Tele-Nursing And Remote Monitoring In Chronic Disease Management

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Abstract

Background: Remote Patient Monitoring is an important component of telenursing especially related to Chronic Disease Management because it gives patients engagement in their own health treatment and monitoring. Chronic conditions, such as diabetes mellitus or hypertension, require continual monitoring and management, so chronic conditions suit remote monitoring interventions well. By the virtue of this study the researcher had tried to touch all the related aspects of remote monitoring of chronic diseases, role of nursing in the same and ways and means used in this process.

Study Objectives: The broader objective of the research is to conduct a systematic review and synthesize the evidence to date that explores tele-nursing and remote monitoring technologies for chronic disease management in Saudi Arabia.

Materials and Methods: Study is a narrative based review study and uses exploratory research design where the data is gathered from various sources on the basis of pre decieded criteria of inclusion and exclusion. PRISMA is used to segregate and screen the collected studies. The results are presented in theoretical and chronological manner to give the clear picture of point in question.

Results: The positives of this technology path are evident, but challenges in the form of literacy in technology, equity of technology infrastructure across the Kingdom, cultural considerations, and regulatory clarity will need to be addressed before telenursing can thrive.

Keywords: Tele-nursing, Remote monitoring, Chronic disease management, Digital health, Nursing informatics, Virtual care, Patient engagement.

Introduction and Background

Context of Tele-Nursing

Managing long-term conditions creates a significant burden on global health systems. In the Kingdom of Saudi Arabia (KSA), national health policies favor prevention and efficiency in health systems, thus technology solutions have been integral to meet this challenge. [1] Telehealth, defined as health services delivered using information and communication technologies (ICT), has significantly changed the patient's experience in the health field by substituting exact charting and manual filing using a digital platform. [2] Telenursing is one aspect of telehealth that exemplifies a paradigmatic shift to nursing

practice and is considered an essential ideology of contemporary nursing practice in KSA. The emphasis of telenursing is centered on patient long-term wellness where the focus is on keeping patients well and maintaining patient autonomy with constant surveillance and follow-up while in a health facility or at home. This technology-enabled patient engagement supports more patient-centered care increases nurse-patient conversations, increase positive patient experiences, and provides seamless care. [3]

Remote Patient Monitoring is an important component of telenursing especially related to Chronic Disease Management because it gives patients engagement in their own health treatment and monitoring. Chronic conditions, such as diabetes mellitus or hypertension, require continual monitoring and management, so chronic conditions suit remote monitoring interventions well. [4] Despite there being a high acceptance rate (approximately 70%) of technology, including telehealth use, and demonstrate a complete understanding of telehealth use by primary HCWs currently research has focused solely on the measured outcomes and effectiveness of remote monitoring in telenursing which is considered vague research. [3], [5]

Model of Tele-nursing and Remote Monitoring

Mobile and communication technologies are included in the healthcare system in Saudi Arabia to deliver healthcare services remotely. [6] An example of a mobile health (mHealth) application that has been implemented in more than 900 medical centers is the SEHA app, which makes up part of the system transformation from embedded health to health system. [7] RPM is utilizing remote devices to monitor high-risk or inability to get out patients, which are confirmed high risk elegible, specifically hypertension or diabetic patients who belong to a Home Healthcare Departments. The devices for all of these monitoring are used by nurses, and to give a general categorization of devices, the following categories:

Remote devices - glucometer, blood pressure devices, pulse oximeter, thermometer, and body analysis scale.

Mobile applications - RAHAH app, an application that allows both the patient and health provider establish and manage personal health record, view device readings, and message each other. With the implementation of RPM, there is ongoing oversight for nurses to observe and follow up, or interact with patients as they navigate their own home environment. An integral and non-negotiable piece is the nurse's responsibility and accountability for training patients and/or family member to utilize the remote device effectively. [9], [10]

Telenursing models can enhance system efficiency in addition to monitoring individual patients. The SEHA mobile application is an example of an effective digital triaging tool that is relieving work in Emergency Departments (EDs). [11] Evidence suggests that more than 24% of patients indicated they were going to the ED but changed their mind after using the SEHA application. [12] This function can support general practitioners in priority setting the right type of preventative care and used health resources appropriately throughout the health system. In Saudi Arabia, telenursing provides potential to access distance populations, particularly given geographic challenges and workforce shortages, and increases continuity of care in patient management for providers. [8], [13] However, tele-nursing has physical and digital literacy challenges and limitations involving infrastructure, cultural competence, and regulatory frameworks to protect patient data and professional ethics in practice in rural/remote areas. It is therefore warranted to conduct a review study exploring the role of tele-nursing and remote monitoring for chronic disease management in Saudi Arabia to synthesize evidence, assess nursing-led digital interventions and explore barriers and opportunities to scale tele-nursing models. By highlighting best practices and research gaps, the study contributes to the strategic advancement of nursing in the Kingdom's digital health ecosystem.

Research Gap

There are limited local studies investigating clinical outcomes, patient satisfaction, and cost-effectiveness of tele-nursing interventions in Saudi Arabia. Even fewer studies describe how nurses in Saudi Arabia interpret and act on information gathered from wearable technology, mobile applications, or cloud-based monitoring systems, and it is unclear the extent of nursing agency in making decisions to act remotely. There have been limited studies on the digital capabilities of nurses in Saudi Arabia,

and especially with rural or non-tertiary nurses. There has been no systematic research into the impact of specialized training curricula on tele-nursing practice.

Research Objective

The broader objective of the research is to conduct a systematic review and synthesize the evidence to date that explores tele-nursing and remote monitoring technologies for chronic disease management in Saudi Arabia.

Research Methodology

Research Design

Present study is based on the pillars of exploratory research design and presents the narrative review of the studies conducted in the area of tele-nursing and remote monitoring of chronic diseases. The researcher has touched the studies conducted on the ways and means of remote health monitoring, knowledge of nurses about the same and future prospects in this particular area of study with a specific focus on Saudi Arabia. Also some of the studies will be from from MEA region and western countries in order to present the global prospect. Most of the studies were considered from the period of 2016 to 2025.

Population: The population of the study was the total number of studies based on the engagement of nurses in remote monitoring of patient suffering from chronic diseases role of nurses in the process of tele-nursing and future prospects of this process. The researcher had tried to take up the studies that are based in Saudi Arabia or at the most MEA region. Researcher accumulated more than 90 studies in this regard and after a thoughtful evaluation and screening some of them were excluded as well.

Inclusion and Exclusion criteria

Inclusion

- National or global studies focused on Saudi Arabia.

- Studies based on the role and importance of tele-nursing for chronic diseases.

- Mostly review articles, reports from government and private agencies and white papers.

- Studies published or presented in English or Arabic will be included.

- Studies published between 2016 to 2025 will be included

Exclusion

- Studies not related to Saudi Arabia or MEA will be excluded

- Studies that have not included the nursing profession or chronic diseases were excluded.

- Any type of editorials, general opinions, non-peer reviewed articles will be excluded.

- Studies in other languages (without translation) will be excluded.

- Studies published before 2016 will be excluded.

Sources of Data and Keywords

Researcher has touched a number of sources for the collection of data. Some of the relevant sources are mentioned here:

- PubMed

- Cochrane Library

- ClinicalTrials.gov

- EMBASE

- Saudi Medical Journal

- King Saud University Repository

Keywords for the study were decided in advance and only those studies were touched that have the following keywords using boolian operators (AND, OR):
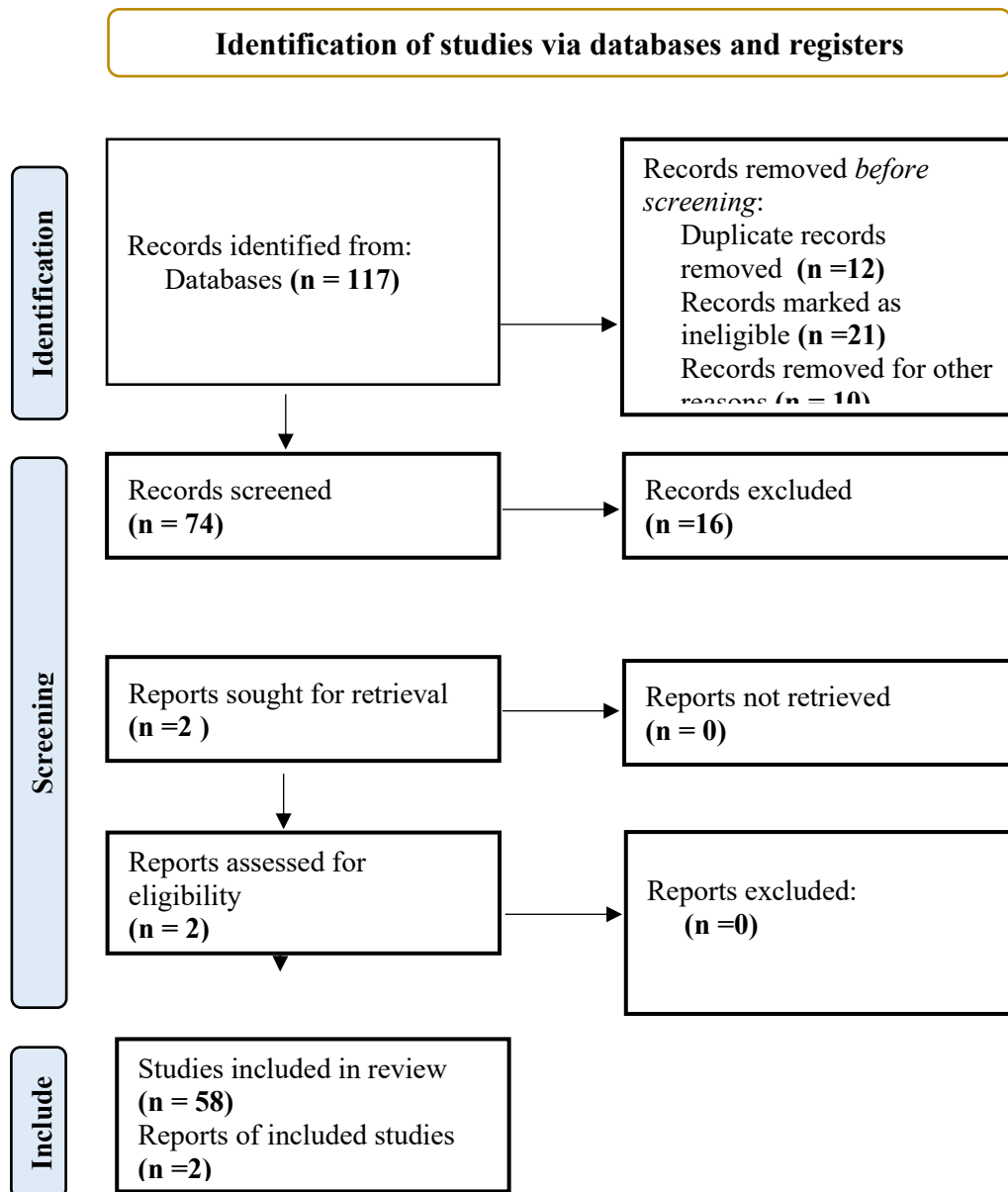
"Tele-nursing", "Remote monitoring", "Chronic disease management", "Digital health", "Nursing informatics", "Virtual care", "Patient engagement", "Mobile health (mHealth)", "Nurse-led interventions", "Health technology adoption".

Information Extraction

Researcher had prepared a format for recording the relevant information, main heading include, design of study and location, demographics of the respondents and number, specific measures of outcome, like improvement in health through remote monitoring, significance of tele-nursing and importance of monitoring patients with chronic diseases. Also the relevance of the respective study to Saudi population in particular is considered.

Results

A total of 117 research studies and 2 reports were identified, all of them were based on the role, impact, significance and applicability of optics in the sector of healthcare in Saudi Arabia and MEA region.

Identification of studies via databases and registers

Identification

Records identified from:
Databases **(n = 117)**

Records removed *before screening*:
    Duplicate records removed **(n =12)**
    Records marked as ineligible **(n =21)**
    Records removed for other reasons **(n = 10)**

Screening

Records screened **(n = 74)**

Records excluded **(n =16)**

Reports sought for retrieval **(n =2)**

Reports not retrieved **(n = 0)**

Reports assessed for eligibility **(n = 2)**

Reports excluded: **(n =0)**

Include

Studies included in review **(n = 58)**
Reports of included studies **(n =2)**

Out of these identified studies, 12 were removed because of duplication of records, references and location and 21 studies were marked as ineligible, as not including the concept of tele-nursing or remote monitoring and 10 for some other unavoidable conditions. Further 74 records were saved for screening, then in the screening process 16 records were further removed on the basis of exclusion criteria stated above. Total studies finalized for review were 58. Then two reports were also included in the study.

Tele-nursing services, which include Seha and Tetamman, have vastly increased access to care for rural populations and underserved areas within Saudi Arabia. [14] Patients with chronic health conditions such as hypertension and diabetes engaged in virtual follow-up appointments to 100% adherence to scheduled appointments, and medication regimes. [15] Remote-monitoring devices, such as wearables and mobile applications, allow patients to monitor and report their identified vital signs such as blood glucose levels, blood pressures, and heart rates. Research has demonstrated that patients who received with ongoing feedback and education by a registered nurse, through a digital platform, reported improved self-care behaviors and lifestyle changes. [11], [16] One study, completed by researchers from hospitals in Riyadh, showed multiple tele-nursing interventions, including working with patients with heart failure, reduced readmissions by 25% within 30 days. [18] Remote-monitoring has also provided early identification of complications, and timely nurse-led interventions. Nurses reported managing patients with chronic conditions reduced burden, decreased documentation, and increased time for patient education. Nurses also expressed concerns and anxiety around monitoring patients remotely, which included digital literacy issues, workload transfer, and the lack of training around specific telehealth platforms. [17], [20]

Restricted access to the internet and devices due to limited infrastructure, particularly in remote areas, also affected access to reliable telehealth. [19] Cultural considerations also impacted a patient's willingness to participate in virtual care, as did gender norms and privacy expectations, especially in older adults and women. [20] Data security and ethical issues were also part of the findings, suggesting the need for clarity on regulations. The findings respond to the transformative potential of tele-nursing within the expanding context of chronic disease management in Saudi Arabia. [21] Findings also point to potential future strategic priorities beyond tele-nursing itself including training, infrastructure, and culturally appropriate care models.

Discussion

The integration of remote monitoring technologies and tele-nursing into chronic disease management represents a leading advancement for the healthcare transformation in Saudi Arabia. The country has meaningful commitments to the Vision 2030 goals and digital health solutions are growing to be recognized as a critical aspect of improving access, continuity and quality of care for patients with chronic conditions, such as diabetes, hypertension and cardiovascular diseases. [22]
Tele-nursing can extend nursing care beyond the physical clinical setting, including the use of virtual platforms for consultations that are centered on monitoring the patient's health status and health education, and remote monitoring devices (e.g., wearable technologies, mobile health applications) enables validation and assessment of vital signs and adherence to treatments in real time. [23] Collectively, the use of these technologies promotes patients to take an accountable partnership role in managing their health, while also allowing the nurse to intervene early, as needed, if complications occur. [24]
Evidence-based studies in Saudi Arabia have already produced meaningful positive results related to patient engagement with tele-nursing interventions and also demonstrated that tele-nursing can reduce readmission rates to the hospital. [25] Such as the use of virtual follow-up visits with diabetic patients, which showed improvements in their insulin compliance and glycosylated hemoglobin control. In a similar fashion, remote cardiac monitoring has allowed for earlier detection of arrhythmias and fewer emergency department visits. [26] Nurses report that digital tools for communication with patients allows them to be more efficient and satisfied in their jobs because they can better manage their time and engage more meaningfully with patients. However, there are challenges for tele-nursing, as are present in other forms of digital communication in nursing. [20], [27]

Digital literacy varies greatly among nurses and patients, especially in rural regions, and there may be access issues to sufficient infrastructure for this type of communication. [28], [29] Patients in - Saudi Arabia - may have cultural antecedents that would deter them from engaging with nurse communication remotely, including gender norms, privacy expectations, and language. Additionally, the lack of standardized practice protocols and regulations may increase the potential impact of ethical, data security, and accountability. [11], [30] In an effort to extend telehealth competencies are being included in education programs for nurses in Saudi Arabia, but as with previous advances in nursing practice, challenges for preparing faculty and facilitating institution-level resource access may impede program. There is an urgent need to explore the long-term implications of tele-nursing, especially in terms of cost/efficiency and scalability and feasibility with national health policy. Tele-nursing and remote monitoring provides a bridge towards transformative health care chronic disease management in - Saudi Arabia. In order to fully realize these benefits, investment in infrastructure, education and culturally-appropriate models of care is critical. It is paramount that nurses are not just offered training on technical aspects, but are also trained as strong leaders in innovation, especially related to digital health delivery.

Conclusion

Tele-nursing and remote monitoring have emerged as novel modalities for chronic disease management in Saudi Arabia, providing greater access and continuity of care for patients as well as supporting patient self-management. Nurses will be instrumental in the virtual care delivery process, using health data to inform self-management advice for patients. The positives of this technology path are evident, but challenges in the form of literacy in technology, equity of technology infrastructure across the Kingdom, cultural considerations, and regulatory clarity will need to be addressed before telenursing can thrive. Upon building nurses' knowledge and skills, and supporting with resources and guidance, to understand digital care models, will be a continued necessity as Saudi provides its Vision 2030 health mandates toward sustainable, patient-centered chronic disease management.

Recommendations

1. Develop formal education regarding telehealth platforms, remote connectivity devices, and data interpretation. Incorporate digital competence learning modules into undergraduate nursing education, and continuing nursing education.
2. Support continued access to internet connectivity and mobile devices for patients living in rural or remote areas. Work with telecommunication companies to assist subsidize mobile health access, and provide patients with chronic disease a device to enable remote monitoring.
3. Establish tele-nursing platforms and communication channels that is culturally specific to Saudi Arabia including gender roles and culture. Collaborate with religious and community leaders to recognize and approve the use of virtual care as being acceptable.

Scope for Future Study

Future research should focus on the effects of tele-nursing interventions on patient outcomes, costs, and efficiencies over a longer period of time in the future. Future studies will look at disease progression, hospitalizations, and quality-of-life measures over a longer period of time. More qualitative and mixed-methods research needs to take place to document the experiences of patients and families who use remote nursing care and create care models that are more inclusive of patient preference, cultures, and trust of virtual platforms. Future research should examine the digital health readiness of nurses from geographic regions, practice settings, and nursing professions. Future research should examine the effectiveness of mentorship and training preparedness and study knowledge gaps in technical skills of older or rural based staff.

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