Prevalence of potentially inappropriate medications in psychogeriatric patients in Indonesia based on the beers 2019 criteria

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ABSTRACT

There has not been much information about the general appropriateness of prescribing for patients who suffer from mental disorders. To find out the prevalence of Potentially Inappropriate Medications (PIM) among psychogeriatric patients and to analyze the associations among PIM, age, gender, and polypharmacy. This was a retrospective, cross-sectional study carried out at four psychiatric hospitals in Yogyakarta. The 2019 Beers criteria were used to analyze the prevalence of PIMs in hospitalized patients. Logistic regression was used to determine the factors associated with the use of PIMs. There were a total of 238 medical records reviewed. The patients participating in the study were predominantly male (52.4%). There was a total of 1425 medications used, with an average of 6.4 per person. Of the 1425 medications used, 895 (62.8%) of them were found to be on the Beers list, and the three most frequent ones were trihexyphenidyl, haloperidol, and risperidone. Based on the multivariate analysis, gender [odds ratio (OR) 1.64; 95% confident interval (CI): 1.22-2.20] and polypharmacy (OR 2.55; 95% CI: 1.89-3.44) were found to be the factors that had an association with an increased risk of PIMs. Elderly patients who suffer from severe psychiatric disorders are commonly given the prescription of PIMs. Nevertheless, it is necessary to consider safety as well as the challenges in dealing with psychogeriatric problems in clinical decision-making for this older population as shown in the Beers Criteria.

Keywords: Beers criteria, Indonesia, Potentially Inappropriate medication, Psychogeriatric

Introduction

Older patients are usually given potentially unsafe prescriptions when discharged from either psychiatric or general hospitals. In fact, the prescription of potentially Inappropriate Medications (PIM) may bring unwanted effects such as readmissions and increased adverse drug reaction (ADR), morbidity, and mortality [1-3]. In relation to this, it is common that many clinicians are careful when prescribing medications for older adults. Unfortunately, standardized processes to minimize the risks of either under or over-prescribing are not yet sufficient. The majority of physicians rely more on their clinical judgment instead of relying on strict criteria when deciding to prescribe or discontinue medications. The American Geriatrics Society Beers Criteria for PIM Use in Older Adults provides a list of PIMs to be avoided in both elderly patients in general and in patients with certain disorders or diseases, of which the dosage is to be reduced or used with either careful monitoring or caution. The Beers criteria serve as one of the most frequently used references and

these criteria had been updated several times, namely in 2012, 2015, and 2019. The 2019 Beers criteria contain several changes, i.e. there are many medications added to the 2019 version but there are a number of medications removed from the 2015 version [4]. In addition, the Beers Criteria also demonstrate a higher level of prevalence of PIMs in geriatric patients compared to other criteria [5]. It can be said that the Beers Criteria are beneficial and can be applied to elderly patients, but these criteria may not be used quite well for all other patients. Hospitalized psychogeriatric patients have commonly prescribed drugs that are included in several PIMs groups as written in the Beers list, particularly first-generation antipsychotics [6] and anticholinergic medication [7].

Nevertheless, to our knowledge, there have been no data that show the prevalence of PIMs according to the 2019 Beers Criteria in Indonesia, especially in older adults with mental health disorders. This way, this study aimed to 1) estimate the prevalence of Potentially Inappropriate Medications (PIMs) among psychiatric patients, 2) and analyze the associations among PIMs, age, gender, and polypharmacy.

Materials and Methods

This was a retrospective study carried out at four psychiatric hospitals in Yogyakarta. Hospitalized geriatric patients aged ≥60 years were enrolled from January 2018 to December 2018. If for a prescription refill, a patient had to have more than one visit during the study period, only the last visit was included in the analysis. Meanwhile, any patients who were given no medications were excluded. The study obtained approval from the Ethics Committee of the Faculty of Medicine of Universitas Islam Indonesia (9/Ka.Kom.Et/70/KE/VI/2019). The data were collected from the medical records of the patients, including gender, age, comorbidities, primary diagnosis, and drugs prescribed. The 2019 Beers criteria were used to analyze the use of PIMs in the patients involved in the study.

Analysis

Descriptive statistics were used to demonstrate the prescription trend in older adults, stratified by age, gender, number of medications, and types of medications most often prescribed for elderly patients to understand the prescription trend of geriatric medications.

The prevalence of PIMs was calculated to determine how frequent doctors prescribed PIMs. PIMs are divided into three categories based on the Beers Criteria, namely (a) the first class (medications that should be avoided in geriatric patients regardless of the patients' conditions), (b) the second class (medications that should be avoided in particular diseases or disorders), and (c) the third class (medications that should be used with caution). Nevertheless, this study focused only on the first class. PIMs-related factors according to the Beers 2019 criteria were examined using multivariate logistic regression.

Results and Discussion

We analyzed the medical records of 238 elderly patients of which 123 (51.7%) of them were men. A total of 124 (52.1 %) patients were found in the age range older than 65 years old. There were a total of 1425 medications given to these patients during the study and the average per patient was 6.4.

Table 1 shows the 20 most common medications used by geriatric patients, the percentage of the total number of medications used, as well as the percentage of the total hospital admission.

Table 1. Main medications used by geriatric patients (n=238)

Medications	Percentage out of the total number of medications used (n=1425)%
Trihexyphenidyl	217 (15.30)
Haloperidol	192 (13.47)
Risperidone	160 (11.23)
Clozapine	109 (7.65)
Alprazolam	53 (3.72)
Lorazepam	49 (3.44)
Donepezil	42 (2.95)
Chlorpromazine	36 (2.53)
Diazepam	34 (2.39)
Fluoxetine	26 (1.82)
Valproate acid	23 (1.61)
Clobazam	23 (1.61)
Trifluoperazine	19 (1.33)
Aripiprazole	17 (1.19)
Aspirin	15 (1.05)
Piracetam	15 (1.05)
Olanzapine	11 (0.77)
Phenobarbital	6 (0.42)
Meloxicam	4 (0.28)

There was a high prevalence of the use of several medications, including anticholinergic, first and second generation of antipsychotics and benzodiazepine. In addition, hospitalized patients also had cholinesterase inhibitors, antidepressant, anticonvulsant, and anti-inflammation as part of their prescriptions.

Of the patients involved in this study, 73 (30.7%) of them had comorbidities as written in their medical records. The comorbidities most often found were hypertension 44 (60.3%), diabetes mellitus 17 (23.3%), dementia 6 (8.2%), diabetes mellitus plus hypertension 5 (6.8%), and congestive heart failure 1 (1.4%).

Table 2 presents the diagnosis for hospitalization in the study samples. The data showed that the majority of the patients

suffered from unspecified schizophrenia, paranoid schizophrenia, and dementia.

Table 2. Diagnosis of psychiatric patients for hospitalization

Diagnosis	Percentage of patients (n=238)
Unspecified schizophrenia	117 (49.2)
Paranoid schizophrenia	60 (25.2)
Dementia	33 (13.9)
Catatonic schizophrenia	20 (8.4)
Bipolar	5 (2.1)
Depression	4 (1.2)

PIM

According to the 2019 Beers Criteria, our data showed that out of the 238 patients examined, 223 (93.7%) of these patients were given at least one of the Potentially Inappropriate Medications included on the Beers list. In our study, the PIMs most frequently prescribed to patients were trihexyphenidyl, haloperidol, risperidone, alprazolam, and lorazepam. **Table 3** shows the prevalence of PIMs in detail.

Table 3. Classification of Potentially Inappropriate Medications based on the 2019 Beers criteria prescribed to older adults.

Inappropriate Medications on the Beers list	Number of medications (n=1425)	Percentage of use of Potentially Inappropriate Medications (n=895) %	Percentage of the total drug used (n=1425) %
Acetylsalicylic acid	15	1.67	1.05
Meloxicam	4	0.44	0.28
Mefenamic acid	2	0.22	0.14
Ketorolac	2	0.22	0.14
Sodium diclofenac	2	0.22	0.14
Metamizole	2	0.22	0.14
Ketoprofen	1	0.11	0.07
Alprazolam	53	5.92	3.72
Lorazepam	49	5.47	3.44
Diazepam	34	3.80	2.39
Clobazam	23	2.56	1.61
Phenobarbital	6	0.67	0.42
Fluoxetine	26	2.90	1.82
Escitalopram	4	0.44	0.28
Sertraline	1	0.11	0.07
Amitriptyline	2	0.22	0.14
Valproate	23	2.56	1.61
Phenytoin	8	0.89	0.56
Gabapentin	1	0.11	0.07
Trihexyphenidyl	217	24.24	15.23
Risperidone	160	17.87	11.23
Quetiapine	2	0.22	0.14
Aripiprazole	17	1.89	1.19
Haloperidol	192	21.45	13.47
Chlorpromazine	36	4.02	2.53
Trifluoperazine	19	2.12	1.33
Fluphenazine	3	0.33	0.21
Zolpidem	4	0.44	0.28
Lithium	4	0.44	0.28

Factors associated with PIM use

In relation to the imbalanced classes between the PIM and non-PIM (approximate 1: 15) participants, SMOTE (Synthetic Minority Over-Sampling Technique) was used to analyze the data as well as obtain a balance between both of the classes. Data imbalance is found when a data class has a higher number of objects than the other class.The data class with more objects is called the major class, while one with fewer objects is called the minor class. The use of imbalanced data in designing a model has a significant effect on the results of the model. Algorithm processing that ignores data imbalance tends to be dominated by major classes, yet ignores minor ones. SMOTE method is one of the solutions to handling data imbalance using different principles and an oversampling method as proposed previously [8].

Table 4 shows the factors associated with the prescriptions of PIMs. Using logistic regression, gender and polypharmacy were found to be associated with PIMs ($p < 0.05$). Gender was found to obtain an odds ratio of 1.64, meaning that there will be PIMs 1.64 times higher in Males than in Females. Meanwhile, the polypharmacy variable had an effect of 2.55, meaning that patients given more than five drugs will experience PIMs 2.55 times higher than those given less than five drugs.

Table 4. Factors associated with the use of Potentially Inappropriate Medications

Characteristics	2019 Beers criteria (n=238)		OR	95% CI	p-value
	PIM (%)	Non-PIM (%)			
Gender					
Male	115 (93.5)	8 (6.5)	1.64	1.22-2.20	**0.001**
Female	108 (93.9)	7 (6.1)			
Age (years)					
≤65	105 (92.1)	9 (7.9)	0.99	0.98-1.02	0.827
>65	118 (95.2)	6 (4.8)			

Comorbidities (Is there any comorbidity)					
Yes	66 (90.4)	7 (9.6)			
			1.08	0.77-1.52	0.664
No	149 (90.3)	16 (9.7)			
Number of medications					
≤5	80 (90.9)	8 (9.1)			
			2.55	1.89-3.44	**0.000**
>5	143 (95.3)	7 (4.7)			

p<0.05 statistically significant (bold); PIMs: Potentially Inappropriate Medications

The finding of the study showed that most psychogeriatric patients were given PIM prescriptions, including trihexyphenidyl, haloperidol, risperidone, alprazolam, and lorazepam. A previous study conducted in New Zealand showed similar results, where anticholinergic agents (e.g, trihexyphenidyl) and benzodiazepine were commonly prescribed to psychogeriatric patients [9]. For patients who suffer from schizophrenia, or psychosis, anticholinergics were mainly given to treat extrapyramidal syndrome (EPS) or prevent antipsychotic-induced EPS [10]. Nonetheless, these medications may lead to peripheral side effects, for example, dry mouth and constipation, and central adverse effects, for example, cognitive impairment, worsening of tardive dyskinesia, and delirium. It has been known that disturbed cognitive abilities are a cardinal feature of schizophrenia that are responsible for many functional disabilities [11].

A study carried out at a psychiatric hospital in the Nederland, which detected PIMs with psychotropic drugs, showed that 1269 medications were prescribed to 169 patients who were involved as the participants in the study, and PIMs were found in 47% of these patients, according to the 2012 Beers Criteria. The majority of PIMs (70%) are related to psychotropic drugs [12]. Another study as reviewed by Mario *et al*. revealed that benzodiazepine, antipsychotics, and antidepressants are the most common Potentially Inappropriate Medications in elderly patients [13]. In addition, psychosis, dementia, and psychiatric diagnosis were found to have a significant association with a higher probability for the use of antipsychotic drugs [14]. Scientific geriatric organizations have warned physicians to not prescribe antipsychotic drugs to older adults for more than four weeks to avoid any serious side effects [15].

The fact that there is a high prevalence of the use of benzodiazepine is potentially related to aging; there is an increase in the number of elderly who suffer from depression and insomnia. Unfortunately, benzodiazepine and benzodiazepines receptor agonists are proven to cause an increase in the risk of falls as well as hip fractures, particularly in people with a prior history of falls. It is also known that non-pharmacological options can be selected as initial treatment for insomnia, which includes sleep hygiene and behavioral intervention [16]. Even if it is challenging to carry out non-pharmacological therapy in hospitalized patients, it is necessary to avoid the use of benzodiazepines in the long term and conduct sleep rehabilitation in community health institutions [17].

Gender and a large number of medications were three main factors that had associated with the use of PIMs. As shown by some previous studies, an increased relation of gender with PIMs exist [18-20]. likewise, a significant association between PIMs and polypharmacy was also shown in many studies. Nonetheless, there has been no agreement on the minimum number of regular drugs to be considered polypharmacy. In most studies, more than five prescribed drugs are considered as the threshold for polypharmacy, and more than 10 drugs as excessive polypharmacy [21]. An increased number of combined medications could increase the risks of inappropriate prescriptions and ADRs [22].

Potentially Inappropriate Medications can be reduced by medication reviews conducted by pharmacists could minimize in the elderly in primary health care [23]. Interventions in the form of collaborative care approach which focuses on pharmacists could reduce PIMs and increase positive clinical outcomes in relation to QoL measures [24]. In other words, pharmacists play an increasingly important role in reducing the burden of medications in an elderly population. In addition, together with general practitioners and home care nurses, this team can achieve better results, such as reduced use of antipsychotics, as shown in the UK [25].

All health professionals who provide health care to geriatric patients must take responsibility for appropriate prescriptions [26].

Strength and limitations

To the best of our knowledge, this is the first study in Indonesia that provides information about the use of PIMs in older adults with psychiatric disorders hospitalized at psychiatric hospitals according to the 2019 Beers Criteria. Some previous studies were conducted on the elderly population in general (instead of elderly patients with mental health disorders) and these studies used the 2012 or 2015 Beers Criteria.

The present study, however, has some limitations. First, this was a cross-sectional study with small sample size, and the data were obtained within a short period. Second, the drug data were obtained from a specific institution for all the study participants, thus not allowing the findings to be generalized to all geriatric patients with psychiatric disorders. Third, this study only focused on analyzing the medications to be avoided by elderly patients but excluded other aspects.

Conclusion

It can be concluded that the awareness of the prescription of PIMs for patients with mental disorders is relatively high in our psychogeriatric hospitalized patients. It is necessary to popularize the use of the Beers Criteria in psychogeriatric services. In fact, among older adults who suffer from psychogeriatric disorders, the use of PIMs is quite often. It is also crucial to consider both safeties, as mentioned in the Beers Criteria, and the complexity of psychogeriatric problem management.

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