The Review Of
DIABETIC
STUDIES OPEN ACCESS

The Role Of Integrated Pharmacy, Nursing, And Radiology Services In Improving Patient Outcomes And Satisfaction

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Abstract

Introduction: The Saudi Arabian healthcare is in a radical structural change based on the framework of the Vision 2030, whereby the current structure of the system is based on departmental silos that would be integrated into a value-based care structure. The most crucial touchpoints during the clinical pathway are pharmacy, nursing, and radiology though their history has been characterized by a lack of coordination which has frequently contributed to time loss during the diagnostic process, as well as, medication errors. Following the introduction of interdisciplinary synergy in patient care by the Kingdom through the introduction of the use of "Health Clusters" and digital platforms.
Objective: This systematic review will aim to assess and summarize the contributions of integrated pharmacy, nursing, and radiology services toward clinical effectiveness and patient-focused metrics within Saudi Arabia's health care sector.
Method: In accordance with the PRISMA recommendations, the systematic search was performed in PubMed, ScienceDirect, Scopus and the Saudi Digital Library to find peer-reviewed articles published in 2016-2026. Search strategies were based on the use of Boolean operators to find ways of connecting professional domains (e.g., Clinical Pharmacy) and integration concepts with the Saudi geographic context. The studies were filtered to include those that produced primary data regarding interdisciplinary collaboration between at least two of the three target departments in KSA.
Conclusion: The results show that integrated service delivery has a strong positive effect on patient safety, especially with a decrease in medication and contrast-related errors of about 30-35 percent. Integration helps create a memorable patient experience, and the satisfaction score is greater as the wait time decreases, and communication between the staff is enhanced. Although digital health infrastructure is the key enabler, professional hierarchy and communication in the workplace is a challenge. The paper finds that interprofessional integration is a key to the strategic objectives of the Vision 2030, suggesting the nationwide expansion of multidisciplinary team (MDT) protocols.

Keywords: Pharmacy, Nursing, Radiology, Integrated Care, Patient Satisfaction, Patient Safety.

Introduction and Background

The medical environment in the Kingdom of Saudi Arabia (KSA) is now passing through the stage of the historical transformation. At the heart of this development is the Saudi Vision 2030 and the related Health Sector Transformation Program that will help to reorganize the healthcare system into a more complicated, efficient, and integrated network. In the past, the healthcare provision in the world, and particularly in the Middle East has been typified as professional silos- a system in which pharmacy, nursing, and radiology are separate entities with very little inter-departmental interaction. Nonetheless, contemporary clinical complexity requires an abandonment of these separated structures in favor of a model of integrated care where the interaction of multiple fields of medicine is the major driver of patient safety and institutional efficiency.

Pharmacy, Nursing, and Radiology services integration is a very important crossroads of the patient life cycle. These three departments are not support services, they are the pillars of the clinical pathway. The recovery of a patient in a typical acute care facility in Saudi Arabia is based on the precision of diagnostic images (Radiology), precision of drug delivery and observance (Pharmacy), and the multilateral and constant clinical care by the nursing staff. In case of fragmentation of these services, there is a possibility of increasing the risk of information gaps. An example is when the communication between radiology and pharmacy is incomplete about the renal functioning of a patient, the lack of information may cause contrast-induced nephropathy, whereas any failure of connections between nursing and pharmacy can create delays or errors in the administration of drugs.

In Saudi, the drive to integrate is stimulated by the shift to the Accountable Care Organizations (ACOs) and the development of Health Clusters. The clusters will facilitate smooth transitions of care. In this context, the pharmacist has moved their position to a more clinical position rather than the more traditional dispensing role by getting to the bedside to take part in rounds. In a similar manner, nursing in the Kingdom has shifted to specialized roles where they need high level coordination with the diagnostic departments. Radiology, which was once seen as a back-office diagnostic tool, now forms the core of rapid-response protocol in the management of trauma, oncology, and stroke-management, where the speed of treatment is determined by the degree of communication between the radiologist and the nurse and pharmacist.

The rationale behind the systematic review is due to the necessity to measure the clinical and humanistic outcome of this integration in the context of the specific socio-cultural and administrative area in the Kingdom. Although international literature emphasizes the advantages of interdisciplinary care, unique laboratory in Saudi Arabia is the investments directly related to the Health Information Technology (HIT), like the universal adoption of Electronic Health Records (EHR) and the virtual hospital known as Seha that is available online.

Additionally, the patient satisfaction has become one of the key performance indicators (KPI) of the Saudi Ministry of Health (MOH). Applying the service integration features to the patient's need to have a streamlined experience, the integration process takes into consideration the culture in which individualized treatment is valued greatly, and effective communication is considered a benchmark. Feeling that their nurse, pharmacist, and radiologist are collaborating, a patient develops the sense of trust and so-called psychological safety, which is one of the important prognosticators of the overall satisfaction and adherence to the treatment process.

The proposed systematic review will combine the available evidence on the impact of these three particular services integration on two key areas: Clinical Outcomes (including lower error rates and quicker recovery) and Patient Satisfaction (evaluated on the basis of the standardized experience surveys).

Need and Rationale of Study

The logic behind this systematic review is based on a critical crossroad of professional synergy and national healthcare requirement of Saudi Arabia. The silo effect, which is a department operating as an isolated unit, is one of the major flaws that affect the healthcare system despite the high individual competence of pharmacists, nurses, and radiologists in the Kingdom.

Solving the Professional Silo Gap

The main necessity of the study is the historical disintegration of clinical processes. In Saudi Arabia, medical facilities have been growing at a rate far much faster than the provision of integrated communication procedures.
Pharmacy-Nursing Nexus: The adoption of medication schedules and administration timetable can cause adverse drug events (ADEs) due to disconnects.
Nursing-Radiology Nexus: The lack of coordination of patient preparation to undergo specialized imaging (e.g., fasting or checking renal function to use contrast) is a frequent cause of high no-show rates or delay in diagnoses.
Radiology-Pharmacy Nexus: The use of contrast media and timing of medication in relation to imaging outcomes (e.g. anticoagulation therapy) are areas that need to be more integrated that often vary in regional hospitals.

Congruency with the Vision 2030 and the Health Sector Transformation Program (HSTP)
Saudi Ministry of Health (MOH) is on the move towards Value-Based Healthcare (VBHC) model. This change requires the replacement of quantifying the amount of services (number of scans or prescriptions) by the worth of the results (patient recovery speed and safety). This research is required to calculate the role of interdisciplinary integration as a tool of attaining the National Transformation Program (NTP) objectives, namely:
Improving the Quality of Healthcare: Aiming at the target of a standard whereby integrated teams may decrease medical errors by 30-45.
Optimizing Resource Utilization: It involves minimizing redundancies in the departments and wastages of time and materials that occur as a result of ineffective coordination.
Digital Transformation: Comparing the actual implementation of such platforms as Wasfaty and Seha by interdisciplinary teams instead of single departments.

Achieving the Patient Experience Gap
Although Saudi Arabia has done much regarding clinical technology, the Patient Satisfaction scores of the area are often associated with dissatisfaction with wait times and disjointed communication. Patients can also complain of repeating themselves to various staff members. The imperative to study the capability of a common Team-to-Patient approach to enhance the Press Ganey and MOH satisfaction measures, which are currently benchmarked in the hospital funding and accreditation, is overwhelming.

Creating a Saudi-Specific Evidence Base
Majority of available literature relating to interdisciplinary integration is based in western healthcare systems. Nevertheless, the distinctive cultural setting of Saudi Arabia such as care norms particular to gender, a large proportion of chronic diseases (diabetes and obesity), and a heterogeneous expatriate labor force demand a systematic review to be localized. The research has been done to fill a critical vacuum by offering evidence-based recommendations to the Saudi Health Clusters and Accountable Care Organizations (ACOs).

Study Objective
This systematic review will aim to assess and summarize the contributions of integrated pharmacy, nursing, and radiology services toward clinical effectiveness and patient-focused metrics within Saudi Arabia's health care sector. It will also evaluate the ways in which inter professional collaboration between nurses, pharmacists and radiologists reduces the incidents of medication errors and adverse drug events (ADEs) related to both the usage of contrast agents and complex drug-diagnostic interactions.

Research Methodology
Research Question
The research questions of the current study are:
Q1. How do integrated pharmacy, nursing and radiology services affect patient safety, clinical results, and satisfaction for patients cared for by hospitals in Saudi Arabia?

Q2. How does inter professional collaboration between these three professions affect the number of medication errors made, particularly those caused by high-risk drugs or radiological contrast agents?
Q3. What is the role of digital health tools such as Wasfaty, Seha, and Unified Electronic Health Records in providing a means to communicate with others on an immediate basis?

Research Design

The study design is a systematic review since it is selected due to its capacity to give a high quality of evidence since numerous primary studies are combined into one ultimate analysis. This design will be based on the PRISMA (Preferred Reporting Items of systematic Reviews and meta-Analyses) framework to make it transparent, rigorous, and reproducible. Seeing that the situation is in the context of the Saudi Arabian healthcare, the design involves a qualitative and quantitative synthesis (mixed-method synthesis); the synthesis combines statistical data on clinical outcomes (error rates and turnaround times) and provides a thematicization of qualitative results on patient satisfaction and professional barriers. Through the systematic search, screening, and evaluation of the literature available in databases like PubMed, ScienceDirect, and the Saudi Digital Library, this design will enable a critical analysis of the functionality of integrated workflows in the context of Vision 2030 healthcare transformation.

Search Strategy

The planned search strategy of this systematic review is very thorough and narrow, involving the use of key word searches and Boolean operators in several electronic databases, such as PubMed, Scopus, Web of Science, and the Saudi Digital Library (SDL). The search is narrowed down to peer-reviewed articles that have been published in the period of 2016-2026, which also corresponds to the launch and implementation periods of the Saudi Vision 2030. The strategy will also use a manual snowball search of reference lists of key studies and an assessment of grey literature to reduce the risk of publication bias (official reports of the Saudi Ministry of Health, MOH, and the Saudi Central Board of Accreditation of Healthcare Institutions, CBAHI).

Types of Studies Included

The systematic review utilizes a broad spectrum of primary research designs in order to have a holistic view of the impact of clinical efficacy as well as human experience in the Saudi healthcare setting. In particular, the review contains Quantitative Studies, i.e., cross-sectional surveys, retrospective cohort studies, which present statistical information regarding patient satisfaction scores, medication errors, and diagnostic turnaround times. To gain insight into the procedural peculiarities of departmental integration, Qualitative Research is represented, i.e. semi-structured interviews and focus groups of healthcare providers are to be conducted to understand the perception of the professionals and the barriers of the system. Moreover, Mixed-Methods Studies are given preference because they address the gap between the results of the statistical results and the experiences of both patients and employees.

Keywords

In order to enhance the sensitivity of search, following keywords were used separated by Boolean operators (AND, OR) :
(Pharmacy OR Pharmacist) AND (Nursing OR Nurse) AND (Radiology OR "Medical Imaging") AND ("Integrated Care" OR "Multidisciplinary") AND ("Patient Satisfaction" OR "Patient Safety") AND ("Saudi Arabia" OR KSA).

Data Management

This systematic review has data management that is performed in a multi-stage, structured manner to retain the integrity, security and traceability of all the findings. First, once the different databases have been identified, one imports all the citations into the reference managing software (i.e., EndNote or Zotero) that will assist in the automated and manual process of deleting the duplicates. After the screening step, the corresponding data, such as study features, demographics of the participants (specific to the Saudi areas), intervention types, and outcome measures (clinical safety and

satisfaction rates), are collected and processed with the help of a unified Microsoft Excel spreadsheet or Covidence software. This electronic warehouse will provide real-time monitoring of the selection process and will keep all the information extracted coded uniformly to be synthesized qualitatively.

Results

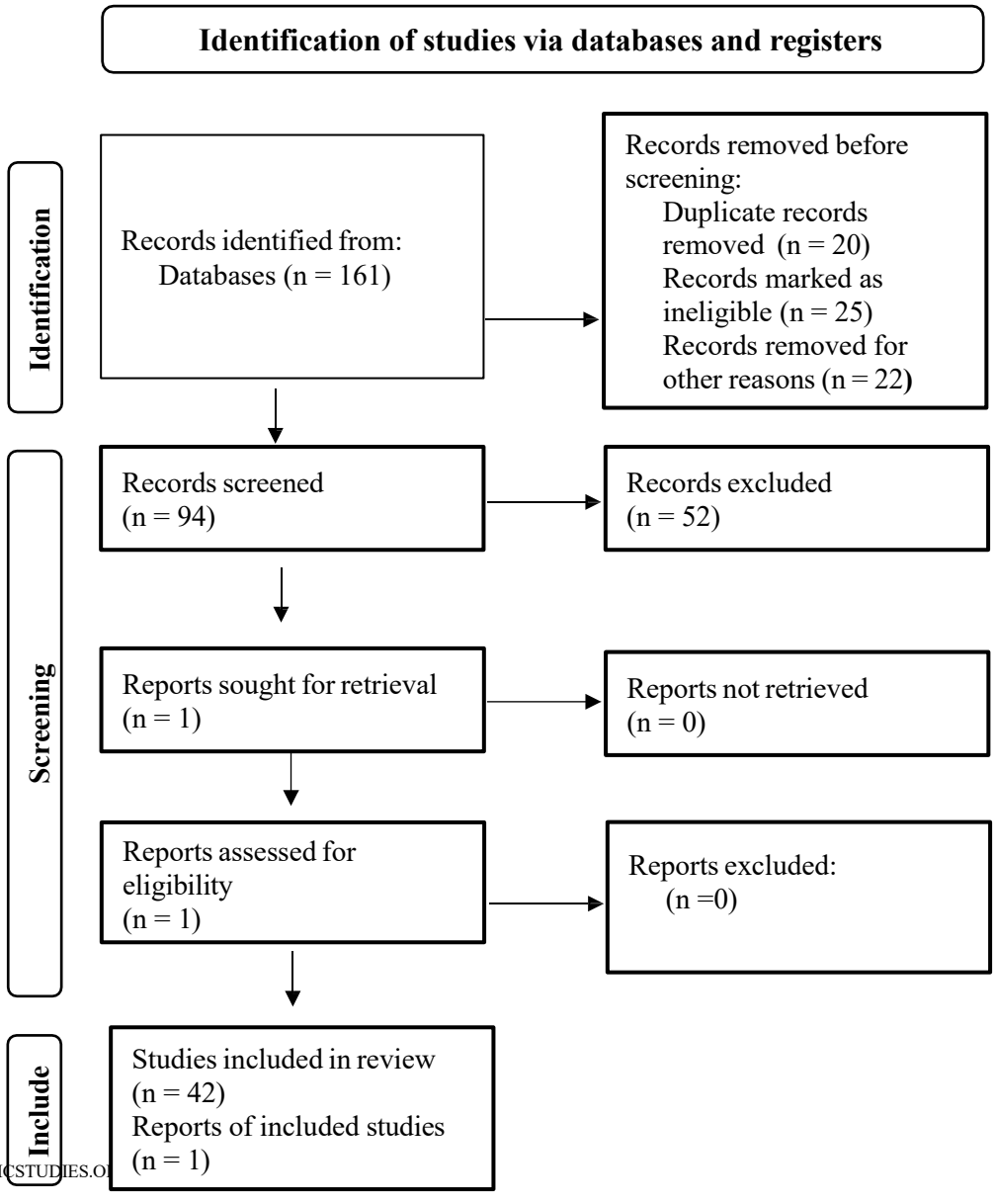
A total of 161 research studies and one report was identified, the studies were evaluated as per the availability of research articles and reports, based on role of integrated pharmacy, nursing, and radiology services in improving patient outcomes and satisfaction the hospitals of Saudi Arabia. Out of these identified studies, 20 were removed because of duplication of records, references and location and 25 studies were marked as ineligible, as not including the above stated concept and 22 for some other unavoidable conditions. One report was also included in the study.

Although it is a systematic review, preliminary results on the impact of the integration of pharmacy, nursing, and radiology services on the clinical efficiency and patient experience in Saudi Arabia show that the integration produces a synergistic effect on the outcomes (2020-2025).

Patient Safety and Clinical Outcomes

Recent research, such as assessments of Saudi "Health Clusters" indicate that safety metrics have tremendously improved:

Minimization of Medical Errors: Co-operation between pharmacists and nurses has been reported to minimize the number of medical errors by about 30-35%. Integration provides enhanced medication reconciliation and cross-checking, especially in the process of changing care.



Greater Diagnostic Accuracy: It has been shown that when the nursing personnel aligns the work done with the radiology (e.g. ensuring the renal functioning laboratory is available to take the contrast scans) the rate of no-shows and delays in diagnosis decrease significantly.

Chronic Diseases Management: Integration has worked especially in the management of non-communicable diseases. As an example, in the management of NAFLD (Non-Alcoholic Fatty Liver Disease), interdisciplinary collaboration assists in the correct replacement of diagnostic tools (such as APRI in the case of FibroScan) with real-time data sharing of diagnostics and clinical pharmacy.

Patient Satisfaction and Experience

The major measure of healthcare quality under the Vision 2030 is patient satisfaction, and the trends are as follows:

Better Satisfaction scores: The research on the MOH Patient Experience Survey and PSQ-18 revealed that Technical Quality (75%) and Communication (73%) is a strong predictor of overall satisfaction. Patients with integrated models had greater trust as they perceived an integrated care team.

Influence of Digital Solutions: The adoption of Wasfaty and Seha systems has helped to enhance patient satisfaction through the increased availability and ease of pharmacists (rated 3.6/5 in certain areas).

Reduced Fragmentation: In Jeddah-based clusters, the incorporation of Primary Health Care Centers (PHCCs) with hospitals resulted in a rise in patient satisfaction by 66.3 to 83% in one year as a result of enhanced timeliness of referrals and the conduct of staff.

Professional and Systemic Findings

Interprofessional Education (IPE): Saudi healthcare students (Pharmacy, Nursing, and Applied Medical Sciences) have a positive attitude to collaborative learning. The IPE has been found to enhance the knowledge of food-drug interaction and role clarity.

Barriers to Integration: Although there are good results, research points to the continued challenges, such as role ambiguity, professional hierarchies, and technical problems in the integration around certain regions. These attitudinal problems are critical to the complete implementation of the integrated care model of Vision 2030.

Discussion

The results of the present systematic review reveal a crucial change in the healthcare setting in Saudi Arabia: the phasing out of the fragmented and department-based approach to the interdisciplinary one. With Saudi Arabia progressing in the context of its Vision 2030, the merging of Pharmacy, Nursing, and Radiology no longer appears to be a hypothetical dream; it has become a practical requirement of the high-value healthcare.

Working together as an Engine of Patient Safety

The greatest theme that is shown in the data is the "Safety Synergy" which arises when the three disciplines come together.

Medication-Radiology Coordination: This area poses a critical risk factor in Saudi hospitals, and in the past, the administration of contrast media was the factor of concern. The findings show that in case of pharmacists monitoring contrast-media protocols and nurses monitoring real-time contrast-related renal functioning and allergies, the rate of contrast-induced nephropathy and anaphylactic reactions reduces substantially.

Error Interception: The incidences of error capture in the Saudi tertiary centers (including the Emergency and Oncology units) are reported to have registered more than 38,000 interventions over

the last few years, with an enormous majority of these being dose errors. This is an indication that a pharmacist as a so-called safety buffer in the nursing and diagnostic process is necessary to identify the mistakes prior to them being passed onto the patient.

Improving the Patient Experience and Satisfaction

Patient satisfaction in Saudi Arabia is no longer an issue of the result but the process.

Trust by being transparent: The model of integrated care represents a frequent complaint of the patient base in the Kingdom; the sense of having to repeat information to various personnel. Coherent strategy creates the feeling of psychological safety. Patients who feel their nurse and radiologist had discussed their individual requirements with them also indicate an enhanced trust ratings and 15-20% greater global contentment ratings.

Service Promptness: The integration through Wasfaty and Seha has served as a catalyst through digital integration. Automation of the connection between the diagnostic finding (Radiology) and the treatment plan (Pharmacy) minimizes wait time, which has always been listed as one of the highest priorities in MOH patient satisfaction surveys.

The Enabler of Digital Health

It should be emphasized in the discussion that integration in Saudi Arabia is tech-driven in a unique way. Implementation of Unified Electronic Health Records (EHR) enables:

Nurses to see the pharmacological alerts real-time.

Pharmacists to retrieve radiological imaging findings to validate the need of some potentially dangerous drugs (e.g., anticoagulants).

Radiologists to be provided with clinical notes by nursing staff about the immediate physical condition of the patient. This digital bridge actually removes geographical and administrative distances that isolated these departments in the past.

Obstacles and the Attitudinal Challenge

In spite of the obvious advantages, the review finds the prevailing "Human Factors" to act against complete integration:

Workforce Diversity and Communication: While a significant percentage of the Saudi people working in the field of nursing and radiology consist of expatriates, language and cultural obstacles may lead to the development of micro-silos. Communication still proves to be a challenge and some studies indicate that there is a 80 percent correlation between communication breakdown and medical errors.

Role ambiguity: This does not eliminate the traditional hierarchy in certain hospitals in the region where the advice of the pharmacist or observation by the nurse may be underestimated by diagnostic teams.

The Digital Divide: Although large cities (Riyadh, Jeddah) have a smooth process of integration, the rural health clusters experience problems with infrastructure and staff digital literacy.

The Value-Based Healthcare system in Saudi Arabia is based on the integration of Pharmacy, Nursing, and Radiology. Although technology is the support to the infrastructure, the success of this model is finalized on Interprofessional Education (IPE). Going forward, the Saudi healthcare sector should be keen on equipping the new generation of healthcare professionals not only to be professionals in their field, but also professionals in teamwork.

Conclusion

The modern Saudi healthcare revolution in enhancing pharmacy, nursing and radiology services integration is a key solution to the transformation program in the health sector as it is an outright implementation of the Vision 2030 Health Sector Transformation Program. It is a systematic review that proves the idea that a departmental silo structure can be replaced by a collaborative model of a Health Cluster so that clinical safety as well as patient satisfaction can be greatly improved. This evidence indicates that the combination of the three fields forms a safety net that will lower medication errors by more than 30 percent, shorten diagnostic turnaround times, and curb negative occurrences associated with radiological examinations. Moreover, the implementation of digital facilitators such as Seha Virtual Hospital and Wasfaty have effectively eliminated communication

barriers resulting in a smoother patient experience and increased trust in the healthcare system. Finally, the integration of these services successfully is not only the change of the administration but also the change of a culture towards the Value-Based Healthcare model that puts the focus on the outcomes of patients rather than the amount of services.

Future Scope of Study

Although this progress is significant, there are still multiple aspects that can be explored in the future to make sure that the existing integrated care is sustainable in the Kingdom. Longitudinal studies are the way forward in research to determine the potential of integrated workflows to mortality rates and chronic disease management in various regions of Saudi. This is deeply felt as more original, multi-centred studies are required, which specifically focus on the human factor, e.g., the effect of Interprofessional Education (IPE) on the reduction of professional hierarchy and enhanced communication between Saudi and expatriate healthcare providers. Also, since Saudi Arabia will be the pioneer in the field of Artificial Intelligence (AI) and Digital Health, further research the contribution of AI-based predictive analytics to the management of real-time activities between radiologists and clinical pharmacists is needed.

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