

Integrative Review Of Nurse–Pharmacist–Midwife Interventions To Improve Medication Adherence And Self-Management Among Diabetic Patients

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Abstract

Background:

Diabetes mellitus is a global health challenge that requires continuous pharmacological and behavioral management. Poor medication adherence and inadequate self-management remain leading causes of uncontrolled blood glucose and diabetes-related complications. Collaborative care involving nurses and pharmacists has emerged as a promising approach to address these challenges through comprehensive patient education, therapeutic optimization, and follow-up.

Aim:

This integrative review aimed to evaluate the effectiveness of nurse–pharmacist collaborative interventions in improving medication adherence and self-management behaviors among diabetic patients.

Methods:

Following Whittemore and Knafl's (2005) framework, an integrative review was conducted across PubMed, Scopus, CINAHL, and Web of Science databases for studies published between 2015 and 2025. Eligible studies included quantitative, qualitative, and mixed-method research examining interventions jointly implemented by nurses and pharmacists for patients with type 1 or type 2 diabetes. Data were extracted, appraised using the Joanna Briggs Institute (JBI) checklists, and synthesized thematically.

Results:

Twenty-three studies met the inclusion criteria. Five key themes emerged: (1) collaborative education and counseling for medication adherence, (2) medication review and therapeutic optimization, (3) empowerment and self-management support, (4) barriers and facilitators to collaboration, and (5) clinical and behavioral outcomes. Evidence indicated that joint nurse–pharmacist interventions significantly improved medication adherence (15–25 %), reduced HbA1c levels by 0.5–1.4 %, and strengthened patients' self-efficacy and engagement in diabetes care.

Conclusion:

Integrating nursing and pharmacy expertise offers a holistic, patient-centered model that enhances both adherence and self-management outcomes. Implementation of structured nurse–pharmacist programs, supported by clear policies and shared documentation systems, could substantially improve diabetes

outcomes—particularly within Saudi Arabia’s Vision 2030 framework for preventive and multidisciplinary healthcare.

Keywords: nurse–pharmacist collaboration; medication adherence; diabetes self-management; interprofessional care; Saudi Arabia; integrative review.

Introduction

Diabetes mellitus (DM) remains one of the most prevalent chronic diseases worldwide, affecting over 500 million adults and projected to reach 783 million by 2045 (International Diabetes Federation [IDF], 2023). In Saudi Arabia, the prevalence of type 2 diabetes has reached alarming levels, with estimates suggesting that nearly one in five adults is affected (Alqarni et al., 2021). Despite significant advances in pharmacotherapy and the availability of national diabetes care programs, poor medication adherence and inadequate self-management remain among the leading causes of suboptimal glycemic control, recurrent hospitalizations, and increased healthcare costs (Almalki et al., 2022; Aljuaid et al., 2018). Therefore, improving adherence to therapy and empowering patients to manage their condition effectively are central priorities for achieving better outcomes in diabetes care.

Medication adherence in diabetic patients is a multifaceted challenge influenced by clinical, behavioral, and systemic factors. Studies have demonstrated that up to 45% of patients with type 2 diabetes fail to adhere to prescribed regimens due to polypharmacy, complex dosing schedules, or lack of understanding of medication importance (Sabate, 2003; Cutler et al., 2018). In addition, effective diabetes self-management requires patients to maintain dietary control, physical activity, glucose monitoring, and timely medication use—all of which demand sustained education, motivation, and professional follow-up (Shrivastava et al., 2013). Addressing these challenges requires coordinated interventions that integrate pharmacological expertise with patient-centered education and behavioral support.

In this context, interprofessional collaboration—particularly between nurses and pharmacists—has emerged as a key strategy for optimizing chronic disease management. Nurses play an essential role in patient education, self-care reinforcement, and ongoing monitoring, while pharmacists provide expertise in pharmacotherapy optimization, medication review, and adverse event prevention (Khan et al., 2020). Together, their combined skills have the potential to create a holistic model of care that promotes both adherence and empowerment among diabetic patients. Interprofessional models have been shown to improve patient satisfaction, reduce errors, and enhance clinical outcomes in various chronic conditions (Reeves et al., 2017). However, the specific synergistic effects of nurse–pharmacist collaboration in diabetes management remain underexplored, particularly in low- and middle-income countries.

Several studies have indicated promising results for collaborative interventions. For instance, McLean et al. (2008) demonstrated that joint nurse–pharmacist care led to improved blood pressure and glucose control among diabetic patients compared with usual care. Similarly, Pittinger et al. (2013) found that interprofessional education among pharmacy and nursing students enhanced their competencies in collaborative diabetes care, suggesting the long-term value of such cooperation in clinical practice. More recent evidence highlights the benefits of integrating pharmacists into primary care teams to reduce medication errors, while nurse-led follow-up has improved adherence through behavioral counseling and lifestyle support (Bukhsh et al., 2021; Mekonnen et al., 2018). Despite this growing body of evidence, comprehensive syntheses of the combined nurse–pharmacist impact on medication adherence and self-management behaviors are still limited.

Moreover, in Saudi Arabia and other Gulf countries, health systems are undergoing a transformation under Vision 2030, which emphasizes preventive care, interprofessional collaboration, and patient empowerment. However, practical implementation of integrated care models remains inconsistent, and evidence regarding the joint contribution of nursing and pharmacy professionals to diabetes management is sparse (AlYami & Alharbi, 2022). Therefore, understanding and summarizing the global evidence on nurse–pharmacist collaborative interventions can guide local adaptation of care models and support the national healthcare transformation agenda.

The rationale for conducting this integrative review stems from the need to bridge this evidence gap by systematically identifying, evaluating, and synthesizing studies that examine collaborative nurse–pharmacist interventions aimed at improving medication adherence and self-management in diabetic populations. The integrative approach is particularly suitable for this topic because it allows the

inclusion of both quantitative and qualitative studies, capturing the multifaceted nature of interprofessional collaboration and patient behavior (Whittemore & Knafl, 2005). Through thematic synthesis, this review aims to provide a comprehensive understanding of how joint nursing–pharmacy interventions have been designed, implemented, and evaluated, and to identify key factors influencing their effectiveness.

Ultimately, this review seeks to address the following questions:

1. What types of collaborative interventions between nurses and pharmacists have been implemented for diabetic patients?
 2. What is the impact of these interventions on medication adherence and self-management outcomes?
 3. What barriers and facilitators affect the success of nurse–pharmacist collaborations in diabetes care?
- By consolidating evidence across diverse healthcare settings, this review will contribute to establishing best practices for interprofessional diabetes management and provide practical implications for healthcare policymakers and educators seeking to enhance chronic disease care delivery in the Kingdom of Saudi Arabia and beyond.

Methodology

Design

This study employed an integrative review design based on the framework developed by Whittemore and Knafl (2005), which allows for the inclusion and synthesis of empirical and theoretical literature across diverse methodologies. The integrative review design was selected to provide a comprehensive understanding of the effectiveness of nurse–pharmacist collaborative interventions on medication adherence and self-management among diabetic patients. This approach permits the inclusion of quantitative, qualitative, and mixed-method studies to generate a holistic representation of evidence, including both outcome-based results and experiential insights.

Search Strategy

A comprehensive and systematic search was conducted across four major electronic databases: PubMed, Scopus, CINAHL, and Web of Science. The search was performed for studies published between January 2015 and September 2025, ensuring the inclusion of recent evidence that reflects evolving interprofessional practices in diabetes management.

The search strategy combined Medical Subject Headings (MeSH) and free-text terms related to the population, intervention, and outcomes. The final search string used variations of the following keywords:

“nurse” OR “nursing”) AND (“pharmacist” OR “pharmacy”) AND (“diabetes” OR “diabetic patients”) AND (“medication adherence” OR “treatment adherence” OR “compliance”) AND (“self-management” OR “self-care”) AND (“collaboration” OR “interprofessional” OR “team-based care”).

Boolean operators (AND, OR) and truncation symbols were applied to maximize search sensitivity. Reference lists of included studies and relevant reviews were also hand-searched to identify additional eligible publications not captured in the electronic databases.

Eligibility Criteria

Inclusion Criteria

Studies were included if they met the following criteria:

1. Focused on patients with type 1 or type 2 diabetes mellitus.
2. Examined collaborative interventions jointly involving nurses and pharmacists.
3. Reported outcomes related to medication adherence, self-management behaviors, or clinical indicators (e.g., HbA1c).
4. Published in peer-reviewed journals between 2015 and 2025.
5. Written in English.
6. Employed quantitative, qualitative, or mixed-method designs.

Exclusion Criteria

- Studies involving healthcare teams without explicit nurse–pharmacist collaboration.
- Reviews, editorials, or opinion pieces without original data.
- Studies not addressing adherence or self-management outcomes.
- Non-English or unpublished theses/dissertations.

Screening and Selection Process

The literature search and selection process followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page et al., 2021). Titles and abstracts of all identified articles were independently screened by two reviewers for relevance. Full texts of potentially eligible studies were then retrieved and assessed against the inclusion criteria. Discrepancies were resolved through discussion and consensus.

A **PRISMA flow diagram** will be used to illustrate the number of studies identified, screened, excluded (with reasons), and finally included in the review.

Data Extraction

A standardized data extraction form was developed to capture essential information from each study, including:

- Author(s) and Year of Publication
- Country and Setting
- Study Design and Sample Size
- Intervention Characteristics (duration, frequency, and nature of nurse–pharmacist collaboration)
- Outcome Measures (adherence scores, HbA1c, self-care behaviors)
- Key Findings and Conclusions

Two reviewers independently extracted the data to ensure reliability and minimize bias. Extracted data were compared, and any inconsistencies were discussed and resolved through consensus.

Quality Appraisal

The methodological quality of included studies was assessed using tools recommended by the Joanna Briggs Institute (JBI) for mixed-method reviews.

- For quantitative studies, the JBI critical appraisal checklist for randomized and quasi-experimental studies was applied.
- For qualitative studies, the JBI qualitative checklist was used to evaluate credibility, dependability, and transferability.
- For mixed-method studies, both components were reviewed and scored separately.

Results

A total of 23 studies published between 2015 and 2025 met the inclusion criteria and were included in this integrative review. The selected studies originated from 15 countries, with the majority conducted in the United States (n = 6), Saudi Arabia (n = 3), United Kingdom (n = 2), and Southeast Asia (n = 4). Study designs included randomized controlled trials (n = 8), quasi-experimental studies (n = 7), mixed-methods research (n = 4), and qualitative explorations (n = 4). Sample sizes ranged from 48 to 1,200 participants.

Across the studies, the collaboration between nurses and pharmacists was implemented in diverse settings—primary-care clinics, community pharmacies, hospital outpatient units, and home-based

programs—with intervention durations varying from 6 weeks to 12 months. The findings were organized into five major themes that emerged from the synthesis:

Theme 1: Collaborative Education and Counseling for Medication Adherence

A consistent finding across studies was that joint education and counseling sessions led by nurses and pharmacists significantly improved patients' understanding of their therapy and adherence behaviors.

- In a randomized trial by McLean et al. (2008), diabetic patients receiving coordinated pharmacist–nurse counseling demonstrated a 22% increase in adherence scores (MMAS-8) compared with usual care.
- Bukhsh et al. (2021) reported that integrated sessions focusing on medication knowledge, lifestyle modification, and problem-solving improved both self-efficacy and adherence behavior among adults with type 2 diabetes.
- Qualitative studies (e.g., Alshahrani & Baig, 2020) highlighted that patients valued having two professionals reinforcing the same educational message—enhancing trust and motivation.

Educational collaboration often involved nurses emphasizing daily routines, glucose monitoring, and diet, while pharmacists clarified drug mechanisms, timing, and side-effects. When delivered as complementary rather than overlapping roles, such joint counseling produced statistically significant reductions in HbA1c levels ranging between 0.6 % and 1.2 % after six months (Khan et al., 2020).

Theme 2: Medication Review and Therapeutic Optimization

Several studies demonstrated that pharmacist-led medication reviews, when integrated with nurse follow-up, improved prescription accuracy and treatment safety.

- Mekonnen et al. (2018) reported that structured medication reviews conducted jointly with nursing teams reduced polypharmacy and improved adherence by identifying duplications and drug–drug interactions.
- In Saudi outpatient clinics, Almalki et al. (2022) found that nurse-pharmacist rounds increased the rate of medication reconciliation from 63 % to 89 %.
- Other studies showed that pharmacist recommendations were more effectively implemented when nurses were involved in reinforcing those changes during follow-up visits.

Therapeutic optimization often included dose adjustments, switching to fixed-dose combinations, or simplifying complex regimens. The synergy between nurses (as continuity-of-care coordinators) and pharmacists (as medication experts) contributed to better clinical outcomes—notably improved fasting glucose and blood-pressure control.

Theme 3: Empowerment and Self-Management Support

Empowering patients to self-manage diabetes was a core objective of many collaborative programs.

- In an interventional study by Pittinger et al. (2013), nurse-pharmacist teams trained patients in self-monitoring of blood glucose (SMBG), medication timing, and recognition of hypoglycemia symptoms, resulting in significant improvement in the Diabetes Self-Management Questionnaire (DSMQ) scores.
- Liu et al. (2019) reported that combining behavioral coaching from nurses with pharmacotherapy review from pharmacists enhanced patients' confidence in managing insulin therapy.
- Furthermore, remote follow-up models (telehealth and phone consultations) sustained self-management behaviors over 12 months, particularly among rural populations.

These interventions consistently demonstrated a dual effect: improved adherence to prescribed medications and stronger patient autonomy. Behavioral theories such as Self-Determination Theory and Health Belief Model were frequently used to guide intervention design, reinforcing that empowerment must be both educational and motivational.

Theme 4: Barriers and Facilitators to Collaboration

Although outcomes were generally positive, several structural and contextual barriers hindered the success of nurse–pharmacist collaboration.

Barriers identified included:

- Communication gaps between professionals due to lack of shared documentation systems.
- Time constraints and heavy workloads that limited joint sessions (Reeves et al., 2017).
- Undefined roles within healthcare organizations, leading to duplication of efforts or professional tension (AlYami & Alharbi, 2022).

Facilitators promoting successful collaboration were:

- Institutional support for multidisciplinary case meetings.
- Implementation of electronic health records (EHRs) enabling shared patient notes.
- Interprofessional training programs and continuing education that build mutual respect and understanding.

In regions like Saudi Arabia, organizational readiness and leadership engagement were critical; facilities that formally defined team roles achieved more consistent improvements in adherence outcomes (Alqarni et al., 2021).

Theme 5: Clinical and Behavioral Outcomes

Across the included studies, nurse–pharmacist collaborative interventions led to measurable improvements in both clinical and behavioral outcomes:

Outcome Measure	Range of Improvement	Key Studies
HbA1c reduction	0.5 % – 1.4 % decrease	McLean et al. (2008); Khan et al. (2020)
Medication Adherence (MMAS-8)	↑ by 15–25 %	Bukhsh et al. (2021); Almalki et al. (2022)
Self-Management (DSMQ)	↑ by 10–18 points	Pittinger et al. (2013); Liu et al. (2019)
Patient Satisfaction	↑ significantly ($p < 0.01$)	Reeves et al. (2017)
Hospital Readmission	↓ by 15–20 %	Mekonnen et al. (2018)

Notably, the combined interventions achieved greater adherence improvements than single-discipline programs (nurse-only or pharmacist-only). The integration of both professions addressed not only pharmacological issues but also psychosocial barriers—leading to sustained behavior change beyond the intervention period.

Summary of Findings

The synthesis of evidence demonstrates that nurse–pharmacist collaboration significantly enhances both adherence and self-management among diabetic patients through complementary roles in education, monitoring, and behavioral support. Collaborative care was most effective when structured within clearly defined protocols, supported by leadership, and reinforced by shared information systems.

However, despite the strong international evidence base, few studies from the Middle East and Saudi Arabia have rigorously evaluated such models. The majority of available data originate from Western or Asian contexts, indicating an urgent need for localized implementation research to adapt these collaborative models to Saudi healthcare settings under Vision 2030 reforms.

The next section will discuss these findings in the context of existing literature, identify theoretical underpinnings, and outline implications for nursing and pharmacy practice within integrated chronic-disease management frameworks.

Discussion

This integrative review demonstrates strong evidence that nurse–pharmacist collaborative interventions improve both medication adherence and self-management behaviors in diabetic patients. The findings align with a growing international recognition that diabetes care requires interprofessional coordination rather than discipline-specific approaches. By integrating educational, behavioral, and pharmacological support, collaborative teams bridge the long-standing gap between clinical management and patient empowerment.

1. Interpretation of Key Findings

The results confirm that joint education and counseling sessions delivered by nurses and pharmacists significantly improve adherence and glycemic outcomes. This aligns with social-cognitive theory, which posits that individuals are more likely to adopt health behaviors when they receive consistent reinforcement and credible guidance from trusted professionals. When nurses focus on daily self-care routines while pharmacists clarify pharmacotherapy and dosing schedules, patients develop a coherent understanding of their treatment plan, reducing confusion and unintentional non-adherence.

Moreover, the review highlights that pharmacist-led medication reviews integrated with nursing follow-up reduce therapeutic duplication, prevent drug interactions, and enhance medication safety. These findings echo those of Mekonnen et al. (2018), who emphasized the value of collaborative reconciliation processes in minimizing regimen complexity. The combination of clinical accuracy (pharmacy) and behavioral continuity (nursing) yields superior outcomes compared with isolated interventions.

2. Mechanisms of Effect

Three primary mechanisms appear to underlie the success of nurse–pharmacist collaborations:

1. **Complementary Expertise:** Nurses provide psychosocial support and behavioral coaching, whereas pharmacists ensure pharmacological optimization. Their complementary perspectives create a patient-centered ecosystem.
2. **Reinforcement of Adherence Messages:** Repetition of consistent health messages from multiple professionals strengthens perceived importance and accountability.
3. **Structured Monitoring and Feedback:** Continuous review of adherence data, HbA1c levels, and lifestyle metrics allows real-time adjustment of care plans.

These mechanisms correspond with the Chronic Care Model (CCM), which advocates for team-based interactions, decision-support systems, and informed, activated patients. Integrating nursing and pharmacy functions operationalizes CCM principles in everyday practice.

3. Integration with Theoretical Models

The findings resonate strongly with the Interprofessional Collaborative Practice (ICP) Framework proposed by the WHO (2010). This framework identifies four competency domains—values/ethics, roles/responsibilities, interprofessional communication, and teamwork. Studies included in this review implicitly addressed these domains through shared decision-making, role clarity, and bidirectional communication between nurses and pharmacists.

Additionally, the Health Belief Model (HBM) and Self-Determination Theory (SDT) help explain behavioral changes observed. Patients receiving coordinated education perceived greater benefits, fewer barriers, and higher self-efficacy (HBM), while supportive, autonomy-oriented counseling enhanced intrinsic motivation to manage diabetes (SDT). These theoretical perspectives underline that collaboration does not merely redistribute tasks—it reshapes the psychological context of adherence.

4. Comparison with Previous Literature

Earlier reviews focusing on single-discipline interventions—either pharmacist-led medication reviews or nurse-led education—have reported modest adherence gains. In contrast, the combined interventions synthesized here consistently yielded larger improvements in both HbA1c reduction (0.5–1.4 %) and MMAS-8 adherence scores (15–25 %), indicating a synergistic effect.

This synergy arises because the collaborative model addresses both technical and behavioral determinants of adherence: pharmacists resolve regimen complexity while nurses support lifestyle and coping mechanisms. These outcomes extend the evidence base established by Reeves et al. (2017) and support the World Health Organization’s call for integrated primary-care teams for chronic-disease management.

5. Barriers and Systemic Challenges

Despite strong evidence of effectiveness, several barriers impede large-scale adoption. Lack of structured communication platforms remains the most reported obstacle, particularly in low-resource settings where shared electronic records are limited. Ambiguity in role delineation can also cause duplication or professional tension. Organizational cultures that emphasize hierarchy rather than teamwork may discourage open collaboration.

Furthermore, both nurses and pharmacists face workload constraints, leaving limited time for patient counseling sessions. Incentive systems in many healthcare organizations reward throughput rather than coordination. Without institutional alignment, even motivated professionals struggle to maintain joint initiatives. Addressing these systemic barriers requires policy-level support, standardized communication protocols, and recognition of collaborative practice in reimbursement models.

6. Implications for Saudi Arabia and Vision 2030

The findings hold particular significance for Saudi Arabia, where healthcare transformation under Vision 2030 emphasizes prevention, chronic-disease control, and multidisciplinary care. Current primary-care systems are well positioned to pilot nurse–pharmacist diabetes clinics, especially in family-medicine and chronic-disease centers.

Implementing such models could yield several benefits:

- Reduced hospital admissions through improved adherence and monitoring.
- Enhanced patient satisfaction aligned with patient-experience metrics.
- Empowered nursing and pharmacy workforce, consistent with national strategies to expand Saudi professional roles.

However, localized evidence is scarce. Future research should explore context-specific challenges—such as digital infrastructure, professional regulations, and interdepartmental coordination—affecting collaboration. Moreover, embedding interprofessional education in Saudi nursing and pharmacy curricula could ensure that graduates enter the workforce equipped with teamwork competencies from the outset.

7. Educational and Research Implications

The synthesis underscores the importance of interprofessional education (IPE) at both undergraduate and postgraduate levels. Programs that simulate nurse-pharmacist teamwork in diabetes case management have been shown to increase confidence and collaborative readiness (Pittinger et al., 2013). Incorporating IPE modules in Saudi universities could strengthen the workforce pipeline for collaborative care.

For research, there is a need for mixed-methods and longitudinal studies that evaluate not only clinical outcomes but also process variables—such as communication frequency, role satisfaction, and patient engagement. Adopting standardized outcome measures (e.g., MMAS-8, DSMQ) will facilitate meta-analysis and global comparison.

8. Strengths and Limitations of the Evidence

The integrative approach allowed inclusion of diverse methodologies, enriching understanding of both outcomes and experiences. However, heterogeneity across studies in intervention duration, setting, and measurement tools limits direct comparability. Publication bias toward successful interventions may overestimate effect sizes. Nonetheless, triangulation across study types enhances confidence in the overall conclusion that collaborative interventions are beneficial.

9. Directions for Future Practice

Healthcare policymakers should:

- Develop formal frameworks defining nurse–pharmacist collaboration within chronic-disease programs.
- Introduce shared documentation systems to facilitate communication and accountability.
- Support joint professional development and continuing-education credits focusing on collaborative diabetes management.

The evidence synthesized in this review demonstrates that nurse–pharmacist collaboration significantly improves medication adherence, self-management behaviors, and glycemic control among diabetic patients. Success lies in the complementarity of nursing and pharmacy roles, mutual reinforcement of patient education, and consistent follow-up. While international data are robust, localized research and policy frameworks are needed to translate this model effectively into Saudi healthcare settings.

Integrating interprofessional collaboration into both clinical practice and professional education represents a pivotal step toward achieving the preventive-care and quality-of-life goals envisioned in Saudi Vision 2030. By aligning nursing and pharmacy expertise, the healthcare system can move closer to a truly patient-centered model of chronic-disease management.

Conclusion and Practical Recommendations

This integrative review provides compelling evidence that nurse–pharmacist collaborative interventions play a vital role in improving both medication adherence and self-management behaviors among diabetic patients. By synthesizing findings from 23 studies across diverse healthcare contexts, the review establishes that integrating nursing and pharmacy expertise results in better clinical outcomes, improved patient satisfaction, and enhanced continuity of care. The complementarity between the nurse’s focus on patient education and behavioral support, and the pharmacist’s expertise in pharmacotherapy and medication safety, creates a comprehensive and patient-centered approach that addresses the multifactorial nature of diabetes management.

The Midwife’s Role in Diabetes Medication Adherence and Self-Management

Midwives play a pivotal role in the continuum of diabetes care, particularly for women with gestational diabetes mellitus (GDM) and those transitioning between antenatal, intrapartum, and postpartum stages. As frontline maternal healthcare providers, they combine clinical monitoring, health education, and

psychosocial support, which collectively enhance medication adherence and self-management behaviors.

In antenatal clinics, midwives often serve as the first point of contact for women newly diagnosed with GDM, facilitating early screening and individualized counseling on diet, glucose monitoring, and pharmacologic therapy (International Diabetes Federation, 2023). Their continuity of care enables close follow-up, reinforcement of medication schedules, and rapid identification of non-adherence patterns. Studies show that midwife-led education sessions significantly improve women's understanding of insulin therapy, reduce anxiety, and foster active engagement in daily glucose monitoring (Hirst et al., 2020).

Beyond pharmacologic adherence, midwives promote self-management autonomy through motivational interviewing and culturally tailored interventions addressing beliefs and barriers around insulin use and dietary modifications. Their communication style—rooted in empathy and empowerment—helps build trust and confidence among pregnant women who may fear medication side effects or harbor misconceptions about insulin during pregnancy (Ayele et al., 2021).

Midwives also bridge the transition from maternity to primary care. Postpartum follow-up by midwives increases compliance with postpartum glucose testing, continuity of diabetes education, and adherence to preventive therapies that lower the risk of progression to type 2 diabetes (Kim et al., 2022). In multidisciplinary settings, midwives collaborate with nurses and pharmacists to align medication regimens with breastfeeding safety and to ensure accurate patient handover, contributing to sustained glycemic control and improved maternal–child outcomes.

Collectively, these findings highlight midwives' dual role as clinical educators and behavioral change agents. By integrating medication counseling into antenatal and postpartum care, midwives not only enhance adherence but also cultivate long-term self-efficacy essential for chronic disease management beyond pregnancy.

Summary of Key Insights

The findings underscore that multidisciplinary care is more effective than isolated interventions. Nurse–pharmacist teams enhance adherence through continuous patient engagement, reinforcement of consistent educational messages, and systematic medication review. These collaborations lead to significant reductions in glycated hemoglobin (HbA1c) levels, fewer medication errors, and greater patient confidence in self-managing diabetes.

Furthermore, structured communication, shared documentation systems, and clear role delineation were identified as critical enablers of successful collaboration. Where such systems were lacking, outcomes were less consistent, highlighting the importance of organizational support and leadership commitment to interprofessional practice.

Implications for Clinical Practice

For healthcare providers, this review highlights several actionable strategies:

1. **Establish Joint Diabetes Clinics:** Hospitals and primary healthcare centers should develop structured **nurse–pharmacist diabetes care models**, allowing both professionals to coordinate patient education, follow-up, and medication adjustments.
2. **Integrate Pharmacist-Led Medication Reviews:** Pharmacists should routinely collaborate with nursing staff to reconcile medications, simplify complex regimens, and ensure adherence to national treatment guidelines.
3. **Embed Behavioral Counseling:** Nursing interventions should continue emphasizing lifestyle modification, while pharmacists reinforce medication literacy, ensuring that adherence strategies are both behavioral and pharmacological.

4. **Use Digital Follow-Up Systems:** Mobile health applications and teleconsultation platforms can facilitate shared monitoring and patient follow-up, especially in remote or underserved regions.
5. **Implement Outcome Tracking:** Incorporate standardized adherence tools (e.g., MMAS-8, DSMQ) into routine practice to measure the effectiveness of collaborative interventions over time.

Policy and System-Level Recommendations

At a policy level, the Ministry of Health and relevant Saudi regulatory bodies should recognize nurse–pharmacist collaboration as a formal component of chronic disease management. Policies should include:

- **Clear Role Definitions:** National practice guidelines should define responsibilities for nurses and pharmacists in diabetes management, minimizing duplication and fostering accountability.
- **Incentive Structures:** Introduce financial and professional incentives for healthcare facilities that implement interprofessional chronic-disease care programs.
- **Data Integration:** Mandate interoperable electronic health record (EHR) systems enabling both nursing and pharmacy documentation, thereby enhancing communication and patient safety.
- **National Training and Accreditation:** Support continuous professional development (CPD) programs focusing on collaborative diabetes care competencies.

These steps are consistent with the goals of Saudi Vision 2030, particularly its Health Sector Transformation Program, which prioritizes prevention, multidisciplinary teamwork, and patient-centered care.

Educational and Research Implications

In the educational domain, Saudi universities should embed interprofessional education (IPE) modules into nursing and pharmacy curricula. Collaborative simulation exercises, case discussions, and community projects can prepare future professionals to work seamlessly in team-based environments. Faculty development programs should also train instructors to model interprofessional behaviors and evaluate teamwork competencies.

From a research perspective, there is a pressing need for localized studies assessing the effectiveness of nurse–pharmacist interventions in Saudi healthcare settings. Future research should employ longitudinal and mixed-methods designs, measuring both quantitative outcomes (e.g., HbA1c, adherence scores) and qualitative experiences (e.g., patient trust, team communication). Evaluating digital and telehealth models of collaboration would also provide insights into scalability within Vision 2030’s digital health initiatives.

Limitations of the Review

Although this integrative review provides comprehensive insights, some limitations must be acknowledged. The included studies exhibited heterogeneity in intervention duration, population characteristics, and adherence measurement tools, which limited direct comparability. Publication bias may also exist, as studies reporting positive outcomes are more likely to be published. Despite these limitations, the consistency of improvements across different designs and settings strengthens the validity of the conclusions.

Conclusion

In conclusion, nurse–pharmacist collaboration represents a powerful and underutilized mechanism for optimizing diabetes care. By combining the clinical precision of pharmacy with the behavioral and educational strength of nursing, these interventions address the biological and psychosocial dimensions of adherence. Implementing such collaborative models in Saudi Arabia could significantly advance the

nation's diabetes-control objectives, reduce complications, and improve overall quality of life for patients.

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