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Literature Review

Effectiveness of Clinical Pharmacy Interventions in Medication Adherence for Geriatric Patients: Literature Review

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ABSTRACT

Background: Medication adherence in geriatric patients is a major challenge as polypharmacy increases the risk of drug-related problems (DRPs). The role of clinical pharmacy is important in addressing these issues through evidence-based approaches. **Objective:** To review the effectiveness of various clinical pharmacy interventions in improving medication adherence in geriatric patients. **Methods:** This article used a systematic review of 13 literature selected from 934 articles based on inclusion criteria in the last 10 years, using PubMed and Google Scholar databases. The focus of the analysis included education, monitoring, and the use of tools such as pill cards and medication reminder charts. **Results:** Clinical pharmacy interventions, such as the use of Beers and STOPP/START criteria, counseling, and educational programs using tools, were shown to improve adherence in geriatric patients. Programs such as pill boxes increased adherence by 83.33%. However, some tools such as medication reminder charts had limited effectiveness**. Conclusion:** A collaborative approach, including patient and family education, monitoring, and clinical criteria-based therapy adjustments, is essential to improve medication adherence in geriatric patients, which directly improves their quality of life.

Introduction

The increase in the aging population is a global phenomenon that presents new challenges in the health sector, particularly regarding medication use in the geriatric population[1]. According to the World Health Organization (WHO), the geriatric group includes those aged 60-74 years, 75-90 years, and those over 90 years[2]. WHO predicts that the elderly population worldwide will reach 1.2 billion by 2025 and will continue to grow to 80 million by 2050[3]. Based on data from the Central Bureau of Statistics (BPS) in 2020, the number of elderly people in Indonesia has also increased, from 7.59% in 2010 to 9.78% in 2020, with a total population of around 10.3 million people, most of whom are over 60 years old. At the same time, there are approximately 5 million people aged over 75 years. This phenomenon can trigger various problems in the geriatric population. Emotional issues and self-centeredness often become challenges in maintaining adherence to regular medication. Several factors influencing this behavior include feelings of losing control, discomfort with dependency on medication, or a lack of understanding regarding the importance of long-term treatment. In addition, geriatric patients generally have more comorbid health conditions compared to other age groups[4]. As a result, managing therapy becomes more complex and often requires the use of multiple types of medications simultaneously (polypharmacy), which can increase the likelihood of drug interactions and side effects[5]. As age advances, the elderly face declining bodily and cognitive functions that affect their independence, as well as impacting social, psychological, and physical aspects of daily life[6]. The quality of life of the elderly is also

influenced by various factors, including physical, psychological, social, and environmental conditions. To improve their quality of life, geriatric patients need optimal support from their families and a conducive environment[7].

In addressing this issue, the role of clinical pharmacy becomes highly significant. Clinical pharmacists possess specialized skills and knowledge that enable them to evaluate, monitor, and manage drug therapy, particularly in patients, including the elderly (geriatric) population[8]. According to the Ministry of Health of the Republic of Indonesia (2016), pharmaceutical services are services provided directly and responsibly to patients, related to the use of pharmaceutical preparations, with the aim of achieving optimal outcomes to improve the patient's quality of life[9]. Through a thorough, evidence-based approach, clinical pharmacy can make a substantial contribution to improving medication adherence among elderly patients. By reviewing relevant literature, we can identify various proven effective methods, while also recognizing the challenges and opportunities to optimize the role of clinical pharmacy in geriatric patient care[10].

The urgency of this study lies in the increasing elderly population, which has a significant impact on the healthcare system, particularly in the area of medication management. Elderly individuals tend to experience a decline in organ function that affects the pharmacokinetics and pharmacodynamics of drugs, thereby increasing the risk of adverse drug reactions and harmful drug interactions if not properly managed[11]. Previous studies have shown that approximately 35-40% of geriatric patients encounter problems related to medication use, such as polypharmacy, non-adherence, and inappropriate medication use[12]. Additionally, the level of medication adherence among geriatric patients in Indonesia remains relatively low due to a lack of understanding, reluctance to take long-term medications, and limited access to adequate information[13]. The role of clinical pharmacists is critically important in identifying, preventing, and resolving medication therapy problems in geriatric patients, which ultimately can improve their quality of life and reduce morbidity and mortality rates[14]. This study is expected to provide a meaningful contribution by optimizing the role of clinical pharmacy through a comparison of effective domestic and international programs in enhancing medication safety for geriatric patients.

Through a deeper understanding of the role of clinical pharmacy in this context, it is expected that more effective strategies can be identified to improve the quality of medication management for elderly patients. This aims to provide optimal benefits for their health and quality of life. The discussion in this literature review will further explore the role of clinical pharmacy by comparing programs implemented domestically (in Indonesia) and internationally to enhance medication safety in geriatric patients.

Materials and Methods

Study Design

This study employed a systematic review method aimed at reviewing and analyzing clinical pharmacy methods and interventions to improve medication adherence in geriatric patients, particularly in addressing the challenges of polypharmacy. The primary focus was on the effectiveness of interventions targeting factors that influence patient adherence, including memory decline, emotional issues, and attitudes toward medication. In addition, this review sought to identify best practices and innovative strategies from both national and international programs that can be adapted to optimize pharmaceutical care and enhance patient outcomes in the geriatric population..

Sample

The sample in this study consisted of scientific articles relevant to the topic. Articles were selected based on inclusion and exclusion criteria. The inclusion criteria were scientific publications published within the last 10 years (2014–2024), written in English or Indonesian, and focused on geriatric patients aged over 60 years. The exclusion criteria included articles published outside the specified timeframe or articles not relevant to the topic.

Data Collection Technique

Data were collected through literature searches in the PubMed and Google Scholar databases. Keywords used included "Geriatric," "Elderly," "Pharmacy," "Clinic," "Management," and other related terms associated with clinical pharmacy interventions on medication adherence in geriatric patients. The initial search yielded 934 articles, which were then further screened based on the inclusion criteria. From this selection process, 13 articles were deemed eligible for further analysis.

Data Analysis Technique

The selected articles were analyzed using narrative synthesis to identify patterns, intervention effectiveness, and supporting and hindering factors related to medication adherence. The analysis included an evaluation of clinical pharmacy intervention methods, their impact on medication adherence, and recommendations for future clinical pharmacy practices.

Ethical Considerations

This study did not involve direct human subjects and therefore did not require ethical approval. However, research ethics principles were still applied, including ensuring that the literature sources used were from legitimate publications, maintaining transparency in data compilation, and respecting the copyrights of the original authors.

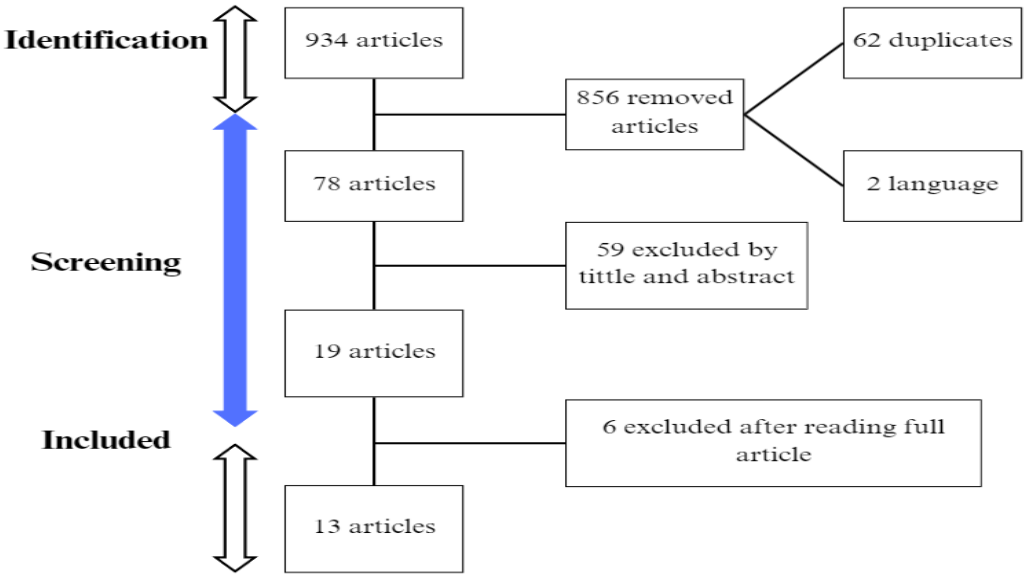

Figure 1. Review Article Selection Process

Results

This study focuses on efforts to improve medication adherence in geriatric patients through various clinical pharmacy interventions. This approach is crucial considering the high risk of drug-related problems (DRP) faced by geriatric patients due to polypharmacy and cognitive decline. The

analysis in this study aims to understand the extent to which various strategies, such as monitoring, patient education, and the use of assistive tools, can effectively enhance medication adherence. Additionally, bibliometric analysis is utilized to map research trends related to clinical pharmacy interventions in geriatric patients, providing insights into the development and future opportunities within this topic.

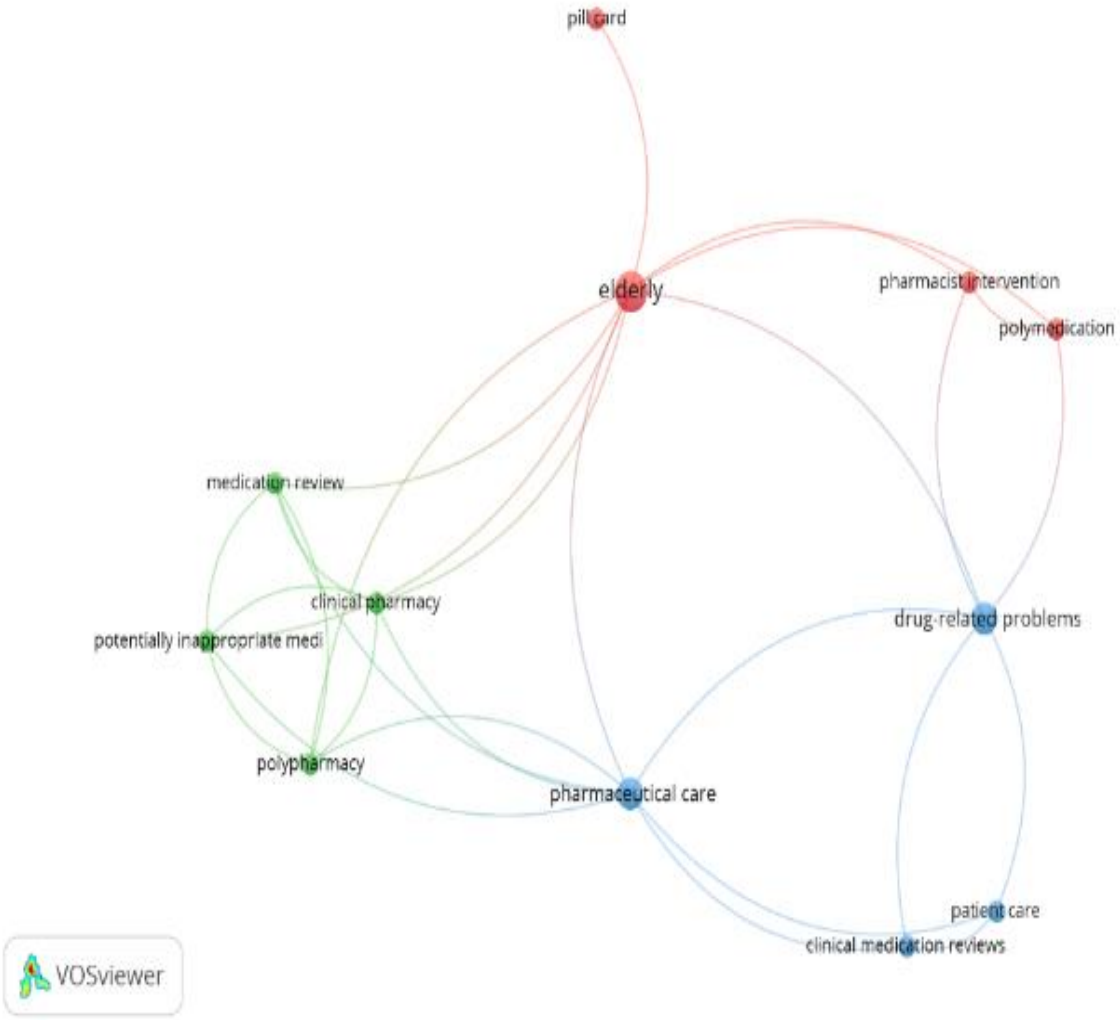

Figure 2. Network Visualization Results

In the network visualization mapping, each interconnected item is displayed in three different colors. The red color represents items in the first cluster, green for the second cluster, and blue for the third cluster. Additionally, the size of each item's circle reflects its frequency the larger the circle, the more frequently the item appears in the data[15]. The mapping results using the VOSviewer software indicate that topics such as elderly/geriatrics, drug-related problems, and pharmaceutical care have been widely studied. In contrast, topics such as pill cards, pharmacy interventions, polypharmacy, patient care, clinical medication reviews, potential medication errors, clinical pharmacy, and medication review are areas that have not been extensively researched.

After conducting the network visualization mapping analysis, the next step was to perform an analysis using overlay visualization. This analysis focuses on the variation in publication years of the articles used. The mapping results indicate that most studies were conducted between 2018 and 2020. The most recent

studies are highlighted in yellow, particularly on topics related to pill cards, while the older studies are represented by darker colors.

The next stage of the mapping process involved using density visualization to identify the most extensively researched areas. In this visualization, brighter colors indicate topics that have received greater research attention[5]. The results of the mapping show that topics related to geriatrics, pharmaceutical care, and drug-related problems are frequently studied. On the other hand, topics such as pill cards, pharmacy interventions, polypharmacy, patient care, clinical medication reviews, potential medication errors, clinical pharmacy, and medication reviews remain under-researched. This mapping also highlights potential research opportunities, particularly in areas with less intensity (darker colors), indicating that these topics have not yet been widely explored.

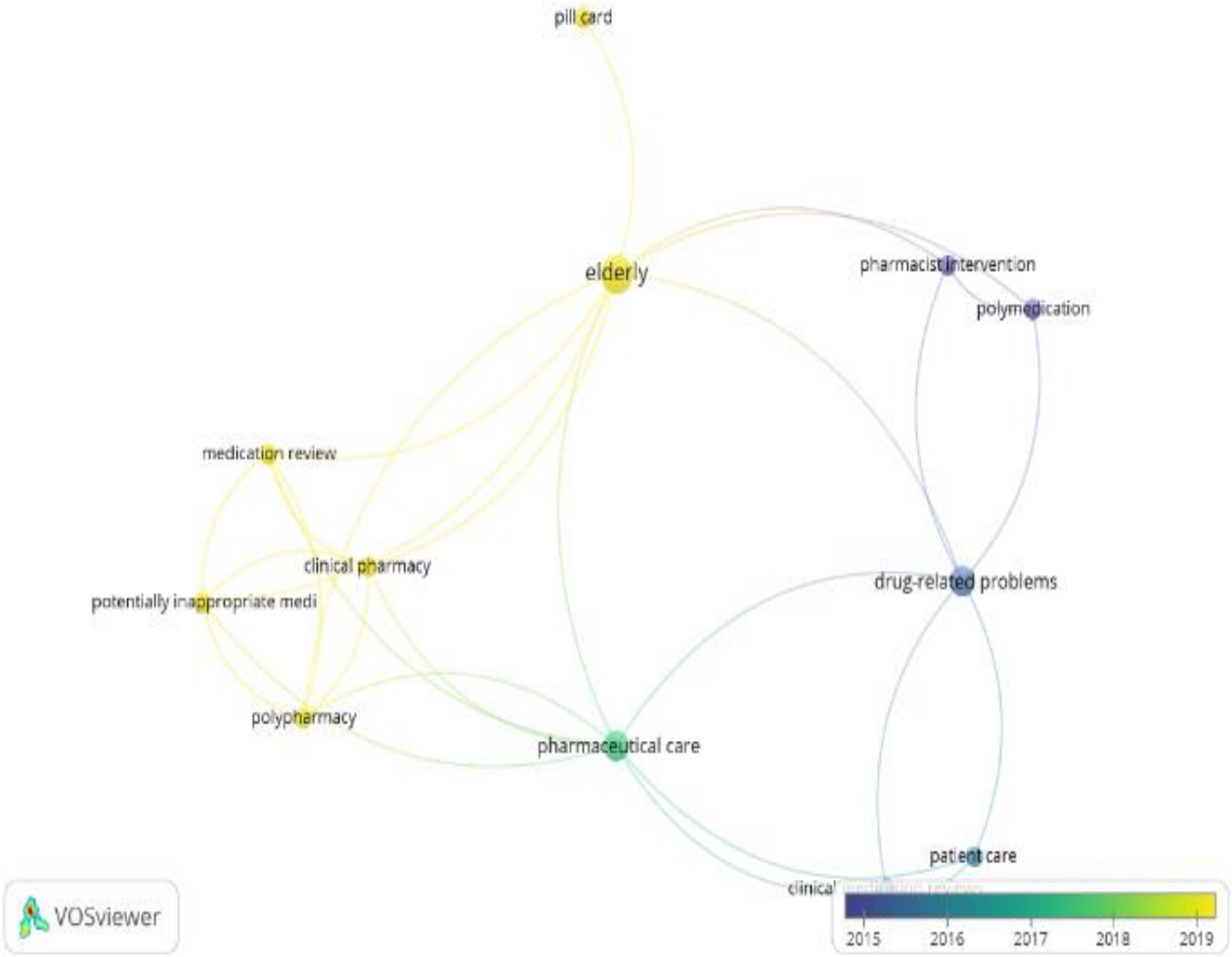

Figure 3. Overlay Visualization Results

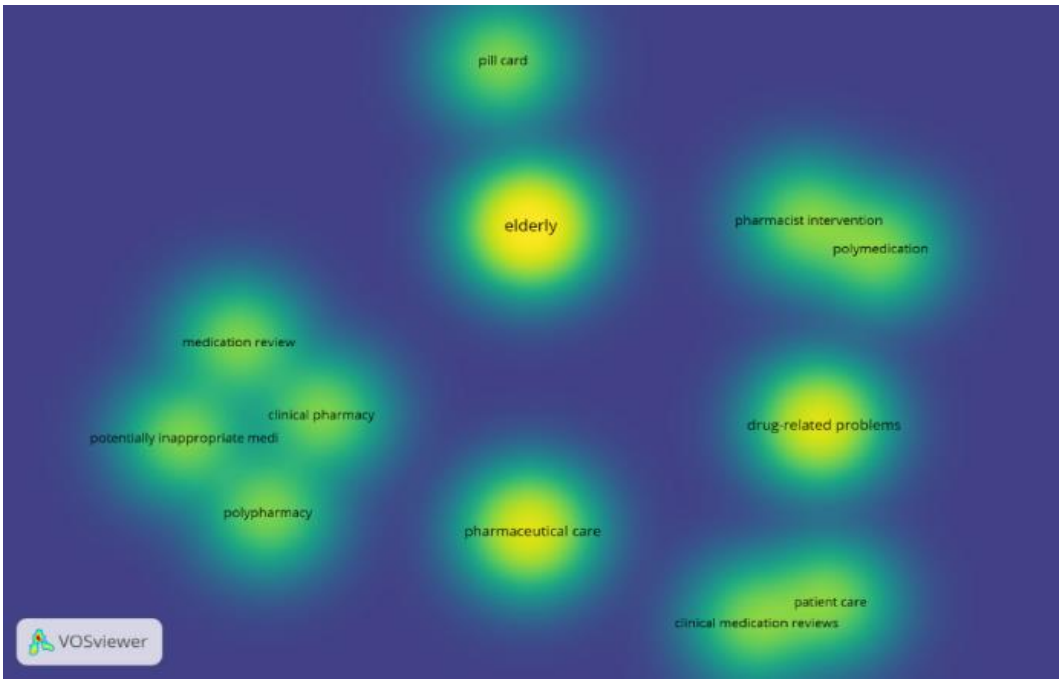

Figure 4. Density Visualization Results

Table 1. Literature Review Results

Author	Year	Title	Method	Instrument	Result
Ertuna, E., et al[16]	2019	Evaluation of pharmacist interventions and commonly used medications in the geriatric ward of a teaching hospital in Turkey: a retrospective study	Retrospective study	Monitoring, counseling, Beers criteria, and STOP/START	There is a relationship between pharmaceutical interventions and medication adherence in geriatric patients, including medication review, use of Beers and STOP/START criteria, monitoring of drug effects, and counseling for patients and their families.
Chau, S. H., et al[17]	2015	Clinical medication reviews in elderly patients with polypharmacy: a cross-sectional study on drug-related problems in the Netherlands	Cross-sectional study	DRP identification, monitoring, and counseling	There is a relationship between pharmaceutical interventions and geriatric patients, including clinical medication reviews, identification of DRPs (over-treatment and under-treatment), and providing monitoring and education for geriatric patients.
Ariyani, H., et al[18]	2023	Effectiveness of Pharmacist Education Using Leaflets and Pill Cards on Medication Adherence in Geriatric Hypertension Patients	Quasi-experimental study	Leaflet and pill card media program	There is a relationship between pharmaceutical interventions and geriatric patients through the use of leaflet and pill card media programs to improve medication adherence.
Febriyanti, A.P[19]	2020	Effectiveness of Medication Reminder Chart in Improving Medication Adherence in Geriatric Patients with Type 2 Diabetes Mellitus	Quasi-experimental study	"Medication Reminder Chart" program	The "Medication Reminder Chart" program is effective in improving medication adherence in geriatric patients.
Sucipto, A., et al[20]	2014	Effectiveness of Diabetes Mellitus Counseling in Improving Adherence and Blood Glucose Control in Type 2 Diabetes Mellitus	Quasi-experimental study	Counseling	Pharmaceutical interventions improve medication adherence in geriatric patients through regular counseling, especially

Author	Year	Title	Method	Instrument	Result
					for those with type 2 diabetes mellitus.
Pahlawadita, C. R., et al[21]	2017	Evaluation of Adherence to Oral Hypoglycemic Therapy in Geriatric Patients with Type 2 Diabetes Mellitus at Sukoharjo Regional Hospital, May-September 2016	Cross-sectional study	MMAS-8 questionnaire and counseling	Pharmaceutical efforts to improve medication adherence in geriatric patients through the MMAS-8 questionnaire, education, and two-way discussions.
Setiawati, M.K., et al[22]	2022	Predictive Factors of the Clinical Impact of Pharmacist Interventions in Hospitalized Geriatric Patients	Quasi-experimental study without control group	Counseling and monitoring	There is a relationship between clinical pharmacy and medication adherence in geriatric patients through DRP identification, education, counseling, and continuous monitoring.
Divandra, C.V.R., et al[23]	2023	Holistic Management of Hypertensive Crisis in Geriatric Patients with Negative Attitudes Towards Medication Adherence, Self-Monitoring, and Lifestyle Modification Using a Family Medicine Approach in the Working Area of Gedong Air Public Health Center	Case Report	Counseling and monitoring	Pharmaceutical interventions to improve medication adherence in geriatric patients through family approaches, education, counseling, regular monitoring, and evaluation.
Hailu, B. Y., et al[24]	2020	Drug Related Problems in Admitted Geriatric Patients: The Impact of Clinical Pharmacist Interventions	Prospective interventional study	DRP identification, counseling, and monitoring	Pharmaceutical interventions in geriatric patients using drug problem identification, patient education and counseling, and strict monitoring and evaluation.
Silva, C., et al[25]	2015	Drug-related problems in institutionalized, polymedicated elderly patients: opportunities for pharmacist intervention	Descriptive cross-sectional study	Monitoring and counseling	Pharmaceutical interventions to improve medication adherence through STOPP and START tools, monitoring medication administration, and educating patients and caregivers.
Beuscrat, J.P., et al[26]	2019	Polypharmacy in Older Patients: Identifying the Need for Support by a Community Pharmacist	Cross-sectional study	Counseling	Pharmaceutical interventions to improve medication adherence through interviews and counseling for patients and their families.
Sammulia, S.F., et al[27]	2016	Comparison of Pill Box and Medication Chart in Improving Medication Adherence and Clinical Outcomes in Geriatric Patients in Batam City	Randomized controlled experimental study	Pill box and medication reminder chart method	Pharmaceutical interventions to improve medication adherence in geriatric patients using pill boxes and medication reminder charts.
Mpila, D.A. [28]	2024	The Effect of Pill Box Intervention on Medication Adherence and Clinical Outcomes in Elderly Patients with Hypertension	Randomized controlled trial	Pill box method	Pharmaceutical interventions to improve medication adherence in geriatric patients using the pill box method.

Discussion

Clinical Treatment/Medication Review

Clinical treatment in geriatric patients is often complex due to polypharmacy and health problems that vary with each individual patient. This is further clarified by several cases in which most geriatric patients were found to be using more than five medications. In one of the reviewed studies, it was noted that geriatric patients used an average of 8.17 medications per patient, significantly increasing the risk of drug-related problems (DRPs)[16]. Additionally, according to Hailu et al. (2020), it was found that among hospitalized geriatric patients, at

least 82% experienced DRPs, which were influenced by the number of comorbidities and the extent of polypharmacy. These findings emphasize that regular medication reviews, particularly by clinical professionals including clinical pharmacists, play a crucial role in improving medication adherence among geriatric patients. Such interventions are essential to minimize the risk of medication errors in this vulnerable population.

Use of Beers Criterion and STOPP/START

The use of the Beers Criteria and STOPP/START has been proven effective in identifying potentially inappropriate medications for geriatric patients. According to Ertuana et al. (2019), these criteria were applied to evaluate inappropriate medication use, with data showing that 22 medications were identified as unsuitable for elderly patients. In addition, the application of the STOPP/START method in institutional settings effectively identified numerous drug-related problems among geriatric patients[25]. This approach can serve as an important strategy to improve medication adherence and reduce the risk of medication errors in elderly patients. Moreover, this method is considered to contribute indirectly to enhancing patient compliance by promoting safer and more appropriate prescribing practices.

Providing Counseling to Geriatric Patients and Families

Counseling provided to both patients and their families is essential to improve medication adherence. This is supported by evidence indicating that counseling on diet, medication control, and pill usage is effective in enhancing adherence and blood glucose management in geriatric patients[20]. Additionally, Setiawati et al. (2022) emphasized the importance of counseling that actively involves the patient's family to ensure proper understanding of the therapy, particularly for geriatric patients who may already experience memory decline. Counseling combined with educational media for family members has been shown to improve patient adherence by up to 45.3%[26].

Identify DRPs

The identification of drug-related problems (DRPs) is one of the key priorities in the management of geriatric patients. According to Ertuana et al. (2019), it was reported that 40.12% of geriatric patients experienced drug interactions, and the identification of DRPs is a critical initial step undertaken by clinical pharmacists. Furthermore, another study found that among patients receiving polypharmacy, at least 49.51% of DRPs were caused by adverse drug events[25]. In addition, research conducted by Sammulia et al. (2016) reported that the use of the PCNE (Pharmaceutical Care Network Europe) method in identifying DRPs significantly aids pharmacists in developing appropriate care plans. This approach contributes to the reduction of polypharmacy and the optimization of medication regimens, which indirectly supports improved adherence by minimizing unnecessary medication burdens.

Geriatric Patient Monitoring

Monitoring geriatric patients requires a collaborative approach involving various medical professionals. One example is the cooperation between clinical pharmacists and geriatric physicians in supporting medication adherence through monitoring drug interactions, deprescribing unnecessary medications, and adjusting dosages[16]. According to Hailu et al. (2020), intensive monitoring by clinical pharmacists can significantly reduce the number of drug-related problems (DRPs) in hospitalized geriatric patients. Additionally, Setiawati et al. (2022) emphasized that pharmacist interventions,

including the monitoring of vital signs and laboratory parameters, can improve medication adherence among elderly patients. Research conducted by Divandra et al. (2023) also reported that consistent monitoring contributes to lowering blood pressure in hypertensive patients and improving their clinical condition, which in turn supports long-term adherence to therapy.

Program Leaflet/Pill Card/Medication Reminder Chart/Pill Box

Educational and reminder programs utilizing media such as leaflets, pill cards, and medication reminder charts have been proven to improve medication adherence among elderly patients. This is supported by data showing that the use of leaflets combined with pill cards significantly increases patient adherence to antihypertensive medications[18]. However, not all of these programs consistently yield positive outcomes. According to Febriyanti (2020), the use of medication reminder charts is not always effective, particularly in patients with physical limitations. Furthermore, a study conducted by Sammulia et al. (2016) reported that, when comparing the effectiveness of pill boxes and medication reminder charts, pill boxes were found to be more effective in improving adherence among geriatric patients. This finding was further reinforced by research conducted by Mpila et al. (2024), which highlighted that the use of pill boxes improved medication adherence in elderly patients from 20% to 83.33%, although no significant changes were observed in blood pressure among patients with stable hypertension.

Conclusion

Based on the literature review and analysis conducted, the management of geriatric patients requires a comprehensive and collaborative approach. Polypharmacy in elderly patients increases the risk of drug-related problems (DRPs), making it essential to closely monitor medication use through collaboration among pharmacists, physicians, and other healthcare professionals. The application of the Beers Criteria and the STOPP/START criteria has proven effective in identifying potentially inappropriate medications in geriatric patients, helping to reduce the incidence of inappropriate drug use and enhancing therapeutic safety.

Pharmaceutical interventions, such as deprescribing unnecessary medications, dose adjustments, and monitoring for adverse drug reactions, have shown positive impacts in reducing the risk of complications and improving therapy effectiveness. Additionally, education and counseling for geriatric patients and their families are crucial in improving medication adherence. Educational tools such as leaflets, pill cards, pill boxes, and medication reminder charts have been shown to enhance patient compliance with medication regimens, although their effectiveness may be influenced by factors such as the patient's physical limitations and educational background. Involving the family in the education and therapy process also plays an important role in supporting treatment success. Therefore, the role of pharmacists and the medical team in educating and monitoring geriatric patient therapy is critical to ensuring medication safety, effectiveness, and adherence.

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