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Research article

Investigating the Prevalence of Medication-induced Falls in Older Patients with Ischemic Stroke during Hospitalization

Nurul Verawati[1], Nanda Puspita[2], Fatwa Hasbi[3*]

[1]Poltekkes Kemenkes Jakarta II, Jakarta, Indonesia

*Corresponding Author: nanda.puspita@poltekkesjkt2.ac.id

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Abstract

Stroke is among the most devastating neurological conditions that affect the elderly. In cases of acute ischemic stroke, hospitalised older patients will receive various regimens both for comorbidities and to prevent recurrent stroke. Multiple pathologies are the main reason geriatric patients receive large amounts of drug therapy. This phenomenon, known as 'polypharmacy ', poses a significant issue in geriatric care. This requires monitoring, so it would not be potentially inappropriate medications that aggravate adverse drug reactions, including the risk of falls. Fall is a complex problem in old age, one of which is associated with medication use. This study aimed to identify potentially inappropriate medications according to the Beers Criteria list that are related to fall risk in older ischemic stroke patients in the hospital. A cross-sectional study used electronic health records (EHR) from 342 geriatric patients at the National Brain Centre Hospital, Jakarta, Indonesia. Systematic random sampling was employed to retrieve samples from the population. Demographic and clinical data were documented, and medications prescribed for patients were analysed. The majority of patients were aged 65 – 74 years (73.1%), male (57.9%), had a length of stay ≤7 days (86%) and had comorbidities (94.4%). Medication categories that need monitoring for risk of falls are anxiolytics (14.04%), anticonvulsants (9.36%), antipsychotics (9.36%), and antidepressants (4.09%), and opioid analgesics (3.51%). There were no significant differences between patients with and without yellow wristbands who received drug regimens associated with a fall risk (p=0.674). Reviewing medication for older patients before discharge may be imperative to prevent the risk of falls due to taking potentially inappropriate medications.

Keywords: Beers criteria, geriatric, medication-induced falls, stroke

Introduction

According to World Health Organization (WHO) projections, nations should prepare for an ageing population. Indonesia, the fourth most populous nation in the world, also has a steadily ageing population[1]. According to Indonesian Central Bureau of Statistics, in 2021, the number of older people has reached 10.82 per cent, with the number of older women being 53.32 per cent higher than older men at 47.68 per cent. This data shows that Indonesia has entered an ageing population because the number of older people is more than 10% of the total population[2]. One of the factors contributing to the increase in the number of elderly is the increase in life expectancy. In Indonesia, life expectancy has increased from 72.51 in 2015 up to 75.47 in 2045[3].

Increasing life expectancy in older people is a challenge in the health sector. As people age, they are more likely to experience various physical complaints due to ageing factors and disease patterns[4]. In old age, health care becomes more complicated due to various disorders, decreased organ function, psychological and social changes, economy, and environment[5].

Stroke is one manifestation of cardiovascular complications commonly experienced by older people. Geriatric patients with ischemic stroke are at risk of being exposed to multiple treatments, namely treatment of the history of the disease before hospital admission, followed by regimens for acute symptoms of stroke, and then long-term rehabilitation efforts. Therefore, geriatric patients with stroke have the potential to receive therapy with more than five items of medication, a condition known as polypharmacy. Rates of polypharmacy have been reported to range from 26% to 75%

among adults who experienced a stroke[6]. Among individuals who have experienced a stroke, polypharmacy has been associated with reduced functional, rehabilitative outcomes, and increased risk of falls[6,7].

Geriatric post-stroke patients are at risk of experiencing permanent disability, a condition that significantly impacts the patient's physical and psychological well-being. Medication use while in the hospital should be monitored to avoid the risk of inappropriate medication use leading to fall risks, which can worsen the patient's condition in the long term. Falls in older people are causing a substantial burden on the quality of life and healthcare systems. Some fall cases in the elderly are related to medication use. Falls may be the consequence of recent medication changes but are usually caused by medicines that have been given for some time[8]. The incidence of falls can cause fractures that potentially reduce the quality of life and increase health expenditure[9].

Beers Criteria is one of the guidelines formulated by clinicians to identify potentially Inappropriate Medications (PIMs), including drugs that should be avoided or used with specific attention in geriatric patients over 65 years[10]. This tool has been widely used for assessing medication management in older patients. The study was conducted at the National Brain Centre Hospital, Prof. Dr. Mahar Mardjono, Jakarta, Indonesia, as a healthcare facility for special treatment of brain and nerve disorders. In this study, the objective was to investigate the prevalence of medication-induced falls in geriatric patients diagnosed with ischaemic stroke in the hospital wards and to determine the correlation between the yellow wristband and medications use during hospitalization.

Methods

This cross-sectional study was conducted at National Brain Centre Hospital Prof. Dr. dr. Mahar Mardjono, Jakarta, Indonesia, from April to June 2022. Retrospective data using electronic health records (EHR) of geriatric patients were obtained from the hospital database. The inclusion criteria for EHR were as follows: older patients ages ≥ 65 years old, admitted to the inpatient department (IPD) due to ischaemic stroke between January 1, 2021, and December 31, 2021. A total of 2.364 patient medical records with an ischaemic stroke, were included in the study population. Ischaemic stroke was identified using the following International Classification of Diseases, 10th revision (ICD-10) codes. The minimum sample size was calculated using the Slovin formula as follows, and 342 patient records were obtained:

$$n = \frac{2364}{1 + 2364 \,.\, (0{,}05)^2}$$

$$n = \frac{2364}{1 + 5{,}91}$$

$$n = \frac{2364}{6{,}91} = 342{,}11 \sim 342$$

The first sample was obtained by randomly taking the first patient's data and sampling according to the predetermined interval (k). Data were assessed for drug-induced falls by using the updated 2019 Beers Criteria lists.

Data analysis

Data on the treatment of geriatric patients with ischemic stroke were compiled and screened to identify medications that potentially cause falls. To determine the prevalence of medication induced fall, list of medication on EHR were matched with the Beers Criteria list. Age, comorbidity, length of stay, and polypharmacy were reported as percentages and presented in frequency distribution table. This study also identify the correlation between the use of yellow wristband (an alert for risk of fall in patient) and the medication use during hospitalization. Chi-square test was applied to determine the correlation. Collected data were analyzed using SPSS 22.0 software with a 95% confidence interval (CI).

Results and Discussion

Among 342 patients, 73.1% were between 65-74 years old, and 57.9% were male. The hospital length of stay was ≤7 days (86.0%), and most of them had comorbidities (94.4%). Almost 75% of patients have been prescribed more than five medications (Table 1). From Table 2, the medication-induced fall risk has been used in 138 out of 342 patients (40.35%). Medication categories that need monitoring for risk of falls are anxiolytics (14.04%), anticonvulsants (9.36%), antipsychotics (9.36%), antidepressants (4.09%), and opioid analgesics (3.51%). Chi-square test results in no significant differences between patients with and without yellow wristbands who received drug regimens associated with a fall risk (p=0.674).

Table 1. Characteristics of the sample study

Variables		N (%)
Sex	Male	198 (57.9)
	Female	144 (42.1)
Age	65-74	250 (73.1)
	75 and above	92 (26.9)
Comorbidity	Yes	323 (94.4)
	No	19 (5.6)
Length of Stay	≤7 days	294 (86)
	> 7 days	48 (14)
Polypharmacy	Yes	255 (74.6)
	No	87 (25.4)

Table 2. Prevalence of medication-induced falls per AGS Beers Criteria 2019

Drug Name	N (%)
Anxiolytics (Benzodiazepines & non benzodiazepines)	48 (14.04)
Alprazolam	29
Diazepam	9
Clonazepam	4
Estazolam	2
Clobazam	2
Zolpidem	2
Anticonvulsants	32 (9.36)
Gabapentin	19
Phenytoin	5
Valproic acid	4
Carbamazepine	2
Levetiracetam	2
Antipsychotics	32 (9.36)
Risperidon	16
Haloperidol	14
Chlorpromazine	1
Sulpiride	1
Antidepressants	14 (4.09)
Amitriptyline	8
Fluoxetine	5
Sertraline	1
Opioid Analgesics	12 (3.51)
Tramadol	6
Fentanyl	3
Codeine	2
Remifentanyl	1
Total	138

Table 3. The use of medication-inducted falls in older patients with and without yellow wristbands

Categories	Medication-induced falls		Total	P-value
	Yes	No		
Patients with yellow wristbands	55	145	200	0.674
Patients without yellow wristbands	42	100	142	

This study demonstrated that hospitalised older patients were at risk of receiving medication-induced falls. For this vulnerable population, the combination of post-acute ischaemic stroke, high prevalence of potentially inappropriate medications, and elevated risk of geriatric syndromes emphasises the crucial need to thoroughly review the risks and benefits of medications when patients are admitted to the hospital and discharged from the hospital.

From this study, there are several classes of drugs, including benzodiazepines, antipsychotics, antiepileptics, and antidepressants, whose benefits for stroke patients are unknown. These drugs are probably prescribed to geriatrics with sleep disorders[11], but their long-term administration needs to be evaluated to weigh the benefit-risk ratio.

Benzodiazepines can cause sedation, postural sway, and memory impairment in the elderly[12]. This medication is discouraged in the geriatric population, especially for long-term use. It is imperative to re-evaluate the necessity or recommend select benzodiazepines that are glucuronidated such as temazepam, oxazepam, lorazepam[13]. Antipsychotic medications may be used to treat behavioural symptoms associated with dementia in geriatrics. This should only be used when the neuropsychiatric symptoms pose a significant safety risk[14]. Antipsychotics commonly cause ADR related to peripheral & central anticholinergics (urinary retention, cognitive dysfunction, delirium)[15]. Beers Criteria recommend limiting the use of the agent for only 6-12 weeks[10]. Instead of a pharmacological approach, healthcare providers may need to introduce a non-pharmacological approach such as cognitive behavioral therapy (CBT) for insomnia, depression or behavioral symptoms related to dementia in older patients [16].

According to this study, around 40% of patients receive medications with a risk of falls. Because of the increased risk of loss of physical function and higher morbidity that follows, falls are incredibly upsetting for older persons[17]. Hip fracture is the most feared fall-related injury. In advanced age, falls typically have a multifactorial aetiology, including comorbidities, sensory impairment, musculoskeletal weakness, postural hypotension, and medications[17,18]. This suggests a significant focus on fall prevention in geriatric care, highlighting the importance of assessing medication use in older adults[19,20].

A nationally representative study in Scotland showed that 12.6% of people with stroke had a record of 11 or more prescription refills compared with only 1.5% of people without stroke. Polypharmacy is an essential marker of the burden of treatment, where patients and caregivers must put extra effort into maintaining treatment protocols and their relations with healthcare providers[7]. A longer list of medications and sensitivity to drug effects lead to adverse drug reactions in most elderly patients. Medicines for elderly patients must be reviewed periodically for indication, therapeutic aims, dose, efficacy and probable side effects[21–23].

The alarmingly high incidence of medication-induced falls indicates the urgent need to consider the advantages and disadvantages of these drugs carefully. Many of the adverse events in geriatric patients are interrelated. For example, cognitive impairment can lead to falls, and depression can exacerbate weight loss[24]. This highlights the importance of a holistic approach to geriatric care, where providers address multiple aspects of health concurrently. Above all, the intent of this study is not to suggest that all medications should be stopped without consideration, but rather to show that the findings should support a comprehensive approach to caring for older adults. The frequent use of medications and the presence of specific geriatric syndromes may be related to the high occurrence and interaction of multiple health conditions, extensive medication use, and geriatric syndromes in the elderly population[25].

The medication-induced falls list included medications often indicated in treating diagnoses. A clinician with the patient must assess the advantages of specific treatments for the disease and any possible impact on the symptoms and consequences of geriatric syndrome[25]. This study proposes a patient-provider dialogue in which the therapeutic benefits of drugs can be balanced against potential hazards associated with specific clusters of geriatric syndromes, quality of life implications, and alignment with care goals. The outdated care models based on individual diseases are no longer effective. Moving toward distinct paradigms based on multimorbid patients, chronic illnesses, syndromes, and person-tailored therapies is crucial. This mindset is essential for geriatric care and should be more deeply ingrained in medical professionals' education[13,26,27].

Conclusion

It is imperative to review the medication list for older patients when discharged from the hospital due to the risk of medicines associated with falls. Deprescribing may be initiated to mitigate the risk of medication harm. To improve patient outcomes, medicines associated with falls must be addressed through an integrated approach incorporating multidisciplinary interventions. In the eyes of healthcare professionals, individual patient goals should take precedence over medications and illnesses.

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Declarations

Author contribution : Nanda Puspita prepared the research design, conceptual framework, and wrote the manuscript, Nurul Verawati carried out data collection, and Fatwa Hasbi analysed the data.

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Additional information : No additional information is available.

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