THE FUNCTION OF RECOMMENDATION OF A PHARMACISTS IN REDUCE PIMs (POTENTIALLY INAPPROPRIATE MEDICATIONS) OF GERIATRIC PATIENTS AT THE GENERAL HOSPITAL DR. MOEWARDI SURAKARTA

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Abstract

The prevalence of potentially inappropriate medications (PIMs) is quite high in geriatric patients. PIMs can be detected using an explicit prescription indicator (a criterion). Explicit criteria that can be used in the identification of PIMs in geriatric patients include: BEERS Criteria, STOPP Criteria, and START Criteria. This study aims to analyze drugs included in the PIMs category based on BEERS Criteria, STOPP Criteria, and START Criteria. This research is a semi-experimental study (intervening in the form of giving recommendations) with prospective data collection in the geriatric ward of Regional General Hospital Dr. Moewardi Surakarta in the period from October 2019 to January 2020. The results showed that out of 70 patients, there were 47 PIMs, PIMs based on BEERS Criteria for 20 patients (28.6%), PIMs based on STOPP Criteria for 10 patients (14.3%) and PIMs based on START Criteria for 17 patients (24.3%). Bivariate analysis showed that there was a relationship between the incidence of adverse drug events (ADEs), with recommendations that were followed up on PIMs based on BEERS Criteria with an RR value of 25 (95% CI 1,2: 520,7), P = 0.04 and PIMs based on START Criteria with an RR value of 5 (95% CI 1: 35.9), P = 0.04, whereas the results of the bivariate analysis on PIMs based on STOPP Criteria showed that there was no relationship between the incidence of ADEs with the recommendations that were followed up with a RR value of 4 (95% CI 0.13: 119.2), P = 0.50. Based on the results of univariate and bivariate statistical analysis, it can be concluded that there are still many incidents of PIMs based on BEERs Criteria, STOPP Criteria, and START Criteria and pharmacists have an important function to reduce PIMs so that the incidence of ESO due to PIMs can be minimized in the regional general hospital Dr. Moewardi Surakarta.

Keywords: *Geriatrics, PIMs, BEERS Criteria, STOP Criteria, START Criteria*

1. INTRODUCTION

Indonesia is a developing country with significant population growth. Globally, Indonesia has the fifth largest elderly population in the world (Central Bureau of Statistics, 2010). Population census data in Surakarta in 2016, the elderly population aged 60-64 years were 19,789 people, with details of the female elderly population being 10,014 people and the male elderly population being 9,769 people (Central Bureau of Statistics, 2016).

In line with the increasing number of elderly populations, the number of cases of inappropriate treatment also increases (Potentially inappropriate medications (PIMs)) related to disability and degenerative changes in elderly patients (Spinewine et al., 2007). There is one way that pharmacists can do is to provide recommendations regarding drugs that are

included in the PIMs category to reduce the incidence of adverse drug events (ADEs) (Alhawassi et al., 2019; Holt et al., 2010).

Physiological changes related to aging cause changes in pharmacokinetics and pharmacodynamics of drugs in elderly (geriatric) patients. In geriatric patients, it is not uncommon to find more than one chronic disease (multiple morbidity) with drug administration classified as polypharmacy (Fialová et al., 2005). Studies in Ireland, Europe, and America show that more than 40% of geriatric patients with chronic disease receive more than five medications concurrently and more than medically indicated (Naughton et al., 2006)

Inappropriate treatment includes the use of drugs that have a higher risk than benefit, especially if there are safer drug alternatives. Inappropriate treatment also includes inappropriate drug dosage or duration, clinical prescribing of drug-drug interactions or drug-disease interactions, and drug use without indications. Inappropriate treatment can be detected using an explicit prescribing indicator (a criterion) or implicitly (based on the enforcement of the patient's clinical condition) (Hamilton & Fairley, 2009). Several explicit criteria that can be used in identifying the potential for inappropriate drug use in geriatric patients include: BEERS Criteria, STOPP Criteria and START Criteria (Momin et al., 2013).

This study aims to determine the percentage of the incidence of PIMs based on the BEERS Criteria, STOPP Criteria, and START Criteria, to determine the drugs that fall into the PIMs category based on the BEERS Criteria, STOPP Criteria, and START Criteria, as well as the relationship between incidence of adverse drug events (ADEs) with recommendations that were followed up. By doing this research is expected to reduce the side effects of drugs so as to increase significant morbidity and mortality, especially in geriatric patients at hospital Dr. Moewardi Surakarta.

2. RESEARCH METHOD

2.1. Research Design and Design

The research design in this study was an intervention study design (in the form of providing recommendations) by the researcher to the responsible pharmacist of the patient (APJP) followed by the responsible doctor of the patient (DPJP) using face-to-face interviews. This research was conducted in the geriatric ward of RSUD Dr. Moewardi Surakarta from October 2019 to January 2020.

2.2. Number of Samples and Sampling Method

The population in this study were geriatric patients with a diagnosis of internal disease who were treated at the inpatient installation of RSUD Dr. Moewardi Surakarta as many as 340 patients. To determine the sample size, the researcher used the Slovin formula. The inclusion criteria in this study were patients aged 60, patients receiving 5 kinds of drugs simultaneously, patients with a doctor in charge of the patient is an internal medicine doctor, patients whose main diagnosis is a diagnosis of internal disease, and patients who are willing to take part in the study with signed an informed consent. The design and procedure of this research will be explained further in Figure 1.
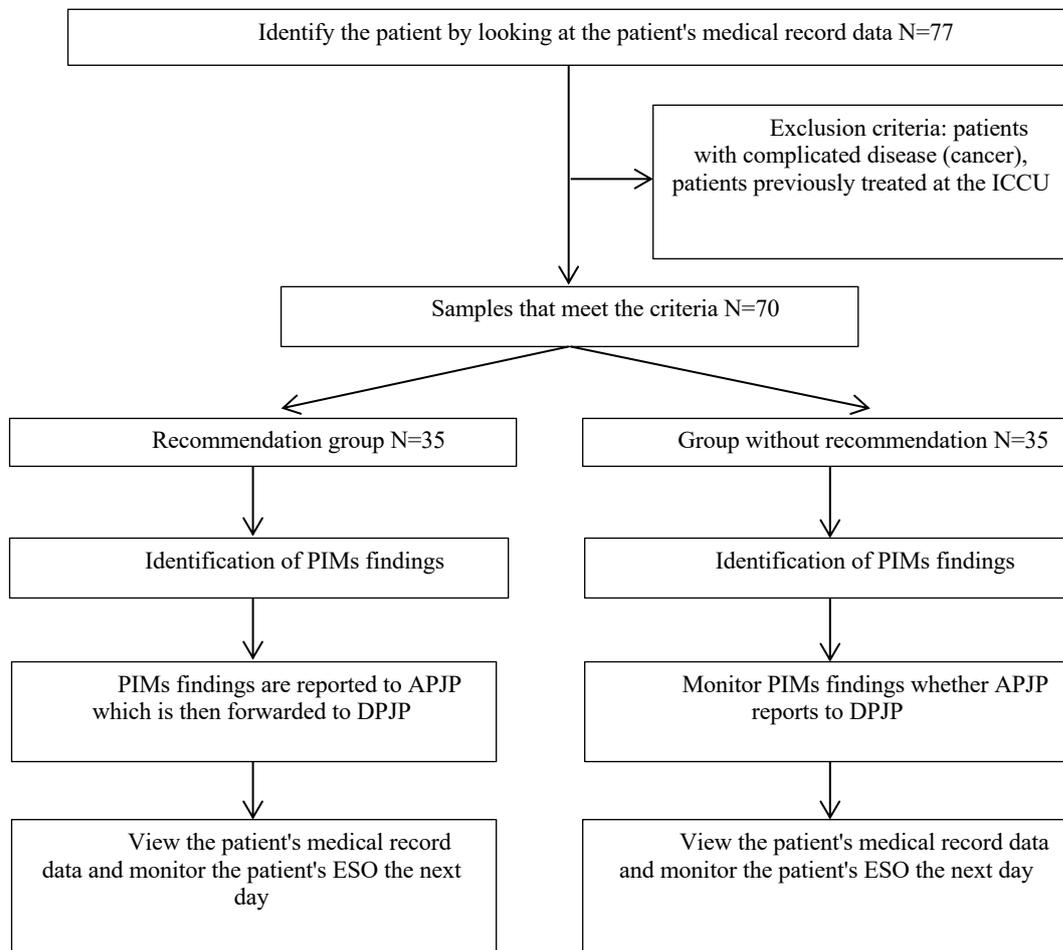
Figure 1 Research design and procedures regarding pharmacist recommendations regarding PIMs in geriatric patients

2.3. Data Collection

Prospective data collection from October 2019 to January 2020. The study was conducted by taking the patient's medical record data according to the inclusion criteria, then the researcher conducted interviews with the patient and/or the patient's family, and directly monitored the patient's condition and treatment. Interventions carried out by providing recommendations submitted by means of face-to-face interviews by researchers to APJP and continued to DPJP.

2.4. Tools and materials

The patient's medical record sheet which includes data on the patient's age, gender, diagnosis of disease, drugs used, duration of hospitalization, laboratory results, responsible doctors and pharmacists. Data were taken from the time the patient was admitted to the hospital that is since the patient was transferred from the ER to the internal medicine inpatient installation until the patient was sent home by the DPJP.

2.5. Ethical Approval

This research has received ethical approval from Research Ethics Committee of RSUD Dr. Moewardi Surakarta as evidenced by the issuance of an Ethical Clearance Certificate numbered 1.121/X/HREC/2019.

2.6. Data Analysis

Data analysis was carried out univariately to see the frequency distribution of PIMs in geriatric patients at RSUD Dr. Moewardi Surakarta. Bivariate analysis also carried out to see if there is a relationship between the recommendations given by the researcher with the potential side effects of PIMs. Univariate and bivariate analysis were performed using the Software Statistical Package For the Social Sciences (SPSS). The data were analyzed using the Frequences test, Mann-Whitney test (numeric data), Chi-Square test (categorical data), if the results does not meet the Chi-Square test requirements, an alternative test is used, namely Fisher's test and the risk ratio (RR) test. The difference is considered significant if the probability value is $p < 0.05$ with 95% confidence level.

3. RESULT AND DISCUSSION

3.1. Patient Characteristics

The total sample of geriatric patients who were hospitalized in the geriatric ward of RSUD Dr. Moewardi Surakarta who met the inclusion and exclusion criteria were 70 patients. Based on univariate descriptive statistical analysis, patient's characteristics data can be seen in table 1, the largest number of gender from study subject is male (65.7%), the largest age is in the range of 60-74 years (78.6%), the highest diagnosis were in the range of 4-6 diagnoses (52.9%), and the longest duration of hospitalization was in the range of 1-7 days (62.9%).

The high prevalence of degenerative diseases in male patients is inseparable from a bad lifestyle such as smoking, diet, alcohol consumption, obesity, lack of physical activity, and stress. The risk factors in male patients are 2 times more than female, so it is easier for male to trigger the degenerative diseases (Handajani et al., 2010). This is different from the research results in China that shows vascular risk factors according to age and sex distribution patterns will give different results, female geriatric patients will have a higher prevalence of diabetes mellitus and hypertension, while male geriatric patients have a higher prevalence of heart disease (Yao et al., 2012). Therefore, the strategies to prevent geriatric multiple morbidity in health care services should emphasize the control of various risk factors based on age and gender. The government has made efforts to optimize health services in Indonesia with the government health insurance issued by the Social Security Administrator.

Table 1 Patient characteristics

Characteristics Group	Amount total N=70 (%)	Recommendation group N=35 (%)	Control group N=35 (%)
Gender			
Woman	24 (34.3)	9 (12.9)	15 (21.4)
Man	46 (65.7)	26 (37.1)	20 (28.6)

Age			
60-74 years old	55 (78.6)	25 (35.7)	30 (42.9)
75- 90 years old	14 (20)	9 (12.9)	5 (7.1)
> 90 years old	1 (1.4)	1 (1.4)	0 (0)
Diagnosis			
1-3 diagnoses	33 (47.1)	16 (22.9)	17 (24.3)
4-6 diagnoses	37 (52.9)	19 (27.1)	18 (25.7)
Treatment duration			
1-7 days	44 (62.9)	26 (37.1)	18 (25.7)
> 7 days	26 (37.1)	9 (12.9)	17 (24.3)

3.2. The incidence of PIMs (Potentially Inappropriate Medications)

Incidence and drugs included in the PIMs category based on the BEERS Criteria, STOPP Criteria, and START Criteria in inpatient geriatric patients at RSUD Dr. Moewardi Surakarta can be seen in table 2 and table 3. The highest incidence of PIMs based on the BEERS Criteria is the use of nonsteroidal anti-inflammatory drugs (NSAIDs) drugs, the incidence of PIMs based on the STOPP Criteria is the largest use of Calcium channel blockers (CCB) drugs, and the greatest incidence of PIMs based on the STOPP Criteria is the use of the biguanide drugs.

The results showed that the most frequently found drugs (drug class) in the PIMs category based on the BEERS Criteria, the STOPP Criteria, and the START Criteria was NSAIDs (ketorolac and aspirin) by 40%, the second common class of drugs found was biguanide (metformin) by 33,33%, the third class was Calcium channel blockers (Amlodipine) by 13,33%, the fourth class was Diuretic drug (Furosemide) by 6,67%, the fifth drug class was the Vitamins & minerals (Calcium & vitamin D) by 4,44%, and the sixth drug class was the Benzodiazepine (Diazepam) by 2,22%.

Table 2 Percentage of PIMs in geriatric patients

PIMs Criteria	Drug	Occurrence Percentage	Pharmacist Recommendation
BEERS	Aspirin tablets (oral)	28,6%	Therapy can be continued for primary protection against cardiovascular disease. Use with caution while monitoring the possible side effects such as bleeding and risk of indigestion.
	Ketorolac injection		Therapy is discontinued, it is recommended to replace with other analgesics that are safer for geriatrics such as Metamizole injection.
	Diazepam tablets (oral)		Therapy can be continued, it is recommended to choose non-pharmacological therapies to treat insomnia.
STOP	Amlodipine tablets (oral)	14,3%	Therapy is discontinued when the patient was constipated.
	Furosemide injection		Therapy is discontinued in geriatric patients if used as monotherapy to treat hypertension, it is recommended to add amlodipine therapy to treat hypertension in patients.

START	Metformin tablets (oral)	24,3%	Therapy is started for geriatric patients who suffering from T2DM.
			Therapy is started for geriatric patients who suffering from osteoporosis.
	Calcium and Vitamin D		

Table 3 Drugs (drug class) that are included in the PIMs category

Drug class	Medicine name	PIMs	Percentage
NSAIDs	Aspirin tablets	*BEERS*	40%
	Ketorolac injection		
Biguanide	Metformin tablets	*START*	33.33%
Calcium channel blockers	Amlodipine tablets	*STOP*	13.33%
diuretic	Furosemide injection	*STOP*	6.67%
Vitamins & minerals	Calcium & Vitamin D	*START*	4.44%
Benzodiazepines	Diazepam tablets	*BEERS*	2.22%

This study still found the use of diazepam (long-acting benzodiazepine) based on the 2015 BEERS Criteria, the use of this class of drugs has been prohibited with a medium quality of evidence category. Administration of benzodiazepines in geriatric patients can increase the risk of cognitive impairment, delirium, falls, fractures, motor vehicles, eye cracks, and sleep disturbances with rapid eye movements in long-acting benzodiazepines (Panel et al., 2015).

3.3. Pharmacists Recommendations Regarding PIMs (Potentially Inappropriate Medications)

Relationship between Drug side effects (ESO) with follow-up recommendations on PIMs based on the BEERS Criteria, STOPP Criteria, and START Criteria in both groups can be seen in table 4 and table 5.

Table 4 Relationship between drug side effects (ESO) with follow-up recommendations on PIMs based on the BEERS Criteria, STOPP Criteria and START Criteria in the recommendation group (Fisher's)

PIMs	Recommended results	Incidence of side effects of PIMs (N = 35)		RR	95% CI		*P value*
		Occur	**Not**		*Lower*	*Upper*	
BEERS	Follow up	1 (9.1%)	5 (45.45%)	6.0	1.003	35,908	0.013
	Not followed-up	5 (45.45%)	0 (0%)				
STOP	Follow up	1 (14.3%)	4 (57.1%)	4.0	0.017	136,957	0.524
	Not followed-up	1 (14.3%)	1 (14.3%)				
START	Follow up	1 (11.1%)	4 (44.45%)	5.0	0.866	28.861	0.040
	Not followed-up	4 (44.45%)	0 (0%)				

Table 5 Relationship between drug side effects (ESO) and follow-up recommendations on PIMs based on the BEERS Criteria, STOPP Criteria and START Criteria in the no-recommendation group (Fisher's)

PIMs	Recommended results	Incidence of side effects of PIMs (N = 35)		RR	95% CI		P value
		Occur	Not		Lower	Upper	
BEERS	Follow up	1 (8.3%)	5 (41.7%)	25.0	1,200	520.734	0.040
	Not given	1 (8.3%)	5 (41.7%)				
STOP	Follow up	1 (16.7%)	2 (33.3%)	4.0	0.134	119,230	0.500
	Not given	2 (33.3%)	1 (16.7%)				
START	Follow up	1 (10%)	5 (50%)	5.0	1.003	35,908	0.040
	Not given	4 (40%)	0 (0%)				

Table 4 showed that there was a significant relationship between the incidence of drug side effects (ESO) and follow-up recommendations on PIMs based on the BEERS Criteria and START Criteria, there was no significant relationship between the incidence of drug side effects (ESO) and follow-up recommendations on PIMs based on the STOPP Criteria in the internal ward of RSUD Dr. Moewardi Surakarta on the recommendation group.

The results of the bivariate statistical analysis of PIMs based on BEERS Criteria with Fisher's test showed an RR value of 6 (95% CI 1: 35.9, p < 0,013) which indicated there was a significant relationship between the two variables.

The results of the bivariate statistical analysis of PIMs based on the START Criteria with Fisher's test showed an RR value of 5 (95% CI 0.86: 28.9, p < 0,040) which indicated that there was a significant relationship between the two variables. While the results of the bivariate statistical analysis of PIMs based on the STOPP Criteria with Fisher's test showed an RR value of 4 (95% CI 0.017: 136.9, p> 0,524) which showed no significant relationship between the two variables.

Based on Table 5, it indicated that there was a significant relationship between the incidence of drug side effects (ESO) and follow-up recommendations on PIMs based on the BEERS Criteria and START Criteria, but no significant relationship based on the STOPP Criteria in the ward internal hospital Dr. Moewardi Surakarta on without recommendation group.

The results of the bivariate statistical analysis of PIMs based on BEERS Criteria with Fisher's test showed an RR value of 25 (95% CI 1.2: 520.7, p < 0,040) which indicated there was a significant relationship between the two variables. The results of the bivariate statistical analysis of PIMs based on the START Criteria with Fisher's test showed an RR value of 5 (95% CI 1: 35.9, p < 0,040) which also indicated there was a significant relationship between the two variables. While the results of the bivariate statistical analysis of PIMs based on the STOPP Criteria with Fisher's test showed an RR value of 4 (95% CI 0.134: 119.2, p > 0,500) which showed no significant relationship between the two variables.

4. CONCLUSION

The greatest incidence of PIMs was found in geriatric patients at Dr. Moewardi Surakarta is PIMs based on BEERS Criteria. The largest class of drugs (drugs) identified by PIMs based on the BEERS Criteria is the group of NSAIDs (aspirin and ketorolac injection), PIMs based on the STOPP criteria are the largest, namely the CCB group (amlodipine), and the largest PIMs based on the START criteria are the biguanide group (metformin). The results of the study in both groups showed there was a significant relationship between the incidence of drug side effects (ESO) and recommendations for follow-up related to PIMs based on the BEERS Criteria and START Criteria, but there was no significant relationship between the incidence of drug side effects (ESO) and follow-up recommendations related to PIMs based on STOP Criteria.

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