



Possibility of Potentially Inappropriate Medication at Admission and Discharge Among Older People Patients in Emergency Department Using the 2019 Beers Criteria

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Abstract

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BACKGROUND: Elderly patients are associated with an increasing prevalence of chronic degenerative diseases which need emergency services which can be a factor in the occurrence of potentially inappropriate medication (PIM). The use of PIM increases the risk of patients requiring hospitalization, drug-related problems, and adverse health outcomes with a prevalence of up to 2–3 times.

AIM: This study aimed to determine the possible incidence of admission and discharge events on PIM in Elderly patients (>60 years old) visiting the emergency department (ED).

MATERIALS AND METHODS: This is a retrospective and observational study at Universitas Airlangga Teaching Hospital in Surabaya for 4 months. This study involved Elderly patients who visited the ED. The 2019 Beers criteria were used to identify the use of PIM. Spearman rho analysis was used to determine the relationship between the possibility of hospital admission and the discharge of patients with PIM.

RESULTS: Most patients were female (50.4%) and aged 60–96. The percentage of elderly patients who received PIM and hospital admission was 73.1%, while those who received PIM and hospital discharge were 26.9%. The Spearman rho analysis showed a weak relationship between the possibility of hospital admission or discharge (p-value 0.000, R 0.255) with PIM.

CONCLUSION: There is a weak but significant correlation between PIM and patient admission and discharge. Elderly patients are more at risk of being hospitalized due to PIM. The number of ED patients who received PIM had a high prevalence of being hospitalized compared to patients who did not receive PIM.

Introduction

Health development is directed at increasing awareness, willingness, and ability to live a healthy life for everyone so that the highest level of health can be realized, marked by increasing life expectancy, and decreasing infant and maternal mortality rates. Based on data from the Central Bureau of Statistics in 2014, life expectancy in Indonesia for women is 73 years, and for men, it is 69 years. The National Development Planning Agency projects that the life expectancy in Indonesia in 2025 can reach 73.6 years. According to the Ministerial Regulation of the Republic of Indonesia, an older person is someone who has reached the age of 60 years. The elderly population in Indonesia in 2020 was estimated at 26,425,560 people or around 9.78%. This number

increased by 2.19% compared to 2010, which was around 7.59% [1], [2]. The increase in the older people population in Indonesia can cause problems related to medical, psychological, economic, and social aspects. Therefore, efforts are made to increase the welfare of the elderly by improving geriatric health services in hospitals [3].

Elderly patients are associated with an increasing prevalence of chronic degenerative diseases which need emergency services [4]. Based on international epidemiological data, it is known that the percentage of elderly patients is 18%, ranging between 11% and 23% of the total visitors to the emergency department (ED). It takes a long time to triage elderly patients in the ED. This makes the ED a unit that is always crowded with patients, including elderly patients who want to get fast and appropriate treatment. Hence, appropriate action is needed to improve patient safety [5], [6], [7].

Potentially inappropriate medications (PIMs) should be avoided because the risks outweigh the benefits; alternative drugs are preferred if they have the same therapeutic effect and are more effective [8], [9]. The PIM is generally evaluated using different scales and criteria, such as the 2019 Beers criteria. Beers criteria are the latest update [10]. PIM in elderly patients is associated with progressively lousy health, which can affect the patient's quality of life. It increases the risk of patients in need of hospitalization, treatment for drug-related problems (DRPs), and adverse health outcomes [11], [12]. PIM can result in falls, confusion, morbidity, and mortality [13]. For example, drug interaction problems from inappropriate use of sedatives and hypnotics administered to elderly patients are strongly associated with the risk of falls, delirium, and hallucinations [14], [15].

PIM is also associated with an increased cost burden on patient care billing [16]. However, this hypothesis requires further research. Factors besides inappropriate use of drugs include gender, age, polypharmacy, many medical disciplines that treat and prescribe, and poor health status [17], [18]. Medical therapy is a significant component in health care efforts for elderly patients; based on existing studies, 10–30% of elderly patients requiring hospital admission correlate with DRPs. The percentage incidence of adverse drug events (ADE) in elderly patients is 5–35% and contributes to the prevalence of the need for elderly patients to be hospitalized by 6–16% [19]. This is where the role of pharmacists in health services for elderly patients and pharmacist intervention is expected to reduce the incidence of ADE and DRP [1], [20]. In addition to those factors, elderly patients with certain chronic conditions have also been associated with a higher risk of PIM compared to elderly patients without comorbidities [21], [22]. However, few studies have been conducted to analyze the possibility of PIM among elderly patients. Research has been conducted in Indonesia regarding the potential for inappropriate treatment, such as looking at the prevalence and factors associated with a potential for inappropriate treatment, polypharmacy which causes an increase in the prevalence of potentially inappropriate treatment, and assessing potentially inappropriate drugs in the elderly patients [23]. This study determined the prevalence of PIM and the incidence of hospital admission and discharged due to PIM in the ED.

Objective

This study aimed to determine the prevalence of PIM in Elderly patients (>60 years old) visiting the ED and the incidence of hospital admission and discharge due to PIM in the ED.

Materials and Methods

Study design

This study was a retrospective and observational study using medical records of Elderly patients at the Universitas Airlangga Teaching Hospital in Surabaya. It was conducted from March to June 2020. The research protocol was approved by the Ethics Committee of the Airlangga University Teaching Hospital (Certificate of approval no.177/KEP/2020) before the start of the study.

Study population and setting

This study involved Elderly patients (≥60-years-old Under the Ministerial Regulation of the Republic of Indonesia) who visited the ED of Universitas Airlangga Teaching Hospital. Those included were Elderly patients registered in the ED who received therapy.

Data source and data extraction

This study used 4-month (March–June 2020) data from the medical records, which included patients' demographic profiles, medication, and admission and discharge. Demographic data contain gender, domicile, marital status, and education. Medication data are information about patients' prescribed medication while undergoing treatment in the ED.

Data handling

The data collection process was carried out through written records on the data retrieval sheet, which were then copied and sorted in Microsoft Excel. Patient identities were kept anonymous with initials to ensure patient confidentiality. Total sampling was carried out and resulted in 349 patients. Data analysis was then presented in the form of a table.

Measures

Dependent variable: PIMs

This study aimed to determine the correlation between PIM and incidents of hospitalization or admission and discharge in Elderly patients. PIM was identified according to the 2019 Beers Criteria. The use of PIM is classified into the elderly patient receiving at least one PIM in the ED, the elderly patient receiving PIM because of drug-disease or drug-syndrome interactions that may exacerbate the disease or syndrome. It is used with caution, should be avoided because of the interaction, and should be avoided or require dose adjustment because of decreased kidney function.

Independent variables

The independent variables in this study were demographic data (gender, domicile, marital status, and education), medication, patient admission, and discharge.

Statistical analysis

Data were inputted into a custom-designed Microsoft Excel database and analyzed using SPSS version 25. Descriptive statistics were used to describe the data in percentages for categorical variables. The Spearman rho analysis was used to determine the relationship between PIM and patient admission or discharge with a significance level of 0.05. Probability values of <0.05 were statistically significant for all analyses.

Results and Discussion

Analysis of respondents' characteristics

For patient characteristics, 349 Elderly patients (age ≥ 60 years) visited the ED in March–June 2020. The mean age of Elderly patients was 68.29 ± 6.533 years; the youngest was 60 years, and the oldest was 96.00 years.

Most are married women living in Surabaya and graduating from senior high school. Each one is explained as follows (Table 1):

Table 1: Age description

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Age	349	60.00	96.00	68.29	6.533

Descriptive analysis

Description of PIM variables

The analysis of the PIM variable shows the prevalence of PIMs among Elderly patients was 56.4%, while the rest did not experience any PIM. Elderly patients mostly experience PIM once. The results of the analysis of the description of the PIM variable are explained as follows (Table 2 and 3):

Table 2: Patient's demographic

Characteristics	Category	Frequency	Percentage
Gender	Man	173	49.6
	Woman	176	50.4
Domicile	Non-Surabaya	18	5.2
	Surabaya	331	94.8
Marital Status	Not married yet	9	2.6
	Widower	13	3.7
	Widow	58	16.6
	Married	269	77.1
Education	Did not finish elementary school	6	1.7
	Elementary School	94	26.9
	Junior High School	42	12.0
	Senior High School	164	47.0
	Diploma 3	18	5.2
	Diploma 4/bachelor's degree	19	5.4
	Master's degree	6	1.7

Table 3: Prevalence of PIM using Beers criteria 2019

Characteristics	Category	Frequency	Percentage
PIM	No	152	43.8
	Yes	197	56.4
Number of PIM	1.00	125	35.8
	>1.00	72	20.6

PIM: Potentially inappropriate medication.

Description of drug type

For types of drugs, two most common types of drugs consumed were metoclopramide followed by omeprazole. The average patient consumed 3–4 types of drugs. In other studies, it was found that many drugs given to patients in the ED were gastrointestinal drugs such as ondansetron, proton pump inhibitor (PPI), diuretics such as furosemide, and NSAIDs such as aspirin [24], [25].

The results of the analysis of the description of the type of drug are described as follows (Table 4):

Table 4: Frequently potential inappropriate medication, according to the 2019 Beers criteria, which is widely used for the elderly in emergency departments

Type of medicine	Frequency	Percentage
Metoclopramide	50	17.9
Omeprazole	46	16.5
Insulin Aspart	34	12.2
Furosemide	28	10
ASA	26	9.3
Ranitidine	22	7.9
Ketorolac	20	7.2
Number of types of drugs		
Average \pm SD	3.9741 \pm 2.34168	
Min–Max	1–12	

Relationship between PIM and the possibility of patient admission and discharge

The crosstab analysis of PIM explains the difference between possible hospital admission and none of the possible hospital admission by looking at the Spearman rho significance value. The results show a relationship between PIM and patient admission and discharge ($p = 0.000$; $R = 0.255$). However, the value of the correlation coefficient between those variables was 0.255, indicating a positive but weak correlation. Patients who experienced PIM had 73.1% of hospital admission. The results of the analysis can be explained as follows (Table 5):

The present study was undertaken with time-limited sampling to determine the correlation between PIM and incidents of hospitalization or admission and discharge in elderly patients. Three hundred and forty-nine data were enrolled and were collected from the medical record.

The prevalence of PIM was relatively high at 56.4%, which is not far different from the recent research findings 21–58% [26], [27], [28], [29]. The

Table 5. Spearman Rho analysis of the relationship between the possibility of admission and discharge with PIM

Variable	Not Using PIM		Using PIM		P Value	R
	Freq	%	Freq	%		
Criteria					0.000	0.255
Admission	88	57.9	144	73.1		
Discharge	64	42.1	53	26.9		

PIM: Potentially inappropriate medication.

prevalence can vary between studies, perhaps because of differences in settings, study designs, or differences in the 2015 Beers criteria. Most elderly patients who experienced PIM were women (50.4%), as women generally live longer and are more vulnerable to health, both physically and psychologically. However, to confirm this, further research is needed [30].

Most of the patients took metoclopramide, followed by omeprazole. Metoclopramide is a dopamine 2-receptor antagonist commonly used to relieve upper gastrointestinal symptoms, including dyspepsia, nausea, vomiting, and gastroparesis. Long-term use of this drug could expose patients to an unnecessary risk of adverse drug reactions [15]. Metoclopramide should not be used in the long-term in elderly patients because it potentially causes tardive dyskinesia [13], [31]. Meanwhile, according to the Beers criteria 2019, metoclopramide can cause extrapyramidal effects, including tardive dyskinesia. The risk may be greater in frail older adults and those with prolonged exposure. They are strongly recommended to avoid metoclopramide unless for gastroparesis with the duration of use <12 weeks [10]. Omeprazole is a part of the PPI class. It is often inappropriately prescribed. Some post-marketing studies showed an association between the duration of PPI therapy and potential side effects in elderly patients. Its side effects include osteoporotic-related fractures, clostridium difficile infection, community-acquired pneumonia, Vitamin B12 deficiency, kidney disease, and dementia [32]. However, comorbidities and polypharmacy may worsen if patients are not prescribed PPIs such as aspirin and steroid [33]. According to the 2019 Beers criteria, PPI is associated with the risk of clostridium difficile infection, bone loss, and fracture. With that said, patients can take those drugs for more than 8 weeks except high-risk patients (administered with oral corticosteroids or chronic NSAID) with erosive esophagitis, Barrett's esophagitis, pathological hypersecretory condition, or demonstrated need for maintenance treatment (because of failure of drug discontinuation trial of H2-receptor antagonist) [10]. Hence, it can be said that most of the problems in elderly patients who require treatment in the ED are gastrointestinal-related problems, which can be attributed to the behaviors of the older people population that resembles a child. They do not realize that they need to eat. This triggers the emergence of problems in the gastrointestinal tract. Another study showed that elderly patients in the ED in Geneva, Switzerland had an abdominal complaints or gastrointestinal-related problems of 3–13% [34].

Based on the results of the PIM crosstab analysis, which explained the relationship between PIM and patient admission and discharged from the hospital, it showed a positive but weak correlation ($p = 0.000$; $R = 0.255$) between these variables and the percentage results showed that patients with PIM ended up being hospitalized by 73.1% (Table 5). This was also shown in

the Portuguese Pharmacovigilance study, where it was reported that the group included in one PIM was 71.4% in the serious group and grouped under the criteria for hospitalization of 35.1% [35]. Research conducted in Australia stated that 60–100% of patients in need of hospitalization experienced PIM at least once [36]. Another study in Japan showed that 47.9% of patients experiencing PIM required hospitalization [30]. At the same time, this study demonstrated that the percentage of elderly patients who experienced PIM and needed hospitalization was 73.1%. This is due to the spread of disease in Indonesia; in one of the studies, it was stated that the diseases suffered by many patients were cardiovascular disease, respiratory tract, digestive tract, as well as endocrine, nutritional, and metabolic disorders so that at the time of administration the therapy provided different outcomes [37].

Meanwhile, interventions are supposed to prevent potential drug side effects and reduce costs. Some drug side effects in elderly patients are associated with PIMs, especially because of the administration of drugs with higher intolerance to pharmacodynamics or pharmacokinetics or drug interaction [38]. Elderly patients were 7 times more likely to have drug side effects than younger patients [39]. Elderly patients with comorbidities or multiple comorbidities are at high risk of drug side effects; thus, special attention to this population is needed [40]. The number of drugs prescribed likely affects the occurrence of PIM as it may increase the possibility of drug side effects and drug interaction [30], [41], [42]. Several studies have found a significant relationship between PIM and cardiovascular diseases, diabetes, osteoporosis, and an increasing number of chronic diseases [43].

Further research needs to take on other factors that might influence PIM, such as comorbidities, individual tolerance of drug therapy, drug allergies, and self-use of drugs by patients, which may be triggers for a worsening of the patient's body condition.

Given the findings of this study, medical personnel can understand better how to reduce the potential harm for elderly patients, especially in terms of drug prescription, to minimize the risk of drug use and the economic burden due to treatment. Pharmacists also have an essential role in improving the compatibility of drugs and providing recommendations for medication discontinuation and monitoring. They also can use some tools to identify PIM, such as the Beers criteria for elderly patients at risk [1], [44]. Furthermore, it is imperative to supply appropriate guidelines on drug therapy management and medication monitoring to avoid PIMs.

Conclusion

A weak but significant correlation was found between PIM and patient hospital admission and

discharge. Elderly patients are more at risk of being hospitalized due to PIM. It is necessary to conduct research on the same topic for a more extended period and a more significant number of samples. Further research can investigate the relationship between PIM and other incidents, such as readmission, length of stay, and adverse drug reaction in elderly patients.

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