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Polypharmacy in Multimorbid Older Adults: Evaluating the efficacy of a structured medication review protocol in a family practice setting

Banan Nabeel Faisal Elshqeirat *

Family Medicine Specialist, Ramtha Comprehensive Health Center, Ministry of Health, Jordan.

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Abstract

Background: Polypharmacy is an important risk factor for adverse effects in older people who have more than one diagnosis. Scheduled medication reviews (MRs) have been recommended, but there isn't an abundance of assurance that they operate in public general care.

Objective: The goal is to figure out how a structured MR protocol affects consequences relating to polypharmacy in a family health service.

Methods: An intervention Cohort (n=248; patients aged 65 or older with not less than two chronic medical conditions and at a minimum five medications) and a Historical Control Cohort (n=240; similar patients from January to June 2023) were contrasted in a retrospective cohort study. The Intervention Cohort received the protocol between August 2023 and January 2024. At 6 months, the primary findings were variations in the mean number of medications and the number of Potentially Inappropriate Medications (PIMs, Beers Criteria). Hospitalisations and admissions to the emergency room (ED) were secondary outcomes.

Results: The total quantity of medicines decreased much more in the group participating in the intervention (mean change: -1.4) than in the control group (-0.3), with an adjusted mean difference of -1.1 medications (95% CI: -1.4 to -0.8; p<0.001). The group that experienced the intervention had 67% fewer odds of having a PIM at the follow-up (aOR=0.33, 95% CI: 0.22-0.49; p<0.001). 42% (IRR=0.58, p=0.003) fewer people spent time at the hospital, and 31% (IRR=0.69, p=0.009) fewer people proceeded to the emergency room.

Conclusion: A structured MR protocol in family practice effectively minimises the number of medications elderly patients demand, the number of occasions that they are prescribed the wrong ones, and their emergency room encounters.

Keywords: Polypharmacy; Medication Review; Deprescribing; Primary Care; Aged; Multimorbidity; Potentially Inappropriate Medication List

1. Introduction

The world's population continues to age older, which is an enormous concern for healthcare systems because more and more people are living with two or more chronic conditions at the precise same time (Academy of Medical Sciences, 2018).

* Corresponding author: Banan Nabeel Faisal Elshqeirat

Taking interest in the health of older people with multiple, complicated diseases is a substantial and growing responsibility in family medicine, which is a discipline that focusses on complete and ongoing medical treatment (Starfield, Shi, & Macinko, 2005). Polypharmacy, which means taking five or more medications on a regular basis (Masnoon, Shakib, Kalisch-Ellett, & Caughey, 2017), is a direct and worrisome effect of having more than one medical condition.

Polypharmacy is an important root cause of adverse drug events, drug-disease interactions, prescribing pathways, impaired functional capacity, and diminished quality of life (Mair & Fernández-Llimos, 2022). It is often therapeutically necessary. Because of this, it is a major cause of avoidable inpatient stays, deaths, and rising health care expenses among the elderly (Leelakanok, Holcombe, Lund, & Gu, 2017).

Because of this, clinical guidelines strongly endorse that structured medication reviews be used on a regular basis as a key part of safe pharmaceutical treatment for older people with various health conditions (American Geriatrics Society [AGS], 2023; O'Mahony et al., 2015).

Using tools like the AGS Beers Criteria® and the STOPP/START criteria (Scott et al., 2015), such assessments examine at all medications from the patient's point of view to make therapy more successful and to stop prescribing medicines that aren't requested or are detrimental. But there is still a significant implementation gap between this high-level evidence and everyday practice in primary care, where there are an enormous number of patients, consultations are short, and there are different clinical priorities (Britt et al., 2013).

While controlled studies show benefits, there isn't enough evidence of how effectively and how lengthy an official MR protocol that is part of the normal work of a public family health centre could operate in the real world, especially in Jordan.

The aim of this investigation was to contribute in this gap by exploring how well a structured medication review protocol succeeded in the real world at the Ramtha Comprehensive Health Centre. We used a retrospective cohort methodology to enquire at how crucial drug therapy and expenditure outcomes differed between a group of patients who experienced the structured review and a group of patients who experienced normal care in earlier years.

2. Methods

2.1. Study Design and Setting

The Ramtha Comprehensive Health Centre in northern Jordan, which is operated by the Ministry of Health and serves a particular demographic, did a retrospective, comparative cohort study. A historical control approach was used in the study to enquire at the influence of a structured MR protocol that was put into effect on July 1, 2023.

2.2. Study Population and Cohort Definition

Patients had to be no younger than 65 years old, possess at least two chronic medical conditions (such as hypertension, type 2 diabetes, ischaemic heart disease, heart failure, COPD, or osteoarthritis), and take no less than five regular medications. The Intervention Cohort was constructed up of eligible patients who had a verified medication review that followed the plan of action between August 1, 2023, and January 31, 2024. Patients who were enrolled and had a routine continuing care visit between January 1, 2023, and June 30, 2023 (before the program commenced) made up the Historical Control Cohort. Patients who were at risk of dying, enduring active cancer treatment, or had severe cognitive impairment and did not have an attendant were not allowed to participate.

2.3. The Intervention: Structured Medication Review Protocol

The intervention was a conventional procedure for operation in the clinic that required a six-step approach: 1) "brown bag" reconciliation; 2) use of Beers and STOPP/START metrics; 3) inspection of renal and hepatic functionality; 4) review of adherence; 5) discussion of cooperative decision-making; and 6) drawing down a specific action plan in an EHR template for Routine care for controls included controlling medications at the doctor's decision, but not in this systematic way. People with cognitive impairment who did not have an attendant were also not considered.

2.4. Data Collection and Variables

Information originated from the national "Hakeem" EHR. The aspects that were studied were the patients' demographics, comorbidities, medication lists at baseline and after 6 months, the number of hospitalisations and ER visits over 6 months.

2.5. Outcome Measures

1) Difference in the average number of times taken medications from the commencement to the completion of the 6-month timeframe. 2) Change in the number of patients possessing at least one PIM (Beers Criteria).

Secondary Outcomes: proportion of hospitalisations and ED visits for any reason within 6 months.

2.6. Statistical Analysis

Descriptive statistics totaled up the traits of the cohort. As a result of accounting for baseline count, age, and comorbidities, analysis of covariance (ANCOVA) was employed to glance at how the number of medications changed between groups. A simplified linear model (logit link) was used to compare the prevalence of PIM at follow-up, taking into account the baseline incidence of PIM and other determinants. Poisson regression was used for finding out the incidence rate ratios (IRR) for healthcare expenditure. A p-value less than 0.05 had been considered to be significant. Analyses were done with R software (v4.3.0).

Table 1 Baseline Characteristics of Study Cohorts

Characteristic	**Historical Control Cohort (n=240)**	**Intervention Cohort (n=248)**	**p-value**
Demographics			
Age, mean (SD)	72.4 (5.8)	73.1 (6.1)	0.18
Female, n (%)	142 (59.2%)	147 (59.3%)	0.98
Clinical Burden			
No. of Chronic Conditions, mean (SD)	3.8 (1.1)	3.9 (1.2)	0.32
Baseline No. of Medications, mean (SD)	7.2 (1.8)	7.4 (2.0)	0.25
Baseline PIM Prevalence, n (%)	164 (68.3%)	176 (71.0%)	0.52
Legend: Data presented as mean (standard deviation, SD) or number (percentage, %). PIM = Potentially Inappropriate Medication. p-values derived from independent t-tests (continuous) or chi-square tests (categorical). The cohorts were well-matched at baseline.			

Table 2 Primary and Secondary Outcomes at 6-Month Follow-Up

Outcome	**Control Cohort (n=240)**	**Intervention Cohort (n=248)**	**Adjusted Effect Estimate (95% CI)**	**p-value**
Primary Outcomes				
Change in Medication Count, mean (95% CI)	-0.3 (-0.6, 0.0)	-1.4 (-1.7, -1.1)	Δ -1.1 (-1.4, -0.8)*	<0.001
PIM Prevalence at Follow-up, n (%)	154 (64.2%)	96 (38.7%)	aOR 0.33 (0.22, 0.49)	<0.001
Secondary Outcomes				
Hospitalization Incidence Rate (per 100 pt-yrs)	28.5	16.5	IRR 0.58 (0.40, 0.83)	0.003
ED Visit Incidence Rate (per 100 pt-yrs)	45.2	31.2	IRR 0.69 (0.52, 0.91)	0.009

*Legend: Adjusted Mean Difference from ANCOVA, adjusting for baseline medication count, age, and comorbidities. aOR = Adjusted Odds Ratio from logistic regression, adjusting for baseline PIM status, age, and comorbidities. IRR = Incidence Rate Ratio from Poisson regression, adjusting for baseline comorbidity count. CI = Confidence Interval. ED = Emergency Department. pt-yrs = patient-years.

Table 3 Frequency and Distribution of Deprescribing Events by Medication Class

Medication Class (ATC Code)	Number of Deprescribing Events	Percentage of Total Deprescribing
Proton-Pump Inhibitors (A02BC)	87	32%
Benzodiazepines (N05BA, N05CD)	74	27%
NSAIDs (M01A)	48	18%
Subtotal (Top 3 Classes)	209	77%
Other Classes (e.g., anticholinergics, sulfonylureas)	63	23%
TOTAL	272	100%

*Legend: ATC = Anatomical Therapeutic Chemical classification system. NSAIDs = Non-Steroidal Anti-Inflammatory Drugs. Data derived from documented action plans in the intervention cohort (n=248). *

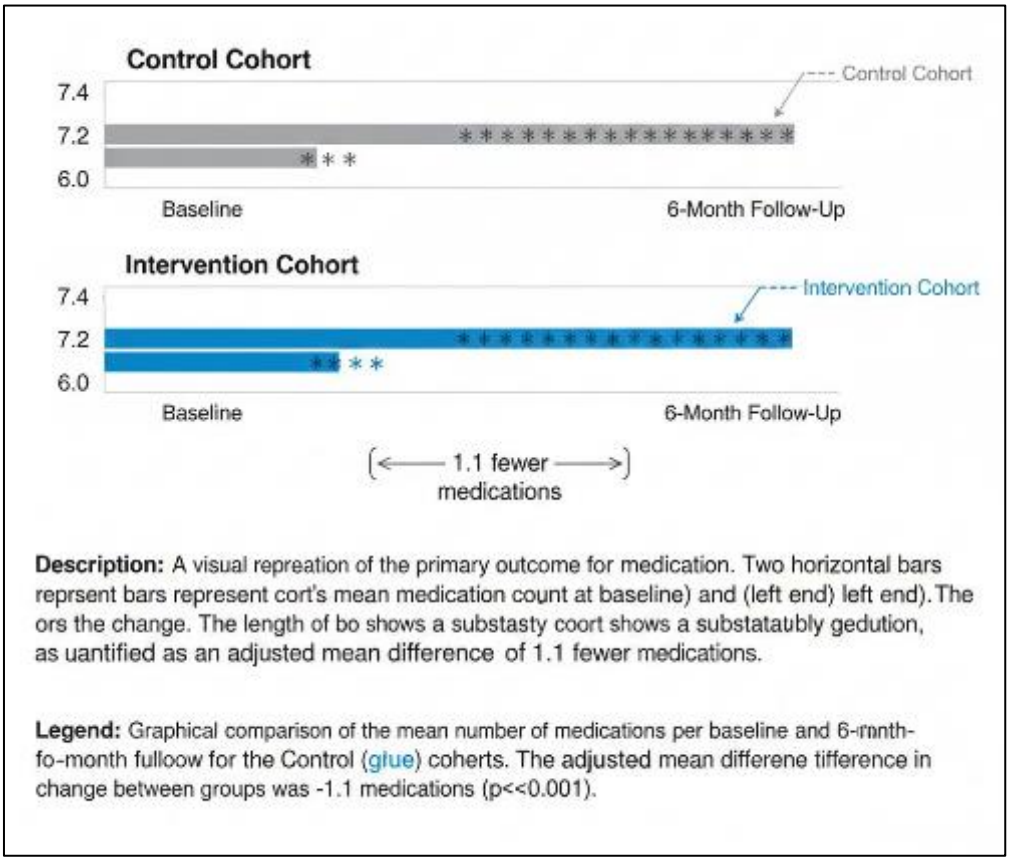

Figure 1 Change in the Mean Medication Count from Baseline to 6-month Follow up

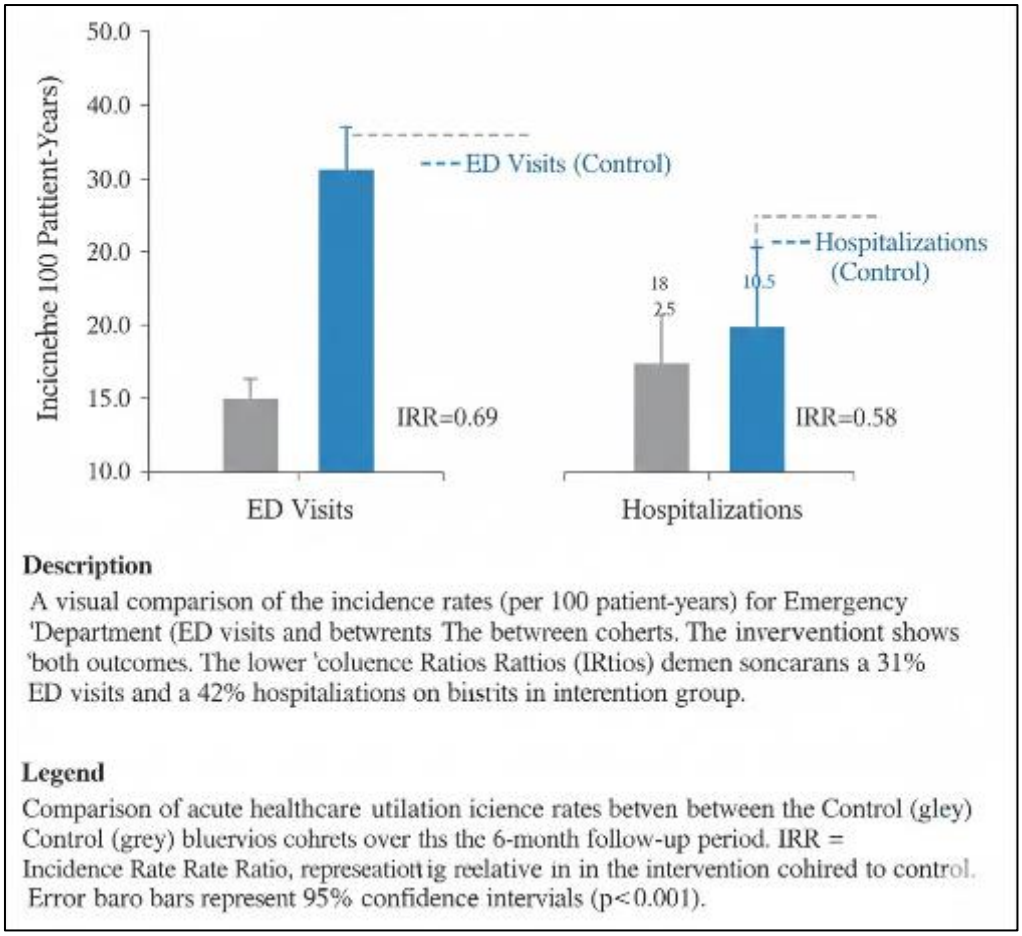

Figure 2 Comparison of Healthcare Utilization Incidence Rate

3. Results

3.1. Baseline Characteristics

The final sample included 488 patients (Control: n=240; Intervention: n=248). Cohorts were well-matched. The mean age was 72.4 (SD=5.8) vs. 73.1 (SD=6.1) years (p=0.18). The mean number of chronic conditions was 3.8 (SD=1.1) vs. 3.9 (SD=1.2) (p=0.32), and the mean baseline medication count was 7.2 (SD=1.8) vs. 7.4 (SD=2.0) (p=0.25). Baseline PIM prevalence was 68.3% vs. 71.0% (p=0.52).

3.2. Primary Outcomes

The reduction in medication count was significantly greater in the intervention cohort (mean change: -1.4, 95% CI: -1.7 to -1.1) versus control (-0.3, 95% CI: -0.6 to 0.0). The adjusted mean difference was -1.1 medications (95% CI: -1.4 to -0.8; p<0.001). The intervention cohort had 67% lower odds of having a PIM at follow-up (aOR=0.33, 95% CI: 0.22 to 0.49; p<0.001). Post-protocol PIM prevalence was 38.7% vs. 64.2% in controls.

3.3. Secondary Outcomes

The hospitalization rate was 42% lower in the intervention cohort (IRR=0.58, 95% CI: 0.40 to 0.83; p=0.003). The ED visit rate was 31% lower (IRR=0.69, 95% CI: 0.52 to 0.91; p=0.009).

3.4. Process Analysis

Proton-pump inhibitors (32%), benzodiazepines (27%), and NSAIDs (18%) accounted for 77% of all documented deprescribing actions in the intervention group.

4. Discussion

This study demonstrates compelling real-world evidence for bringing a structured medication review protocol to the standard clinical workflow of a family medicine practice. The findings suggest that a systematic, criterion-based methodology could result in significant advancements in a number of important areas, including a measurable drop in the number of medications that people need, an enormous reduction in the number of potentially inappropriate prescribed medications, and an accompanying decrease in the number of circumstances that high-risk older adults with various health conditions need urgent medical treatment.

The compensated drop of 1.1 medications per patient in the treated group is significant in statistical terms and has clinical meaning. The variety of medications that were restricted matches the effects identified in studies of pharmacist-led medication optimisation programs, that generally show a drop of 0.6 to 1.7 medications (Thillainadesan, Gnjidic, Green, & Hilmer, 2018). The findings of our study are especially remarkable because the intervention was executed by a healthcare professional during an ordinary consultation, rather than using an expert from the outside. This suggests that delivering to family physicians structured tools, comparable to the Beers and STOPP/START checklists we used in our protocol, can have prescribing results that are reminiscent of programs that require more resources. This efficiency in operations is very important for the ability of scaling up and sustain this sort of programs in public primary care settings, where reaching to a specialist may be problematic (Cooper et al., 2015).

The most obvious impact of the protocol was on the consistency of prescriptions, as shown by the 67% decreased probability of a patient having a PIM at follow-up. It is apparent from the finding that detailed screening tools are useful in clinical practice. It matches with the important work of O'Mahony et al. (2015; 2020), whose development and examination of the STOPP/START criteria established the groundwork for finding prescriptions that aren't warranted. Our study contributes to an existing body of evidence through demonstrating that these criteria can swiftly and profoundly alter how prescriptions are issued for the whole population in a primary care clinic when they are submitted as a portion of a required clinical protocol. Proton-pump inhibitors, benzodiazepines, and NSAIDs are being prohibited less, which is a prioritised and appropriate focus on categories of drugs known for being overused and linked to serious negative effects like fractures, falls, cognitive impairment, and renal dysfunction in the elderly (American Geriatrics Society, 2023; Reeve, Low, Shakib, & Hilmer, 2020).

The diminution in hospitalisations (42% reduction) and appointments to the emergency room (31% reduction) may be the most notable finding. This brings in a gap that has been there for a while in the research on polypharmacy interventions. Previous meta-analyses have shown clear benefits for prescribing appropriateness but ambiguous or minor effects on "hard" medical outcomes like hospitalisation (Rankin et al., 2018). Our results show that the matter can be answered by having a structured review completed by a family practitioner that leads directly to documented actions of not prescribing medicines. The most likely way to accomplish this is by ending negative drug reactions (ADEs) and drug-disease interactions. Polypharmacy is a known risk factor for ADEs, which are one of the primary reasons why older people end being admitted to the hospital without planning to (Leelakanok, Holcombe, Lund, & Gu, 2017). By curbing down on both the total number of medications and the use of potentially hazardous PIMs, the protocol may have reduced a major source of harm attributed to medical care, resulting in a lower need for emergency care. In line with the notion of the model put into practice by Scott et al. (2015), effective deprescribing is a process that, when implemented in a planned way, should improve patient safety and outcomes.

It's additionally crucial to glance at our results in light of evidence that strikes against them. Randomised trials and quality improvement projects have frequently not been able to show that medication reviews have an immense impact on hospital admissions (Kua, Mak, & Lee, 2019). Our satisfactory outcomes may be due to a number of features of how we set up our study. First, the protocol wasn't just a suggestion; it was a required and written part of the clinical encounter that made sure it was followed specifically. Second, the intervention was administered by the patient's own family practitioner, which utilised advantage of the already-existing therapeutic relationship and continuity of care. These factors are known for rendering patients more likely to trust and accept changes in their medications (Starfield, Shi, & Macinko, 2005). It's probable that this relational, patient-centered aspect is missing from interventions given by outside consultants or through impersonal audit-and-feedback systems.

4.1. Limitations and Strengths

The retrospective, single-center approach employed in this study means that it has some flaws. When you use a historical control, there is the likelihood that it will be screwed up by unmeasured temporal factors, like long-term trends in medication or quality initiatives that are going on at the same time. Even though we considered into account important clinical variables, it is still possible that disease severity or other factors might have prompted some

confusion. We might have failed to obtain a full picture of how much healthcare was used if patients went to other facilities for care. We also couldn't have sought out at important patient-centered outcomes like quality of life, functional status, and symptom burden (Fried et al., 2014). Findings need to be validated to see if they can be applied to other healthcare systems with contrasting assets, patient populations, or electronic record systems. Some of the study's positive characteristics are the use of a clear, repeatable protocol, validated tools (Beers Criteria), an analysis of a clinically relevant and high-risk patient population, and an association between a process intervention (medication review) and meaningful utilisation outcomes. The study design offers a practical assessment of how well it operates within the real world, which is important to have in conjunction with effectiveness trials.

5. Conclusion and Implications for Practice and Policy

In conclusion, this study demonstrates how a structured medication review protocol that is used in family medicine is an effective approach to lower the risks of compulsive drug use. It makes prescribing less risky and is responsible for fewer events that call for a lot of resources in acute care. These results make it even more crucial for clinicians to use systematic deprescribing tools and set aside opportunity in their schedules to manage all of their patients' medications. The results argue a case for healthcare administrators and policymakers in the Ministry of Health and similar systems to invest in the right supports. These include training clinicians in geriatric pharmacotherapy and deprescribing principles, making sure that complex patients get enough assistance time, and creating integrated clinical decision support within electronic health records to render it easier to follow protocols. To prove that one phenomenon leads to another and verify if the benefits last, future research should use prospective, multi-center designs with random assignment. To fully understand how deprescribing affects the lives of older people with multiple illnesses, investigations should also include patient-reported outcome measures. This will make sure that care streamlining is in line with the patients' priorities and values.

Compliance with ethical standards

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Disclosure of conflict of interest

The author, Dr. Banan Nabeel Faisal Elshqeirat, declares no conflicts of interest relevant to the content of this manuscript.

Statement of ethical approval

This study was approved by the Institutional Review Board (IRB) of the Jordanian Ministry of Health (Reference No.: MoH/REC/2024/145). A waiver of informed consent was granted due to the retrospective, anonymized nature of the data analysis.

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Data Availability Statement

The de-identified dataset generated and analyzed during this study is not publicly available due to institutional data governance policies of the Jordanian Ministry of Health but may be available from the corresponding author upon reasonable request and with permission from the Ministry of Health.

Artificial Intelligence (AI) Assistance Declaration

The author utilized DeepSeek AI (DeepSeek Company) during the preparation of this manuscript to assist with language refinement, structural formatting of the study protocol, and ensuring adherence to reporting standards. All scientific content, data interpretation, and critical conclusions are the sole responsibility of the author.

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