

Prevalence, Patterns, and Risk Factors of Polypharmacy Among Elderly Patients: A Cross-Sectional Study

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Abstract

Background:

Polypharmacy is common among older adults because of the increasing prevalence of multimorbidity and chronic diseases requiring long-term pharmacological treatment. Although multiple medicines may be clinically appropriate, increasing medication burden can contribute to medication-related risks and emphasizes the need for regular medication review. The present study assessed the prevalence, patterns, and factors associated with polypharmacy among elderly patients attending a secondary-level hospital.

Methods:

A hospital-based cross-sectional observational study was conducted among 300 elderly patients aged ≥ 60 years attending Sub-Divisional Hospital, Dhuri, District Sangrur, Punjab, India, from August 2024 to July 2025. Demographic characteristics, comorbidities, and medication profiles were assessed using patient interviews and clinical/prescription records. Polypharmacy was defined as the concurrent use of ≥ 5 medications, while hyperpolypharmacy was defined as the use of ≥ 10 medications. Continuous variables were expressed as mean $\pm$ standard deviation and categorical variables as frequency and percentage. Associations between categorical variables were assessed using the chi-square test, continuous variables were compared using appropriate statistical tests, and multivariable logistic regression was performed to identify factors independently associated with polypharmacy. A p-value < 0.05 was considered statistically significant.

Results:

The study included 300 elderly patients with a mean age of 70.13 ± 6.48 years. Males constituted 163 (54.3%) participants and females 137 (45.7%). The mean number of comorbidities was 2.30 ± 1.29 , while the mean number of medications was 4.56 ± 1.56 . Polypharmacy was present in 150 patients (50.0%; 95% CI: 44.2–55.8%). No patient received ≥ 10 medications; therefore, hyperpolypharmacy was not observed. The mean number of comorbidities was significantly higher among patients with polypharmacy than among those without polypharmacy (2.55 ± 1.29 vs 2.05 ± 1.24 ; $p=0.001$). Antihypertensive medicines were the most frequently recorded medication class, used by 209 (69.7%) patients, followed by antidiabetic medicines in 144 (48.0%) and proton-pump inhibitors in 128 (42.7%). Age group and sex were not significantly associated with polypharmacy. In multivariable logistic regression, each additional comorbidity was independently associated with increased odds of polypharmacy (adjusted OR 1.40; 95% CI: 1.15–1.69; $p<0.001$).

Conclusion:

Polypharmacy was common among elderly patients in the study setting, affecting one-half of the study population. The number of comorbidities was the principal independent factor associated with polypharmacy, whereas age and sex were not independently associated with medication burden. These findings emphasize the need for systematic medication reconciliation and periodic medication review, particularly among elderly patients with multiple chronic conditions, to promote rational and patient-centred pharmacotherapy.

Keywords: Polypharmacy; Elderly; Multimorbidity; Medication burden; Comorbidities; Medication review; Older adults.

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Introduction

Population ageing is accompanied by a growing burden of chronic diseases, multimorbidity, and long-term medication use. Older adults frequently require treatment for conditions such as hypertension, diabetes mellitus, cardiovascular disease, arthritis, chronic respiratory disorders, and other age-related illnesses. As the number of coexisting conditions increases, the likelihood of receiving several medications simultaneously also

risks. Polypharmacy is commonly defined as the regular use of five or more medications, although there is no universally accepted numerical threshold and the clinical appropriateness of the medication regimen remains more important than the number of drugs alone.^{1,2}

The increasing use of multiple medicines among older adults has become an important issue in clinical practice because physiological changes

associated with ageing can alter drug absorption, distribution, metabolism, and elimination. In addition, older patients often have reduced renal and hepatic reserve, altered body composition, and increased sensitivity to certain pharmacological effects. These changes may increase the risk of adverse drug reactions, drug–drug interactions, medication errors, treatment non-adherence, falls, hospitalization, and other adverse outcomes.^{3,4} The World Health Organization has therefore identified medication safety in polypharmacy as an important component of its global patient-safety agenda and has emphasized systematic medication review and person-centred prescribing for patients receiving multiple medicines.⁵

Polypharmacy is particularly relevant in patients with multimorbidity. Although the concurrent use of several medications may be clinically justified when each medicine has a clear indication, the accumulation of medicines can also result in therapeutic duplication, unnecessary treatment, inappropriate prescribing, and potentially harmful drug combinations. The distinction between appropriate and inappropriate polypharmacy is therefore important. Appropriate polypharmacy occurs when multiple medicines are prescribed on the basis of evidence and individual patient needs, whereas inappropriate polypharmacy may expose patients to unnecessary medication-related risks without providing sufficient clinical benefit.^{2,6}

Another important concern is the use of potentially inappropriate medications (PIMs) among older adults. Age-related physiological changes and the presence of multiple diseases may make some medicines particularly hazardous in this population. The American Geriatrics Society Beers Criteria provides an established framework for identifying medications that are potentially inappropriate in adults aged 65 years and older, including medications associated with adverse drug events, drug–disease interactions, clinically important drug–drug interactions, and medications requiring caution or dose adjustment in specific circumstances.⁷

The burden of polypharmacy may be influenced by several patient- and healthcare-related factors. Advanced age, multimorbidity, frequent healthcare visits, hospitalization, multiple prescribers, and the presence of chronic diseases have been associated with greater medication burden.^{6,8} In routine clinical practice, patients may also receive medicines from different departments or healthcare providers, making comprehensive medication reconciliation and periodic review particularly important. The problem may be more challenging in resource-constrained healthcare settings, where medication histories can be incomplete and opportunities for structured medication review may be limited.

In India, the growing elderly population and increasing prevalence of non-communicable diseases have created an expanding need for long-term pharmacological treatment. However, evidence concerning the pattern and determinants of polypharmacy at the level of secondary and sub-divisional healthcare facilities remains comparatively limited. Studies conducted in tertiary centres may not fully represent the medication-use patterns of elderly patients receiving care at smaller hospitals, where patients may present with a different combination of chronic illnesses, prescribing practices, and access to healthcare services.

A better understanding of the prevalence and pattern of polypharmacy at the hospital level can help identify patients who may benefit from medication review and rationalization of therapy. It can also provide useful information for clinicians, pharmacists, and hospital administrators regarding prescribing practices and medication-related risks among older adults. Therefore, the present study was undertaken to assess the prevalence, patterns, and risk factors of polypharmacy among elderly patients, with particular emphasis on the number and types of medications prescribed and the clinical factors associated with increased medication burden.

Materials and Methods

Study Design and Setting

A hospital-based cross-sectional observational study was conducted to assess the prevalence, patterns, and risk factors of polypharmacy among elderly patients attending Sub-Divisional Hospital (SDH), Dhuri, District Sangrur, Punjab, India. The study was conducted in the routine clinical setting of the hospital, with eligible participants assessed during their hospital visit or admission.

Study Period and Sample Size

The study was carried out over a period of one year, from August 2024 to July 2025. A total of 300 elderly patients were included in the study. Participants were selected from eligible patients attending the hospital during the study period.

Study Population

The study population comprised elderly patients aged 60 years and above who were receiving medical treatment at SDH Dhuri. Information regarding demographic characteristics, clinical conditions, and prescribed medications was collected using a structured data-collection proforma.

Inclusion Criteria

Patients were included if they were aged 60 years or above, attended SDH Dhuri during the study period, and were receiving one or more prescribed medications. Patients who provided the required information for assessment of their medication profile were included.

Exclusion Criteria

Patients who were unwilling to participate, those with incomplete medication records, and patients for whom reliable information regarding their current medication use could not be obtained were excluded from the study.

Data Collection

Data were collected through patient interviews and review of relevant clinical and prescription records. Demographic details such as age and sex were recorded. Clinical information included the presence of comorbid conditions and relevant medical history. Details of prescribed medications, including the drug name, dose, frequency, and therapeutic class, were recorded for each participant.

For the purpose of the study, polypharmacy was defined as the concurrent use of five or more medications. Patients receiving ten or more medications were considered to have hyperpolypharmacy. The total number of medications being used by each participant was calculated at the time of assessment.

Assessment of Risk Factors

Potential factors associated with polypharmacy were assessed, including age, sex, number of comorbidities, and major chronic disease conditions. The medication profile of patients with and without polypharmacy was compared to identify differences in prescribing patterns and medication burden.

Statistical Analysis

The collected data were entered, coded, and analyzed using IBM SPSS Statistics software. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. The Chi-square test was used to assess associations between categorical variables, and appropriate statistical tests were applied for comparison of continuous variables. A p-value of <0.05 was considered statistically significant. Where appropriate, regression analysis was used to identify factors independently associated with polypharmacy.

Ethical Considerations

The study was conducted after obtaining approval from the appropriate institutional authority. Informed consent was obtained from the participants before data collection. The confidentiality of participants' personal and clinical information was maintained throughout the study.

RESULTS:

Study population and overall medication burden.

In this study, 300 elderly patients were included. The mean age was 70.13 ± 6.48 years (range, 60–92). There were 163 (54.3%) male and 137 (45.7%) female participants. The mean number of comorbidities was 2.30 ± 1.29 (range, 1–6), while the mean number of medications was 4.56 ± 1.56 (range, 1–8).

Prevalence of polypharmacy. Polypharmacy, defined as concurrent use of five or more medications, was present in 150 of 300 patients (50.0%; 95% CI, 44.4–55.6). The remaining 150 patients (50.0%) received fewer than five medications. Medication counts ranged from 1 to 8; therefore, no participant met the predefined criterion for hyperpolypharmacy (≥ 10 medications).

Table 1. Demographics characteristics and medication burden of the study population

Characteristic	Overall (N=300)	Range / 95% CI
Age, years	70.13 ± 6.48	60–92
Male sex	163 (54.3%)	—
Female sex	137 (45.7%)	—
Comorbidities, n	2.30 ± 1.29	1–6
Medications, n	4.56 ± 1.56	1–8
Polypharmacy (≥ 5 medicines)	150 (50.0%)	95% CI 44.2–55.8%
Hyperpolypharmacy (≥ 10 medicines)	0 (0.0%)	—

Distribution by age and sex.

Polypharmacy was observed in 70/136 (51.5%) patients aged 60–69 years, 70/141 (49.6%) aged 70–79 years, and 10/23 (43.5%) aged ≥ 80 years; the association between age group and polypharmacy was not statistically significant ($\chi^2=0.52$, $p=0.773$). Similarly, polypharmacy was present in 84/163 (51.5%) males and 66/137 (48.2%) females, with no significant association with sex ($\chi^2=0.34$, $p=0.562$).

Table 2. Comparison of continuous characteristics according to polypharmacy status

Variable	No polypharmacy (n=150)	Polypharmacy (n=150)	Test statistic	p-value
Age, years	70.04 ± 6.17	70.21 ± 6.80	-0.23	0.817
Number of comorbidities	2.55 ± 1.18	2.05 ± 1.36	3.36	<0.001

Statistical significance was defined as $p < 0.05$.

Table 3. Major chronic conditions according to polypharmacy status

Condition	No polypharmacy n (%)	Polypharmacy n (%)	p-value
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Hypertension	85 (56.7%)	75 (50.0%)	0.247
Diabetes mellitus	53 (35.3%)	48 (32.0%)	0.541
Dyslipidemia	33 (22.0%)	30 (20.0%)	0.671
Ischemic heart disease	26 (17.3%)	23 (15.3%)	0.639
COPD	11 (7.3%)	19 (12.7%)	0.124
Chronic kidney disease	8 (5.3%)	14 (9.3%)	0.184
Osteoarthritis	38 (25.3%)	29 (19.3%)	0.212

Table 4. Medication classes used by the study population

Medication class	Overall, n (%)	No polypharmacy, n (%)	Polypharmacy, n (%)	p-value
Antihypertensives	209 (69.7%)	108 (72.0%)	101 (67.3%)	0.379
Antidiabetics	144 (48.0%)	70 (46.7%)	74 (49.3%)	0.644
Statins/lipid-lowering agents	117 (39.0%)	57 (38.0%)	60 (40.0%)	0.723
Antiplatelets	104 (34.7%)	54 (36.0%)	50 (33.3%)	0.627
Proton-pump inhibitors	128 (42.7%)	58 (38.7%)	70 (46.7%)	0.161
Analgesics/NSAIDs	73 (24.3%)	34 (22.7%)	39 (26.0%)	0.501
Antibiotics	42 (14.0%)	26 (17.3%)	16 (10.7%)	0.096
Bronchodilators	59 (19.7%)	26 (17.3%)	33 (22.0%)	0.309

Percentages in the overall column use N=300; percentages in the two polypharmacy columns use n=150 per group. Medication classes were recorded as binary indicators in the supplied dataset; individual drug names, doses, and frequencies were not available for this analysis. Pearson χ^2 test compares class use between groups.

Medication-count distribution. The most common medication burden was four medicines (80/300,

26.7%), followed by five medicines (67/300, 22.3%), six medicines (47/300, 15.7%), three medicines (42/300, 14.0%), seven medicines (29/300, 9.7%), two medicines (19/300, 6.3%), eight medicines (7/300, 2.3%), and one medicine (9/300, 3.0%).

Multivariable analysis of factors associated with polypharmacy

In multivariable logistic regression including age, sex, and number of comorbidities, the overall model was statistically significant (likelihood-ratio $p=0.005$; pseudo- $R^2=0.031$). Each additional comorbidity was independently associated with higher odds of polypharmacy (adjusted OR 1.40, 95% CI 1.15–1.69, $p<0.001$). Age and male sex were not independently associated with polypharmacy.

Table 5. Multivariable logistic regression for polypharmacy

Predictor	Adjusted OR	95% CI	p-value
Age (per year)	0.98	0.94–1.02	0.281
Male sex	1.19	0.75–1.90	0.457
Comorbidities (per additional condition)	1.40	1.15–1.69	<0.001

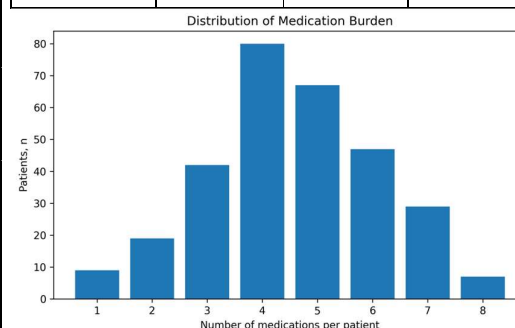


Fig 1: Number of study participants according to the total number of medications recorded.

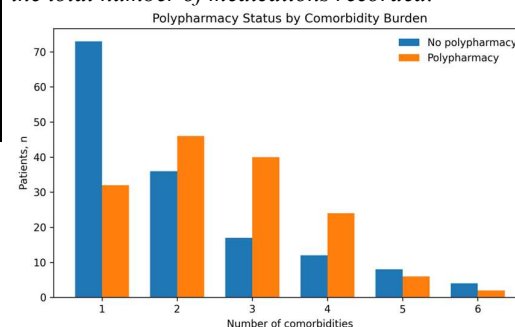


Fig 2: Distribution of patients with and without polypharmacy according to the number of recorded comorbidities.

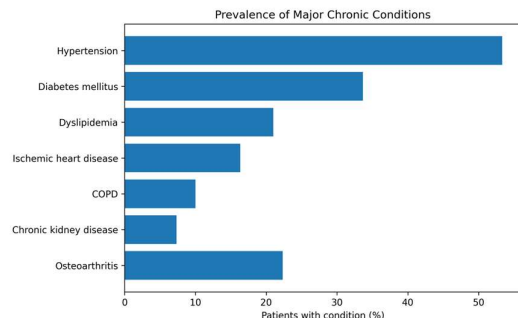


Fig 3: Percentage of the total study population with each major chronic condition recorded in the dataset.

Discussion

The present hospital-based cross-sectional study evaluated the prevalence, pattern, and factors associated with polypharmacy among 300 elderly patients attending a Sub-Divisional Hospital in Dhuri, District Sangrur, Punjab. Polypharmacy, defined in the present study as the concurrent use of five or more medications, was identified in 150 patients (50.0%). The mean number of medications used per patient was 4.56 ± 1.56 , indicating a substantial medication burden in this elderly population. Importantly, no participant received ten or more medications; therefore, hyperpolypharmacy was not observed in the present study. These findings indicate that although extreme medication burden was uncommon, the use of five or more medicines affected one-half of the study population and therefore represents an important target for medication review.

The prevalence of polypharmacy observed in the present study is consistent with the broader evidence that medication burden increases substantially among older adults because of multimorbidity and the need for long-term pharmacological management. Polypharmacy is not inherently inappropriate, as several medicines may be clinically justified when multiple chronic conditions coexist. However, the number of medicines increases the complexity of treatment and may increase the possibility of adverse drug reactions, drug–drug interactions, medication errors, and difficulties with adherence.^{9,10} Consequently, the clinical significance of polypharmacy should be considered not only in terms of the number of medicines but also with regard to therapeutic indication, effectiveness, safety, and treatment goals.

The mean medication burden of 4.56 medicines per patient in this study is particularly relevant because the threshold used to define polypharmacy was five or more medicines. Thus, a relatively small increase in medication burden can move a patient from non-polypharmacy to polypharmacy. This

finding highlights the importance of regular medication reconciliation and review in elderly patients, particularly those with multiple chronic diseases. The World Health Organization has emphasized medication review, medication reconciliation, and person-centred approaches as important strategies for improving medication safety in patients exposed to polypharmacy.¹¹

A major finding of the present study was the significant association between the number of comorbidities and polypharmacy. Patients with polypharmacy had a greater mean number of comorbid conditions than patients without polypharmacy, and the difference was statistically significant. Furthermore, multivariable logistic regression demonstrated that each additional comorbidity was independently associated with increased odds of polypharmacy (adjusted OR 1.40, 95% CI 1.15–1.69; $p < 0.001$), after adjustment for age and sex. This finding is clinically plausible because each additional chronic condition may introduce an additional therapeutic requirement and consequently increase the total number of medicines prescribed.

The relationship between multimorbidity and polypharmacy has been described in previous studies. A systematic review by Dhalwani et al. reported that multimorbidity is strongly associated with polypharmacy in older adults.¹² Similarly, Payne et al. demonstrated that the number and combination of chronic conditions are important determinants of medication burden among older people.¹³ The present findings therefore support the concept that polypharmacy in elderly patients should be considered in the context of multimorbidity rather than as an isolated prescribing phenomenon.

In the present study, age group was not significantly associated with polypharmacy. Although advanced age is frequently considered a potential determinant of medication burden, the absence of a statistically significant association in this population may partly reflect the relatively restricted age distribution of the study participants, all of whom were aged 60 years or older. The proportion of polypharmacy was 51.5% among patients aged 60–69 years, 49.6% among those aged 70–79 years, and 43.5% among those aged 80 years or older. These differences were small and did not reach statistical significance. Previous evidence suggests that age alone may be less important than the accumulation of chronic conditions and healthcare utilization when determining medication burden.^{12,13}

Similarly, sex was not significantly associated with polypharmacy in the present study. Polypharmacy was observed in 51.5% of male participants and 48.2% of female participants. The lack of a significant difference suggests that medication burden in this population was more closely related

to clinical complexity than to sex. Nevertheless, previous studies have reported variable associations between sex and polypharmacy, indicating that demographic factors may differ across populations depending on disease prevalence, healthcare-seeking behaviour, prescribing patterns, and healthcare access.¹⁴

The medication-class analysis demonstrated that antihypertensive medicines were the most frequently recorded class, being used by 209 patients (69.7%), followed by antidiabetic medicines in 144 patients (48.0%) and proton-pump inhibitors in 128 patients (42.7%). The high use of antihypertensive and antidiabetic therapies is consistent with the substantial burden of chronic non-communicable diseases among older adults. Long-term management of hypertension and diabetes commonly requires continued pharmacotherapy and, in some patients, combination treatment.¹⁵ The frequent use of these medication classes therefore contributes substantially to the overall medication burden observed in elderly patients.

The relatively high use of proton-pump inhibitors is also noteworthy. Although acid-suppressive therapy may be clinically appropriate for selected patients, prolonged use should be periodically reviewed because unnecessary continuation of medicines can contribute to potentially inappropriate polypharmacy. Medication review should therefore evaluate not only medicines prescribed for major chronic diseases but also medicines that may have been continued beyond their original indication. Deprescribing frameworks emphasize that medication reduction should be individualized and should consider the indication, anticipated benefit, potential harm, patient preferences, and treatment goals.¹⁶

The present study did not demonstrate statistically significant associations between polypharmacy and the individual chronic conditions recorded in the dataset, including hypertension, diabetes mellitus, dyslipidemia, ischemic heart disease, chronic obstructive pulmonary disease, chronic kidney disease, and osteoarthritis. This finding should be interpreted cautiously. The absence of an individual disease-level association does not imply that these conditions are unrelated to medication burden. Rather, the overall number and combination of comorbidities may be more important than the presence of any single chronic disease. The significant association between total comorbidity count and polypharmacy supports this interpretation.

The distinction between appropriate and inappropriate polypharmacy is particularly important when interpreting these findings. A patient receiving five or more medicines cannot automatically be considered to have inappropriate treatment. Older adults with multiple chronic

diseases may require several evidence-based medicines to achieve appropriate disease control and reduce the risk of complications.¹⁷ The objective of medication review should therefore not simply be to reduce the number of medicines but to determine whether every medicine has a current indication, provides meaningful benefit, is appropriately dosed, and remains consistent with the patient's clinical circumstances and goals.

Medication review is especially important in older adults because age-related physiological changes can alter pharmacokinetics and pharmacodynamics. Reduced renal and hepatic reserve, changes in body composition, and increased pharmacodynamic sensitivity can increase vulnerability to medication-related adverse outcomes.¹⁸ The use of explicit prescribing criteria, such as the American Geriatrics Society Beers Criteria, can assist clinicians in identifying potentially inappropriate medications and medication combinations in older adults.¹⁹ However, such criteria should be regarded as a clinical decision-support tool rather than a substitute for individualized assessment.

The present study has several practical implications. First, the finding that one-half of elderly patients were exposed to polypharmacy suggests that medication review should be incorporated into routine care for older adults at the study setting. Second, the independent association between increasing comorbidity count and polypharmacy indicates that patients with multiple chronic diseases may be prioritized for comprehensive medication review. Third, the medication-class pattern suggests that chronic disease management accounts for a substantial proportion of the medication burden. Collaboration between physicians, pharmacists, nurses, and other healthcare professionals may therefore be useful in identifying unnecessary duplication, potentially inappropriate medications, adherence problems, and opportunities for deprescribing where clinically appropriate.

The study also has limitations. The cross-sectional design permits identification of associations but does not establish causality between comorbidity burden and polypharmacy. The study was conducted at a single hospital, which may limit the generalizability of the findings to other healthcare settings or geographical regions. In addition, the supplied dataset records medication classes rather than detailed individual drug names, doses, frequencies, treatment duration, or clinical indications. Consequently, the present analysis cannot determine whether individual medicines were appropriate or inappropriate, cannot reliably assess Beers Criteria status at the drug level, and cannot evaluate drug-drug interactions or medication adherence. Furthermore, because no patient received ten or more medicines, the study

could not meaningfully evaluate hyperpolypharmacy as a separate outcome. Despite these limitations, the study provides useful hospital-level evidence regarding medication burden among elderly patients. The inclusion of 300 participants and the use of multivariable analysis strengthens the assessment of factors associated with polypharmacy. The finding that comorbidity burden remained independently associated with polypharmacy after adjustment for age and sex supports the importance of multimorbidity as a central determinant of medication burden.

Overall, the findings demonstrate that polypharmacy is common among elderly patients attending the study hospital, affecting 50% of the study population. The strongest factor associated with polypharmacy was the number of comorbidities rather than age or sex. These findings support the implementation of structured medication reconciliation and periodic medication review, particularly among elderly patients with multiple chronic conditions. Future multicentre studies incorporating individual drug names, treatment indications, potentially inappropriate medication criteria, drug–drug interactions, adherence, and clinical outcomes would provide a more comprehensive assessment of the quality and safety of polypharmacy in this population.

Conclusion

The present study demonstrates that polypharmacy is common among elderly patients attending the Sub-Divisional Hospital, Dhuri, with one-half of the study population receiving five or more medications. The mean medication burden was 4.56 ± 1.56 medicines per patient, while hyperpolypharmacy was not observed. The number of comorbidities was the principal factor independently associated with polypharmacy, whereas age and sex were not significantly associated with medication burden after adjustment. Antihypertensive medicines were the most frequently recorded medication class, followed by antidiabetic medicines and proton-pump inhibitors.

These findings highlight the importance of systematic medication reconciliation and periodic medication review in elderly patients, particularly those with multiple chronic conditions. Medication review should focus not merely on reducing the number of medicines but on ensuring that each medicine has a valid indication, appropriate benefit–risk balance, and continued relevance to the patient's clinical needs. Further multicentre studies incorporating individual medication details, potentially inappropriate medication assessment, drug–drug interactions, adherence, and clinical outcomes are warranted to better characterize the quality and safety of polypharmacy among older adults.

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