Managing Polypharmacy in Elderly Emergency Patients: A Collaborative Approach Between Nurses, Physicians, and Pharmacists

Fatimah Saeed Alsaqer[1], Ali Salman Al-Khalaf[2], Mohammad Salman Alradhwan[3], Betool Abdullah Hussain Al Kwitem[4], Dalal Eissa Al Sunsiher[5], Ahmed Abdullah Ojaym[6], Louloah Abdullah Alomran[7], Sukyna M.A Albetty[7], Zainab Mohammed Alwabari[8], Fatimah Mohammad Alyaseen[9], Zahra Mahroos Almahroos[10], Majed Awn Ali Al Thowaimer[11], Nouf Hameed Alanazi[12], Areej Sliuman S Almouled[13]

[1]NURSING, QATIF HEALTH NETWORK, Saudi Arabia
[2]Pharmacist technician, Alkulabiyah health center, Saudi Arabia
[3]Health Assistant nursing, Qatif Primary Health Care, Saudi Arabia
[4]General practice, Alrashydiah primary health center, Alahsa, Saudi Arabia
[5]Nurse, Maternity and children Hospital, Alahssam, Saudi Arabia
[6]General practice, Al shoabain PHC rijal almaa, Saudi Arabia
[7]Health Assistant nursing, Alreef Primary Health Care Center, Qatif City, Saudi Arabia
[8]GP, MOH health cluster, Almansoura health center, Alahsa, Saudi Arabia
[9]Health Assistant Nursing, Alawamyah Primary Health Care Center, Qatif City, Saudi Arabia
[10]Emergency medical services, dammam medical complex, Dammam, Saudi Arabia
[11]Health information technician, Qatif Central Hospital, Qatif, Saudi Arabia
[12]Social worker, Erada mental complex, Ha'il, Saudi Arabia
[13]Nurse specialist, King Abdullah Specialist Hospital for Children and Maternity, Saudi Arabia

Abstract

Managing polypharmacy in elderly emergency patients is a critical issue that requires a collaborative approach among healthcare professionals, including nurses, physicians, and pharmacists. As patients age, they often experience multiple chronic conditions, leading to the prescription of various medications. This polypharmacy can increase the risk of adverse drug events, medication non-adherence, and overall poor health outcomes. Therefore, an interdisciplinary strategy that emphasizes communication and shared decision-making is essential. Nurses play a vital role in initial patient assessments and providing valuable insights into medication adherence and patient history. Physicians must ensure appropriate prescribing practices and consider the patient's comprehensive medication profile, while pharmacists can offer expertise in medication management, identifying potential drug interactions, and recommending alternatives when necessary. A structured approach to polypharmacy management involves regular medication reviews, leveraging technology for better tracking of

prescriptions, and implementing protocols that prioritize safer prescribing practices. Education and training for each team member about the complexities of geriatric pharmacotherapy can enhance collaborative efforts. Additionally, involving patients and their caregivers in discussions about their medication regimen fosters adherence and empowering patients to voice their concerns. By working together, nurses, physicians, and pharmacists can effectively optimize medication management for elderly emergency patients, ultimately improving patient safety and health outcomes.

Keywords: Polypharmacy, elderly patients, emergency care, collaborative approach, nurses, physicians, pharmacists, medication management, adverse drug events, medication adherence, geriatric pharmacotherapy.

The phenomenon of polypharmacy, defined as the concurrent use of multiple medications by a single patient, presents a complex and increasingly prevalent challenge in geriatric healthcare, particularly within the emergency department (ED) setting. As the global population ages, healthcare professionals are confronted with the urgent need to manage polypharmacy effectively among elderly patients who present with acute medical conditions [1]. This demographic is often characterized by multimorbidity—wherein patients suffer from multiple chronic diseases—which further complicates medication management. In this context, the potential for adverse drug events (ADEs), hospital readmissions, and overall declines in health outcomes intensifies. This has underscored the necessity for a collaborative approach among healthcare providers—specifically, nurses, physicians, and pharmacists—to implement effective strategies that prioritize patient safety, optimize therapeutic outcomes, and enhance the overall quality of care delivered to elderly patients in emergency situations [2].

Polypharmacy is particularly problematic among elderly patients due to age-related pharmacokinetic and pharmacodynamic changes that can affect drug absorption, distribution, metabolism, and elimination. Additionally, older adults frequently exhibit increased sensitivity to medications and higher susceptibility to adverse reactions, which can exacerbate existing health conditions and contribute to functional decline and increased care requirements. A study conducted by the American Geriatrics Society (AGS) indicated that nearly 30% of older adults are prescribed five or more medications, with many facing polypharmacy-related complications, including falls, cognitive impairment, and medication non-adherence. Furthermore, the complexity of medication regimens can overwhelm patients and caregivers, making it difficult to maintain accurate medication lists, leading to unintentional omissions or duplications in therapy [3].

Given these challenges, fostering a collaborative healthcare environment in the ED is essential for tackling polypharmacy in elderly emergency patients. Each member of the healthcare team—nurses, physicians, and pharmacists—brings unique expertise and perspectives that, when combined, can result in more comprehensive and safer medication management practices. Nurses play a critical role in patient assessment and education, gathering vital information on the patient's health history and understanding the psychological and social factors influencing medication adherence. They serve as frontline caregivers who observe patients' responses to medications and can identify potential drug-related problems that require timely intervention [4].

Physicians, responsible for diagnosing and formulating treatment plans, must be aware of the implications of polypharmacy when prescribing and managing medications. Their

clinical judgment is paramount in weighing the benefits of a drug against potential risks, especially for elder patients with complex health issues. An informed approach by physicians is critical; however, the inclusion of pharmacists in this collaboration can significantly enhance medication safety. Pharmacists possess specialized training in drug interactions and pharmacotherapy and can conduct thorough medication reconciliations. They can evaluate existing regimens, recommend evidence-based alternatives, and provide counsel on polypharmacy reduction strategies tailored to each patient's individual health profile [5].

Implementing a collaborative care model in the ED necessitates a systemic change in how healthcare professionals communicate and share responsibilities regarding medication management. Emergency departments are often fast-paced environments where time constraints can lead to rushed decisions about medication prescriptions without a thorough review of the patient's complete medication profile. Integrating standardized protocols for medication review within the ED process can improve the identification of polypharmacy issues before medication orders are finalized. This could involve establishing interdisciplinary rounds that include nurses, physicians, and pharmacists working together to assess and optimize elderly patients' medication regimens before they leave the ED [6].

Moreover, utilizing technology, such as electronic health records (EHR), can facilitate real-time communication among the care team, allowing for more accurate documentation of medication lists, alerts for potential drug interactions, and easy access to clinical guidelines focused on geriatric care. Such technological enhancements can foster a more effective collaborative approach, ensuring that discussions about medication management are informed by reliable data and best practices [7].

Risks and Challenges Associated with Polypharmacy

Polypharmacy, defined as the concurrent use of five or more medications, has emerged as a significant public health concern, particularly among older adults and individuals with chronic health conditions. While the objective of prescribing multiple medications often aims to optimize treatment outcomes for complex medical issues, the practice is fraught with risks and challenges that can have profound implications for patient safety, adherence to medication regimens, and overall health [8].

Adverse drug events (ADEs) are a major consequence of polypharmacy. An ADE refers to any injury resulting from the use of a drug, which includes side effects, allergic reactions, and overdoses. The risk of ADEs increases significantly with the number of medications a patient takes; studies suggest that older adults taking five or more medications are at a substantially higher risk of experiencing an ADE than those on fewer medications. This increased vulnerability can be attributed to several intrinsic factors, such as age-related physiological changes that affect drug metabolism and elimination [9].

Older adults often have multiple comorbidities leading to prescriptions for different health conditions. For example, a patient with diabetes may also suffer from hypertension, heart failure, and depression. Each medication prescribed carries its own set of side effects, and the likelihood of experiencing ADEs rises as more medications are added to a patient's regimen. These events can not only deteriorate a patient's health but may also result in hospitalizations, increased healthcare costs, and premature mortality [10].

Another critical risk associated with polypharmacy is the potential for harmful medication interactions. Drug interactions can occur when two or more drugs react with each other in the body, leading to decreased effectiveness of one or both medications or, conversely, an enhancement of adverse effects. Polypharmacy dramatically heightens the risk of these interactions because each additional

medication can introduce new pathways of interaction [11].

For instance, a person taking a blood thinner (like warfarin) for cardiovascular health may also be prescribed antibiotics or nonsteroidal anti-inflammatory drugs (NSAIDs), which can further complicate their anticoagulation therapy. The clinical consequences of such interactions may not be immediately evident and can manifest as either acute or chronic health issues. In some cases, these harmful interactions may not be predictable, highlighting the need for careful surveillance and monitoring of patients on multiple medications [12].

Moreover, healthcare professionals often rely on clinical guidelines and drug databases to manage the risks of polypharmacy; however, not all drug interactions are included in these resources. As such, the failure to recognize potential interactions can lead to serious, possibly life-threatening complications. This highlights the necessity for a collaborative approach to medication management involving physicians, pharmacists, and patients [9].

Non-adherence to medication regimens represents another significant challenge in the context of polypharmacy. With the increase in the number of prescribed medications, patients may find it difficult to organize their regimens, leading to difficulties in maintaining consistent drug intake. Non-adherence can arise from various factors, including pill burden, complexity of dosing schedules, and cognitive impairment, often seen in older adults [13].

The impact of non-adherence is substantial; it can lead to treatment failures, exacerbation of chronic illnesses, and increased healthcare costs. Studies indicate that non-adherence rates can be as high as 50% in patients prescribed multiple medications. The cognitive load required to manage multiple prescriptions can often overwhelm patients, especially when they are not provided with adequate education on the importance of adhering to their medication regimens [12].

Additionally, polypharmacy can sometimes result in patients being less engaged in their medications, as the overwhelming number may create confusion about the purpose and importance of each medication. This lack of understanding may contribute to a sense of fatalism regarding their health, where patients perceive that regardless of their medication use, health outcomes remain unchanged. Consequently, addressing non-adherence in these patients requires a multifaceted approach, incorporating strategies to simplify medication regimens, enhance patient education, and engage healthcare providers in open dialogue [14].

Given the inherent risks and challenges associated with polypharmacy, proactive measures are essential to promote safe and effective medication management. One such strategy involves regular medication reviews, often conducted by clinicians or pharmacists, to assess the appropriateness of continued prescriptions. This includes evaluating the need for each medication, recognizing potential drug interactions, and identifying any adverse effects experienced by the patient. Deprescribing, or the process of tapering or discontinuing inappropriate medications, can improve health outcomes and minimize the risks associated with polypharmacy [15].

Education is also crucial; healthcare providers must offer clear, comprehensive information about each medication's purpose, potential side effects, and the significance of adherence to the regimen. Involving patients in decision-making processes regarding their medications fosters a sense of ownership and can improve adherence rates. Moreover, utilizing technology, such as medication management apps and pill organizers, can assist patients in keeping track of their medications and align their dosing schedules [14].

Furthermore, establishing interdisciplinary care teams comprising physicians, pharmacists, nurses, and social workers can enhance the coordination of care. These teams can ensure that all aspects of a patient's treatment plan are

aligned, potentially reducing the likelihood of adverse events and improving overall health outcomes [16].

Role of Nurses in Medication Management in Emergency Settings:

In emergency settings, the first step in medication management is a thorough assessment of the patient. Given that elderly patients often arrive in a state of crisis, nurses must quickly gather pertinent information that includes the patient's medical history, current medication list, allergies, and any existing health conditions. This initial evaluation allows nurses to identify possible medication discrepancies or contraindications that could complicate treatment [17].

Nurses utilize a variety of assessment tools and techniques that facilitate comprehensive evaluations. These may include taking vital signs, conducting cognitive assessments using tools like the Mini-Mental State Examination (MMSE), and performing physical examinations that help determine the patient's overall well-being. Furthermore, due to age-related physiological changes, including alterations in drug metabolism and excretion, nurses must be vigilant about how a patient's age and organ function affect medication efficacy and safety. A nuanced understanding of pharmacokinetics and pharmacodynamics is essential, as elderly patients often experience increased sensitivity to both therapeutic and adverse drug effects [18].

Effective communication is another vital component of the assessment phase. Nurses need to engage family members or caregivers who may provide additional insight into the patient's medication history and any other factors influencing their healthcare decisions. This collaborative approach fosters a holistic understanding of the patient's medication regimen and potential issues that could arise during emergency treatment [15].

Following the assessment, patient education becomes a critical focus. Effective medication management not only involves administering medications but also ensuring that elderly patients and their caregivers understand the medications being prescribed. The capacity for self-management among older adults varies widely and can be influenced by physical limitations, cognitive impairment, and health literacy. As such, nurses play an indispensable role in educating both patients and their families about their medications, addressing concerns about dosages, potential side effects, and interactions with other prescribed or over-the-counter medications [19].

Teaching strategies may include utilizing plain language and visual aids to enhance understanding, emphasizing the importance of adherence to prescribed regimens, and explaining how medications work to alleviate symptoms or manage conditions. For instance, a nurse may take time to explain the purpose and side effects of anticoagulants to a patient with a history of atrial fibrillation, thereby helping them understand the importance of antithrombotic therapy in preventing thromboembolic events [20].

In emergency settings, time management poses challenges; however, nurses prioritize patient education as a form of risk mitigation. By equipping patients and caregivers with critical information, nurses empower them to take an active role in medication management, ultimately improving outcomes and minimizing potential errors. Nurses often provide written educational materials that families can take home, reinforcing vital information and serving as reminders for medication schedules [8].

The role of nurses in medication management does not conclude with initial assessment and education; continuous monitoring is essential to ensure patients respond effectively to their treatment regimens. The elderly population is particularly vulnerable to adverse effects from medications due to factors such as polypharmacy and age-related physiological changes. Nurses utilize evidence-based protocols to routinely monitor patients for therapeutic outcomes, complications, and changes in condition [13].

Active monitoring may include observing for specific side effects, potential signs of medication interactions, and overall patient responses to treatments. In emergency settings, where rapid changes in a patient's condition can occur, this vigilant oversight is crucial. For example, if an elderly patient is receiving a new medication for pain management, the nurse must closely monitor the patient for signs of sedation or respiratory depression, which are critical concerns in older adults [21].

Additionally, nurses are responsible for identifying trends or abnormalities in a patient's vital signs or laboratory results that may warrant adjustments in their medication regimen. Data interpretation plays a significant role here; nurses must be adept at recognizing deviations from normal ranges and initiating appropriate action, including notifying physicians for potential medication adjustments. This proactive approach to monitoring not only promotes patient safety but also fosters a collaborative healthcare environment [22].

Physician Responsibilities in Prescribing Practices

The practice of medicine is an intricate interplay of science, art, and a deep understanding of the human condition. A paramount responsibility of physicians lies in the realm of prescribing medications, an aspect of their work that incorporates clinical knowledge, ethical considerations, and acute awareness of patient needs and histories. As the modern healthcare landscape becomes increasingly complex, with an expanding array of pharmacological options and a growing recognition of personalized medicine, understanding physicians' responsibilities in prescribing practices has never been more important [23].

At the core of any successful prescribing practice is a thorough evaluation of the patient. Physicians must gather comprehensive patient histories, which encompass not just the current medical issues but also past medical, social, and family histories. This holistic approach is crucial in recognizing potential contraindications, drug interactions, and allergies that might adversely affect patient outcomes. Furthermore, understanding the patient's socioeconomic context, cultural background, and lifestyle choices can significantly influence the likelihood of adherence to prescribed regimens [24].

In this context, tailoring medication regimens becomes a collaborative endeavor between the physician and the patient. Effective communication facilitates an open dialogue about the patient's preferences, understanding of their condition, and concerns regarding treatment options. Physicians should foster an environment of trust where patients feel comfortable discussing their beliefs about medications, possible side effects, and previous experiences with therapies [25].

While personalizing treatment is essential, physicians also bear the responsibility of adhering to clinical guidelines and evidence-based practices. These guidelines are developed based on large-scale studies and expert consensus to optimize patient outcomes through standardizing treatment protocols. Although these guidelines provide a framework for clinical decision-making, they should not supplant the individualization of care. Physicians are tasked with the responsibility of interpreting these guidelines in the context of a unique patient's circumstances, weighing the potential advantages and disadvantages of various treatment options [26].

Moreover, physicians must remain abreast of evolving research, pharmaceutical developments, and emerging evidence that may impact prescribing practices. Continuous professional development is essential, enabling healthcare providers to adapt their practices based on the latest findings, ensuring that they provide care that is not only relevant but forward-thinking and grounded in solid clinical evidence [27].

Ethical considerations underpin every aspect of health care, including prescribing practices. Physicians must navigate complex moral

dilemmas, such as balancing the need for effective treatment with the principles of non-maleficence (doing no harm) and autonomy (respecting patient choice). The discussion surrounding polypharmacy—prescribing multiple medications for a single patient—underscores the need for physicians to critically evaluate medication regimens, particularly for older adults or those with complex health issues. Reducing unnecessary medications can significantly enhance patients' quality of life, minimize side effects, and lower healthcare costs [28].

Furthermore, the pharmaceutical industry plays a substantial role in shaping prescribing habits through marketing and incentives. Physicians have an ethical duty to scrutinize the motivations behind a medication's promotion and to remain skeptical of promotional materials that may not present a balanced view. Responsible prescribing also involves being mindful of the potential for over-prescribing or inappropriate utilization of medications, particularly in the case of pain management or antibiotics [29].

Incorporating a patient's history into prescribing practices goes beyond gathering data; it involves a nuanced understanding of how that history informs potential treatment pathways. Physicians must consider chronic conditions, previous medication responses, and patterns of adherence that may affect future treatment decisions. For instance, a patient with a history of substance use may warrant cautious consideration regarding opioids or stimulants, while a patient with a history of blood disorders may need careful selection of anticoagulants [24].

Additionally, the integration of patient history aids in the identification of social determinants of health, such as access to care, transportation issues, and financial constraints, which can significantly influence a patient's ability to follow through with prescribed treatment. Ensuring that medications are both accessible and affordable forms a critical aspect of responsible prescribing, with physicians playing a pivotal role in advocating for their patients within the healthcare system [30].

Modern technology has transformed healthcare delivery, providing new avenues for improving prescribing practices. Electronic Health Records (EHRs) enhance the continuity of care by ensuring that patient histories, allergies, and previous prescriptions are readily accessible. This information is invaluable in preventing drug interactions and enabling clinicians to make informed prescribing decisions [18].

Moreover, interdisciplinary collaboration is paramount when it comes to managing complex medical cases. Physicians should work closely with pharmacists to review medication regimens, understand pharmacogenomics, and navigate issues around polypharmacy. By doing so, healthcare teams can collectively optimize therapeutic regimens tailored to individual patients, bolstering safety and effectiveness [31].

Pharmacists' Expertise in Medication Review and Counseling:

The role of pharmacists in the healthcare continuum has evolved tremendously over the years, especially in the context of medication management. As frontline healthcare providers, pharmacists have gained increased recognition for their ability to review prescriptions, counsel patients, and provide recommendations that enhance medication safety and efficacy. This expertise is particularly crucial in emergency settings, where prompt and accurate medication management can significantly impact patient outcomes, especially in vulnerable populations such as the elderly [32].

Medication review is a systematic assessment of a patient's medications, aimed at identifying potential medication-related problems and optimizing therapeutic outcomes. Pharmacists possess specialized training and knowledge that enable them to conduct thorough medication reviews. They are well-versed in pharmacology, drug interactions, and the physiological changes associated with aging,

making them indispensable assets in the healthcare team, particularly for elderly patients who often present with polypharmacy— the concurrent use of multiple medications [32].

In emergency departments (ED), elderly patients frequently arrive with acute medical issues that could be exacerbated by their existing medications. The complexities of their medical history, comorbidities, and varying physiological responses to medications necessitate a pharmacist's expertise to ensure accurate medication reconciliation. By conducting comprehensive reviews, pharmacists can identify discrepancies in prescriptions, such as duplications, contraindications, or inappropriate dosages, which are particularly concerning in the elderly, who are at higher risk for adverse drug reactions [33].

One of the critical tasks performed by pharmacists during medication review is the identification of drug-drug interactions. Polypharmacy elevates the risk for patients, as combinations of medications can lead to unexpected pharmacokinetic and pharmacodynamic interactions. For instance, an elderly patient who is prescribed a new antibiotic may already be taking anticoagulants, raising concerns about bleeding risks. Pharmacists are equipped to assess these interactions in real-time, using specialized software and clinical guidelines [34].

The effects of drug interactions can be severe, ranging from diminished therapeutic effects to serious clinical complications. By recognizing these interactions, pharmacists can recommend safer alternatives or dosage adjustments, contributing to enhanced therapeutic efficacy while minimizing the risk of adverse outcomes. Moreover, ongoing education and training keep pharmacists updated on new medications and interaction profiles, ensuring they are prepared to handle emerging challenges faced in emergency settings [35].

In addition to identifying potential issues, pharmacists play a vital role in making recommendations to optimize patient care. In emergency situations where physicians are required to make quick decisions, pharmacists can provide critical information regarding the appropriateness of specific medications for elderly patients and propose alternatives when necessary. For example, in cases where a patient presents with a heart condition and is currently on a drug that may exacerbate their symptoms, the pharmacist can advocate for switching to a safer option [36].

Furthermore, pharmacists also engage in collaborative practice with physicians, enabling an interdisciplinary approach that leverages the unique expertise of each team member. Emergency departments that integrate pharmacists into their workflow benefit from improved patient outcomes, shortened hospital stays, and reduced healthcare costs. To facilitate this collaboration, some facilities have implemented protocols that enable pharmacists to conduct patient evaluations, adjust medications based on established guidelines, and even initiate therapy for specific conditions, such as anticoagulation monitoring [37].

Counseling is another critical component of the pharmacist's expertise in medication management. While the emergency setting may seem fast-paced, appropriate counseling is necessary to prepare patients for the safe and effective use of their medications during and after hospital care. This is especially important for elderly patients who can often be overwhelmed by new prescriptions or changes to existing regimens [38].

Pharmacists can provide counseling on various aspects of medication use, including the importance of adherence, the correct administration of medications (e.g., route, timing), potential side effects, and when to seek help if they experience adverse reactions. Given their understanding of pharmacotherapy and the nuances of elderly care, pharmacists can tailor their counseling to the specific needs and capabilities of this demographic, often utilizing teach-back methods to ensure comprehension [39].

Moreover, engaging families or caregivers in the counseling process is essential, as they often play a pivotal role in medication management for elderly patients. Educating caregivers about potential drug interactions, the importance of consistent medication schedules, or lifestyle modifications required to enhance medication effectiveness reinforces a team-based approach to patient care [40].

Conclusion:

In conclusion, effectively managing polypharmacy in elderly emergency patients necessitates a concerted and collaborative effort among nurses, physicians, and pharmacists. The complexities associated with multiple medications, particularly in a vulnerable population such as the elderly, highlight the importance of an interdisciplinary approach that prioritizes patient safety and well-being. By harnessing the unique expertise of each healthcare professional, it becomes possible to conduct thorough medication reviews, identify potential drug interactions, and enhance patient education regarding their treatment regimens. Furthermore, the inclusion of patients and caregivers in the decision-making process fosters a sense of ownership and encourages adherence to prescribed therapies.

As the healthcare landscape continues to evolve, ongoing training, communication, and the adoption of best practices will be crucial in addressing the challenges of polypharmacy. Initiatives that promote teamwork and integrated care models can significantly mitigate the risks associated with multiple medications and improve health outcomes for elderly patients. Ultimately, a collaborative framework that brings together nurses, physicians, and pharmacists not only reinforces the quality of care but also ensures that aging patients receive the safest and most effective medication management possible in emergency settings.

WORKS CITED

Brown J. D., Hutchison L. C., Li C., Painter J. T., Martin B. C. (2016). Predictive Validity of the Beers and Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) Criteria to Detect Adverse Drug Events, Hospitalizations, and Emergency Department Visits in the United States. J. Am. Geriatr. Soc. 64 (1), 22–30.

Bulajeva A., Labberton L., Leikola S., Pohjanoksa-Mäntylä M., Geurts M. M., de Gier J. J., et al. (2014). Medication Review Practices in European Countries. Res. Soc. Adm Pharm 10 (5), 731–740.

Clyne B., Bradley M. C., Hughes C., Fahey T., Lapane K. L. (2012). Electronic Prescribing and Other Forms of Technology to Reduce Inappropriate Medication Use and Polypharmacy in Older People: a Review of Current Evidence. Clin. Geriatr. Med. 28 (2), 301–322.

Bergert F. W., Braun M., Ehrenthal K., Feßler J., Gross J., Hüttner U., et al. (2014). Recommendations for Treating Adult and Geriatric Patients on Multimedication. Int. J. Clin. Pharmacol. Ther. 52 (Suppl. 1), 1–64.

By the 2019 American Geriatrics Society Beers Criteria® Update Expert Panel (2019). American Geriatrics Society 2019 Updated AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults. J. Am. Geriatr. Soc. 67 (4), 674–694.

Cadogan C. A., Ryan C., Gormley G. J., Francis J. J., Passmore P., Kerse N., et al. (2017). A Feasibility Study of a Theory-Based Intervention to Improve Appropriate Polypharmacy for Older People in Primary Care. Pilot Feasibility Stud. 4, 23.

Bokhof B., Junius-Walker U. (2016). Reducing Polypharmacy from the Perspectives of General Practitioners and Older Patients: A Synthesis of Qualitative Studies. Drugs Aging 33 (4), 249–266.

Clyne B., Cooper J. A., Hughes C. M., Fahey T., Smith S. M. (2016). 'Potentially Inappropriate or Specifically Appropriate?' Qualitative Evaluation of General Practitioners Views on Prescribing, Polypharmacy and Potentially Inappropriate Prescribing in Older People. BMC Fam. Pract. 17 (1), 109.

Chau S. H., Jansen A. P., van de Ven P. M., Hoogland P., Elders P. J., Hugtenburg J. G. (2016). Clinical Medication Reviews in Elderly Patients with Polypharmacy: a Cross-Sectional Study on Drug-Related Problems in the Netherlands. Int. J. Clin. Pharm. 38 (1), 46–53.

Austad B., Hetlevik I., Mjølstad B. P., Helvik A. S. (2016). Applying Clinical Guidelines in General Practice: a Qualitative Study of Potential Complications. BMC Fam. Pract. 17, 92.

Barnett K., Mercer S. W., Norbury M., Watt G., Wyke S., Guthrie B. (2012). Epidemiology of Multimorbidity and Implications for Health Care, Research, and Medical Education: a Cross-Sectional Study. Lancet 380 (9836), 37–43.

Beers M. H. (1997). Explicit Criteria for Determining Potentially Inappropriate Medication Use by the Elderly. An Update. Arch. Intern. Med. 157 (14), 1531–1536.

Cadogan C. A., Ryan C., Francis J. J., Gormley G. J., Passmore P., Kerse N., et al. (2015). Improving Appropriate Polypharmacy for Older People in Primary Care: Selecting Components of an Evidence-Based Intervention to Target Prescribing and Dispensing. Implement Sci. 10, 161.

Brown J. D., Hutchison L. C., Li C., Painter J. T., Martin B. C. (2016). Predictive Validity of the Beers and Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) Criteria to Detect Adverse Drug Events, Hospitalizations, and Emergency Department Visits in the United States. J. Am. Geriatr. Soc. 64 (1), 22–30.

Clyne W., Blenkinsopp A., Seal R. (2008). A Guide to Medication Review National Prescribing Centre. UK: NHS.

Dunning T. (2017). Medicines and Older People: Polypharmacy, Adherence and Safety. Int. Diabetes Nurs. 14 (1), 10–15.

Farmer C., Fenu E., O'Flynn N., Guthrie B. (2016). Clinical Assessment and Management of Multimorbidity: Summary of NICE Guidance. BMJ 354, i4843.

Doan J., Zakrzewski-Jakubiak H., Roy J., Turgeon J., Tannenbaum C. (2013). Prevalence and Risk of Potential Cytochrome P450-Mediated Drug-Drug Interactions in Older Hospitalized Patients with Polypharmacy. Ann. Pharmacother. 47 (3), 324–332.

Cooper J. A., Cadogan C. A., Patterson S. M., Kerse N., Bradley M. C., Ryan C., et al. (2015). Interventions to Improve the Appropriate Use of Polypharmacy in Older People: a Cochrane Systematic Review. BMJ Open 5 (12), e009235.

Franco J. V. A., Terrasa S. A., Kopitowski K. S. (2017). Medication Discrepancies and Potentially Inadequate Prescriptions in Elderly Adults with Polypharmacy in Ambulatory Care. J. Fam. Med Prim Care 6 (1), 78–82.

Eyigor S., Kutsal Y. G. (2012). Polypharmacy in the Elderly: To Prescribe, or Not Prescribe "that Is the Question". Turk Geriatri Dergisi 15 (4), 445–454.

Garpestad E., Devlin J. W. (2017). Polypharmacy and Delirium in Critically Ill Older Adults: Recognition and Prevention. Clin. Geriatr. Med. 33 (2), 189–203.

Guthrie B., Makubate B., Hernandez-Santiago V., Dreischulte T. (2015). The Rising Tide of Polypharmacy and Drug-Drug Interactions: Population Database Analysis 1995-2010. BMC Med. 13, 74.

Hamilton H., Gallagher P., Ryan C., Byrne S., O'Mahony D. (2011). Potentially Inappropriate Medications Defined by STOPP Criteria and the Risk of Adverse Drug Events in Older Hospitalized Patients. Arch. Intern. Med. 171 (11), 1013–1019.

Croke L. (2020). Beers Criteria for Inappropriate Medication Use in Older Patients: An Update from the AGS. Am. Fam. Physician 101 (1), 56–57.

Drenth-van Maanen A. C., van Marum R. J., Knol W., van der Linden C. M., Jansen P. A. (2009). Prescribing Optimization Method for Improving Prescribing in Elderly Patients Receiving Polypharmacy: Results of Application to Case Histories by General Practitioners. Drugs Aging 26 (8), 687–701.

Fried T. R., O'Leary J., Towle V., Goldstein M. K., Trentalange M., Martin D. K. (2014). Health Outcomes Associated with Polypharmacy in Community-Dwelling Older Adults: a Systematic Review. J. Am. Geriatr. Soc. 62 (12), 2261–2272.

Nobili A., Garattini S., Mannucci P. M. (2011). Multiple Diseases and Polypharmacy in the Elderly: Challenges for the Internist of the Third Millennium. J. Comorb 1, 28–44.

McNicholl I. R., Gandhi M., Hare C. B., Greene M., Pierluissi E. (2017). A Pharmacist-Led Program to Evaluate and Reduce Polypharmacy and Potentially Inappropriate Prescribing in Older HIV-Positive Patients. Pharmacotherapy 37 (12), 1498–1506.

May C., Montori V. M., Mair F. S. (2009). We Need Minimally Disruptive Medicine. BMJ 339, b2803.

Meyer L., Wehling M. (2020). Knowledge on and Use of the FORTA ("Fit fOR the Aged")-List and the FORTA App by General Practitioners in Baden-Württemberg, Germany. Eur. Geriatr. Med. 11 (3), 499–503.

Mansur N., Weiss A., Beloosesky Y. (2012). Looking beyond Polypharmacy: Quantification of Medication Regimen Complexity in the Elderly. Am. J. Geriatr. Pharmacother. 10 (4), 223–229.

Martin-Khan M. G., Edwards H., Wootton R., Varghese P., Lim K., Darzins P., et al. (2016). Web-based (Online) Comprehensive Geriatric Assessment Is More Time Efficient, and as Reliable, as Reading Patient Medical Records and Conducting Traditional in Person Consultations. J. Telemed. Telecare 22 (8), 478–482.

Mc Namara K. P., Breken B. D., Alzubaidi H. T., Bell J. S., Dunbar J. A., Walker C., et al. (2017). Health Professional Perspectives on the Management of Multimorbidity and Polypharmacy for Older Patients in Australia. Age Ageing 46 (2), 291–299.

Montori V. M., Brito J. P., Murad M. H. (2013). The Optimal Practice of Evidence-Based Medicine: Incorporating Patient Preferences in Practice Guidelines. JAMA 310 (23), 2503–2504.

Midão L., Giardini A., Menditto E., Kardas P., Costa E. (2018). Polypharmacy Prevalence Among Older Adults Based on the Survey of Health, Ageing and Retirement in Europe. Arch. Gerontol. Geriatr. 78, 213–220.

Morin L., Johnell K., Laroche M. L., Fastbom J., Wastesson J. W. (2018). The Epidemiology of Polypharmacy in Older Adults: Register-Based Prospective Cohort Study. Clin. Epidemiol. 10, 289–298.

Masnoon N., Shakib S., Kalisch-Ellett L., Caughey G. E. (2017). What Is Polypharmacy? A Systematic Review of Definitions. BMC Geriatr. 17 (1), 230.

Monteiro L., Maricoto T., Solha I., Ribeiro-Vaz I., Martins C., Monteiro-Soares M. (2019). Reducing Potentially Inappropriate Prescriptions for Older Patients Using Computerized Decision Support Tools: Systematic Review. J. Med. Internet Res. 21 (11), e15385.

O'Mahony D., O'Sullivan D., Byrne S., O'Connor M. N., Ryan C., Gallagher P. (2015). STOPP/START Criteria for Potentially Inappropriate Prescribing in Older People: Version 2. Age Ageing 44 (2), 213–218.