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Role of Pharmacists in Promoting the Rational Use of Medicines: A Narrative Review

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Abstract **Objectives:** The Rational Use of Medicines (RUM) requires that patients receive medicines appropriate to their clinical needs, in doses that meet their individual requirements, for an adequate period and at the lowest cost to them and their community. Pharmacists contribute to RUM in several ways, but the evidence for these contributions is dispersed across different practice settings, intervention types and outcome measures. **Objective:** To provide a narrative overview of the principal roles through which pharmacists may contribute to RUM, to describe the type and strength of the supporting evidence and to identify conditions that influence the transferability of pharmacist-led services. **Methods:** A narrative review was conducted using a structured, non-systematic search of PubMed/MEDLINE, Scopus and Web of Science, supplemented by Google Scholar, for English-language publications from 2000 to 2025. Systematic reviews, meta-analyses and original studies addressing pharmacists' roles in RUM were prioritised; guidelines and policy documents were used to provide definitions and context rather than evidence of effectiveness. No formal quality appraisal or quantitative pooling was performed and findings are presented descriptively. **Results:** Five themes were identified: medication review and optimisation; patient education and adherence; antimicrobial stewardship; pharmacovigilance and medication safety; and digital health technologies. The most consistent review-level evidence concerned pharmacist-led medication reconciliation at hospital transitions and hospital antimicrobial stewardship, both of which were associated with improvements in process and selected clinical outcomes. Evidence for medication review in older people, adherence interventions and digital tools was more heterogeneous, frequently of low certainty and sensitive to setting, intervention design and outcome measurement. Reported effects varied according to pharmacists' scope of practice, access to clinical information and integration with prescribers. **Conclusion:** Pharmacists have the potential to support RUM across hospital, primary care and community settings, but the size and consistency of benefit differ by intervention and context. Because this review did not systematically appraise or pool the evidence, it cannot establish the overall effectiveness of pharmacist interventions. Adequate training, access to patient information, interprofessional collaboration, regulatory support and rigorous evaluation appear to be prerequisites for realising this potential.

Key Words Rational Use of Medicines, Clinical Pharmacy, Medication Safety, Antimicrobial Stewardship, Medication Adherence, Pharmaceutical Care

INTRODUCTION

The Rational Use of Medicines (RUM) is a basic element of functioning healthcare systems. The World Health Organization (WHO) defines it as patients receiving medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community [1,2]. Irrational use of medicines remains common.

WHO has estimated that more than half of all medicines are prescribed, dispensed or sold inappropriately [1]. This figure should be interpreted with caution: it is a global approximation derived largely from prescribing and dispensing indicator surveys in primary care facilities, predominantly in low- and middle-income countries, rather than a precise measurement applicable to every health system [1,3]. Irrational use is nevertheless associated with adverse drug events, avoidable costs, antimicrobial resistance and poorer patient outcomes [3,4].

RUM overlaps with, but is not identical to, several related concepts. Medication safety concerns the prevention of avoidable harm from medicines; adherence describes the extent to which patients take medicines as agreed with prescribers; antimicrobial stewardship is a coordinated set of actions to optimise antimicrobial use; and cost-effectiveness concerns the relationship between costs and health outcomes [5-7]. RUM is the broader construct that links these elements: a medicine can be taken adherently and still be used irrationally if the regimen itself is inappropriate. In this review, the term RUM is used for this overarching construct and the related concepts are referred to separately where the evidence relates specifically to them.

Pharmacists' expertise in pharmacotherapy and medication management places them in a position to address these problems [8,9]. Historically focused on dispensing, the role of the pharmacist has expanded towards patient-centred care, including medication therapy management, patient counselling and participation in multidisciplinary teams [9,10]. Pharmacists may collaborate with prescribers to support appropriate prescribing, review prescriptions to identify drug-related problems before they reach the patient, educate patients, contribute to antimicrobial stewardship and pharmacovigilance and use digital health tools [5,11-16]. Review-level evidence suggests that pharmacist involvement is associated with fewer medication errors and discrepancies, although the strength of this evidence varies by setting and intervention [13,17]. Barriers such as limited access to medical records, weak collaboration with other professionals, regulatory constraints and variation in pharmacist training may limit these contributions [18-20].

Several systematic reviews have examined individual pharmacist services, such as medication reconciliation, medication therapy management or antimicrobial stewardship and overviews have summarised clinical pharmacy services in general [21-24]. Fewer sources bring these roles together explicitly under the RUM framework while also distinguishing the type of supporting evidence and the contextual conditions on which outcomes depend. This review addresses that gap. Its aims were (i) to summarise the principal roles through which pharmacists may contribute to RUM; (ii) to describe, for each role, the type of supporting evidence and the outcomes measured; and (iii) to identify conditions that affect the transferability of pharmacist-led services between health systems. The scope is international. Although most authors work in Saudi Arabia, the review did not restrict the search to any country or region and Saudi-specific evidence was not synthesised separately; implications for health systems such as that of Saudi Arabia are considered in the discussion.

METHODS

Review Design

This study is a narrative review. A narrative design was selected because the review question is broad, spans several distinct types of pharmacist service and requires integration of evidence from different study designs and health-system contexts. The review was not designed or conducted as a systematic review and its findings are presented descriptively. Reporting was informed by the Scale for the Assessment of Narrative Review Articles (SANRA) criteria [25].

Search Strategy

A structured, non-systematic literature search was conducted in PubMed/MEDLINE, Scopus and Web of Science, with Google Scholar used as a supplementary source. The search covered publications from 1 January 2000 to 31 December 2025. The final search of each database was run on 23 September 2026. The search combined three concept blocks with Boolean operators: (1) pharmacists and pharmacy services; (2) rational use of medicines and related concepts; and (3) the specific service areas of interest. The complete PubMed search string, with its adaptations for Scopus and Web of Science, is reported in Appendix A. Reference lists of key systematic reviews were also checked to identify additional relevant sources.

Because Google Scholar returns large, relevance-ranked and changing result sets, it was used only to identify publications missed by the bibliographic databases. For each query, the first 212 records ranked by relevance were screened and no further records were reviewed.

Eligibility Criteria

Sources were included if they (a) addressed a role, service or intervention delivered wholly or partly by pharmacists; (b) reported outcomes related to RUM, including prescribing appropriateness, medication errors or discrepancies, adverse drug events, adherence, antimicrobial use, healthcare utilisation or costs; (c) were published in English in a peer-reviewed journal; and (d) were original research, systematic reviews or meta-analyses. Sources were excluded if they concerned only other health professionals, were editorials, commentaries or opinion pieces without empirical data, had no evident relevance to RUM, or duplicated an included publication.

Clinical guidelines, policy statements and institutional reports from bodies such as WHO, the International Pharmaceutical Federation (FIP), the Organisation for Economic Co-operation and Development (OECD) and professional societies were not treated as evidence of effectiveness. They were cited separately, as contextual sources, to provide definitions, frameworks and policy recommendations. A small number of foundational publications that pre-date 2000 were also cited for definitions or historical context.

Source Selection

Titles and abstracts were screened for relevance and potentially relevant records were assessed in full text. Screening and full-text assessment were performed by two authors (A.A.H. and S.K.A.) and disagreements were resolved by a third author (A.A.). The numbers of records retrieved, removed as duplicates, screened and excluded at each stage were not systematically recorded; a PRISMA-style flow diagram therefore cannot be provided and this is acknowledged as a limitation.

Three operational criteria guided prioritisation among eligible sources. Relevance meant that the source examined a pharmacist-delivered role or intervention and reported at least one RUM-related outcome. Clarity of outcomes meant that the outcome was explicitly defined and measured, rather than inferred. Methodological priority followed a conventional evidence hierarchy: systematic reviews and meta-analyses of controlled studies were preferred, followed by randomised and non-randomised controlled studies, then observational studies, then descriptive reports. These criteria were used to prioritise sources for synthesis, not to judge certainty of evidence.

Data Extraction and Synthesis

For each prioritised source, the study design, setting, population, type of pharmacist intervention, comparator where applicable, outcomes and principal limitations were extracted. Four themes were defined in advance, based on the search concepts and the WHO core components of RUM [1]: medication review and optimisation, patient education and adherence, antimicrobial stewardship and pharmacovigilance and medication safety. A fifth theme, digital health technologies, emerged during synthesis because digital tools were repeatedly reported as enablers across the four predefined themes. Within each theme, findings were compared across studies, noting where results agreed or differed and how they related to setting, scope of practice and intervention design.

Quality Considerations

No formal quality appraisal or risk-of-bias assessment was performed and results were not pooled quantitatively. Prioritising systematic reviews or articles in established journals does not by itself establish the certainty of evidence. To make the evidence base transparent, the design of each representative source is reported in Table 1 and the text distinguishes findings from systematic reviews of controlled studies from those based on observational or descriptive evidence. Where the authors of a cited systematic review graded the certainty of evidence, that grading is reported.

RESULTS

Overview of the Evidence Base

The synthesis drew on 56 cited sources published between 1987 and 2025, of which 41 (73%) were published in 2010 or later. They comprised 25 systematic reviews, meta-analyses, scoping reviews or overviews of reviews (including 5 Cochrane reviews); 3 primary empirical studies; 15 narrative reviews, conceptual or methodological papers; and 13 guidelines, policy statements, institutional reports or books. Sources published before 2000 were cited for definitions, historical context or, in one case, as a landmark controlled study. The evidence for effectiveness therefore rests mainly on published systematic reviews, whose primary studies were themselves of variable design and quality; policy and guideline documents were used for context only.

The empirical sources originated mainly from high-income countries, particularly the United States, the United Kingdom, Australia, Canada and western Europe, with fewer from low- and middle-income settings, notably the review of non-prescription antimicrobial sales [26]. Populations included hospital inpatients, patients at hospital transitions, older adults with polypharmacy, outpatients with chronic diseases such as diabetes, hypertension and dyslipidaemia and community pharmacy users. Interventions ranged from single components, such as admission medication reconciliation, to multifaceted programmes combining medication review, counselling and follow-up. Representative sources are summarised in Table 1.

Medication Review and Optimisation

Medication review is an umbrella term for several distinct activities. Medication reconciliation is the process of creating and verifying an accurate medication list at transitions of care. Comprehensive medication review, often delivered within Medication Therapy Management (MTM), is a structured assessment of all of a patient's medicines to identify and resolve drug-related problems. Deprescribing is the supervised withdrawal or dose reduction of medicines whose risks outweigh their benefits [27-29]. These activities differ in intensity, timing and required access to clinical information.

The most consistent evidence concerns medication reconciliation at hospital transitions. A systematic review of 19 studies found that pharmacy-led reconciliation reduced medication discrepancies at admission and discharge [17]. A companion meta-analysis of 17 studies (8 randomised trials; 21,342 patients) reported lower all-cause readmissions (Risk Ratio (RR) 0.81, 95% Confidence Interval [CI] 0.70-0.95), emergency department visits (RR 0.72, 95% CI 0.57-0.92) and adverse drug event-related hospital revisits (RR 0.33, 95% CI 0.20-0.53), but no difference in mortality (RR 1.05, 95% CI 0.95-1.16); heterogeneity was substantial for some outcomes [21]. A systematic review of 30 randomised trials of pharmacist interventions at care transitions found the strongest evidence for clinical medication review delivered within multifaceted programmes, whereas reconciliation alone was less effective unless combined with counselling and medication review [30].

For MTM in outpatient settings, a systematic review of 44 studies found that MTM improved medication appropriateness, but evidence was insufficient for most clinical outcomes and the authors rated the strength of evidence as low [22]. Among older people with polypharmacy, a Cochrane review of 32 studies, most involving pharmaceutical care, found that it was uncertain whether interventions reduced potentially inappropriate medications (very low-certainty evidence) and that interventions may make little or no difference to hospital admissions (low-certainty evidence) [31].

Table 1: Representative Sources Informing Each Theme, with Design, Outcomes and Principal Limitations

Source	Setting/population	Design and scope	Pharmacist intervention	Principal outcomes (as reported)	Principal limitations
Mekonnen *et al.* [17]	Hospital admission and discharge; international	SR and MA; 19 studies	Pharmacy-led medication reconciliation	Fewer medication discrepancies at admission and discharge	Mostly process outcomes; heterogeneous definitions of discrepancy
Mekonnen *et al.* [21]	Hospital transitions; adults; international	SR and MA; 17 studies (8 RCTs), 21,342 patients	Pharmacist-led medication reconciliation programmes	All-cause readmission RR 0.81 (0.70–0.95); ED visits RR 0.72 (0.57–0.92); ADE-related revisits RR 0.33 (0.20–0.53); mortality RR 1.05 (0.95–1.16)	Substantial heterogeneity; possible publication bias for ED visits
Ensing *et al.* [30]	Hospitalisation and care transitions	SR; 30 RCTs (best-evidence synthesis of 15)	Reconciliation, clinical medication review, counselling, follow-up	Strongest evidence for clinical medication review within multifaceted programmes; conflicting evidence for isolated components	Variable trial quality and reporting
Weber *et al.* [46]	Hospital discharge	Scoping review; 25 studies	Discharge counselling, reconciliation, medication review, follow-up	Interventions associated with reduced readmissions most often included patient counselling	Included only studies reporting reduced readmissions; no pooling
Viswanathan *et al.* [22]	Outpatient MTM; mostly United States	SR and MA; 44 studies	Medication therapy management	Improved medication appropriateness; insufficient evidence for most clinical outcomes	Low strength of evidence (authors' grading)
Rankin *et al.* [31]	Older people with polypharmacy; multiple settings	Cochrane SR; 32 studies, about 28,672 participants	Mainly multifaceted pharmaceutical care	Uncertain effect on PIMs (very low certainty); little or no difference in hospital admissions (low certainty)	Heterogeneous interventions and outcome measures
Kaboli *et al.* [13]	Hospital inpatients	SR; 36 studies	Clinical pharmacist participation in inpatient care	Fewer adverse drug events and medication errors reported; effects on other outcomes varied	Mixed designs and outcome definitions
Chisholm-Burns *et al.* [11]	Multiple care settings; United States	SR and MA; 298 studies	Pharmacists as members of care teams	Favourable effects on HbA1c, LDL-C, blood pressure and adverse drug events	High heterogeneity; many uncontrolled studies
Farhana *et al.* [32]	Chronic diseases; outpatient and community	SR; 26 RCTs	Pharmacist-led counselling and behavioural interventions	Adherence improved in 18 of 26 trials (69%)	Indirect, mostly self-reported adherence measures; 38% of trials at high risk of bias
Rotta *et al.* [24]	Clinical pharmacy services; multiple settings	Overview of 49 SRs (269 RCTs)	Clinical pharmacy services	Positive effects in hypertension and diabetes; inconclusive in other conditions and for adherence and appropriateness	Inconsistent definitions of services and outcomes
Davey *et al.* [23]	Hospital inpatients	Cochrane SR; 221 studies	Antibiotic stewardship interventions (multidisciplinary, not pharmacist-specific)	More patients treated according to policy; shorter treatment duration; no increase in mortality	Pharmacist contribution not separable from team effect
Baur *et al.* [41]	Hospitals	SR and MA; 32 studies	Antibiotic stewardship programmes	Lower incidence of infection or colonisation with resistant bacteria and of C. difficile infection	Mostly before–after designs; programme components varied
Sakeena *et al.* [26]	Community pharmacies; low- and middle-income countries	SR	Dispensing practice (descriptive)	Non-prescription supply of antimicrobials frequently reported	Mainly simulated-client and cross-sectional studies
Bates *et al.* [15]	Hospital; United States	Prospective before–after comparison	CPOE plus team intervention	Fewer non-intercepted serious medication errors	Single centre; early-generation system
Slight *et al.* [49]	Hospital data extrapolated nationally; United States	Cost estimation study	Medication-related CDSS alerts	Inappropriate overrides associated with substantial costs of preventable ADEs	Model-based extrapolation from one centre

Abbreviations: ADE, Adverse Drug Event; CDSS, Clinical Decision Support System; CI, Confidence Interval; CPOE, Computerised Provider Order Entry; ED, Emergency Department; HbA1c, Glycated Haemoglobin; LDL-C, Low-Density Lipoprotein Cholesterol; MA, Meta-Analysis; MTM, Medication Therapy Management; PIM, Potentially Inappropriate Medication; RCT, Randomised Controlled Trial; RR, Risk Ratio (95% CI); SR, Systematic Review. Outcomes are reported as stated by the source authors and were not re-analysed or independently appraised in this review

Hospital-based review of clinical pharmacists in inpatient care has been associated with fewer adverse drug events and medication errors [13] and a meta-analysis of 298 studies of pharmacists in team-based care reported favourable effects on several clinical and safety outcomes [11]. Collaboration between pharmacists and physicians appears to be associated with better prescribing quality [29,30].

Several limitations apply. The effect of a medication review depends on whether prescribers accept and implement pharmacist recommendations, on the availability of follow-up and on how outcomes are defined. Deprescribing must also be balanced against the risk of undertreatment, because withdrawing a medicine without monitoring can lead to symptom recurrence or the omission of beneficial therapy [28,31]. Process outcomes, such as the number of drug-related problems identified, are frequently reported, whereas patient-relevant outcomes are less often measured or improved.

Patient Education and Adherence

Pharmacist-led counselling and education aim to improve patients' understanding of their treatment, appropriate self-management and adherence. A systematic review of 26 randomised trials in chronic diseases found that pharmacist-led interventions improved adherence in 18 trials (69%), whereas seven showed no effect. All trials used indirect adherence measures, mostly self-report questionnaires; seven used objective indirect measures such as pill counts, electronic monitoring or refill records; and 10 trials (38%) were at high risk of bias [32]. A Cochrane review of adherence interventions across all providers found that even the most effective interventions produced modest and inconsistent improvements [6]. Because self-report, refill data, electronic monitoring and clinical outcomes capture different aspects of adherence, results based on different measures are not directly comparable [33].

Improved adherence is beneficial only when the prescribed regimen is clinically appropriate. From a RUM perspective, the target is adherence to a justified, safe and individualised treatment plan and adherence counselling should therefore be combined with medication review and, where necessary, referral to the prescriber.

Evidence on clinical outcomes is condition-specific. An overview of 49 systematic reviews found positive effects of clinical pharmacy services on patient outcomes in hypertension and diabetes, but inconclusive results in other conditions such as dyslipidaemia and for interventions targeting adherence and prescribing appropriateness, partly because of inconsistent outcome measurement [24]. A meta-analysis of pharmacists in team-based care reported favourable effects on glycated haemoglobin, blood pressure and low-density lipoprotein cholesterol [11] and a systematic review of community pharmacy interventions reported improvements in adherence in most studies, with more variable effects on other health outcomes [34]. These findings should not be generalised to all chronic diseases. A Cochrane review of non-dispensing roles of outpatient pharmacists also reported improvements in some patient outcomes and prescribing patterns, with variation across studies [35].

Community pharmacists also advise on self-medication and over-the-counter medicines, helping patients to select appropriate products and recognise when medical referral is required [36]. Evidence on how best to improve pharmacists' counselling practice is limited: a systematic review of 17 trials found that educational meetings combined with materials, outreach and feedback may improve counselling, but most studies had unclear risk of bias [37].

Antimicrobial Stewardship

Stewardship activities differ between settings. In hospitals, pharmacists in multidisciplinary antimicrobial stewardship programmes may review indications, recommend agents, adjust doses, support intravenous-to-oral conversion and monitor duration, often with access to microbiology results [38,39]. In community pharmacies, the main responsibilities are dispensing antibiotics only against a valid prescription where this is required, educating patients and referring them when appropriate; access to diagnostic information and prescribing authority are usually limited [40].

Most outcome evidence comes from hospitals and concerns stewardship programmes as a whole, rather than pharmacists specifically. A Cochrane review of 221 studies of interventions to improve antibiotic prescribing in hospital inpatients found that they increased the proportion of patients treated according to antibiotic policy and reduced the duration of treatment without increasing mortality [23]. A meta-analysis of 32 studies reported that stewardship programmes were associated with lower incidence of infection and colonisation with multidrug-resistant Gram-negative bacteria, extended-spectrum beta-lactamase-producing bacteria and meticillin-resistant Staphylococcus aureus and of Clostridioides difficile infection [41]. A further meta-analysis found that adherence to stewardship objectives, such as guideline-concordant empirical therapy and de-escalation, was associated with lower mortality, although most included studies were observational [42]. These findings include process measures (prescribing compliance, duration), clinical outcomes (mortality, infections) and resistance outcomes, which should be distinguished when interpreting the role of pharmacists.

In the community setting, non-prescription supply of antimicrobials remains common in many low- and middle-income countries, largely according to simulated-client studies [26]. The extent to which community pharmacists can prevent unnecessary dispensing depends on prescription-only regulations, their enforcement and pharmacists' scope of practice, all of which vary between jurisdictions [26,40].

Pharmacovigilance and Medication Safety

This theme includes several related but distinct activities: detecting and reporting Adverse Drug Reactions (ADRs) to pharmacovigilance systems; reporting medication errors to incident systems; reconciling medication lists at transitions; and broader surveillance of medication safety within organisations [7,14]. Pharmacists' contribution to ADR reporting has been described mainly in narrative and survey-based literature, which identifies barriers such as uncertainty about causality, workload, unfamiliarity with reporting systems and lack of feedback [43,44]. Higher reporting rates indicate greater detection and engagement, but do not on their own demonstrate a reduction in the incidence of harm.

Evidence that pharmacist involvement reduces medication errors comes mainly from systematic reviews of hospital practice and medication reconciliation, which report fewer errors, discrepancies and adverse drug events [13,17]. Observational studies describe the types of clinical pharmacist interventions accepted by prescribers, such as dose adjustment and prevention of drug interactions [45]. Reductions in medication-related readmissions have been reported in reviews of transition interventions, mostly involving medication reconciliation, counselling and post-discharge follow-up [21,46].

Digital Health Technologies

Digital tools are not a single intervention. Electronic prescribing and Computerised Provider Order Entry (CPOE) structure prescribing and eliminate illegible orders; Clinical Decision Support Systems (CDSS) generate alerts for interactions, contraindications or dose errors; electronic medication reconciliation and shared records support continuity across settings; and telepharmacy and remote monitoring extend services to patients who cannot easily attend a pharmacy [16,47,48]. In an early controlled study, CPOE combined with a team intervention reduced non-intercepted serious medication errors [15] and a systematic review of trials identified automatic provision of decision support within clinician workflow as a feature associated with improved practice [16].

These tools also have limitations and potential harms. Excessive or poorly prioritised alerts lead to alert fatigue and inappropriate overrides; one analysis estimated that inappropriately overridden medication alerts in the United States were associated with substantial costs from preventable adverse drug events [49]. Incomplete medication lists, poor interoperability, privacy risks, digital exclusion of some patients and the need for staff training may further limit benefit [47,48]. Evidence that telepharmacy improves patient outcomes is still largely descriptive [48].

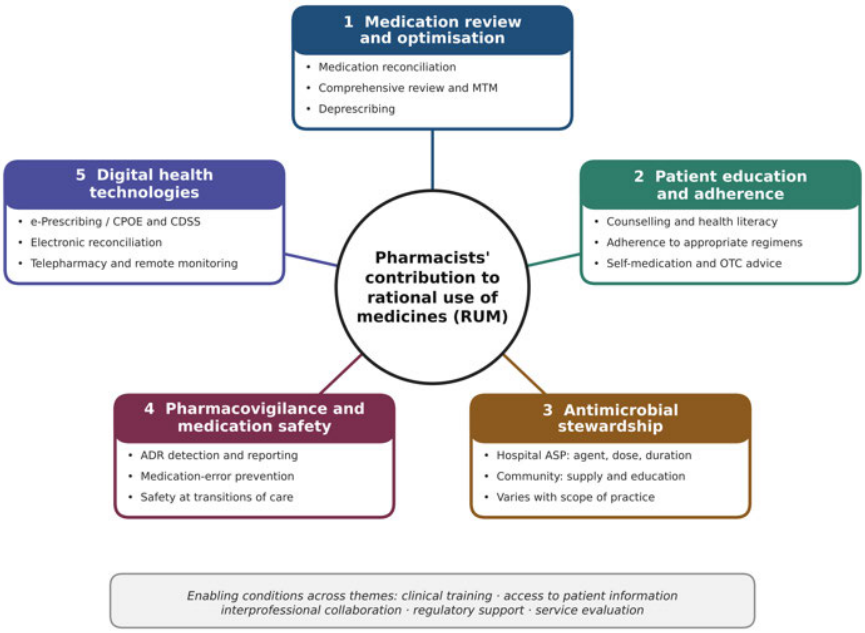


Figure 1: Five Themes Describing Pharmacists' Contribution to the Rational use of Medicines Identified in this Narrative Review. Each Panel Lists the Principal Activities within the Theme. The Lower Panel Summarises Enabling Conditions that Recurred across Themes. The Figure is a Conceptual Summary of the Narrative Synthesis and does not Represent the Relative Strength of Evidence for each Theme (see Table 1)

Synthesis across Themes

Across the five themes, the evidence suggests that pharmacists can contribute to several components of RUM, but the strength of evidence differs considerably. Review-level evidence from controlled studies is strongest for medication reconciliation at hospital transitions and for hospital stewardship programmes; it is weaker or of lower certainty for medication review in older people and for adherence interventions; and it is largely descriptive for pharmacovigilance reporting and telepharmacy. Figure 1 summarises the five themes and the enabling conditions identified across them.

DISCUSSION

Principal Findings

This review indicates that pharmacists' contributions to RUM extend beyond dispensing to medication review, patient education, stewardship, safety surveillance and the use of digital tools. However, the evidence does not support a uniform conclusion that pharmacist involvement improves outcomes. Benefits appear most consistent where interventions are well defined, multifaceted and integrated with prescribers and where outcomes are clearly specified [24,33]. Single-component interventions and those measured with heterogeneous outcomes show less consistent effects.

Interpretation and Comparison with Existing Evidence

The finding that coordinated interventions at transitions of care outperform isolated reconciliation is consistent with a scoping review of discharge interventions associated with reduced readmissions, which most commonly included patient counselling, medication reconciliation, medication review and post-discharge follow-up [34]. It is also consistent with WHO's estimate of the global burden of preventable medication-related harm, which supports attention to transitions, polypharmacy and high-risk situations [7,50]. The uncertain effect of medication review on hospitalisation among older people [31] suggests that identifying drug-related problems does not necessarily translate into patient-relevant benefits unless recommendations are implemented and followed up.

For adherence, the predominance of self-reported measures and the high proportion of trials at risk of bias limit confidence in the size of the effect [6,32]. For stewardship, most effectiveness evidence relates to multidisciplinary hospital programmes, so the specific contribution of pharmacists cannot always be separated from that of the team [23,41]. For pharmacovigilance, increased reporting is a necessary but insufficient indicator of improved safety.

Transferability across Health Systems

The transferability of these findings depends on at least four features of health systems. First, scope of practice: in some systems pharmacists may modify or initiate therapy under collaborative agreements, whereas in others their role is advisory [20,51]. Second, prescribing authority, which determines whether pharmacists can act on identified problems or must rely on prescriber acceptance. Third, access to patient records, including diagnoses and laboratory results, which conditions the quality of medication review and stewardship decisions [19]. Fourth, funding: where pharmacy income is linked to dispensing volume rather than to cognitive services, the provision of clinical services may be difficult to sustain [20].

Because most empirical evidence originates from high-income systems with established clinical pharmacy, findings may not transfer directly to settings where these conditions differ, including many low- and middle-income countries. For Saudi Arabia, where most of the authors practise, the applicability of these findings should be examined against national regulations, workforce capacity and information-system integration, which were not specifically assessed in this review.

Interprofessional Collaboration

Access to information alone may not improve RUM unless pharmacists' recommendations are communicated effectively and considered by prescribers. A Cochrane review found that interventions to improve interprofessional collaboration may improve professional practice and healthcare outcomes, although the certainty of evidence was low and varied between intervention types [52]. Shared care plans, multidisciplinary rounds, collaborative practice agreements and clear documentation of pharmacist recommendations are proposed mechanisms for improving acceptance, but they have not been evaluated consistently [51].

Economic Considerations

Economic benefits of pharmacist services are plausible, because non-adherence and medication-related harm impose substantial costs [48,53]. A review of economic evidence concluded that pharmacists have been reported to reduce costs in a range of settings, but noted that many evaluations were of limited quality or included only partial costs and that the most cost-effective services were not clearly identified [54]. Economic benefits should therefore be regarded as an area requiring further evidence rather than a demonstrated universal saving. Effects are likely to depend on intervention intensity, target population, remuneration arrangements and the outcomes included in evaluations [55].

Implementation and Equity

Implementation depends on workforce capacity, training and organisational support [18]. Rural and underserved settings may benefit from telepharmacy, but they may also face greater barriers in connectivity and staffing [48]. Patients' health literacy, language and access to digital services influence whether education and digital interventions reach those with the greatest need. Interventions that rely on digital access may widen inequalities if alternative channels are not provided. These considerations are drawn from the reviewed literature but have rarely been evaluated directly.

Implications for Practice and Policy

The following implications are the authors' recommendations, informed by, but not directly tested in, the reviewed evidence. Health services could prioritise pharmacist-led reconciliation and medication review at transitions of care, where the evidence is most consistent and integrate pharmacists into stewardship and patient-safety programmes with access to the clinical information they need. Pharmacy education should strengthen competencies in clinical reasoning, communication, pharmacovigilance, deprescribing, digital health and interprofessional practice [10,18]. Regulators could consider expanding pharmacists' scope of practice where competency assessment and accountability are in place and payers could evaluate reimbursement models for cognitive services. In each case, services should be introduced with prospective evaluation of clinical, humanistic, utilisation and economic outcomes.

Limitations

This review has several limitations. First, as a narrative review, it did not follow a fully reproducible systematic process: the numbers of records at each stage of selection were not recorded and selection may have been influenced by the reviewers' judgement. Second, no formal quality appraisal was undertaken, so the certainty of evidence for each theme could not be graded independently. Third, the review cannot quantify the overall effectiveness of pharmacist interventions, or establish that one intervention is superior to another, because the evidence was neither systematically assessed nor quantitatively pooled. Fourth, limiting the search to three bibliographic databases and a restricted portion of Google Scholar may have missed relevant studies, including those indexed in regional databases. Fifth, the restriction to English-language, peer-reviewed publications may have introduced language and publication bias and may have under-represented evidence from non-English-speaking countries, including Arabic-language studies. Sixth, the included evidence was heterogeneous in populations, health systems, intervention components and outcome measures, which limits direct comparison. Finally, policy and guideline documents were used for context and their recommendations should not be interpreted as evidence of effectiveness.

Future Research

Future studies should use rigorous designs and report priority outcomes, including medication-related harm, prescribing appropriateness measured with validated tools, adherence measured with validated or objective methods, antimicrobial use and resistance, patient-reported outcomes, healthcare utilisation and cost-effectiveness. Implementation studies should report pharmacists' training, intervention components, comparator care, fidelity, uptake of recommendations by prescribers and contextual factors, so that results can be replicated and compared. More research is needed in low- and middle-income countries, community pharmacies and rural settings, including Saudi Arabia and the wider Gulf region. Future systematic reviews in this area should follow current reporting standards, such as PRISMA 2020 [56].

CONCLUSION

This narrative review suggests that pharmacists have the potential to support the rational use of medicines through medication review, patient education and adherence support,

antimicrobial stewardship, pharmacovigilance and the use of digital health technologies. The most consistent supporting evidence relates to medication reconciliation at hospital transitions and hospital stewardship programmes, whereas evidence for other services is more variable and often of low certainty. Because the review did not systematically appraise or pool the evidence, it does not establish the effectiveness or cost savings of pharmacist interventions. Realising the potential contribution of pharmacists appears to depend on adequate clinical training, access to patient information, interprofessional collaboration, supportive regulation and rigorous evaluation of pharmacist-led services.

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Data Availability
All sources are cited in the reference list.

Conflicts of Interest
The authors declare no conflicts of interest.

Ethical Statement
Not applicable, as this review used published literature only.

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Appendix A. Search Strategy

Search Period: 1 January 2000 to 31 December 2025. Date of final search: 23 September 2026. Boolean operators combined a pharmacist concept block with a RUM and service-area concept block. Database-specific syntax is shown below.

Database	Search string
PubMed/MEDLINE	("Pharmacists"[MeSH] OR "Pharmaceutical Services"[MeSH] OR pharmacist*[tiab] OR "pharmaceutical care"[tiab] OR "clinical pharmacy"[tiab]) AND ("Drug Utilization"[MeSH] OR "Medication Therapy Management"[MeSH] OR "Medication Reconciliation"[MeSH] OR "Medication Errors"[MeSH] OR "Medication Adherence"[MeSH] OR "Antimicrobial Stewardship"[MeSH] OR "Pharmacovigilance"[MeSH] OR "Decision Support Systems, Clinical"[MeSH] OR "Telemedicine"[MeSH] OR "rational use of medicines"[tiab] OR "rational drug use"[tiab] OR "medication review"[tiab] OR deprescrib*[tiab] OR "medication safety"[tiab] OR adherence[tiab] OR "antimicrobial stewardship"[tiab] OR "antibiotic stewardship"[tiab] OR pharmacovigilance[tiab] OR "adverse drug reaction*"[tiab] OR "electronic prescribing"[tiab] OR telepharmacy[tiab]) AND English[la] AND ("2000/01/01"[dp] : "2025/12/31"[dp])
Scopus	TITLE-ABS-KEY(pharmacist* OR "pharmaceutical care" OR "pharmaceutical services" OR "clinical pharmacy") AND TITLE-ABS-KEY("rational use of medicines" OR "rational drug use" OR "drug utilization" OR "drug utilisation" OR "medication therapy management" OR "medication review" OR "medication reconciliation" OR deprescrib* OR "medication safety" OR "medication error*" OR adherence OR "antimicrobial stewardship" OR "antibiotic stewardship" OR pharmacovigilance OR "adverse drug reaction*" OR "clinical decision support" OR "electronic prescribing" OR telepharmacy) AND PUBYEAR > 1999 AND PUBYEAR < 2026 AND LANGUAGE(english)
Web of Science Core Collection	TS=(pharmacist* OR "pharmaceutical care" OR "pharmaceutical services" OR "clinical pharmacy") AND TS=("rational use of medicines" OR "rational drug use" OR "drug utilization" OR "drug utilisation" OR "medication therapy management" OR "medication review" OR "medication reconciliation" OR deprescrib* OR "medication safety" OR "medication error*" OR adherence OR "antimicrobial stewardship" OR "antibiotic stewardship" OR pharmacovigilance OR "adverse drug reaction*" OR "clinical decision support" OR "electronic prescribing" OR telepharmacy); Publication years: 2000–2025; Language: English
Google Scholar (supplementary)	Combinations of "pharmacist" with each theme term (e.g. "pharmacist" "rational use of medicines"; "pharmacist" "antimicrobial stewardship"); first 212 records per query screened by relevance ranking.