

IGSCPS SPECIAL EDITION

RESEARCH ARTICLE

# Evaluation of drug-related problems among hospitalised elderly patients at a secondary hospital in East Borneo

Welinda Dyah Ayu<sup>1</sup> , Elida Zairina<sup>2,3,4</sup> , Umi Athiyah<sup>2,3</sup> 

<sup>1</sup> Doctoral Programme of Pharmaceutical Science, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

<sup>2</sup> Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

<sup>3</sup> Innovative Pharmacy Practice and Integrated Outcome Research (INACORE) Group, Universitas Airlangga, Surabaya, Indonesia

<sup>4</sup> Centre of Excellence for Patient Safety and Quality, Universitas Airlangga, Surabaya, Indonesia

## Keywords

DRP  
Geriatric  
PCNE V9.00

## Correspondence

Elida Zairina  
Department of Pharmacy Practice  
Faculty of Pharmacy  
Universitas Airlangga  
Surabaya  
Indonesia  
elida-z@ff.unair.ac.id

## Abstract

**Background:** The elderly population often requires increased drug intake (polypharmacy) due to diminished organ function, particularly in the liver and kidneys, responsible for processing medications. Identifying drug-related problems (DRPs) in this demographic is crucial for mitigating morbidity, mortality, and overall drug therapy costs. **Objective:** This study aimed to identify DRPs and their determinants in hospitalised geriatric patients. **Methods:** An observational retrospective study was conducted in the Secondary Hospital in East Borneo from January 2019 - December 2021. Data were collected from medication charts, including patients aged 60-79, medical progress notes, and laboratories. DRPs were identified and classified using Pharmaceutical Care Network Europe's (PCNE) classification V9.0. **Results:** Of the 614 included patients, 79% were aged 60-69 years, 56.0% were male, and 73% were prescribed  $\geq$  five medications. DRPs were identified in 75.2% of patients, primarily related to treatment effectiveness (27.19%) and treatment safety (53.42%). Causes included inappropriate monitoring (14.5%), improper drug combinations (51.79%), excessive drug dosage (16.61%), and inadequate drug dosage (13.51%). **Conclusion:** The high frequency of DRPs, specifically concerning treatment effectiveness and safety, highlights the need for enhanced monitoring and prescribing procedures, contributing to preventing and treating future DRPs in the elderly population.

## Introduction

Elderly patients have a high risk of Drug-Related Problems (DRPs) due to age-related pharmacokinetic and pharmacodynamic changes. Handling geriatric patients is very complex and requires Comprehensive Geriatric Health Services (preventive, promotive, curative, rehabilitative, and palliative) with a holistic approach by an integrated team (Niriayo *et al.*, 2018). A study on geriatric patients revealed that 49% of patients experienced DRPs. The most common DRPs were untreated indications (24.1%), too-high a dose (19.1%), inappropriate drug administration (12.9%) and drug interactions (9.5%) (Budnitz *et al.*, 2012). It is estimated that one in ten geriatric patients experience adverse drug reactions that cause them to be admitted

to hospital or experience a drug reaction during hospitalisation (Planas *et al.*, 2005). In the development of the healthcare world, the term “*deprescribing*” is defined as an attempt to intentionally discontinue a drug or reduce the dose to improve a person's health or reduce the risk of adverse side effects (OMS, 2009). Medication error is any preventable event that may cause or lead to inappropriate medication use or harm to the patient. In contrast, the medication is controlled by the care-giving professional, patient, or consumer. Elderly patients are more likely to take multiple medications and metabolise medications differently than younger adults, which may exacerbate DRPs and readmission (Smith & Christensen, 1996). In the last decade, several strategies have failed to improve

elderly patient well-being and reduce healthcare costs (Susilaningsih *et al.*, 2017). However, these patients account for 15–30% of all drug-related hospital admissions (Skjøt-Arkil *et al.*, 2018). This study aimed to identify the classification of DRPs among elderly patients admitted in a hospital based on the PCNE version 9.0.

## Methods

### Design

This observational study was conducted from January 2019 to December 2021 at the Secondary Hospital in East Borneo. The data collection was conducted retrospectively from the medical records of patients. Patients aged 60 to 79 years who were hospitalised with complete medical records were taken and used as the study population. This study used a total sampling method of 614 medical records. DRPs were categorised using PCNE Version 9.0. The PCNE of DRP is divided into five domains: problem (P), cause (C), intervention (I), acceptance of intervention (A), and outcome (O). Only the domains of DRP type (P) and cause (C) were investigated. The inclusion criteria were all hospitalised elderly patients who were screened through medical records from January 2019 to December 2021, with ages ranging from 60 to 79 years old.

### Assessment

We reviewed the medications used through the medical records and laboratory data available to identify and address DRPs. The sheet has three main sections: patient demographics, medical history, and laboratory data. The following data was recorded for each patient's age, gender, relevant medical and medication history, vital signs, medications used on admission, medications started during hospitalisation and on discharge, as well as results of routine laboratory tests and diagnosed diseases that were critical to identifying drug therapy issues. Independent data collection was done by two well-trained senior pharmacists who took medication review documentation from the medical records. All medications used in the inclusion data were documented on a standardised report form by two trained senior pharmacists.

## Results

### Demographic characteristics of the study participants

The demographic characteristics among geriatric patients can be seen in Table I. Among the 614

participants included in this study, 56.0% were men. Most were young elderly, defined as 60 to 69 years old (79%). Most of them had a duration of treatment of more than three years (64%). More than half of the participants had several drug therapies in the range of five to ten (73%). The comorbidity that most geriatric patients had was Coronary Artery Disease (27.08%).

**Table I: Patient demographic characteristics**

Demographic characteristics	Frequency (%)
<b>Sex</b>	
Men	344 (56.0)
Women	270 (44.0)
<b>Age</b>	
Young elderly (60 to 69 years)	485 (79.0)
Middle-aged (70 to 79 years)	129 (21.0)
<b>Duration of treatment</b>	
Less than three years	218 (36.0)
More than three years	396 (64.0)
<b>Number of drug therapies</b>	
Less than five	166 (27.0)
Five to ten	448 (73.0)
<b>Comorbidities of congestive heart failure patients</b>	
CAD†	164 (27.08)
CKD	114 (18.78)
CHF	101 (16.64)
DM	76 (12.52)
HT	56 (9.22)
Stroke infark	26 (4.28)

†CAD = Coronary artery disease; CKD = Chronic kidney disease; CHF = Congestive heart failure; DM = Diabetes melitus; HT = Hipertensi

### Clinical characteristics of study participants

More than half of the 641 patients included in the study (19.25) had stayed less than five days in the hospital. Most of them had improved results from hospitalisation (40.9%), and the majority of them had readmission two times within a year (41.21%), as seen below in Table II.

**Table II: Clinical characteristics of geriatric patients**

Clinical characteristics	Frequency (%)
<b>Length of hospitalisation</b>	
Less than five days	373 (60.75)
Five to ten days	241 (29.25)
<b>Hospitalisation results</b>	
Improving	198 (40.90)
Died	155 (32.02)
Forced return to home	131 (27.01)
<b>Readmission (within a year)</b>	
Once	243 (39.58)
Two times	253 (41.21)
Three times	118 (19.22)

**Prevalence and causes of DRPs**

A total of 495 DRPs were identified in 614 patients, with an average of 1.01 DRPs per patient. The most common DRPs were "treatment safety P2" (53.4%; 288/614) and "treatment effectiveness P1" (27.19%; 134/614). Within the "treatment safety P2" domain, "Adverse drug event (possibly) occurring P2.1" was the only subcategory in this study, shown below in Table III.

**Table III: Problem domain of DRPs based on PCNE V9**

Code	Primary domain	Secondary domain	Frequency (%)
P1	Effectiveness of treatment	P. 1.3 Untreated symptoms or indications	167 (27.19)
P2	Medication safety	P. 2.1 Adverse drug events (may) occur	328 (53.42)

As seen in Table IV, 614 causes were identified for 592 DRPs. The primary causes of DRPs were "dose selection C3" (30.13%; 185/614) and "drug selection C1"

(66.29%; 407/614). Within the "dose selection C3" domain, "drug dose too high C3.2" (13.52%; 83/614) and "drug dose too low C3.1" (16.61%; 102/614).

**Table IV: Cause domain of DRPs based on PCNE V.9**

Code	Primary domain	Secondary domain	Frequency (%)
C1	Drug selection	C1.3 No indication for the drug	89 (14.5)
		C1.4 Inappropriate combinations, e.g., drugs, herbs, or supplements	318 (51.79)
C3	Dose selection	C3.1 Drug dosage is too low	83 (13.51)
		C3.2 Drug dosage is too high	102 (16.61)

**Discussion**

Drug-related problems are a significant public health concern. The physiological changes, pharmacokinetics, pharmacodynamics, the tendency of disease complications, and the development of polypharmacy in the elderly make this population vulnerable to drug-related problems that can aggravate side effects and reduce the effectiveness of treatment.

In our study, 495 DRPs were identified in a population of 614 geriatric patients, an average of 1.77 per patient. Most of the patients had two or three DRPs detected. In the present study, the most commonly observed DRPs were related to an inappropriate combination of drugs (51.79). Drug-drug interactions in the elderly are similar to those in the general population. However, induction of cytochrome P-450 (CYP450) drug metabolism by certain medicines (e.g. phenytoin,

carbamazepine, rifampin) may be decreased in older adults, making the change (an increase) in drug metabolism less dramatic. Many additional medicines block CYP450 metabolism, increasing the toxicity of drugs that rely on that pathway for elimination. Because older adults often take more medications, they are more likely to experience multiple difficult-to-predict CYP450 interactions. Also, concurrent use of  $\geq$  one drug with similar side effects can enhance the risk or severity of adverse effects. Furosemide and digoxin are two examples of drugs that interact in which digoxin's products are exacerbated by furosemide. Concurrent administration of loop diuretics may result in hypokalemia or hypomagnesemia, increasing the risk of arrhythmias associated with cardiac glycosides. Low potassium levels may increase the risk of arrhythmias, and therefore, the plasma potassium and magnesium levels must be monitored when using these medicines in

combination (Lea, 2019). This interaction can be avoided by providing potassium and magnesium supplements to patients with low calcium and magnesium levels. Prevention of potassium and magnesium loss with potassium-sparing diuretic replacement is also beneficial (Field *et al.*, 2004). The findings of this study are in line with previous research, which found that the incidence of DRPs mainly occurred in the drug interaction category with a percentage of 58.89% and 79.54% (Helling & Johnson, 2014).

The significant number of DRPs in geriatric patients was caused by drug interactions that occur in the treatment of patients, worsening the patient's condition and affecting an increase in toxicity. This can also pose a high risk to the patient, as the changes that occur from the result of drugs given simultaneously can cause drug interactions that result in reduced effectiveness of the drug. Irrational drug use, such as polypharmacy prescribing, is a problem that often occurs in the treatment of patients.

## Conclusion

In this study, it can be concluded that the prevalence of DRPs in elderly patients is relatively high. The involvement of pharmacists in pharmaceutical care has a positive effect in reducing the incidence of DRPs and medication errors in elderly patients.

## Source of funding

The study was supported by the Ministry of Education and Higher Degree of Indonesia (PDD 2023 Contract No. 114/E5/PG.02.00.PL/2023).

## References

- Budnitz, D. S., Lovegrove, M. C., Shehab, N., & Richards, C. L. (2012). Emergency hospitalisation for adverse drug events in older Americans. *Survey of Anesthesiology*, *56*(2), 65–66. <https://doi.org/10.1097/01.sa.0000412401.21757.36>
- Field, T. S., Gurwitz, J. H., Harrold, L. R., Rothschild, J. M., Debellis, K., Seger, A. C., Fish, L. S., Garber, L., Kelleher, M., &

- Bates, D. W. (2004). Strategies for detecting adverse drug events among older persons in the ambulatory setting. *Journal of the American Medical Informatics Association*, *11*(6), 492–498. <https://doi.org/10.1197/jamia.M1586>

- Helling, D. K., & Johnson, S. G. (2014). Defining and advancing ambulatory care pharmacy practice: It is time to lengthen our stride. *American Journal of Health-System Pharmacy*, *71*(16), 1348–1356. <https://doi.org/10.2146/ajhp140076>

- Lea, M. (2019). *Towards safer drug therapy and improved clinical outcomes in elderly and multimorbid patients Oslo 2018* [University of Oslo]. <http://hdl.handle.net/10852/69763>

- Niriayo, Y. L., Kumela, K., Kassa, T. D., & Angamo, M. T. (2018). Drug therapy problems and contributing factors in the management of heart failure patients in Jimma University Specialized Hospital, Southwest Ethiopia. *PLoS ONE*, *13*(10), 1–14. <https://doi.org/10.1371/journal.pone.0206120>

- OMS. (2009). *Global priorities for patient safety research. Better knowledge for safer care*. WHO Library Cataloguing-in-Publication Data, 12. [http://apps.who.int/iris/bitstream/10665/44205/1/9789241598620\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/44205/1/9789241598620_eng.pdf)

- Planas, L. G., Kimberlin, C. L., Segal, R., Brushwood, D. B., Hepler, C. D., & Schlenker, B. R. (2005). A pharmacist model of perceived responsibility for drug therapy outcomes. *Social Science and Medicine*, *60*(10), 2393–2403. <https://doi.org/10.1016/j.socscimed.2004.10.018>

- Skjøt-Arkil, H., Lundby, C., Kjeldsen, L. J., Skovgård, D. M., Almarsdóttir, A. B., Kjølhed, T., Duedahl, T. H., Pottegård, A., & Graabæk, T. (2018). Multifaceted pharmacist-led interventions in the hospital setting: A systematic review. *Basic and Clinical Pharmacology and Toxicology*, *123*(4), 363–379. <https://doi.org/10.1111/bcpt.13030>

- Smith, C. P., & Christensen, D. B. (1996). Identification and clarification of drug therapy problems by Indian health service pharmacists. *Annals of Pharmacotherapy*, *30*(2), 119–124. <https://doi.org/10.1177/106002809603000201>

- Susilaningsih, F. S., Mediani, H. S., Kurniawan, T., Widiawati, M., Maryani, L., & Meharawati, I. (2017). Sosialisasi model praktik kolaborasi interprofesional pelayanan kesehatan di rumah sakit. *Jurnal Aplikasi Ipteks Untuk Masyarakat*, *06*(1), 10–13.