intelligence, machine learning, and wearable devices, the future of mHealth holds immense promises for even more personalized, accessible, and efficient care. Pharmacists and nurses will continue to be at the forefront of this evolution, shaping the future of healthcare through the integration of mobile health technologies.

In conclusion, the role of pharmacists and nurses in leveraging mHealth technology is essential for improving the quality of care and advancing the efficiency of healthcare systems. The ongoing development and adoption of mHealth tools will further enhance their ability to deliver high-quality, patient-centered care.

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