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# Clinical Pharmacist Interventions in Preventing Medication-Related Hospital Readmissions

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**ABSTRACT:** Hospital readmissions are an important indicator of healthcare quality, continuity of care, and patient safety. Medication-related problems, including adverse drug reactions, medication discrepancies, inappropriate prescribing, non-adherence, and inadequate patient education, may contribute to preventable hospital readmissions. Clinical pharmacists are increasingly involved in medication reconciliation, comprehensive medication review, discharge counselling, and post-discharge follow-up to improve medication safety during transitions of care.

This manuscript presents a systematic-review framework informed by published systematic reviews, meta-analyses, and clinical studies concerning pharmacist-led medication management during hospital admission, discharge, and post-discharge care. A definitive systematic review should search PubMed/MEDLINE, Embase, the Cochrane Library, CINAHL, and other relevant databases using reproducible search strategies. Eligible studies should compare pharmacist-led interventions with usual care or another relevant comparator and report hospital readmissions, medication-related readmissions, emergency department visits, adverse drug events, or other patient-relevant outcomes. Study selection, risk-of-bias assessment, and evidence synthesis must be completed and documented before the manuscript is represented as a fully conducted systematic review.

## 1. INTRODUCTION

Hospital readmissions represent a significant challenge for healthcare systems because they increase healthcare expenditure, disrupt patient recovery, and may indicate gaps in the quality or continuity of care. Medication-related problems are important contributors to potentially preventable readmissions, particularly among patients with multiple chronic conditions and complex medication regimens. These problems include adverse drug reactions, medication discrepancies, inappropriate prescribing, drug interactions, dosing errors, and poor medication adherence. The transition from hospital to home is a particularly vulnerable period because medication regimens frequently change during hospitalization. Patients may experience difficulties understanding new prescriptions, obtaining medicines, following dosing instructions, or recognizing adverse effects. Incomplete communication between hospital professionals, primary care providers, and community pharmacists may further increase medication-related risks. Clinical pharmacists possess specialized expertise in pharmacotherapy, medication safety, and the optimization of drug treatment. Their involvement in transitional care can help identify medication-related problems and support the safe continuation of treatment after discharge. Common interventions include medication reconciliation, comprehensive medication

review, discharge counselling, adherence support, and post-discharge follow-up. Medication reconciliation helps identify discrepancies between a patient's existing medication history and the prescribed discharge regimen. Comprehensive medication review evaluates the appropriateness, effectiveness, safety, and monitoring requirements of individual medicines.

Patient counselling improves understanding of medication changes, administration instructions, potential adverse effects, and warning signs requiring medical attention. Post-discharge follow-up provides an opportunity to identify emerging problems and facilitate timely communication with the treating healthcare team. Collaboration between clinical pharmacists, physicians, nurses, and community healthcare professionals may further strengthen continuity of care. However, the effectiveness of pharmacist-led interventions in reducing hospital readmissions has varied across published studies.

**1. The Role of Clinical Pharmacists**

Clinical pharmacists apply specialized knowledge of pharmacology, therapeutics, pharmacokinetics, medication safety, and patient counselling to improve medication use. Their activities may begin during hospital admission and continue through discharge and community follow-up.

At admission, pharmacists can obtain an accurate medication history, identify discrepancies, assess medication-related risks, and support appropriate prescribing. During hospitalization, they may review treatment effectiveness, identify adverse drug reactions, recommend dose adjustments, and support antimicrobial stewardship. Before discharge, pharmacists can reconcile the final medication regimen, clarify changes, provide patient education, and communicate important information to the next care provider. Post-discharge interventions may include telephone consultations, outpatient medication review, collaboration with primary care physicians, communication with community pharmacists, and referral for further clinical assessment when medication-related concerns arise.

The potential advantage of this approach is continuity. Instead of treating medication reconciliation, counselling, and follow-up as isolated activities, an integrated clinical pharmacy service can connect medication decisions made in hospital with the practical realities of treatment at home.

**1.2 Rationale for the Review**

Previous reviews have examined pharmacist-led medication reconciliation, hospital-based medication reviews, medication counselling, and post-discharge pharmacy services. Their findings suggest benefits for selected outcomes but also demonstrate variability in effectiveness.

For example, Mekonnen and colleagues reported favourable pooled estimates for hospital readmissions and emergency department visits in a review of pharmacist-led medication reconciliation programmes. In contrast, Renaudin and colleagues found no significant difference in all-cause readmissions in a meta-analysis of randomized trials of hospital-based pharmacist-led medication reviews, although drug-related readmissions were reduced.

Differences between these findings may reflect variations in study populations, intervention intensity, professional collaboration, follow-up duration, comparator care, and outcome definitions. Some interventions begin at admission and continue after discharge, whereas others involve a single medication review or counselling session. These approaches should not automatically be considered equivalent.

**2. CONCEPTUAL FRAMEWORK**

**2.1 Medication Safety During Transitions of Care**

Transitions of care occur when responsibility for a patient's treatment moves between healthcare professionals or settings. Common transitions include admission from the community to hospital, transfer between hospital departments, discharge to home, and movement into rehabilitation or long-term care.

Each transition introduces opportunities for communication failures. Medication lists may be incomplete, treatment changes may not be documented clearly, and patients may receive conflicting instructions from different professionals. These problems can lead to omissions, duplications, inappropriate continuation of discontinued medicines, or incorrect dosing.

An effective transition process should establish an accurate medication history, document the reasons for treatment changes, ensure access to prescribed medicines, and communicate relevant information to the next care provider.

Clinical pharmacists can contribute to each of these steps. Their role is particularly valuable when patients use numerous medicines or have complicated treatment regimens that require careful coordination.

**2.2 Mechanisms Linking Pharmacist Interventions to Readmission Prevention**

Pharmacist interventions may prevent readmissions through several mechanisms.

First, medication reconciliation can identify discrepancies between the medication history, inpatient prescriptions, and discharge regimen. Resolving clinically important discrepancies may prevent treatment interruption, duplication, and dosing errors.

Second, comprehensive medication review can identify inappropriate prescribing, contraindications, drug interactions, unnecessary treatment, and inadequate monitoring. Recommendations may improve the balance between therapeutic benefit and medication-related risk.

Third, patient counselling can improve understanding of medication indications, dosing schedules, administration techniques, adverse effects, and warning signs requiring medical attention. Better understanding may support adherence and timely recognition of complications.

Fourth, post-discharge follow-up can identify problems that become apparent only after patients return home. Examples include inability to obtain medicines, difficulty using an inhaler, uncertainty about dose changes, and symptoms suggestive of an adverse reaction.

Finally, communication with prescribers and community healthcare professionals can facilitate timely treatment adjustments and clarify responsibility for ongoing monitoring.

These mechanisms are complementary. Their combined effect may be greater than that of a single intervention when the programme is well coordinated and adapted to patient needs.

**2.3 The Importance of Intervention Intensity**

The term *clinical pharmacist intervention* covers a broad range of activities. Some programmes involve medication reconciliation alone, whereas others include comprehensive medication review, discharge counselling, written medication plans, telephone follow-up, and communication with primary care.

Differences in intervention intensity can influence both clinical outcomes and resource requirements. A brief review may be sufficient to resolve a straightforward discrepancy, while patients with multiple chronic conditions may require repeated consultations and coordinated monitoring.

However, greater intervention intensity does not necessarily guarantee better outcomes. Additional activities must be clinically relevant, delivered at appropriate times, and integrated into the wider care pathway.

Future research should describe intervention components, timing, duration, professional responsibilities, and fidelity to the planned protocol in sufficient detail to allow replication.

**2.4 Patient-Level and System-Level Influences**

Medication-related readmissions are influenced by factors beyond the prescribing process. These include health literacy, cognitive impairment, physical limitations, affordability of medicines, availability of caregivers, transportation, access to primary care, and the complexity of chronic disease management.

Healthcare-system characteristics are also important. Pharmacist availability, staffing levels, electronic health record interoperability, prescribing authority, discharge procedures, and communication between hospital and community services can affect intervention delivery.

Consequently, the same pharmacist-led programme may produce different outcomes in different settings. Evaluation should account for both clinical characteristics and the organization of care.

## 3. METHODS

### 3.1 Review Design and Reporting Standards

The review should be conducted as a systematic review using a prespecified protocol and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement.

PRISMA 2020 provides guidance for reporting the rationale, objectives, eligibility criteria, information sources, search methods, study-selection process, data collection, risk-of-bias assessment, synthesis methods, and results of a systematic review.

The protocol should be finalized before screening begins. Where feasible, it should be registered in an appropriate prospective review registry, such as PROSPERO, provided the review meets the registry's eligibility requirements. Registration details must be added only after registration has actually occurred.

The present manuscript provides a structured evidence synthesis and a reproducible methodological framework. It should not be interpreted as proof that a new systematic database search, independent dual screening, or a new meta-analysis has already been completed.

### 3.2 Review Question

The review question can be structured according to the Population, Intervention, Comparator, Outcomes, and Study design framework:

**Population:** Adults or children discharged from hospital, with particular attention to patients receiving multiple medicines, patients with chronic diseases, older adults, and individuals at elevated risk of medication-related harm.

**Intervention:** Clinical pharmacist-led or pharmacist-involved medication reconciliation, medication review, prescribing optimization, discharge counselling, medication adherence support, and post-discharge follow-up.

**Comparator:** Usual care, standard discharge procedures, non-pharmacist-led medication management, or another relevant intervention.

**Outcomes:** Medication-related hospital readmissions, all-cause hospital readmissions, emergency department visits, adverse drug events, medication discrepancies, medication adherence, mortality, length of stay, patient satisfaction, and healthcare costs.

**Study designs:** Randomized controlled trials, controlled clinical trials, and eligible non-randomized comparative studies. Observational designs should be included or excluded according to a prespecified protocol.

The primary outcome should be defined in advance. A suitable primary outcome is the proportion of patients experiencing at least one adjudicated medication-related hospital readmission within 30 days after discharge. If evidence is insufficient for this exact outcome, the protocol should specify how related outcomes will be handled.

## 4. CHARACTERISTICS OF CLINICAL PHARMACIST INTERVENTIONS

### 4.1 Medication Reconciliation

Medication reconciliation is the process of obtaining an accurate medication history, comparing it with current prescriptions, identifying discrepancies, and resolving clinically important differences.

It is particularly important during admission and discharge, when treatment regimens may change rapidly. Pharmacists can use prescription records, medication containers, patient interviews, caregiver information, and communication with community providers to construct a reliable medication history.

Discrepancies may be intentional or unintentional. An intentional change may reflect an appropriate clinical decision, whereas an unexplained omission or duplication may indicate a medication-safety problem. Clinical context is therefore essential when interpreting discrepancies.

Medication reconciliation is a central component of many pharmacist-led transition programmes. Nevertheless, reconciliation alone may be insufficient to prevent readmission if identified problems remain unresolved, patients cannot obtain their medicines, or follow-up arrangements are inadequate.

### 4.2 Comprehensive Medication Review

Comprehensive medication review evaluates whether each medicine is indicated, effective, safe, and appropriate for the individual patient.

The review may identify unnecessary therapy, therapeutic duplication, drug interactions, contraindications, inappropriate dosing, inadequate treatment, and opportunities for simplification. Renal and hepatic function, age, frailty, laboratory findings, comorbidities, and treatment goals should inform the assessment.

Medication review may be especially relevant for patients receiving multiple medicines or drugs associated with serious harm if used incorrectly. Examples include anticoagulants, insulin and other glucose-lowering agents, opioids, immunosuppressants, and medicines requiring therapeutic drug monitoring.

Pharmacists should communicate recommendations clearly to the responsible prescriber and document whether the recommendations were accepted, modified, or declined. The clinical outcome depends not merely on identifying a problem but on implementing an appropriate response.

### 4.3 Discharge Counselling and Patient Education

Discharge counselling aims to ensure that patients understand their medication regimens and can use their medicines safely at home.

Important elements include medication indications, dose and timing, administration techniques, missed-dose instructions where appropriate, expected adverse effects, serious warning signs, monitoring requirements, and the purpose of treatment changes.

Counselling should be tailored to the patient's health literacy, language, cognitive capacity, and preferred learning method. Written instructions should be consistent with the final prescription and should avoid unexplained medical terminology.

The teach-back method can help assess understanding by asking patients to explain the medication plan in their own words. Caregivers should be involved when appropriate and with the patient's consent.

Education alone may not overcome financial barriers, cognitive impairment, inadequate access to medicines, or poor coordination between providers. It is therefore best viewed as one component of a broader intervention.

### 4.4 Post-Discharge Follow-Up

The early post-discharge period provides an opportunity to identify medication problems before they lead to serious clinical deterioration.

Follow-up may be conducted by telephone, secure digital communication, outpatient consultation, home visit, or collaboration with community pharmacists. The appropriate approach depends on patient risk, clinical complexity, local resources, and the nature of the intervention.

A structured follow-up consultation may assess whether prescribed medicines have been obtained, whether the patient understands the regimen, whether adverse effects have occurred, and whether monitoring has been completed.

Pharmacists should establish clear pathways for escalating concerns to prescribers or emergency services. Follow-up should not delay urgent clinical evaluation when a patient reports symptoms suggestive of a serious adverse drug event.

### 4.5 Communication with Primary Care and Community Pharmacy

Medication-related readmission prevention requires continuity between hospital and community care. Pharmacists can support this continuity by transmitting an accurate discharge medication list, explaining medication changes, identifying outstanding monitoring requirements, and communicating unresolved concerns.

Effective communication should specify which medicines have been started, stopped, or changed and why. It should also identify who is responsible for subsequent review and monitoring.

Electronic discharge summaries may improve the availability of medication information, but interoperability problems and incomplete documentation can undermine their usefulness. Direct communication may be necessary for high-risk changes or unresolved safety concerns.

Collaboration with primary care physicians and community pharmacists can help ensure that medication plans remain appropriate as the patient's condition evolves after discharge.

## 5. EVIDENCE FROM PUBLISHED SYSTEMATIC REVIEWS AND META-ANALYSES

### 5.1 Pharmacist-Led Medication Reconciliation at Care Transitions

Mekonnen, McLachlan, and Brien published a systematic review and meta-analysis evaluating pharmacist-led medication reconciliation programmes during hospital transitions. Their review included 17 studies involving 21,342 adult patients, of which eight were randomized controlled trials.

The authors reported a pooled relative risk of 0.81 for hospital readmission, with a 95% confidence interval of 0.70–0.95. They also reported reductions in adverse drug event-related hospital revisits and emergency department visits. The corresponding estimates were RR 0.33 (95% CI 0.20–0.53) and RR 0.72 (95% CI 0.57–0.92), respectively.

These findings suggest that comprehensive pharmacist-led medication reconciliation programmes may improve post-hospital healthcare utilization. However, the studies differed in intervention components, settings, follow-up periods, and methodological quality. The pooled results should not be interpreted as proof that every medication reconciliation intervention will produce the same benefit.

The findings also highlight the importance of distinguishing a comprehensive programme from a single reconciliation activity. Several included interventions combined reconciliation with counselling, telephone follow-up, or other medication-management activities.

### 5.2 Hospital-Based Medication Review

Renaudin and colleagues examined randomized controlled trials of pharmacist-led medication reviews conducted in hospital settings. Their review included 19 randomized trials involving 4,805 participants.

The pooled estimate for all-cause readmissions did not demonstrate a statistically significant difference between intervention and control groups (RR 0.97; 95% CI 0.89–1.05). However, drug-related readmissions were lower in the intervention group (RR 0.25; 95% CI 0.14–0.45). All-cause emergency department visits were also reduced (RR 0.70; 95% CI 0.59–0.85).

These results are clinically important because they suggest that pharmacist-led medication review may influence medication-specific outcomes more consistently than broader readmission outcomes.

The findings should nevertheless be interpreted cautiously. The review authors described the evidence as low quality and emphasized the need for stronger randomized trials. Differences in intervention design and study populations may have affected the observed estimates.

### 5.3 Community Medication Reconciliation After Discharge

A systematic review by Nazar and colleagues examined pharmacist-led medication reconciliation in community settings after hospital discharge. The review included 14 studies comprising randomized trials, cohort studies, and pre-post intervention studies.

The evidence indicated that pharmacists could identify and resolve medication discrepancies. However, the included studies did not consistently demonstrate reductions in hospital readmissions, emergency department attendance, or primary care workload.

This distinction illustrates the difference between a process outcome and a patient outcome. Improving medication-list accuracy is valuable, but the clinical effect depends on the relevance of identified discrepancies, the effectiveness of corrective action, and the patient's broader clinical circumstances.

Community-based services may be particularly valuable when patients encounter problems that cannot be identified reliably during hospitalization. Nevertheless, their effects should be evaluated using robust comparative designs.

### 5.4 Post-Discharge Pharmacist Medication Review Clinics

A systematic review published in 2023 examined hospital-based post-discharge pharmacist medication review clinics and included 57 studies, comprising 14 randomized controlled trials and 43 non-randomized studies.

The review identified several service models, including post-discharge pharmacist review alone, inpatient interventions combined with post-discharge review, and collaborative clinics involving pharmacists and other healthcare professionals.

The authors found substantial variation in pharmacist activities and reported outcomes. This heterogeneity made it difficult to determine which specific activities were responsible for favourable clinical results.

The review supports the importance of clearly describing the intervention delivered in both study arms. Without this information, differences in outcomes cannot be attributed confidently to a particular pharmacist activity.

## 6. EFFECTS ON MEDICATION-RELATED AND ALL-CAUSE READMISSIONS

### 6.1 Medication-Related Readmissions as a Primary Outcome

Medication-related readmission is a clinically relevant endpoint for interventions designed specifically to improve medication safety. It may be more sensitive than all-cause readmission to the effects of medication reconciliation, treatment review, and adherence support.

However, outcome classification requires consistent criteria. Studies should specify how medication causality is assessed, whether reviewers are blinded to treatment allocation, and whether readmissions are classified as definitely, probably, possibly, or unlikely to be medication-related.

Independent adjudication using standardized criteria can reduce the risk that intervention groups appear to have fewer medication-related events simply because their records contain more detailed medication information.

Future trials should distinguish between readmissions caused directly by adverse drug events and those associated with medication omissions, non-adherence, inadequate treatment, or unresolved discrepancies.

### 6.2 All-Cause Hospital Readmissions

All-cause readmission is widely used because it is relatively straightforward to measure and captures the overall burden of subsequent hospitalization. Nevertheless, it may be influenced by many factors that are not directly affected by medication interventions.

For example, a pharmacist may successfully prevent an anticoagulant-related bleeding event while a patient is readmitted for pneumonia. The intervention may have improved medication safety without changing the all-cause readmission outcome.

Conversely, a reduction in all-cause readmissions does not necessarily establish that medication-related events were prevented. The difference may reflect changes in follow-up, disease management, access to outpatient services, or other components of a multifaceted intervention.

Both outcomes should therefore be reported whenever feasible.

### 6.3 Thirty-Day Readmission

Thirty-day readmission is a common endpoint because it captures an important period of post-discharge vulnerability while allowing sufficient time for many transitional-care interventions to exert an effect.

A systematic review and meta-analysis of randomized trials evaluating pharmacist medication counselling reported an association with improved medication adherence and reduced 30-day hospital readmission. The authors nevertheless noted that the overall methodological quality of the evidence ranged from low to very low.

Thirty-day outcomes should be interpreted alongside longer follow-up periods. Some medication-related complications occur after the first month, while early readmissions may be driven by conditions that were already developing before discharge.

Researchers should also distinguish the proportion of patients readmitted at least once from the total number of readmission events. These measures answer different questions and should not be treated as interchangeable.

## 7. HIGH-RISK POPULATIONS AND CLINICAL SETTINGS

### 7.1 Older Adults With Polypharmacy

Older adults are frequently exposed to complex medication regimens because of multimorbidity, frailty, and the involvement of multiple prescribers. Age-related changes in renal function, hepatic function, body composition, and drug sensitivity can increase susceptibility to adverse effects.

Polypharmacy is not necessarily inappropriate, because many patients require several medicines to manage multiple conditions. The clinical concern is the use of medicines whose combined risks, benefits, and monitoring requirements are not adequately reviewed.

Clinical pharmacists can assess potentially inappropriate medicines, dosing, drug interactions, anticholinergic burden, fall risk, and opportunities for regimen simplification. They can also support shared decision-making when deprescribing is considered.

The success of these interventions should be assessed through clinically relevant outcomes rather than the number of medicines discontinued.

### 7.2 Patients With Cardiovascular Disease

Patients discharged after heart failure, myocardial infarction, arrhythmia, or other cardiovascular conditions may receive multiple medicines requiring careful monitoring.

Anticoagulants, antiplatelet agents, diuretics, renin–angiotensin system medicines, and other cardiovascular therapies can produce important benefits but may also cause harm if dosing, adherence, or monitoring is inadequate.

Clinical pharmacists can verify treatment regimens, assess interactions, review renal function and electrolytes, and reinforce instructions concerning monitoring and warning symptoms.

In heart failure, for example, medication counselling may address dosing schedules, monitoring, and the importance of seeking clinical assessment when symptoms worsen. Pharmacist interventions should complement, rather than replace, medical assessment and multidisciplinary disease management.

### 7.3 Patients With Diabetes

Medication-related problems in diabetes include hypoglycaemia, dosing errors, misunderstanding of insulin regimens, inappropriate use of glucose-lowering medicines during acute illness, and difficulties obtaining medicines or monitoring supplies.

At discharge, pharmacists can verify the intended regimen, assess the patient's ability to administer treatment, explain monitoring requirements, and identify potential barriers to adherence.

Patients with changing renal function, reduced oral intake, or complex insulin schedules may require particular attention. Clear communication with the treating clinician is essential when treatment adjustments are needed.

Readmission prevention in diabetes also depends on nutrition, disease education, access to follow-up, and recognition of complications. Medication-focused interventions should therefore be integrated with broader diabetes care.

### 7.4 Patients With Renal or Hepatic Impairment

Renal and hepatic impairment can alter drug clearance and increase the risk of accumulation, toxicity, and adverse reactions. Medication regimens that were appropriate before an acute illness may become unsuitable following changes in organ function.

Clinical pharmacists can assess whether doses require adjustment, whether contraindications apply, and whether additional monitoring is needed. They can also review medicines that may worsen renal function or interact with treatments used during hospitalization.

Discharge planning should document important monitoring requirements and identify the professional responsible for reviewing results.

These activities may be especially relevant for patients whose organ function remains unstable at discharge.

**CONCLUSION**

Clinical pharmacist interventions represent an important strategy for improving medication safety during transitions of care and potentially preventing avoidable hospital readmissions. Medication reconciliation, comprehensive medication review, discharge counselling, adherence support, and post-discharge follow-up address different but interconnected causes of medication-related harm.

Published systematic reviews and meta-analyses suggest that pharmacist-led programmes can improve medication management and may reduce selected outcomes, particularly drug-related readmissions and medication-related hospital revisits. However, the evidence for reducing all-cause hospital readmissions remains inconsistent, and intervention effectiveness varies across populations and healthcare settings.

The most promising approach appears to be a coordinated model that combines accurate medication information, individualized treatment review, patient education, communication with community healthcare professionals, and timely follow-up. Implementation should be supported by adequate staffing, clear professional responsibilities, appropriate digital infrastructure, and continuous evaluation.

Future research should use standardized definitions, rigorous study designs, transparent intervention reporting, and patient-centred outcomes. Particular attention should be given to identifying the populations most likely to benefit and determining the most effective combination and timing of pharmacist activities.

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