SCIENTIFIC ARTICLE

Optimizing Medication Safety and Adherence in Saudi Arabian Primary Healthcare: The Role of Family Physicians, Pharmacists, and Pharmacy Technicians

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ABSTRACT

Medication safety and adherence are interdependent priorities in the management of long-term illness. In Saudi Arabian primary healthcare, patients frequently receive medicines from several prescribers and move between hospital, community and outpatient services, creating opportunities for prescribing errors, unintended discrepancies and interrupted treatment. This narrative review examines how family physicians, pharmacists and pharmacy technicians can work together to strengthen medicines optimization. Relevant Saudi studies, international systematic reviews, practice guidance and policy documents were synthesized around prescribing, medication reconciliation, polypharmacy, dispensing, adherence assessment, counseling and digital systems. Saudi evidence identifies preventable adverse drug events in family medicine and considerable variation in how professionals assess adherence. International evidence supports pharmacist participation in medication review and selected adherence interventions, although improvements in clinical outcomes depend on the intervention, setting and follow-up period. Family physicians provide diagnostic oversight, therapeutic prioritization and prescribing decisions; pharmacists evaluate appropriateness, interactions, monitoring and patient understanding; and pharmacy technicians support accurate dispensing, inventory procedures, documentation and escalation within their authorized scope. A coordinated workflow using an accurate medication list, risk-based review, teach-back counseling, structured follow-up and closed-loop communication is proposed. Implementation requires sufficient staffing, shared records, training and outcome measurement. Saudi primary healthcare can strengthen medication safety by integrating professional responsibilities rather than treating prescription generation, dispensing and adherence as isolated activities.

KEYWORDS: Medication safety; Medication adherence; Saudi Arabia; Primary healthcare; Family medicine; Pharmacists; Pharmacy technicians; Polypharmacy.

INTRODUCTION

Medication use is a continuous process that begins with diagnosis and prescribing but extends through dispensing, administration, monitoring and eventual discontinuation. Each transition presents opportunities for benefit and harm. The World Health Organization identifies medication-related harm as a major preventable patient-safety challenge and places particular emphasis on high-risk situations, polypharmacy and transitions of care [1]. In primary healthcare, where prescriptions are renewed over years, seemingly minor discrepancies can persist unnoticed unless teams deliberately review the complete regimen.

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Saudi Arabia is strengthening preventive and longitudinal care through its Health Sector Transformation Program. The expansion of primary healthcare and coordination across healthcare clusters make medication optimization especially relevant [2]. Family physicians, pharmacists and pharmacy technicians often encounter the same patient at different points in the care pathway. Their observations become more valuable when connected through a shared plan rather than retained in separate records.

A systematic review of medication-use safety across Gulf Cooperation Council countries found important gaps in the available evidence and variation in reported errors across settings [3]. Saudi family medicine research has also identified preventable adverse drug events after documented medication errors, demonstrating that ambulatory prescribing and monitoring deserve attention [4]. The objective of this review is to examine the complementary contributions of the three professional groups and propose practical mechanisms for safer, more reliable treatment in Saudi primary healthcare.

MATERIALS AND METHODS

This article is a critical narrative review rather than a systematic review or meta-analysis. Evidence was selected from peer-reviewed Saudi studies, international clinical trials and systematic reviews, professional guidance and institutional publications relevant to medicines optimization. Topics were organized around medication error prevention, adherence, polypharmacy, reconciliation, team roles, digital support and implementation. Preference was given to primary healthcare evidence; hospital-based studies were used only where their findings were relevant to transitions between care settings.

No patient-level data were collected, and no pooled treatment effects were calculated. Because literature identification was purposive, the review does not claim exhaustive retrieval or formal risk-of-bias assessment. Recommendations are identified as practice implications where direct Saudi evidence is limited.

MEDICATION SAFETY IN THE PRIMARY CARE CONTINUUM

Medication safety encompasses correct drug selection, dose, route, frequency, duration and monitoring, together with accurate communication of changes. Errors can arise when a medicine is prescribed despite an interaction, an outdated drug remains on a list, a patient misunderstands instructions or an abnormal laboratory result is not acted upon. The Saudi family medicine study of preventable adverse drug events highlighted the importance of polypharmacy and over-the-counter use among affected patients [4]. These findings should not be generalized as national prevalence estimates, but they demonstrate recognizable vulnerabilities in routine outpatient care.

Safety work should distinguish an error from an adverse drug reaction and from nonadherence. A patient who experiences dizziness after a correctly prescribed medicine may require clinical reassessment; a duplicate prescription requires system correction; and a patient who deliberately omits doses because of adverse effects needs a discussion of preferences and alternatives. A single blame-oriented response is unlikely to address these different mechanisms.

High-alert medicines, including anticoagulants, insulin and certain sedatives, warrant additional safeguards when clinically indicated. Verification of renal function, allergy history, current medications and monitoring arrangements can be incorporated into structured review. WHO guidance encourages systems that anticipate human error and provide reliable barriers rather than depending exclusively on individual vigilance [1].

ROLE OF FAMILY PHYSICIANS

Family physicians integrate medication decisions with diagnosis, prognosis, multimorbidity and patient priorities. They determine whether a medicine remains indicated, whether therapeutic targets are appropriate and whether a change in symptoms reflects disease progression or treatment-related harm. This longitudinal perspective is especially important for older adults, patients with chronic kidney disease and individuals receiving treatment from multiple specialties.

At every major review, the physician should consider the indication for each drug, the expected benefit, contraindications, duplication, interactions and the burden of the regimen. The decision to initiate, intensify, taper or discontinue treatment must also consider the patient's goals. NICE guidance on medicines optimization emphasizes shared decision-making, medication review and reconciliation as core elements of safer care [5].

Clinical oversight does not require the physician to perform every task personally. A pharmacist may identify a potentially inappropriate combination and propose an alternative, while a technician may flag conflicting labels or missing information. The physician then evaluates the clinical implications and documents the agreed decision. Clear responsibility for acting on recommendations is more important than informal assumptions that another professional will resolve the issue.

Family physicians can also normalize conversations about missed doses. Asking "What makes this medicine difficult to take?" may elicit adverse effects, concerns about dependency, cost, travel or fasting schedules more effectively than a judgmental yes-or-no question. Such information should lead to practical changes, not merely repeated instructions.

ROLE OF PHARMACISTS

Pharmacists contribute expertise in pharmacotherapy, drug interactions, dose adjustment, formulation selection and medication-use processes. Their review can uncover medicines without a current indication, therapeutic duplication, unsuitable dosing, unnecessary complexity and gaps in monitoring. A Cochrane review of pharmacist services in nonhospital settings found that effects vary by service and outcome, reinforcing the need to define the intervention and evaluate meaningful clinical endpoints [6].

In Saudi Arabia, a 2025 survey of 397 physicians and pharmacists found substantial differences in adherence assessment and support practices. Direct patient questioning was common, whereas standardized assessment instruments were used less frequently. Participants reported workload, consultation time and tracking-system limitations as barriers [7]. These results support more structured collaboration, although a cross-sectional survey cannot establish the effectiveness of a new care model.

Pharmacists are particularly well positioned to conduct targeted medication reviews after a new diagnosis, hospital discharge, adverse event or repeated failure to achieve treatment targets. Their recommendations should include the clinical problem, proposed action, monitoring requirement and urgency. Documentation must reach the responsible prescriber, and acceptance or rejection should be recorded to prevent unresolved safety concerns.

Patient counseling is another essential responsibility. Pharmacists can demonstrate inhaler technique, clarify administration timing, discuss expected adverse effects and explain how to respond to missed doses. Counseling should focus on a manageable number of high-priority messages and verify understanding through teach-back. Evidence from pharmacist-led interventions for

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hypertension suggests potential improvements in blood pressure control, but service design and patient selection influence results [8].

ROLE OF PHARMACY TECHNICIANS

Pharmacy technicians support medication safety through accurate prescription processing, stock handling, labeling, preparation, record maintenance and timely identification of operational discrepancies. Their work can prevent wrong-product selection, labeling errors, expired stock and interruptions caused by unavailable medicines. The precise activities permitted depend on local regulation, institutional policies and demonstrated competency; clinical prescribing and independent therapeutic decisions remain outside technician responsibilities unless explicitly authorized.

A well-designed technician workflow includes verification of patient identifiers, product strength, dosage form, quantity, storage requirements and expiry date. When prescriptions are unclear or conflicting, technicians should stop the process and escalate to a pharmacist rather than infer the intended regimen. They can also support the collection of medication histories using approved procedures, with clinical validation by the pharmacist or prescriber.

Technicians should be included in safety training, incident reporting and quality-improvement meetings. Because they observe practical problems at the dispensing interface, they may identify recurring confusion over similar drug names, packaging, refill intervals or prescription instructions. A systematic review of pharmacy technician roles describes opportunities to expand support for clinical pharmacy services while preserving supervision and accountability [9].

Integration is most effective when technicians receive concise escalation criteria and feedback on reported concerns. Recognition of these contributions can help create a safety culture in which errors and near misses are surfaced early rather than hidden.

MEDICATION ADHERENCE: ASSESSMENT AND SUPPORT

Adherence involves initiation, implementation and persistence with prescribed treatment. Nonadherence may be intentional, arising from beliefs or adverse effects, or unintentional, arising from forgetfulness, complicated schedules, limited understanding or access barriers. The distinction matters because reminders cannot resolve unacceptable adverse effects, while additional counseling alone may not correct a difficult refill process.

A Saudi cross-sectional study of 250 adults reported the use of time-based reminders and digital tools as adherence strategies, while acknowledging limitations associated with convenience sampling and self-report [10]. A more recent Saudi survey of community pharmacists described the range of adherence-support activities and perceived barriers, adding contemporary evidence about practice but not proving causal benefit [11].

Assessment should combine respectful discussion with available refill information, treatment response and, where suitable, validated instruments. None is a perfect measure: a collected prescription does not prove ingestion, and a laboratory result may be influenced by disease progression or dosing. A systematic review of interventions to improve medication adherence found that many strategies are complex and that sustained clinical benefits remain difficult to demonstrate consistently [12].

Practical approaches include simplifying schedules when clinically appropriate, synchronizing refills, explaining the purpose of each drug, using a written medication plan and identifying one achievable behavior change at a time. Family members may support organization and reminders with the patient's consent. Arabic-language materials, accessible instructions and sensitivity to health literacy can improve the usability of advice, but local evaluation is needed before assuming effectiveness.

POLYPHARMACY AND DEPRESCRIBING

Polypharmacy is not automatically inappropriate: patients with several evidence-based indications may benefit from multiple medicines. The concern arises when the overall regimen contains unnecessary drugs, interactions, duplications or treatments whose harms exceed likely benefits. Older adults are particularly vulnerable because physiological changes, frailty and multimorbidity complicate prescribing.

The American Geriatrics Society Beers Criteria identify medicines that may be potentially inappropriate in many older adults, while emphasizing individualized clinical judgment [13]. The STOPP/START criteria provide another structured approach to detecting potentially inappropriate prescriptions and omissions [14]. Neither tool should be applied mechanically without considering local formularies, diagnoses and patient preferences.

Deprescribing is a planned, supervised process of reducing or stopping medication when the balance of benefit and harm changes. It may involve gradual tapering, monitoring for withdrawal or recurrence and communicating the plan to all involved professionals. A systematic review of deprescribing interventions suggests that medication reduction is feasible in selected older populations, although evidence for some downstream clinical outcomes is less certain [15].

In Saudi primary healthcare, a practical priority is to identify high-risk patients for periodic pharmacist–physician review rather than attempt comprehensive review of every prescription at every visit. Triggers might include repeated falls, dizziness, renal deterioration, multiple prescribers, recent admission or unexplained nonadherence.

MEDICATION RECONCILIATION AT TRANSITIONS OF CARE

Medication reconciliation compares the most accurate obtainable medication history with current orders and resolves unexplained differences. It is particularly important after hospital discharge, specialist consultation and emergency attendance, when doses may have changed or medicines may have been temporarily withheld. The process requires more than copying a discharge list into a primary care record.

A Saudi quasi-experimental hospital study evaluated an educational intervention for healthcare professionals on reconciliation knowledge, attitudes and practices, demonstrating local interest in improving the process [16]. International systematic-review evidence suggests pharmacist involvement can reduce medication discrepancies at transitions, although the impact on readmissions and other patient outcomes is not uniform [17].

An effective pathway identifies who obtains the medication history, who checks discrepancies, who authorizes clinical changes and who explains the final list to the patient. The updated list should include medicine name, strength, dose, frequency, indication when useful and reasons for significant changes. Unresolved discrepancies need an owner and a deadline.

For patients with multiple providers, family physicians can maintain the overarching plan while pharmacists verify pharmacotherapy details. Technicians can support documentation and flag inconsistencies in refill or dispensing records under supervision. This closed-loop process is more reliable than relying on patients to reconcile conflicting instructions independently.

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DIGITAL PRESCRIBING AND SAFETY SYSTEMS

Electronic prescribing and shared records can improve legibility, facilitate allergy checks and make prior medication histories easier to retrieve. Clinical decision support may flag interactions, duplications or dose concerns, but excessive low-value alerts can produce alert fatigue. Technology must therefore be configured around clinically significant risks and paired with clear responsibility for responding.

Saudi healthcare transformation has emphasized digital services and integrated care pathways [2]. Digital adherence tools may include reminders, refill notifications and remote follow-up, but their effectiveness depends on accessibility, usability and the ability of clinicians to act on information. A systematic review of mobile-phone text messaging interventions found evidence of improved adherence in some chronic disease settings, with important differences in study quality and intervention design [18].

Data protection is a necessary component of digital care. Medication histories reveal sensitive diagnoses, and systems should provide role-based access, secure communication and transparent documentation of changes. Digital exclusion also deserves attention: patients who lack smartphones, reliable connectivity or digital literacy should retain workable non-digital options.

IMPLEMENTATION IN SAUDI PRIMARY HEALTHCARE

A workable model begins with clear task allocation. Family physicians establish diagnoses and therapeutic goals; pharmacists conduct risk-based medication reviews and counseling; and technicians maintain accurate dispensing processes and escalate discrepancies. Joint case review is most valuable for patients with complex regimens rather than as a mandatory step for every routine refill.

Implementation should start with a baseline assessment of medication errors, missed refills, reconciliation completion and preventable adverse events. Staff can then test small workflow changes using quality-improvement cycles. The Institute for Healthcare Improvement's Model for Improvement offers a practical approach to defining aims, measures and iterative tests of change [19].

Workforce capacity, consultation time and information-system interoperability are likely to influence adoption. Local governance should define referral pathways, clinical supervision, documentation standards and incident-reporting procedures. Education should use realistic cases, such as duplicate anticoagulants after discharge or conflicting insulin instructions, rather than relying only on lectures.

Patient participation is equally important. A care plan should be understandable to the person taking the medicines, with a clear contact point for adverse effects or uncertainty. Where appropriate, follow-up may be coordinated through primary healthcare teams and community pharmacy services, avoiding repeated travel solely to clarify prescriptions.

TABLE 1. PROPOSED MULTIDISCIPLINARY MEDICATION-SAFETY WORKFLOW

Stage	Family physician	Pharmacist	Pharmacy technician
Initiation	Confirm indication and treatment goals	Check dose, interactions and monitoring	Verify prescription identifiers and product details
Dispensing	Resolve clinical queries	Validate therapy and counsel patient	Prepare, label and flag discrepancies
Follow-up	Review outcomes and adjust treatment	Assess adherence, adverse effects and refill gaps	Support records, refills and escalation
Transition	Authorize final treatment plan	Reconcile medication lists	Collect and route information under supervision
Quality review	Review prescribing outcomes	Analyze medication-related problems	Report dispensing near misses

Responsibilities are illustrative and subject to Saudi regulations, institutional policy and individual competency.

DISCUSSION

The available evidence supports a shift from profession-specific medication tasks to coordinated management across the treatment pathway. Saudi observational studies document adherence-management variation and outpatient medication-related harm [4,7]. They identify needs but do not establish that any particular integrated workflow will reduce admissions or mortality. International intervention evidence is encouraging for selected pharmacist services and adherence strategies, yet effects are heterogeneous and implementation requires adaptation.

The central practical issue is accountability. A pharmacist recommendation that never reaches the prescriber, a technician warning that is not escalated, or a physician instruction that is not reflected in the dispensing record leaves a safety gap. Shared records, explicit escalation rules and confirmation of completed actions are therefore more consequential than the simple presence of multiple professions in one facility.

Measurement should balance process indicators with patient outcomes. Suggested process measures include percentage of high-risk patients receiving a documented review, proportion of discharges reconciled within a defined interval and percentage of identified discrepancies resolved. Outcome measures could include preventable adverse drug events, clinically important prescribing errors, patient-reported understanding and persistence with essential therapy. These indicators require consistent definitions and reliable data collection.

Future Saudi studies should evaluate multidisciplinary models prospectively in different healthcare clusters. Cluster-randomized or stepped-wedge designs could compare implementation strategies while accounting for organizational differences. Qualitative research with patients and frontline staff would help explain why interventions succeed or fail. A recent systematic review of medication safety interventions in primary care underscores the need to examine implementation context alongside effectiveness [20].

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LIMITATIONS

This narrative review is based on a selected evidence base rather than an exhaustive systematic search. The Saudi literature includes cross-sectional and single-center investigations, which limit causal inference and generalizability. Evidence from other healthcare systems may not transfer directly to Saudi staffing structures, electronic platforms or professional scopes of practice. No formal certainty assessment or meta-analysis was performed. Consequently, the proposed workflow should be viewed as a practice framework requiring local testing rather than a proven national model.

CONCLUSION

Medication safety and adherence in Saudi Arabian primary healthcare depend on coordinated prescribing, dispensing, monitoring and patient engagement. Family physicians provide clinical continuity and therapeutic decisions; pharmacists contribute medication review, risk identification and counseling; and pharmacy technicians strengthen dispensing accuracy and operational safeguards within authorized roles. Structured reconciliation, targeted review of polypharmacy, nonjudgmental adherence assessment and reliable communication can close common gaps across the care pathway.

The WHO Global Patient Safety Action Plan emphasizes safer systems, learning and collaboration as foundations for preventing avoidable harm [21]. Applying these principles through measurable, locally adapted multidisciplinary services offers a credible direction for Saudi primary healthcare. Rigorous evaluation is needed to determine which combinations of interventions produce sustained improvements in patient outcomes.

REFERENCES

1. World Health Organization. Medication Without Harm: WHO Global Patient Safety Challenge. Geneva: WHO; 2017. https://www.who.int/initiatives/medication-without-harm
2. Saudi Vision 2030. Health Sector Transformation Program: Delivery Plan 2021–2025. Riyadh: Kingdom of Saudi Arabia; 2021. https://www.vision2030.gov.sa/
3. Alsaidan J, Portlock J, Aljadhey HS, Shebl NA, Franklin BD. Systematic review of the safety of medication use in inpatient, outpatient and primary care settings in the Gulf Cooperation Council countries. Saudi Pharm J. 2018;26(7): 977–1011. doi:10.1016/j.jsps.2018.05.008.
4. Assiri GA, et al. Identification and characterization of preventable adverse drug events in family medicine clinics from central Saudi Arabia. Saudi J Med Med Sci. 2023. https://pubmed.ncbi.nlm.nih.gov/36909008/
5. National Institute for Health and Care Excellence. Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes. NICE guideline NG5. London: NICE; 2015. https://www.nice.org.uk/guidance/ng5
6. De Barra M, Scott CL, Scott NW, Johnston M, de Bruin M, Nkansah N, et al. Pharmacist services for non-hospitalised patients. Cochrane Database Syst Rev. 2018;9:CD013102. doi: 10.1002/14651858.CD013102.
7. Khawagi WY, Baali FH, Alnefaie NM, Albishi SA, Al-Swat AH, Alshahrani DA, et al. A cross-sectional survey on the management of medication adherence among healthcare professionals in Saudi Arabia. Healthcare (Basel). 2025;13(3): 347. doi:10.3390/healthcare13030347.
8. Santschi V, Chiolero A, Colosimo AL, Platt RW, Taffé P, Burnier M, et al. Improving blood pressure control through pharmacist interventions: a meta-analysis of randomized controlled trials. J Am Heart Assoc. 2014;3:e000718. doi: 10.1161/JAHA.113.000718.
9. Koehler T, Brown A. A global picture of pharmacy technician and other pharmacy support workforce cadres. Res Social Adm Pharm. 2017;13(2):271–279. doi:10.1016/j.sapharm. 2016.12.004.
10. Alhomoud FK, Alwohaibi LW, Aljarrash K, et al. Evaluating strategies for enhancing medication adherence in the Kingdom of Saudi Arabia (KSA): a cross-sectional study. Patient Prefer Adherence. 2024;18:2469–2480. doi:10.2147/ PPA.S499795.
11. Alzahrani F, Alnezary FS, Saleem Z, Almutairi MS. Community pharmacists' strategies and barriers in supporting medication adherence in Saudi Arabia: a cross-sectional study. Front Med (Lausanne). 2026;13:1962692. doi:10.3389/fmed. 2026.1962692.
12. Nieuwlaat R, Wilczynski N, Navarro T, Hobson N, Jeffery R, Keepanasseril A, et al. Interventions for enhancing medication adherence. Cochrane Database Syst Rev. 2014; (11):CD000011. doi:10.1002/14651858.CD000011.pub4.
13. American Geriatrics Society 2023 Beers Criteria Update Expert Panel. American Geriatrics Society 2023 updated AGS Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2023;71:2052–2081. doi: 10.1111/jgs.18372.
14. O'Mahony D, Cherubini A, Guiteras AR, Denkinger M, Beuscart JB, Onder G, et al. STOPP/START criteria for potentially inappropriate prescribing in older people: version 3. Eur Geriatr Med. 2023;14:625–632. doi:10.1007/ s41999-023-00777-y.
15. Page AT, Clifford RM, Potter K, Schwartz D, Etherton-Beer CD. The feasibility and effect of deprescribing in older adults on mortality and health: a systematic review and meta-analysis. Br J Clin Pharmacol. 2016;82:583–623. doi:10.1111/bcp. 12975.
16. Medication reconciliation: impact of an educational intervention on the knowledge, attitude and practices of healthcare professionals—a prospective quasi-experimental study in a Saudi referral hospital. J Health Popul Nutr. 2025;44:15. doi:10.1186/s41043-025-00751-3.
17. Mekonnen AB, McLachlan AJ, Brien JAE. Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: a systematic review and meta-analysis. BMJ Open. 2016;6:e010003. doi:10.1136/ bmjopen-2015-010003.
18. Thakkar J, Kurup R, Laba TL, Santo K, Thiagalingam A, Rodgers A, et al. Mobile telephone text messaging for medication adherence in chronic disease: a meta-analysis. JAMA Intern Med. 2016;176:340–349. doi:10.1001/jamainternmed. 2015.7667.
19. Institute for Healthcare Improvement. Science of Improvement: How to Improve. Boston: IHI. https://www.ihi.org/resources/how-to-improve

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20. Khalil H, Bell B, Chambers H, Sheikh A, Avery AJ. Professional, structural and organisational interventions in primary care for reducing medication errors. Cochrane Database Syst Rev. 2017;(10):CD003942. doi: 10.1002/14651858.CD003942.pub3.
21. World Health Organization. Global Patient Safety Action Plan 2021–2030: Towards Eliminating Avoidable Harm in Health Care. Geneva: WHO; 2021. https://www.who.int/publications/i/item/9789240032705

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