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Patterns of High-Alert Medicine Use in Geriatric Patients at Rumah Sakit Umum Pusat Dr. Cipto Mangunkusumo

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ABSTRACT

Background: Geriatric patients are patients who are often associated with multiple diseases and decreased organ function so they are at greater risk of developing unwanted drug reactions due to drug use when compared to other adults. High Alert Medication (HAM) are drugs that have a high risk of causing significant harm to patients if used incorrectly.

Objectives: This study aims to determine the pattern of HAM use among inpatient geriatric patients at Rumah Sakit Umum Pusat Nasional Dr. Cipto Mangunkusumo Jakarta.

Methods: Retrospective cohort study by reviewing primary data from medical records (MR) of inpatient geriatric patients who used HAM for the period January 1 to December 31, 2023. The sample consisted of 300 geriatric patients who met the inclusion criteria using a purposive sampling technique. Descriptive data analysis includes data in the form of frequencies and percentages (%).

Results: Based on gender, women with a total of 162 (54%) patients dominated. Based on age, the age range of 60 to 70 years with a total of 104 (68.87%) patients with a diagnosis of hypertension dominated compared to other ages. Based on the type of HAM used namely Insulin group HAM with 53 (20.38%) times of administration with the type of insulin in the form of novorapid flexpen 3 ml (13,532%) and anticoagulant group HAM with 49 (18,84%) times of administration with the type of anticoagulant in the form of heparin sodium 5 ml (13,181%) with the diagnosis of hypertension.

Conclusion: The types of HAM that dominate the use in the therapy of hospitalized geriatric patients are novorapid flexpen 3 ml and heparin sodium 5 ml given parenterally with a diagnosis of hypertension.

Keywords: Geriatrics; High Alert Medication; inpatient care

INTRODUCTION

Every country in the world is experiencing growth in the number and proportion of the elderly population. The World Health Organization (WHO) predicts that by 2030 there will be 1 in 6 people aged 60 years or more. In 2020 the portion of the population aged >60 years will increase from 1 billion to 1.4 billion. In 2050, the population aged >60 years in the world is predicted to double to 2.1 billion.[1] The percentage of elderly people in Indonesia increased by 3% during 2010-2021 to 10.82%. According to the Badan Pusat Statistik (BPS), in 2023 it shows that as many as 63.59% are young elderly (60-69 years), 27.76% are middle-aged (70-79 years), and 8.65% are elderly (> 80 years and above).[2]

Geriatric patients are elderly patients with multiple diseases and/or disorders due to decreased organ, psychological, social, economic, and environmental function who require integrated health services with a multidisciplinary approach that works in an interdisciplinary manner. The elderly are residents aged 60 years or more.[3] BPS 2023 data shows that 5.52% of geriatrics have been hospitalized with an average treatment time of

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5 to 6 days.[2] Geriatric syndromes include sarcopenia, weakness, dementia, and weight loss will increase with age and will decrease if treatment is carried out.[4]

One of the drug problems in geriatric patients is polypharmacy.[5] Around 5% to 28% of inpatient geriatric patients experience undesirable events caused by drug use.[6] Polypharmacy can increase the risk which is closely related to the occurrence of side effects and prolongs the length of treatment.[7] Polypharmacy is closely related to high disease morbidity. A study conducted by Aryaldi on geriatric patients in several polyclinics found that there was polypharmacy in 400 geriatric patients.[8] Several other studies also stated that the incidence of polypharmacy was often found in geriatric patients compared to other adults. This is because geriatric patients experience decreased organ function and various types of diseases which cause an increase in drug use. As a result, this can lead to the potential for inappropriate drug use and three times the risk of experiencing an Undesirable Drug Reaction (UDR)[9, 10, 11]

High-Alert Medications (HAM) are drugs that have a high risk of causing significant harm to patients if used incorrectly. Although errors in the use of HAM may not be more common than with other drugs, the consequences of errors in These drugs can be very serious.[12] Some drugs that have a high risk of causing UDR include cytostatic drugs, drugs that look similar and sound almost the same. Drug names that look and sound similar or Look Alike Sound Alike (LASA) and high-concentration electrolytes.[13]

HAM has a greater potential to cause UDR in patients, ranging from 0.24 to 89.6 errors per 100 prescriptions. A study conducted by Aradhya stated that the occurrence of UDR in patients who were given HAM was caused by errors in prescribing.[14] The Institute for Safe Medication Practices (ISMP) defines drugs that need to be watched out for (high-alert drugs) as drugs that have a high risk of causing significant UDR in patients. According to the report mentioned by the ISMP National Medication Error Reporting Program (ISMP MERP), high-alert drugs are at the top of the list of drugs that affect the patient's condition moderately to severely when an error occurs.[15]

Rumah Sakit Umum Pusat Nasional (RSUPN) Dr. Cipto Mangunkusumo Jakarta has a guidebook on the use of HAM which will be published in 2022. The use of HAM is based on general guidelines including prescribing, storing, preparing, and administering to patients. Guidelines for the use of HAM to prevent or reduce the risk of injury due to the use of these drugs. HAM used at RSUPN Dr. Cipto Mangunkusumo Jakarta, namely electrolytes and concentrated electrolytes, general anesthetics, cytostatics, drugs that affect the blood, parenteral diabetes, vasoconstrictors, neuromuscular blockers, and nutritional products.[16] This study aims to determine the pattern of human rights use in inpatient geriatric patients at RSUPN Dr. Cipto Mangunkusumo Jakarta.

METHODS

Study Design

This study was carried out at the Medical Records Installation at RSUPN Dr. Cipto Mangunkusumo from January to March 2024. This study is a retrospective study by reviewing primary data from medical records of inpatient geriatric patients who used HAM for the period January 1 to December 31, 2023. The patient data collection technique used Electronic Health Records (EHR) Pharmacy at RSUPN Dr. Cipto Mangunkusumo. Data collection in this study included age, gender, diagnosis, payment status, and use of HAM drugs. Descriptive data analysis includes data in the form of frequencies and percentages (%).

Population and samples

The population in this study was all medical record data of inpatient geriatric patients who used HAM for the period January 1 to December 31, 2023. The study sample taken was 300 inpatient geriatric patients using a purposive sampling technique who met the inclusion criteria in the form of patients aged 60 years or older. Moreover, patients who received HAM therapy, patients discharged from the hospital from January 1 to December 31, 2023, as well as Building A patients who had received treatment for more than 7 days. Meanwhile, the exclusion criteria were inpatient geriatric patients with incomplete medical records containing the data required in the study, such as no type of HAM and length of treatment of less than 7 days. This aims to make it easier for researchers to identify the type of HAM used during the patient's treatment period and the patient's progress regarding the therapy that has been used.

RESULTS AND DISCUSSION

This study was conducted using 300 RM inpatient geriatric patients at RSUPN Dr. Cipto Mangunkusumo Jakarta who met the inclusion criteria and were used as a sample in the study. Based on the study results in Table I.

Table I. Characteristics of Geriatric Patients at RSUPN Dr. Cipto Mangunkusumo Jakarta Period January to December 2023

Characteristics	Total (n=300)	Percentage (%)
Gender		
Man	138 patients	46
Woman	162 patients	54
Age (years)		
60 – 70	184 patients	61,33
71 – 80	91 patients	30,33
81 – 93	25 patients	8,33
Diagnosis		
Sepsis	34 patients	11,33
Hypertension	151 patients	50,33
CHF (congestive heart failure)	5 patients	1,67
Pneumonia	110 patients	36,67
Payment Status		
JKN (Jaminan Kesehatan Nasional)	300 patients	100

characteristics based on gender of women (54%) dominate more than men (46%). Meanwhile, characteristics based on age 60-70 years obtained a percentage of 61.33%. This is in line with several studies which state the same thing that female patients dominate more than male patients.[17, 18] According to the BPS in 2023, there are more elderly women (52.82%) than men (47.72%) and as many as 63.59% of the elderly are classified as young elderly (60-69 years).[2] In the diagnostic characteristics in this study, it was found that hypertension (50.33%) had a higher prevalence compared to other diagnoses. The incidence of hypertension will increase with increasing age. There are 1 in 3 geriatric patients who are not aware that they have hypertension.[19] In the characteristics section regarding the patient's payment status, 100% use Jaminan Kesehatan Nasional (JKN). Studies regarding the use of JKN in health facilities have had a positive impact, especially regarding out-of-pocket (OOP) payments better known as payment for care using one's own money which is much smaller compared to patients who do not use JKN.[20]

Table II. Characteristics of HAM and Number of Administration to Geriatric Patients at RSUPN Dr. Cipto Mangunkusumo Jakarta Period January to December 2023

HAM characteristics	Total	Percentage (%)
	Number of Medication (n=569)	
Orally	26	4,57%
Parenteral	534	93,85%
Patches	9	1,58%
Administration of HAM	**Each patient (n=300)**	
HAM single agent	134	44,67%
Two HAM combinations	99	33%
Three HAM combinations	51	17%
Four HAM combinations	13	4,33%
Five HAM combinations	2	0,67%
Six HAM combinations	1	0,33%

Based on the study the characteristics and types of human rights provision used at RSUPN Dr. Cipto Mangunkusumo listed in Table 2 shows that the injection dosage form is more widely used with a percentage of the number of administrations of 93.85% compared to other preparations. According to the list of human rights contained in the 2024 ISMP and the guide to the use of human rights in RSUPN Dr. Cipto Mangunkusumo is that almost 90% of the drug dosage forms used are injections.[16] This is of course in line with the study data obtained as listed in Table II

Based on Table 2, single agents are used more often with a percentage of 44.67% compared to combinations. This is adjusted to the severity of the disease experienced by each patient. Monotherapy is preferred because it can increase patient compliance so that treatment goals are achieved more quickly. Apart from that, it can also save medical costs.[21] The single agent that is mostly given to geriatric patients at RSUPN Dr. Cipto Mangunkusumo namely heparin sodium 5 ml solution, injection 5000 units/1 ml, novorapid flexpen 3 ml solution, injection 100 iu/1 ml and tranexamic acid solution, injection 500 mg/5 ml compared to other groups where the three types of HAM above are given separately parenteral.

Table III. Characteristics of the Use of High-Alert Medicine Based on Group in Inpatient Geriatric Patients at RSUPN Dr. Cipto Mangunkusumo Jakarta Period January to December 2023

Class/ Name of Drugs	Total of patients = 300 patients (Number of Medication = 569)	Percentage (%)
Insulin		
Novorapid flexpen 3 ml solution, injection 100 iu/1 ml	77	13,53
Lantus solostar 3 ml solution, injection 100 iu/1 ml	23	4,04
Novomix 30 flexpen 3 ml suspension, injection 30 %ww; 70 %ww	1	0,18
Humalog kwikpen 3 ml suspension, injection 100 iu/1 ml	3	0,53
Levemir flexpen 3 ml solution, injection 300 iu/3 ml	1	0,18
Apidra solostar solution, injection 300 iu/3 ml	1	0,18
Humalog mix 25 kwikpen 3 ml suspension, injection 25 %wv; 75 %ww	1	0,18
Anticoagulants		
Lovenox solution, injection 4000 iu/0.4 ml	4	0,70
Arixtra solution, injection 2.5 mg/0.5 ml	2	0,35
Heparin sodium 5 ml solution, injection 5000 unt/1 ml	75	13,18
Warfarin sodium tablet 2 mg	7	1,23
Simarc tablets 2 mg	9	1,58
Xarelto tablets, film-coated 10 mg	10	1,76
Cardiac Glycosides		
Fargoxin injection, solution 0.5 mg/2 ml	4	0,70
Anti-fibrinolytic		
Tranexamic acid solution, injection 500 mg/5 ml	73	12,83
Adrenergic agonist		
Norepinephrine solution, injection 4 mg/4 ml	41	7,20
Epinephrine ethical solution, injection 1 mg/ml	14	2,46
Electrolyte		
Calcii gluconas solution, injection 1000 mg/10 ml	58	10,19
Magnesium sulfate 25 ml solution, injection 20 %wv	18	3,16
Meylon (Sodium bicarbonate) 25 ml solution, injection 84 mg/ml	3	0,53
Concentrated Electrolyte		
Sodium chloride (NaCl) 500 ml infusion 3 %wv/500 ml	8	1,41
Potassium chloride (Kcl) 25 ml infusion 74.6 mg/1 ml	5	0,88
Nutritional products		
Dextrose 25 ml solution, injection 40 %wv	42	7,38
Narcotic analgesics		
Morphine solution, injection 10 mg/ml	23	4,04
Durogesic patch 12 mcg	9	1,58
Fentanyl 2 ml solution, injection 50 mcg/1 ml	44	7,73
Anti Diuretic Hormone (ADH)		
Farpresin solution, injection 20 iu/1 ml	1	0,18
Benzodiazepines		
Fortanest solution, injection 5 mg/5 ml	12	2,11

Based on patient MR data, 28 types of HAM were obtained consisting of 11 groups, namely insulin, anticoagulants, cardiac glycosides, antifibrinolytics, adrenergic agonists, electrolytes, concentrated electrolytes, nutritional products, opioid analgesics, anti-diuretic hormones (ADH) and benzodiazepines. Each patient received one or more types of HAM treatment therapy given with different intensities and administration times. This depends on the symptoms and complaints of the disease experienced by each patient which is based on the doctor's diagnosis.

Table III shows the use of types of HAM in geriatric patients at RSUPN Dr. Cipto Mangunkusumo is a type of insulin, namely novorapid flexpen 3 ml solution, injection 100 iu/1 ml, which dominates its use by 13.53% compared to others. Furthermore, the anticoagulant group is heparin sodium 5 ml solution, injection 5000 units/1 ml with a delivery percentage of 13.18% and the antifibrinolytic group is the tranexamic acid solution, injection 500 mg/5 ml with a delivery percentage of 12.83%. Apart from the three types of HAM above, several types of HAM are used in medical therapy with a smaller percentage of use, including calcium gluconate solution, injection 1000 mg/10 ml (10.19%), fentanyl 2 ml solution, injection 50 mcg/1 ml (7.73%), dextrose 25 ml solution, injection 40 %wv (7.38%), norepinephrine solution, injection 4 mg/4 ml (7.20%), fortanest solution, injection 5 mg/5 ml (2.11%), sodium chloride (NaCl) 500 ml infusion 3 %wv/500 ml (1.41%), fargoxin injection, solution 0.5 mg/2 ml (0.70%) and farpresin solution, injection 20 iu/ 1 ml (0.18%).

Novorapid flexpen solution injection is a preparation containing insulin aspart which is included in the short-acting insulin analogs, which has a faster onset and shorter duration of action than human insulin. Insulin aspart is indicated for the treatment of diabetes types 1 and 2. The main side effect of insulin aspart is hypoglycemia.[22] Novorapid can be given at a concentration of 0.05 units/ml to 1.0 units/ml in an infusion solution of 0.9% NaCl, Dextrose 5 % or 10%, and KCl.[16] The total daily insulin dose is usually between 0.4 to 1 unit/kg per day.22 The dose generally used in this study is novorapid flexpen 3 ml solution, injection 100 iu/1 ml with three uses. times a day adjusted to the patient's clinical condition.

Heparin is an anticoagulant indicated for the prevention and treatment of thrombotic events such as deep vein thrombosis and pulmonary embolism as well as atrial fibrillation. Recommendations for heparin dosing are not the same for every indication. For example, in patients with acute coronary syndrome or stroke, the dose is much lower due to the increased risk of bleeding. Typical side effects of using heparin include bleeding, thrombocytopenia, and injection site reactions. Bleeding is the main side effect associated with the use of heparin.[23] The dose of heparin commonly used in this study is 5000 UNT to 1000 UNT with once-daily use adjusted to the patient's clinical condition.

Intravenous tranexamic acid is generally used in patients with severe bleeding requiring massive transfusion protocols or when hyper-fibrinolysis is present. The dosage for the use of tranexamic acid is the same as for other types of HAM, namely, it is adjusted to each indication. For example, a selective cesarean section with a dose of 1 g for 5 minutes at least 10 minutes before the procedure and the dose used for cardiac surgery indications is given IV at a dose of 50 mg/kg for > 30 minutes after anesthesia.[24] The dose of tranexamic acid solution used at RSUPN Dr. Cipto Mangunkusumo is generally 500 mg/5 ml with used three times a day which is adjusted to the patient's clinical condition.

Based on Table IV, the number of patients and the administration of HAM based on the diagnosis of geriatric patients at RSUPN Dr. Cipto Mangunkusumo Jakarta namely in the age range of 60-70 years dominates with the diagnosis of sepsis with a total of 22 (64.70%) patients, hypertension with a total of 104 (68,87%) patients, CHF (congestive heart failure) with a total of 3 (60%) patients and pneumonia with a total of 55 (50%) patients compared to other ages. However, when viewed from the administration of the HAM group used, the diagnosis of sepsis with the use of the adrenergic agonist group dominated, namely 19 (21.11%) times of administration compared to other HAM groups. Whereas in the diagnosis of hypertension and CHF with the administration of HAM groups that dominate the use for both diagnoses is insulin with each administration of 53 (20.38%) times for the diagnosis of hypertension and 5 (45.45%) times for the diagnosis of CHF (congestive heart failure) when compared to other HAM groups. The results of the diagnosis of pneumonia with the HAM group that dominated its use were insulin with 43 (20.67%) times of administration compared to other HAM groups.

The limitations of this study are that the geriatric patient subjects used in this study are considered the same and do not classify the severity of the disease experienced by patients based on the type of HAM used. In addition, the data presented is data that has been previously listed, so researchers are only able to manage existing data without directly reviewing patients regarding the HAM that has been used.

Table IV. The Number of Geriatric Patients and the Provision of HAM Based on the Results of the Diagnosis at RSUPN Dr. Cipto Mangunkusumo Jakarta Period January to December 2023

Characteristics	Diagnosis (n=300 patients)		Number of Medication (n=569)	
	Sepsis (Patients)	Hypertension (Patients)	CHF (Patients)	Pneumonia (Patients)
Usia (years)				
60-70	22	104	3	55
71-80	10	38	2	41
81-93	2	9	0	14
Total	**34**	**151**	**5**	**110**
Drugs Class	**Sepsis**	**Hypertension**	**CHF**	**Pneumonia**
Insulin	6	53	5	43
Anticoagulants	15	49	1	42
Cardiac Glycosides	0	1	2	1
Anti-fibrinolytic	10	45	0	18
Adrenergic agonist	19	10	1	25
Electrolyte	16	32	2	29
Concentrated Electrolyte	1	7	0	5
Nutritional products	9	10	0	23
Narcotic analgesics	11	46	0	19
Anti Diuretic Hormone (ADH)	1	0	0	0
Benzodiazepines	2	7	0	3
Total	**90**	**260**	**11**	**208**

CONCLUSION

The conclusion of this study is the use of HAM drugs, namely Insulin with 53 (20.38%) times of administration and anticoagulants with 49 (18.84%) times of administration when compared to the administration of other HAM groups with a diagnosis of hypertension. The type of insulin that dominated its use was novorapid flexpen 3 ml with a dose of 100 iu/1 ml (13.532%) and the anticoagulant group was heparin sodium solution 5 ml with a dose of 5000 units/1 ml (13.181%).

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STATEMENT OF ETHICS

Ethical Clearance This study has received ethical approval from Ahmad Dahlan University with number 012309216 and RSUPN Dr Cipto Mangunkusumo Jakarta with number KET-1770/UN2.F1/ETIK/PPM.00.02/2023.

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