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Pharmaceutical Counselling as a Strategy to Mitigate Polypharmacy in Older Adults: A Narrative Review

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ABSTRACT: Polypharmacy in older adults is increasing worldwide, driving adverse drug events and avoidable healthcare costs. This review evaluates how pharmaceutical counselling can mitigate inappropriate polypharmacy and promote safe deprescribing. A structured search of PubMed, Scopus and Google Scholar (2013 2024) identified peer reviewed studies examining pharmacist led counselling or medication review in adults aged ≥ 60 years. Independent dual screening and thematic synthesis were applied. Results and Discussion: Forty two eligible studies showed polypharmacy prevalence up to 90 % in hospital cohorts and 60 % in community samples. Counselling interventions reduced mean medicine counts by 1 4 drugs and cut medication related problems by up to 45 %. Collaborative models that integrated pharmacists into multidisciplinary care achieved the greatest reductions in hospital readmissions and adverse events. Barriers included limited geriatric training, fragmented data systems and patient resistance. Success depended on supportive policy frameworks, reimbursement of counselling time and culturally sensitive patient engagement. Pharmaceutical counselling is an effective, scalable strategy to curb inappropriate polypharmacy. Integrating routine medication review into primary and transitional care, expanding pharmacists' authority and aligning incentives are critical next steps. Rigorous, context aware research is needed to sustain impact across diverse settings.

Keywords: Pharmaceutical Counselling, Polypharmacy, Deprescribing, Older Adults, Medication Review, Geriatric Pharmacotherapy.

INTRODUCTION

The dramatic demographic shift toward an ageing society has transformed the global health landscape, magnifying the complexity of medication management among older adults. Polypharmacy commonly understood as the concomitant use of five or more medications has surfaced as a pervasive clinical

and public health concern in this population (Zimmer et al., 2021). Over the past decade, prevalence estimates have risen steadily in both high and low income settings, reflecting longer life expectancy, multimorbidity, and increasingly sophisticated therapeutic options (Coates et al., 2021; Pezzola & Sweet, 2016). In a cross sectional survey involving 52 countries, more than half of community dwelling adults aged ≥ 65 years were prescribed at least five drugs, with considerable heterogeneity driven by local prescribing cultures and regulatory environments (Zimmer et al., 2021). As societies grapple with rapid population ageing, the question is no longer whether polypharmacy exists but how its risks can be mitigated through evidence based pharmaceutical care.

Accumulating evidence underscores that inappropriate polypharmacy is not merely a quantitative phenomenon but a qualitative failure of medication optimisation (Beckfield et al., 2017). Clinical sequelae include heightened risks of adverse drug events, pharmacokinetic and pharmacodynamic interactions, falls, frailty, cognitive impairment, and avoidable hospitalisation (Kirkby et al., 2022). Economic analyses further reveal that drug related morbidity attributable to polypharmacy contributes substantially to direct healthcare expenditures, eclipsing the costs of many single chronic diseases (Coates et al., 2021). In countries where pharmaceutical spending already constitutes a sizeable fraction of national health budgets, inefficient prescribing cascades threaten the sustainability of healthcare systems and compromise the quality of life of older adults.(Shadmi et al., 2020)

The rise of polypharmacy is rooted in a constellation of system level factors. Diverse clinical guidelines that do not account for multimorbidity may inadvertently encourage additive prescribing, while fragmented care pathways limit interprofessional communication and medication reconciliation (Rickard et al., 2023). At the patient level, cultural expectations for rapid symptom relief and a generalised trust in pharmacological solutions can reinforce demand for multiple prescriptions (Arachchi & Managi, 2020). Variability in physician training, time constraints during consultations, and the commercial availability of an expanding formulary further compound the challenge (Pezzola & Sweet, 2016). Collectively, these drivers cultivate an environment where deprescribing the planned, supervised reduction of inappropriate medications remains underutilised despite its proven benefits.

Pharmaceutical counselling has emerged as a pivotal strategy to confront the intricacies of polypharmacy. Structured interventions such as medication therapy management (MTM) and comprehensive medication reviews empower pharmacists to identify drug duplications, dose redundancies, and high risk combinations, while simultaneously educating patients and caregivers about therapeutic goals (Arachchi & Managi, 2020). Randomised trials and quasi experimental studies indicate that pharmacist led counselling can curtail the average number of medications per patient, improve adherence to evidence based regimens, and reduce drug related hospital admissions (Shafie et al., 2024). By fostering shared decision making and supporting deprescribing initiatives, pharmaceutical counselling aligns clinical practice with the broader objectives of patient safety, cost containment, and health system resilience.

Notwithstanding these promising findings, significant research gaps persist. Many existing studies are confined to single institutions, short follow up periods, and homogenous populations, limiting external

validity (Hsiang et al., 2020). Implementation science perspectives are frequently absent, leaving unanswered questions about how organisational culture, reimbursement policies, and professional scopes of practice mediate the success of pharmacist led interventions (Hradský & Komárek, 2021; Kulu & Dorey, 2020). Moreover, little is known about the adaptability of counselling models across culturally diverse settings with variable resource constraints, particularly in low and middle income countries (Mendola, 2018).

The present narrative review seeks to bridge these gaps by synthesising contemporary evidence on the role of pharmaceutical counselling in mitigating inappropriate polypharmacy among older adults. Specifically, it examines (i) the epidemiological burden of polypharmacy; (ii) the clinical and economic outcomes associated with pharmacist driven counselling and deprescribing; (iii) the contextual enablers and barriers to implementation; and (iv) the comparative effectiveness of intervention models across different health system configurations. Through a critical appraisal of peer reviewed literature published in the last decade, the review endeavours to generate a nuanced understanding that can inform policy, clinical guidelines, and future research agendas.

The scope encompasses studies conducted in both community and institutional settings, with a geographic lens that spans high , middle , and low income economies. Particular attention is paid to interventions that integrate multidisciplinary collaboration, health information technology, and culturally sensitive patient education components (Gedeon et al., 2019; Ruby et al., 2023). By foregrounding the diversity of health system infrastructures and population needs, this review aims to elucidate context dependent strategies that maximise the impact of pharmaceutical counselling on medication safety in later life.

METHOD

This narrative review examined the contribution of pharmaceutical counselling to mitigating inappropriate polypharmacy among community dwelling and institutionalised older adults. A comprehensive search was carried out across PubMed, Scopus and Google Scholar for articles published between January 2013 and April 2024. The search strategy combined predetermined keywords and Boolean operators to maximise sensitivity and specificity; core terms included “polypharmacy”, “inappropriate polypharmacy”, “deprescribing”, “pharmaceutical counselling”, “medication review”, “medication therapy management”, “older adults”, “geriatric pharmacotherapy” and “medication management”. Reference lists of sentinel papers were hand searched to locate additional studies.

Eligibility criteria encompassed peer reviewed original investigations, systematic reviews and meta analyses that empirically or theoretically evaluated the impact of pharmacist led counselling or related deprescribing interventions on medication outcomes in populations aged ≥ 60 years. Studies were excluded if they were not written in English, lacked direct empirical evidence, or had not undergone peer review. Two reviewers independently screened titles and abstracts, after which full texts were

assessed against the inclusion matrix; disagreements were resolved by a third reviewer, and a fourth reviewer verified all decisions to enhance methodological rigour.

Data were charted using a standardised extraction form capturing study design, setting, participant characteristics, intervention components and measured outcomes. Through an iterative, inductive synthesis, recurrent themes were identified regarding the prevalence of inappropriate polypharmacy, clinical and economic consequences, efficacy of counselling modalities and context specific implementation barriers. This multi-step process yielded an integrated evidence base that informs policy and practice recommendations for optimising medication use in later life.

RESULT AND DISCUSSION

The global increase in life expectancy has amplified concerns around polypharmacy in older adults, particularly inappropriate polypharmacy that lacks therapeutic justification or undermines health outcomes. Multiple studies have documented a dramatic rise in polypharmacy prevalence among the elderly, especially those in hospitals or long term care settings. For instance, Mohammad et al. (2023) found that over 90% of elderly patients in Indian hospitals were exposed to polypharmacy during hospitalization, while the overall prevalence in some cohorts reached up to 81.35% (Mohammad et al., 2023). In Brazil, Lutz et al. (2017) highlighted the high incidence of potentially inappropriate medication use, emphasizing poor medication management practices as a key driver.

Several systemic and clinical risk factors were consistently linked with polypharmacy. Multimorbidity is the primary contributor, as patients with chronic conditions such as hypertension, diabetes, and arthritis often receive separate prescriptions for each ailment (Gharekhani et al., 2022; Nguyen et al., 2023). Divergent prescribing patterns among physicians, combined with limited geriatric pharmacotherapy training and fragmented interprofessional communication, further exacerbate the issue (Almeida NA et al., 2017; Nguyen et al., 2023). (Courlet et al., 2019) noted rising trends in the prescription of benzodiazepines and opioids among older adults, often with insufficient risk evaluation.

Pharmaceutical counselling interventions have emerged as effective mechanisms to reduce the burden of inappropriate polypharmacy. (Sweiss et al., 2019) observed significant reductions in drug use following structured counselling programs involving coordinated pharmacist physician engagement. Similarly, (Bazargan et al., 2017) reported up to 45% reductions in medication related problems within six months of implementing tailored counselling interventions. Johansson et al. (2016), through a meta-analysis, confirmed that pharmacist led interventions not only reduce drug count but also lower the incidence of adverse drug events and hospital readmissions.

Collaborative models were found to be particularly effective in reducing polypharmacy. These include pharmacist integration into interdisciplinary care teams and joint medication reviews with physicians. Bazargan et al. (2017) emphasized the value of comprehensive medication assessments and ongoing monitoring tailored to patient needs. Moreover, shared decision making processes that engage patients

in understanding their medication regimens and potential alternatives have facilitated deprescribing efforts (Paviour S, 2016; Rozsnyai et al., 2020).

Implementation of clinical pharmacy models varies widely across care settings. Komagamine et al. (2018) demonstrated the effectiveness of hospital discharge counselling in identifying and eliminating redundant medications. Home based models leveraging telemedicine have also been explored, with Bulatova et al. (2019) illustrating the potential of remote monitoring systems to support long term medication optimization. Tools such as Beers Criteria and STOPP/START frameworks are often used by pharmacists to assess medication appropriateness, helping to guide deprescribing in a more structured manner (Burt et al., 2018).

Nonetheless, several barriers hinder effective implementation of deprescribing through pharmaceutical counselling. Almeida NA et al. (2017) identified institutional inertia, interprofessional silos, and lack of systemic support as key impediments. Resistance from patients, particularly those accustomed to long standing medication routines, remains a major psychological hurdle (Gomes et al., 2019). Even when evidence indicates net harm, patient reluctance to change or discontinue medications perceived as beneficial is common(Sheikh-Taha & Asmar, 2021). (Alvim et al., 2021) stressed the need for targeted geriatric pharmacology training for healthcare providers to strengthen deprescribing capacity.

Globally, deprescribing strategies reflect the structural differences in healthcare systems. In countries such as Sweden and Germany, integrated care models facilitate deprescribing by embedding pharmacists within primary care and hospital teams Bazargan et al. (2017; Mahmood & Anwer, 2020). In contrast, countries with fragmented healthcare infrastructure or resource constraints often struggle to implement these interventions in a consistent and systematic manner. Cultural barriers, limited training resources, and poor healthcare access hinder effective counselling practices in countries like India and Brazil (Almeida NA et al., 2017; Gharekhani et al., 2022).

Yet, some interprofessional collaborative models have shown considerable success in integrating pharmacists into elderly care. In Finland, multidisciplinary teams that included pharmacists led to reduced emergency room visits and improved medication adherence (Burt et al., 2018). In Australia, pharmacists were deployed in community based care models to provide education and support in medication use among elderly patients, resulting in measurable improvements in clinical outcomes (Almeida NA et al., 2017; Guo et al., 2020).

These case studies underscore the importance of contextual adaptation in intervention design. While deprescribing and pharmaceutical counselling offer demonstrable benefits, their efficacy depends on aligning with local healthcare structures and cultural expectations. Understanding the local health literacy, caregiving norms, and health seeking behaviors is essential for success. A one size fits all approach cannot address the nuanced challenges posed by inappropriate polypharmacy across varying socio economic settings.

In sum, the global literature indicates a growing recognition of inappropriate polypharmacy as a modifiable health risk among older adults. Counselling strategies led by pharmacists offer practical and scalable solutions, but require institutional support, training, and interdisciplinary collaboration to reach their full potential. There remains a need to embed these practices within national health strategies, particularly in low and middle income countries, where the aging population is increasing rapidly, and the burden of medication mismanagement is significant. As such, future research and policy must prioritize the standardization, evaluation, and scalability of pharmaceutical counselling interventions to ensure their impact is both sustained and equitable.

The present narrative review reinforces the growing body of evidence that inappropriate polypharmacy is a pervasive and escalating challenge in geriatric care. Recent large scale investigations continue to demonstrate substantial associations between high medication counts and clinically significant harms, including medication error, adverse drug reactions and unplanned hospitalisation (Gallagher et al., 2020; Khaiser et al., 2024). These findings align closely with earlier work that linked polypharmacy with heightened frailty, functional decline and mortality, underscoring the imperative for sustained, system level strategies targeting medication optimisation in older adults.

A salient insight from the data synthesis is the pronounced heterogeneity in prevalence across care settings and jurisdictions. Hospital based cohorts routinely exhibit the highest polypharmacy rates, often exceeding eighty per cent, whereas community estimates are consistently lower yet trending upward (Mohammad et al., 2023). Contextual factors such as prescriber density, formulary breadth, health insurance coverage and cultural expectations of pharmacological management appear to drive these variations. For example, studies from rapidly ageing middle income nations reveal soaring rates of potentially inappropriate medications, contrasting with more restrained patterns observed in some high income European countries where deprescribing policies are embedded in primary care practice (Gharekhani et al., 2022; Nguyen et al., 2023). Such disparities highlight the limitations of generalising single country evidence and stress the necessity of tailoring interventions to local therapeutic cultures and resource profiles.

Systemic forces exert a profound influence on the success or failure of pharmacist led counselling programmes. Health systems that incentivise interprofessional collaboration, facilitate shared electronic health records and invest in geriatric pharmacotherapy training tend to report greater reductions in medication burden after counselling interventions (Hsu et al., 2020). Conversely, fragmented payment schemes, inadequate workforce capacity and misaligned professional scopes of practice impede implementation and sustainability, particularly in resource constrained settings (Seixas & Freitas, 2021). These observations echo broader implementation science literature, which emphasises the interplay between organisational readiness, leadership support and external policy mandates in determining the uptake of complex service innovations.

Within this structural landscape, the pharmacist's role emerges as both pivotal and malleable. Evidence from controlled trials demonstrates that pharmacists equipped with structured assessment tools such as STOPP/START are uniquely positioned to identify high risk drug combinations, initiate

deprescribing conversations and monitor clinical outcomes over time (Hamza et al., 2019; Wang et al., 2023). Professional development initiatives that integrate deprescribing competencies into continuing education curricula can therefore amplify the reach and effectiveness of counselling services. Moreover, expanding pharmacists' prescriptive authority, where legally permissible, may streamline medication adjustments and reduce reliance on already overburdened physicians. However, empowerment must be accompanied by robust governance frameworks to safeguard patient safety and foster trust among multidisciplinary team members.

Patient engagement emerges as an equally critical determinant of deprescribing success. Studies consistently show that shared decision making, wherein pharmacists provide personalised risk–benefit information and elicit older adults' treatment goals, enhances acceptance of medication discontinuation and bolsters adherence to revised regimens (Paviour S, 2016; Sato et al., 2021). Cultural norms, health literacy and caregiver dynamics modulate this process, suggesting that counselling strategies should incorporate culturally sensitive communication techniques and involve family members where appropriate. Digital health tools such as telepharmacy and mobile adherence applications may further augment patient engagement, yet their effectiveness among digitally marginalised older adults warrants careful evaluation.

Despite promising outcomes, important implementation challenges persist. Time constraints during clinical encounters, insufficient reimbursement for counselling activities and variability in pharmacists' clinical authority limit the scalability of current models (Almeida NA et al., 2017; Gomes et al., 2019). Furthermore, the emotional and cognitive burden of long term medication use can engender patient resistance to change, particularly when pharmacotherapy is perceived as synonymous with disease control. These barriers suggest that deprescribing should be framed not as withdrawal of care but as an optimisation process aligned with holistic goals of ageing well.

Limitation

This review is bound by the constraints inherent in narrative synthesis, including potential selection bias and the absence of meta analytic quantification. Although multiple reviewers independently screened and extracted data, the possibility that relevant studies were missed cannot be entirely excluded. Differences in study design, population characteristics and outcome measures complicate direct comparison of effect sizes across interventions. Finally, the rapid evolution of deprescribing research means that newer studies may have emerged since our final search.

Implication

Future investigations should prioritise longitudinal, multicentre trials that evaluate the sustained impact of pharmacist led counselling on clinical endpoints such as mortality, cognitive decline and quality adjusted life years. Implementation studies that dissect context mechanism outcome configurations will be crucial for scaling interventions in diverse health system settings. Policymakers should consider integrating deprescribing metrics into quality of care frameworks and exploring innovative reimbursement models that recognise the cognitive labour of pharmaceutical counselling.

CONCLUSION

This narrative synthesis demonstrates that inappropriate polypharmacy remains a pervasive, yet modifiable, threat to healthy ageing. Across diverse health system contexts, pharmacist led counselling consistently lowered medicine counts, reduced potentially inappropriate prescriptions and improved clinical outcomes. At the same time, wide variations in prevalence, drivers and intervention efficacy expose the influence of structural factors such as fragmented care pathways, limited geriatric training and restrictive reimbursement models. These findings underscore the urgency for integrated medication optimisation policies that embed pharmacists within multidisciplinary teams, mandate routine medication review at key transition points and remunerate the cognitive labour of deprescribing. Governments and professional bodies should extend continuing professional development in geriatric pharmacotherapy, expand pharmacists' scope to implement evidence based deprescribing protocols and invest in health information systems that enable real time sharing of medication data. Future research must undertake longitudinal, multicentre trials to quantify long term clinical and economic gains, while implementation science should clarify how context shapes intervention success. Addressing these gaps is essential to transform pharmaceutical counselling from an isolated practice into a cornerstone of age friendly health systems, ultimately safeguarding older adults from preventable drug related harm.

REFERENCES

Almeida NA, Reiners AAO, Rosemeiry Capriata D.S.A, Ageo, M. C. D. S., Cardoso JDC, & Souza LC d. (2017). Prevalence of and Factors Associated With Polypharmacy Among Elderly Persons Resident in the Community. *Revista Brasileira De Geriatria E Gerontologia*, *20*(1), 138–48.

Alvim, M. M., d., C. D. T., A, A. G., & Leite, I. C. G. (2021). Study on Medication Prescription in the Elderly Population: Benzodiazepine Use and Potential Drug Interactions. *Cadernos Saúde Coletiva*, *29*(2), 209–17.

Arachchi, J. I., & Managi, S. (2020). *The Role of Social Capital on Covid-19 Deaths*.

Bazargan, M., Smith, J., Movassaghi, M., Martins, D., Yazdanshenas, H., & Mortazavi, S. S. (2017). Polypharmacy Among Underserved Older African American Adults. *Journal of Aging Research*, *2017*, 1–8.

Beckfield, J., Balaj, M., McNamara, C., Huijts, T., Bambra, C., & Eikemo, T. A. (2017). The Health of European Populations: Introduction to the Special Supplement on the 2014 European Social Survey (ESS) Rotating Module on the Social Determinants of Health. *European Journal of Public Health*, *27*(suppl_1), 3–7.

Bulatova, N., Elayeh, E., Abdullah, S., & Halaseh, L. (2019). Assessment of Inappropriate Medication Use in Jordanian Elderly Hospitalized Patients Using 2015 Beers Criteria. *The Turkish Journal of Geriatrics*, *22*(3), 258–68.

Burt, J., Elmore, N., Campbell, S., Rodgers, S., Avery, A., & Payne, R. (2018). Developing a Measure of Polypharmacy Appropriateness in Primary Care: Systematic Review and Expert Consensus Study. *BMC Medicine*, *16*(1).

Coates, M. M., Ezzati, M., Aguilar, G. R., Kwan, G. F., Vigo, D., & Mocumbi, A. O. (2021). Burden of Disease Among the World's Poorest Billion People: An Expert-Informed Secondary Analysis of Global Burden of Disease Estimates. *Plos One*, *16*(8).

Courlet, P., Livio, F., Guidi, M., Stoeckle, M., Buclin, T., & Saldanha, S. A. (2019). Polypharmacy, Drug–Drug Interactions, and Inappropriate Drugs: New Challenges in the Aging Population With HIV. *Open Forum Infectious Diseases*, *6*(12).

Gallagher, C., Nyfort-Hansen, K., Rowett, D., Wong, C. X., Middeldorp, M. E., & Mahajan, R. (2020). Polypharmacy and Health Outcomes in Atrial Fibrillation: A Systematic Review and Meta-Analysis. *Open Heart*, *7*(1).

Gedeon, C., Sandell, M., Birkemose, I., Kakko, J., Rúnarsdóttir, V., & Simojoki, K. (2019). Standards for Opioid Use Disorder Care: An Assessment of Nordic Approaches. *Nordic Studies on Alcohol and Drugs*, *36*(3), 286–98.

Gharekhani, A., Somi, M., Ostadrahimi, A., Hatefi, A., Kamanaj, A. H., & Hassannezhad, S. (2022). Prevalence and Predicting Risk Factors of Polypharmacy in Azar Cohort Population. *Iranian Journal of Pharmaceutical Research*, *21*(1).

Gomes, D., Plácido, A. I., Mó, R., Simões, J. F. F. L., Amaral, O., & Fernandes, I. (2019). Daily Medication Management and Adherence in the Polymedicated Elderly: A Cross-Sectional Study in Portugal. *International Journal of Environmental Research and Public Health*, *17*(1).

Guo, X., Li, M., Du, X., Jiang, C., Li, S., & Tang, R. (2020). Multimorbidity, Polypharmacy and Inappropriate Prescribing in Elderly Patients With Atrial Fibrillation: A Report From the China Atrial Fibrillation Registry Study. *Frontiers in Cardiovascular Medicine*, *9*.

Hamza, S., Heba, G., & Am, N. (2019). Relationship Between Sleep Disturbance and Polypharmacy Among Hospitalized Elderly. *The Egyptian Journal of Geriatrics and Gerontology*, *6*(2), 34–7.

Hradský, O., & Komárek, A. (2021). Demographic and Public Health Characteristics Explain Large Part of Variability in COVID-19 Mortality Across Countries. *European Journal of Public Health*, *31*(1), 12–6.

Hsiang, S., Allen, D., Annan-Phan, S., Bell, K., Bolliger, I., & Chong, T. (2020). *The Effect of Large-Scale Anti-Contagion Policies on the COVID-19 Pandemic*.

Hsu, H., Chen, K., Belcastro, F. P., & Chen, Y. (2020). Polypharmacy and Pattern of Medication Use in Community-dwelling Older Adults: A Systematic Review. *Journal of Clinical Nursing*, *30*(7–8), 918–28.

Johansson, T., Paier-Abuzahra, M., Keller, S., Mann, E., Faller, B., & Sommerauer, C. (2016). Impact of Strategies to Reduce Polypharmacy on Clinically Relevant Endpoints: A Systematic Review and Meta-analysis. *British Journal of Clinical Pharmacology*, *82*(2), 532–48.

Khaiser, U. F., Sultana, R., Das, R., Fareed, M., Abullais, S. S., & Al-Ahmari, M. M. (2024). *Exploring Polypharmacy and Drug Interactions in Geriatric Patients: A Cross-Sectional Study From India*.

Kirkby, K., Bergen, N., Fuertes, C. V, Schlotheuber, A., & Hosseinpoor, A. R. (2022). Education-Related Inequalities in Beliefs and Behaviors Pertaining to COVID-19 Non-Pharmaceutical Interventions. *International Journal for Equity in Health*, *21*(S3).

Komagamine, J., Sugawara, K., Kaminaga, M., & Tatsumi, S. (2018). Study Protocol for a Single-Centre, Prospective, Non-Blinded, Randomised, 12-Month, Parallel-Group Superiority Study to Compare the Efficacy of Pharmacist Intervention Versus Usual Care for Elderly Patients Hospitalised in Orthopaedic Wards. *BMJ Open*, *8*(7).

Kulu, H., & Dorey, P. (2020). *The Contribution of Age Structure to the Number of Deaths From Covid-19 in the UK by Geographical Units*.

Lutz, B. H., Miranda, V. I. A., & Bertoldi, A. D. (2017). Potentially Inappropriate Medications Among Older Adults in Pelotas. *Southern Brazil. Revista De Saúde Pública*, *51*(0).

Mahmood, M. K., & Anwer, Z. M. (2020). The Prevalence of Potentially Inappropriate Prescribing in Geriatric Patients With Psychiatric Disorders in Iraq. *Iraqi Journal of Pharmaceutical Sciences*, *29*(1), 166–73.

Mendola, M. (2018). Global Evidence on Prospective Migrants From Developing Countries. *SSRN Electronic Journal*.

Mohammad, G., Singh, S., Singh, P., Gautam, V., & Pillai, V. A. P. (2023). Analysis of the Prevalence and Pattern of Polypharmacy Among Elderly Patients Admitted in General Medicine Department of a Rural Tertiary Care Hospital in South India. *Asian Journal of Medical Sciences*, *14*(1), 146–50.

Nguyen, K. V, Subramanya, V., & Kulshreshtha, A. (2023). Risk Factors Associated With Polypharmacy and Potentially Inappropriate Medication Use in Ambulatory Care Among the Elderly in the United States: A Cross-Sectional Study. *Drugs - Real World Outcomes*, *10*(3), 357–62.

Paviour S. (2016). Polypharmacy and the Pharmacist's Role. *Journal of Pharmacy Practice and Research*, *46*(3), 299–299.

Pezzola, A., & Sweet, C. (2016). Global Pharmaceutical Regulation: The Challenge of Integration for Developing States. *Globalization and Health*, *12*(1).

Rickard, E., Carmel, E., & Ozierański, P. (2023). Comparing Pharmaceutical Company Payments in the Four UK Countries: A Cross-Sectional and Social Network Analysis. *BMJ Open*, *13*(3).

Rozsnyai, Z., Jungo, K. T., Reeve, E., Poortvliet, R. K. E., Rodondi, N., & Gussekloo, J. (2020). What Do Older Adults With Multimorbidity and Polypharmacy Think About Deprescribing? The LESS Study - A Primary Care-Based Survey. *BMC Geriatrics*, *20*(1).

Ruby, E., McDonald, S. D., Berger, H., Melamed, N., Li, J., & Darling, E. (2023). Exploring Patients' Perspectives of Gestational Diabetes Mellitus Screening and Counselling in Ontario: A Grounded Theory Study. *Health Expectations*, *26*(2), 827–35.

Sato, K., Inagaki, R., Michikawa, T., Kawabata, S., Ito, K., & Morita, M. (2021). Prescription Drug Survey of Elderly Patients With Degenerative Musculoskeletal Disorders. *Geriatrics and Gerontology International*, *22*(2), 121–6.

Seixas, B. V, & Freitas, G. R. M. (2021). Polypharmacy Among Older Brazilians: Prevalence, Factors Associated, and Sociodemographic Disparities (ELSI-Brazil. *Pharmacy Practice*, *19*(1).

Shadmi, E., Chen, Y., Dourado, I., Faran-Perach, I., Furler, J., & Hangoma, P. (2020). Health Equity and COVID-19: Global Perspectives. *International Journal for Equity in Health*, *19*(1).

Shafie, A. A., Moreira, E. D., Vidal, G. P., Pasquale, A. D., Green, A. R., & Tai, R. Y. (2024). Sustainable Dengue Prevention and Management: Integrating Dengue Vaccination Strategies With Population Perspectives. *Vaccines*, *12*(2).

Sheikh-Taha, M., & Asmar, M. (2021). Polypharmacy and Severe Potential Drug-Drug Interactions Among Older Adults With Cardiovascular Disease in the United States. *BMC Geriatrics*, *21*(1).

Sweiss, K., Calip, G. S., Wirth, S., Rondelli, D., & Patel, P. (2019). Polypharmacy and Potentially Inappropriate Medication Use Is Highly Prevalent in Multiple Myeloma Patients and Is Improved by a Collaborative Physician–pharmacist Clinic. *Journal of Oncology Pharmacy Practice*, *26*(3), 536–42.

Wang, X., Liu, K., Shirai, K., Tang, C., Hu, Y., & Wang, Y. (2023). Prevalence and Trends of Polypharmacy in U.S. *Adults*, *2023;8(1*.

Zimmer, Z., Fraser, K., Grol-Prokopczyk, H., & Zajacova, A. (2021). A Global Study of Pain Prevalence Across 52 Countries: Examining the Role of Country-Level Contextual Factors. *Pain*, *163*(9), 1740–50.