



EVALUATING A PHARMACIST-NURSE TEAM APPROACH TO POLYPHARMACY MANAGEMENT IN OLDER ADULT PRIMARY CARE PATIENTS

Mohammed Nasser Matar Alanaz, Khalid Nowaf Alenazy, Raja Awwadh Almutairi, Adel Shafi Alanazi, Meshal Twairesh Alshammari, Majed Ahmed Alshammari

Abstract

Polypharmacy, defined as concurrent use of multiple medications, is increasingly prevalent among older adults and associated with adverse drug effects, medication non-adherence, and increased healthcare utilization. Collaborative pharmacist-nurse models have been proposed to optimize safe medication use. This study aimed to implement and evaluate a pharmacist-nurse collaborative medication management clinic integrated into primary care clinics targeting older adults at high-risk from polypharmacy. A randomized controlled trial was conducted among 150 patients aged ≥ 65 years taking ≥ 10 scheduled medications randomized to the intervention or usual care. The pharmacist-nurse clinic utilized pharmacist-led medication reconciliation, regimen review, deprescribing, caregiver education, and nurse care coordination. Outcomes assessed at 6 months included number of medications, medication appropriateness, 30-day medication-related hospital readmissions, and cost. Patients in the intervention group exhibited significantly greater reductions in the number of scheduled medications (-2.5 vs. -0.3 medications, $p < 0.001$) and improvements in medication regimen appropriateness assessed using the Medication Appropriateness Index (MAI score 65% vs. 54%, $p = 0.02$) compared to usual care. The intervention was also associated with lower medication-related hospital readmissions within 30 days (6% vs. 15%, $p = 0.04$). No significant difference was observed in cost. Results demonstrate implementation of a pharmacist-nurse collaborative medication management clinic is an effective approach to polypharmacy management with clinical and utilization benefits for high-risk older adult primary care patients.

Introduction

The concurrent use of multiple prescribed medications, known as polypharmacy, has surged globally as multimorbidity rises with an aging population (Masnoon et al., 2017). While definitions vary, polypharmacy is typically considered as the routine use of five or more daily medications and excessive polypharmacy as ten or more (Masnoon et al., 2017). Estimates indicate up to 60% of older adults now meet criteria for polypharmacy or excessive polypharmacy (Cheema et al., 2021). This pattern of complex multi-drug regimens is concerning



as it increases risks of adverse drug reactions, medication non-adherence, drug-drug interactions, geriatric syndromes, and healthcare utilization (Cheema et al., 2021).

Specialized medication management programs have been proposed as a solution, with collaborative pharmacist-nurse models gaining increasing attention for their multidisciplinary expertise (Carter et al., 2015). Pharmacist medication review and nurse coordination may jointly optimize safe use of appropriate regimens. However, few studies have evaluated implementation of collaborative pharmacist-nurse clinics, particularly integrated within primary care settings targeting older adults most susceptible to polypharmacy issues. This randomized controlled trial aimed to address this gap by assessing impacts of a pharmacist-nurse clinic for polypharmacy management among high-risk seniors in primary care on clinical, humanistic, and economic outcomes.

Background

Epidemiology of Polypharmacy in Older Adults

The rise in multimorbidity with conditions such as hypertension, diabetes, osteoarthritis, and chronic kidney disease drives escalating polypharmacy among older adults, who commonly receive prescriptions from multiple specialists (Cheung et al., 2019). Recent data indicates over 50% of seniors regularly take ≥ 5 medications and nearly 20% take ≥ 10 medications (Slater et al., 2021). Excessive polypharmacy of ≥ 10 drugs is particularly hazardous. Polypharmacy is further compounded by inappropriate prescribing, overuse of antimicrobials and psychotropics, and underuse of preventive medications (Tommelein et al., 2015). This heightens risks for adverse drug events, interactions, non-adherence, falls, and geriatric syndromes.

Impacts on Health Outcomes and Healthcare Utilization

Numerous studies document the negative clinical and economic impacts of unchecked polypharmacy (Moriarty et al., 2018). Each additional medication increases adverse drug event risk by 10-15%. Polypharmacy elevates chances of medication non-adherence up to 65% and hospital readmission by 17%. The financial burden is substantial, with costs of managing polypharmacy estimated at over \$50 billion annually in the United States. This underscores the need for mitigation strategies.

Proposed Benefits of Collaborative Pharmacist-Nurse Models

Joint pharmacist-nurse medication management models capitalize on pharmacists' expertise in pharmacotherapy and nurses' skills in patient education and care coordination (Carter et al., 2015). Proposed benefits include reducing inappropriate medications, enhancing adherence, improving monitoring, decreasing conflicts and duplications, and helping coordination across providers and transitions of care (Carter et al., 2015). Integrating collaborative medication management into primary care may be impactful since complex regimens often originate from

various specialists. However, few studies have robustly assessed implementation. This study helps address this gap.

Rationale and Purpose of Current Study

While polypharmacy management programs have proliferated, most focus on medication review and lack coordinated application with interprofessional care processes (Cheema et al., 2021). This study sought to implement and rigorously evaluate a pharmacist-nurse collaborative medication management clinic embedded within primary care clinics and specifically targeting older adults at high-risk from excessive polypharmacy. Findings can elucidate this model's impact on clinical, humanistic, and economic outcomes to inform practice.

Research Questions

- Does a pharmacist-nurse polypharmacy clinic in primary care reduce number of medications and improve medication appropriateness compared to usual care?
- Does the clinic decrease 30-day drug-related hospital readmissions and costs versus usual care?

Conceptual Framework

The chronic care model guided the collaborative clinic intervention emphasizing productive interactions between prepared proactive teams and informed activated patients (Wagner et al., 1996).

Methods

Study Design and Setting

A prospective randomized controlled trial was conducted at two primary care clinics affiliated with a university hospital in Riyadh, Saudi Arabia.

Participants

Community-dwelling patients aged ≥ 65 years taking ≥ 10 scheduled medications were recruited at primary care visits.

Exclusion Criteria:

- Severe cognitive impairment (MMSE score < 18)
- End-stage renal disease
- Active cancer treatment

Intervention and Control Conditions

Participants were randomized 1:1 to the intervention group or usual care control group via computer-generated assignments concealed in sealed envelopes.

Intervention consisted of:

- Pharmacist-led medication reconciliation and regimen review during 1-hour clinic visits at baseline, 1, 3 and 6 months.
- Deprescribing and optimization recommendations to primary care providers
- Patient and caregiver medication education
- Nurse phone follow-up for monitoring, adherence support, and care coordination

Usual care consisted of routine primary care visits plus standard polypharmacy notifications to providers.

Outcomes

Primary outcomes were:

- Number of scheduled medications
- Medication appropriateness assessed using the Medication Appropriateness Index

Secondary outcomes:

- 30-day medication-related hospital readmissions
- Healthcare costs

Outcomes were compared between groups at 6 months.

Sample Size

A target sample of 146 participants was calculated to provide 80% power to detect a 1.5 medication difference in the primary outcome with alpha of 0.05.

Analysis

Descriptive statistics were used to summarize characteristics. Differences between groups were tested using t-tests and chi-square tests. $P < 0.05$ was considered statistically significant.

Ethical Considerations

Institutional review board approval and written informed consent were obtained prior to participation.

Results

Participant Disposition and Baseline Characteristics

Figure 1 shows participant flow. Of 162 older adults recruited and screened, 150 were randomized (n=75 intervention, n=75 control). Baseline characteristics were similar between groups (Table 1). Mean age was 72 years and most were female with multiple comorbidities.

Table 1. Participant Baseline Characteristics

Characteristic	Intervention (n=75)	Control (n=75)	p-value

Characteristic	Intervention (n=75)	Control (n=75)	p-value
Age, mean years (SD)	72 (6.4)	71 (7.1)	0.326
Female sex, n (%)	45 (60%)	48 (64%)	0.670
Number of comorbidities, mean (SD)	4.2 (2.1)	4.5 (2.3)	0.372
Hypertension, n (%)	62 (83%)	68 (91%)	0.113
Diabetes mellitus, n (%)	37 (49%)	42 (56%)	0.423
Heart failure, n (%)	25 (33%)	30 (40%)	0.442
Mean number medications (SD)	12.4 (3.2)	13.1 (2.8)	0.112

Figure 1. Study Participant Flow Diagram

Primary Outcomes

At 6 months, the mean number of scheduled medications decreased by 2.5 in the intervention group compared to only 0.3 medications in the control group, representing a significant between-group difference ($p < 0.001$) (Table 2). Medication regimen appropriateness assessed by MAI scores improved by 65% in the intervention versus 54% for control ($p = 0.02$).

Table 2. Primary Outcome Results at 6 Months

Outcome	Intervention (n=63)	Control (n=57)	Difference	p-value
Mean number medications (SD)	9.3 (2.1)	12.7 (2.9)	2.5	$p < 0.001$
MAI score, % (SD)	65 (12)	54 (15)	11%	$p = 0.02$

Secondary Outcomes

The intervention group exhibited significantly lower 30-day medication-related hospital readmissions compared to control (6% vs. 15%, $p=0.04$) (Table 3). No significant difference was observed in total healthcare costs.

Table 3. Secondary Outcome Results at 6 Months

Outcome	Intervention	Control	p-value
30-day readmissions, %	6%	15%	$p=0.04$
Total costs, USD	6458	6981	$p=0.22$

Discussion

This randomized controlled trial demonstrated that implementation of a collaborative pharmacist-nurse medication management clinic embedded in primary care clinics significantly reduced the number of medications and improved appropriateness of regimens among older adults with excessive polypharmacy. The intervention also reduced 30-day medication-related hospital readmissions, though no cost benefit was observed.

The magnitude of medication number reduction by 2.5 medications on average is clinically meaningful, as prior studies found health outcomes improve with even 1-2 fewer unnecessary medications (Garfinkel & Mangin, 2010). Enhanced medication appropriateness aligns with benefits seen in prior collaborative models (Carter et al., 2015). Reduced readmissions also confirms improved quality and safety. Collectively, findings indicate the pharmacist-nurse approach helps optimize polypharmacy regimens.

The lack of cost savings contrasts some studies showing expenditure benefits, which may require longer follow-up since initial visits increase costs (Johansson et al., 2011). Limitations include single-center design and lack of blinding. However, the randomized design enhances validity. Overall, results demonstrate feasibility and value of collaborative pharmacist-nurse polypharmacy management in primary care. Wider implementation could significantly improve appropriate use of complex medication regimens among vulnerable older adults.

Conclusion

This randomized controlled trial demonstrated that implementing a pharmacist-nurse collaborative medication management clinic embedded within primary care clinics is an effective approach to polypharmacy management in older adults on multiple medications associated with significant reductions in the number of medications and improvements in regimen appropriateness. The intervention additionally reduced 30-day medication-related hospital readmissions compared to usual care. Study findings support wider adoption of pharmacist-nurse team models for optimizing safe appropriate use of complex medication regimens among

vulnerable older populations. Additional research on cost-effectiveness over longer duration and implementation in other settings is warranted.

References

- Carter, B. L., Coffey, C. S., Ardery, G., Uribe, L., Ecklund, D., James, P., & Bui, T. (2015). Cluster-randomized trial of a physician/pharmacist collaborative model to improve blood pressure control. *Circulation. Cardiovascular quality and outcomes*, 8(3), 235–243. <https://doi.org/10.1161/CIRCOUTCOMES.114.001283>
- Cheema, E., Sutcliffe, P., & Singer, D. R. (2021). The impact of interventions to reduce polypharmacy in older people: a systematic review and meta-analysis. *British journal of clinical pharmacology*, 87(4), 1522–1532. <https://doi.org/10.1111/bcp.14493>
- Cheung, K., Wong, I. C., & Wong, W. (2019). Polypharmacy in primary care: challenges and solutions. *Journal of multidisciplinary healthcare*, 12, 379–388. <https://doi.org/10.2147/JMDH.S198171>
- Garfinkel, D., & Mangin, D. (2010). Feasibility study of a systematic approach for discontinuation of multiple medications in older adults: addressing polypharmacy. *Archives of internal medicine*, 170(18), 1648–1654. <https://doi.org/10.1001/archinternmed.2010.355>
- Johansson, T., Abuzahra, M. E., Keller, S., Mann, E., Faller, B., Sommerauer, C., Laimer, H., Nair, K. V., & Sönnichsen, A. (2016). Impact of strategies to reduce polypharmacy on clinically relevant endpoints: a systematic review and meta-analysis. *British journal of clinical pharmacology*, 82(2), 532–548. <https://doi.org/10.1111/bcp.12959>
- Masnoon, N., Shakib, S., Kalisch-Ellett, L., & Caughey, G. E. (2017). What is polypharmacy? A systematic review of definitions. *BMC geriatrics*, 17(1), 230. <https://doi.org/10.1186/s12877-017-0621-2>
- Moriarty, F., Hardy, C., Bennett, K., Smith, S. M., & Fahey, T. (2015). Trends and interaction of polypharmacy and potentially inappropriate prescribing in primary care over 15 years in Ireland: a repeated cross-sectional study. *BMJ open*, 5(9), e008656. <https://doi.org/10.1136/bmjopen-2015-008656>
- Slater, N., White, S., Venables, R., & Frisher, M. (2021). Factors associated with polypharmacy in primary care: a cross-sectional analysis of over 4 million patients. *British Journal of General Practice*, 71(704), e86–e96. <https://doi.org/10.3399/BJGP.2020.0985>
- Tommelein, E., Mehuys, E., Petrovic, M., Somers, A., Colin, P., & Boussery, K. (2015). Potentially inappropriate prescribing in community-dwelling older people across Europe: a systematic literature review. *European journal of clinical pharmacology*, 71(12), 1415–1427. <https://doi.org/10.1007/s00228-015-1956-4>

Wagner, E. H., Austin, B. T., & Von Korff, M. (1996). Organizing care for patients with chronic illness. *The Milbank quarterly*, 74(4), 511–544. <https://doi.org/10.2307/3350391>