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The Role of Pharmacists in Promoting Medication Safety, Improving Patient Care, and Enhancing Health Outcomes

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ABSTRACT: Medication errors and preventable adverse drug events remain among the most persistent threats to patient safety in modern healthcare systems. Pharmacists, as the healthcare professionals with the deepest specialized knowledge of pharmacotherapy, occupy a uniquely positioned role in preventing, detecting, and mitigating these risks across every stage of the medication use process. This paper examines the multidimensional contribution of pharmacists to medication safety, patient care, and health outcomes, moving beyond the traditional dispensing function to consider clinical pharmacy services, medication therapy management, patient education, and pharmacovigilance. Drawing on the Institute of Medicine's patient safety framework, Reason's Swiss cheese model of layered defenses, and the Systems Approach to medication error prevention, the paper develops an original conceptual model, SHIELD (Screening, Harm Prevention, Interaction Management, Education, Leadership in stewardship, and Dispensing accuracy), to organize the distinct mechanisms through which pharmacists protect patients from medication-related harm. The discussion is situated within the Saudi Arabian healthcare context, referencing the regulatory functions of the Saudi Commission for Health Specialties (SCFHS), the Saudi Food and Drug Authority (SFDA), and the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI), and considers how the expansion of clinical pharmacy roles and digital health infrastructure under Vision 2030 is reshaping pharmacist practice. The paper concludes by identifying persistent barriers to full pharmacist scope-of-practice utilization and offering recommendations for strengthening pharmacist integration into collaborative care teams.

1. INTRODUCTION

Medications are the most common therapeutic intervention in healthcare, and their misuse — through prescribing error, dispensing error, administration error, or poor adherence — remains one of the leading preventable causes of patient harm worldwide. Within this landscape, the pharmacist occupies a distinctive position: trained specifically in pharmacology, pharmacokinetics, and drug therapy management, the pharmacist functions as the final safeguard between a prescribing decision and the patient who receives that medication, while also serving as an active clinical partner in shaping the therapy itself.

This paper examines how pharmacists contribute to medication safety, patient care, and health outcomes across the full continuum of pharmaceutical care — from prescription verification and dispensing through clinical monitoring, patient counseling, and post-marketing surveillance. It proposes an integrative framework, SHIELD, to organize these contributions,

and situates the discussion within the regulatory and institutional context of the Saudi healthcare system, where the pharmacy profession is undergoing significant expansion in scope and clinical responsibility under Vision 2030.

1.1 Purpose and Scope

The purpose of this paper is to provide a comprehensive account of the pharmacist's role in medication safety and patient outcomes, structured around six core protective mechanisms captured in the SHIELD framework. The scope encompasses hospital, community, and clinical pharmacy settings, with particular attention to the growing role of pharmacists in chronic disease management, antimicrobial stewardship, and pharmacovigilance within Saudi Arabia.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

This paper's analysis draws on three established patient safety models, synthesized into an original framework specific to pharmacy practice.

2.1 The Institute of Medicine Patient Safety Framework

The Institute of Medicine's landmark report, *To Err Is Human*, identified medication errors as a major preventable cause of patient harm and called for systemic, rather than purely individual, approaches to error prevention. This systems perspective underlies the modern understanding of the pharmacist's role: safety is achieved not by relying on any single practitioner's vigilance but by embedding multiple, overlapping checks throughout the medication use process.

2.2 Reason's Swiss Cheese Model

Reason's model conceptualizes safety systems as a series of defensive layers, each containing potential gaps or weaknesses. Harm occurs only when the gaps in multiple layers align. Pharmacists function as one of the most consistently effective layers in this model, given their specialized training in identifying dosing errors, drug interactions, and therapeutic duplications that may have passed undetected through the prescribing stage.

2.3 The SHIELD Framework

Building on these models, this paper proposes SHIELD as an organizing framework for the pharmacist's protective role in patient care:

- Screening — systematic review of prescriptions for appropriateness, dosing accuracy, and contraindications before dispensing.
- Harm Prevention — active intervention to prevent adverse drug events, including allergy and duplicate-therapy checks.
- Interaction Management — identification and mitigation of drug-drug, drug-disease, and drug-food interactions.
- Education — patient and caregiver counseling to support correct use, adherence, and self-monitoring.
- Leadership in stewardship — clinical leadership in antimicrobial stewardship, anticoagulation management, and formulary oversight.
- Dispensing accuracy — verification systems and quality controls that ensure the right drug, dose, and patient at the point of dispensing.

SHIELD reframes the pharmacist not as the last checkpoint before a medication reaches the patient, but as an active clinical partner shaping the therapy from the moment it is prescribed.

3. SCREENING: PRESCRIPTION REVIEW AND VERIFICATION

The pharmacist's screening function begins the moment a prescription is received, whether electronically or in written form. This process involves far more than a mechanical check of legibility; it requires clinical judgment about the appropriateness of the drug, dose, route, and frequency for the specific patient.

3.1 Core Activities

- Verification of dose appropriateness relative to patient age, weight, renal and hepatic function, and indication.
- Cross-referencing against known allergies and prior adverse reactions documented in the patient record.
- Detection of therapeutic duplication across multiple prescribers, particularly in patients receiving care from several specialists.
- Identification of prescribing errors originating from look-alike, sound-alike drug names or transcription mistakes.

3.2 Impact on Outcomes

Evidence from hospital pharmacy intervention studies consistently shows that pharmacist review of prescriptions before dispensing intercepts a meaningful proportion of prescribing errors before they reach the patient. This screening function is particularly critical in high-risk populations, including pediatric, geriatric, and critically ill patients, where narrow therapeutic margins increase the consequences of dosing error.

4. HARM PREVENTION: REDUCING ADVERSE DRUG EVENTS

Adverse drug events represent one of the most common and costly categories of preventable patient harm. Pharmacists contribute to harm prevention through both proactive and reactive mechanisms embedded throughout the medication use process.

4.1 Core Activities

- Medication reconciliation at transitions of care, including hospital admission, transfer, and discharge, to prevent omission or duplication errors.
- Therapeutic drug monitoring for high-alert medications with narrow therapeutic indices, such as anticoagulants, aminoglycosides, and antiepileptics.
- Identification of patients at elevated risk for adverse drug events due to polypharmacy, advanced age, or organ dysfunction.
- Participation in root-cause analysis following medication-related incidents to strengthen system-level defenses.

4.2 Impact on Outcomes

Pharmacist-led medication reconciliation programs are associated with measurable reductions in discrepancy rates at care transitions, a point in the care pathway that is disproportionately associated with preventable adverse events. Structured harm prevention activities also reduce hospital readmissions attributable to medication-related complications, particularly among patients managing multiple chronic conditions.

5. INTERACTION MANAGEMENT: DRUG-DRUG AND DRUG-DISEASE SAFETY

As patients increasingly manage multiple chronic conditions with multiple concurrent medications, the risk of clinically significant drug interactions grows substantially. Pharmacists are trained specifically to identify and manage these risks using both clinical judgment and decision-support technology.

5.1 Core Activities

- Systematic screening for drug-drug interactions using clinical decision support systems integrated into dispensing software.
- Assessment of drug-disease interactions, such as contraindicated medications in patients with renal impairment, hepatic disease, or cardiac conditions.
- Evaluation of drug-food interactions that may affect absorption, efficacy, or toxicity.
- Communication with prescribers to recommend therapeutic alternatives when significant interaction risk is identified.

5.2 Impact on Outcomes

Given the growing burden of polypharmacy, particularly among older adults and patients with multiple comorbidities, pharmacist-led interaction screening functions as a critical safeguard against preventable hospitalizations. The integration of clinical decision support tools has strengthened this function, though pharmacist clinical judgment remains essential to distinguish clinically significant interactions from those of negligible practical concern.

6. EDUCATION: PATIENT COUNSELING AND ADHERENCE SUPPORT

Medication effectiveness depends not only on correct prescribing and dispensing but on correct use by the patient. Pharmacists are often the healthcare professional with the most direct and repeated contact with patients regarding their medications, positioning them uniquely to support adherence and self-management.

6.1 Core Activities

- Counseling on correct administration technique, timing, and duration of therapy.
- Explanation of expected effects, potential side effects, and warning signs requiring medical attention.
- Adherence support for chronic disease management, including diabetes, hypertension, and cardiovascular disease.
- Health literacy-appropriate communication tailored to patient age, language, and educational background.

6.2 Impact on Outcomes

Medication non-adherence is a major contributor to poor chronic disease control and avoidable hospitalization. Structured pharmacist counseling and adherence support programs are associated with improved glycemic control, blood pressure management, and reduced emergency department utilization among patients with chronic conditions, underscoring the pharmacist's role as an active partner in long-term care rather than a one-time point of contact.

7. LEADERSHIP IN STEWARDSHIP: ANTIMICROBIAL AND FORMULARY GOVERNANCE

Beyond individual patient interactions, pharmacists increasingly occupy system-level leadership roles in stewardship programs designed to optimize medication use across entire healthcare institutions.

7.1 Core Activities

- Leadership of antimicrobial stewardship programs, including review of antibiotic appropriateness, duration, and de-escalation opportunities.
- Anticoagulation management services, coordinating dosing and monitoring for patients on long-term anticoagulant therapy.
- Participation in pharmacy and therapeutics committees governing hospital formulary decisions.
- Contribution to institutional clinical guideline development for high-risk medication classes.

7.2 Impact on Outcomes

Pharmacist-led antimicrobial stewardship programs are associated with reduced rates of antimicrobial resistance, shorter durations of unnecessary antibiotic therapy, and lower incidence of *Clostridioides difficile* infection. These programs represent one of the clearest examples of how pharmacist clinical leadership translates into institution-wide, rather than purely individual, improvements in patient safety.

8. DISPENSING ACCURACY: THE FINAL SAFEGUARD

Despite the expansion of pharmacists' clinical roles, the accuracy of the dispensing process itself remains a foundational safety function, particularly as prescription volumes and medication complexity continue to increase.

8.1 Core Activities

- Verification systems, including barcode scanning and independent double-checks, to confirm the right drug, dose, and patient.
- Quality control procedures for compounded and specialty medications requiring precise preparation.
- Labeling accuracy and clear instructions to minimize the risk of administration error by patients or caregivers.
- Systematic reporting and analysis of near-miss dispensing errors to identify system vulnerabilities.

8.2 Impact on Outcomes

Technology-supported dispensing systems, combined with pharmacist oversight, have been shown to substantially reduce dispensing error rates relative to manual processes alone. This function, while less visible than clinical counseling or stewardship leadership, remains the point at which the majority of medication safety defenses converge before a drug physically reaches the patient.

9. INTEGRATED SUMMARY: THE SHIELD FRAMEWORK IN PRACTICE

Table 1 summarizes the six SHIELD components, their representative activities, and their principal linkage to patient outcomes, illustrating how the pharmacist's protective function operates continuously across the medication use process.

Table 1. Pharmacist Contributions Mapped to the SHIELD Framework

SHIELD Component	Primary Activity	Outcome Linkage
Screening	Prescription review and dose verification	Intercepted prescribing errors
Harm Prevention	Medication reconciliation and monitoring	Fewer adverse drug events
Interaction Management	Drug-drug and drug-disease screening	Reduced avoidable hospitalization
Education	Patient counseling and adherence support	Improved chronic disease control
Leadership in Stewardship	Antimicrobial and anticoagulation programs	Lower resistance and complication rates
Dispensing Accuracy	Verification and quality control systems	Reduced dispensing error rates

10. PHARMACY PRACTICE WITHIN THE SAUDI HEALTHCARE SYSTEM

The pharmacy profession in Saudi Arabia has undergone substantial transformation over the past decade, moving from a predominantly dispensing-oriented role toward an expanded clinical scope of practice consistent with international models of pharmaceutical care.

10.1 Regulatory and Institutional Context

SCFHS governs pharmacist licensing, scope-of-practice standards, and continuing professional development requirements, progressively formalizing clinical pharmacy competencies as a condition of licensure. SFDA regulates medication safety at the national level, overseeing drug registration, quality control, and post-marketing pharmacovigilance reporting, much of which depends on frontline pharmacist reporting of adverse events. CBAHI accreditation standards embed medication management and pharmacist involvement in multidisciplinary rounds directly into hospital quality criteria, reinforcing the clinical pharmacy role at the institutional level.

10.2 Vision 2030 and Digital Transformation

Vision 2030's healthcare transformation strategy has supported the expansion of clinical pharmacy positions across Ministry of Health facilities and the integration of e-prescribing systems that strengthen pharmacist screening capacity. The continued development of the Nphies platform and integrated electronic health records is expected to further enhance pharmacists' ability to access complete patient medication histories at the point of dispensing, closing a critical information gap that has historically limited interaction screening accuracy.

11. CHALLENGES TO OPTIMAL PHARMACIST UTILIZATION

- Scope-of-practice constraints: In some settings, pharmacists remain underutilized relative to their clinical training, particularly where prescribing authority and independent clinical decision-making remain limited.
- Workforce and workload pressures: High prescription volumes in community and outpatient pharmacy settings can compress the time available for clinical screening and patient counseling.
- Incomplete medication histories: Fragmented health records across providers can limit the accuracy of interaction and duplication screening at the point of dispensing.
- Underreporting of adverse drug events: Pharmacovigilance systems depend on consistent frontline reporting, which remains variable across practice settings.
- Interprofessional integration gaps: Pharmacists are not always embedded in multidisciplinary rounds or care planning discussions, limiting their contribution to proactive rather than reactive safety functions.

12. RECOMMENDATIONS

Building on the SHIELD framework and the challenges identified above, this paper offers the following recommendations for strengthening the pharmacist's contribution to medication safety and patient outcomes:

- Expand clinical pharmacist positions embedded within multidisciplinary care teams, particularly in high-risk units such as intensive care and oncology.
- Strengthen electronic health record integration to give pharmacists real-time access to complete patient medication histories and laboratory data at the point of dispensing.
- Formalize pharmacist participation in medication reconciliation at all transitions of care, supported by institutional policy and CBAHI-aligned quality standards.
- Invest in structured pharmacovigilance training and simplified adverse event reporting pathways to strengthen SFDA post-marketing surveillance data.
- Expand pharmacist-led chronic disease management clinics for conditions such as diabetes, hypertension, and anticoagulation therapy.
- Support continuing professional development aligned with SCFHS requirements that emphasizes both clinical pharmacotherapy skills and interprofessional collaboration competencies.

13. CONCLUSION

Pharmacists occupy a distinctive and expanding role in the prevention of medication-related harm and the improvement of patient outcomes. The SHIELD framework proposed in this paper — Screening, Harm Prevention, Interaction Management, Education, Leadership in stewardship, and Dispensing accuracy — illustrates that this role extends well beyond the traditional dispensing function to encompass clinical judgment, patient education, and system-level leadership. Within the Saudi healthcare system, the regulatory foundations provided by SCFHS, SFDA, and CBAHI, together with the digital transformation goals of Vision 2030, are creating increasingly favorable conditions for pharmacists to practice at the full extent of their clinical training. Sustained improvement in medication safety and patient outcomes will depend on continued investment in clinical pharmacist integration, information system interoperability, and interprofessional collaboration that positions pharmacists as active partners throughout the patient care continuum.

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