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Evaluation of Rationality of Geriatric Patients' Prescription Based On Beers Criteria in a Tertiary Care Hospital in India

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Abstract

AIM: Irrational prescribing for geriatric patients has become an important public health problem worldwide. Because India is one of the most populated countries having a great proportion of old people in the world, studies on the prevalence of inappropriate prescriptions can be very beneficial to increase the knowledge of health care providers and to reduce the occurrence of adverse drug events among this population.

METHODS: A group of 482 inpatients above 64 years old were enrolled in a prospective study. Chart review method was used. The data were collected from patients' prescription and medicine charts. Each prescription was checked individually for the inappropriate drug by using the AGS 2015 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. Suggestions were given to the physicians for inappropriate medications.

RESULTS: The prevalence of potentially inappropriate medication is found to be 11.66% (n = 56). Out of 56 inappropriate medications, the most frequently inappropriate medication is Digoxin (25%) followed by Sprinolactone 19.64%. This study founds age, some medication, length of stay and number of diagnosis as predictors for getting a PIM. Feedback of the physicians varies based on the suggestions.

CONCLUSION: This study concludes that the prevalence of PIMs among geriatrics patients of ≥ 65 years old is 11.66%. Some predictors have been identified for getting a PIM. This study shows that physicians' feedback is dependent on the suggestions being given.

Introduction

Inappropriate medication (IM) is the use of medicines that cause more risk than benefit, particularly when safer drugs can be used instead of them [1]. The prevalence of irrational prescribing in older patients is high which can lead to increased risk of adverse drug events, morbidity, mortality and healthcare problems. Therefore, the irrational prescription is a major safety issue, and by the ageing of the population, it is likely to become even more prevalent in the future [2].

It is a very difficult practice to prescribe rationally to elderly patients because available information on rational drug prescription is based on data of younger individuals while the characteristics of them are very different from that of old people [4]. The pharmacokinetic [4] and pharmacodynamic [5] characteristics of older people change over time. Due to the potentially serious consequences of inappropriate prescribing, researchers have designed various tools for measuring inappropriate prescription [6]. Beer's Criteria is one of those guidelines which emphasises on avoiding prescription of medications that are not necessary, which consequently helps to manage the problems of polypharmacy, drug interactions, and adverse drug reactions [8].

Prevalence of inappropriate medication is high in general, but it is variable in different parts of the world [7]. An electronic search of the PUBMED

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database for articles published between 1991 and 2006 showed that prescription of potentially inappropriate medications to older people is highly prevalent in the United States and Europe and its proportion ranged from 12% in community-dwelling elderly to 40% in patients of nursing home [8], [9], [10], [11], [12], [13], [14], [15], [16].

Studies have investigated the prevalence of potentially inappropriate medications among elderly patients in different countries but the findings of the studies have not shown the same rate of prevalence of inappropriate medications because each country has a specific clinical practice setting [17], [18], [19], [20], [21], [22], [23], [24], [25].

Every year, out of three adults ≥ 65 years, one has one or more adverse reactions to a medication or medications. This is why it is important for researchers to identify the use of drugs that are associated with more risks than benefits in older people [18]. India has approximately 16% of the world population, so reasonably it will have a large number of elderly patients [19]. Because India is one of the most populated countries having a great proportion of old people in the world, studies on the prevalence of inappropriate prescriptions can be very beneficial to increase the knowledge of the healthcare providers and to reduce the occurrence of adverse drug events and morbidity and mortality among this population.

In this study we aimed at determining the prevalence of PIMs prescribed for elderly inpatients in the Indian setting, identifying the most commonly prescribed inappropriate medications, investigating predictors of PIMs which can act as an alert system for reducing the chance of prescribing inappropriate medication. Another point that we aimed to investigate is physicians' response to suggestions given by the pharmacist about PIMs. This can be considered as a method to assess the mentality of the physicians towards the suggestions given by the clinical pharmacists as clinical pharmacists are not well-accepted by most of the physicians in clinical settings. Such research findings can be used to improve the rapport amongst clinical pharmacist and physicians, which can finally lead to better clinical outcomes.

Material and Methods

A prospective study was carried out in an inpatient setting of a tertiary hospital in Bangalore, India after obtaining approval of the Institutional Review Board. The duration of the study was six months from September 2016 to February 2017.

Four hundred and eighty-two patients ≥ 65 were enrolled from six wards: Male medical ward, Female medical ward, Orthopedic ward, Gynecology

ward, ICU and Surgery ward. Patients who had incomplete information in their files were excluded from the study.

A self-developed form was used for collecting information about the patients. The forms were completed at the time of admission and updated daily till the date of discharge of the patients. Chart review method was used. The data were collected from patients' prescription and medicine charts of the patients.

Each prescription was checked individually for inappropriate drug prescribing by using the AGS 2015 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. For each medication order, the name, dosage, the frequency of dosing and nature of prescription (scheduled or given on an as-needed basis) were collected. Prescriptions for creams, ointments and drops were not included. A prescription was considered to be inappropriate if it had one or more drugs included in Beers list of inappropriateness. Suggestions were given to the physicians for inappropriate medications, and responses of the physicians were recorded.

Statistical analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) software version 16. All the data were presented as frequency and percentage. Prevalence was used for assessing the number of inappropriate medication use. The odds ratio was applied for determining predictors of inappropriate medication use. Value of $P < 0.05$ was considered statistically significant.

Results

The analysis of data for appropriateness of drug therapy was performed, and the results showed that 11.66% (n = 56) out of the 480 patients received at least 1 inappropriate medication (Table 1).

Table 1: Prevalence of inappropriate medicine use by Beers Criteria 2015 (n = 56)

List of medications that should be avoided based on Beers criteria 2015 independent of diagnosis		
Name of drug	Strength of recommendation	Number of patients
Digoxin	Strong	14 (25%)
Spironolactone	Strong	11 (19.64%)
Indomethacin	Strong	5 (8.92%)
Nitrofurantoin	Strong	2 (3.57%)
nifedipine	Strong	3 (5.35%)
Diazepam	Strong	5 (8.92%)
Promethazine	strong	2 (3.57%)
Amiodarone	strong	2 (3.57%)
Amitriptyline	Strong	3 (5.35%)
Metoclopramide	strong	2 (3.57%)
Dicyclomine	strong	3 (5.35%)
Potentially inappropriate medication use due to drug-disease or drug-syndrome interactions		
Ranitidine	Strong	3 (5.35%)
Fluoxetine	strong	1 (1.78%)

Certain risk factors were found to be associated with PIM. These risk factors increased the

likelihood of inappropriate medications. Age was the demographic factor influencing the chance of PIM; the number of medications prescribed, some diagnosis and length of hospitalisation were the clinical variables exerting influence on the chance of getting PIMs in patients (Table 2).

Table 2: Number of patients in each group, Prevalence of PIM and Predictors of PIM using Beers Criteria 2015

Variable		Total (n)	Patients with IMU	Patients with AMU	Prevalence (%)	Odds Ratio (CI 95%)	P value
All		480	56	424	11.66		
Age	65-74	265	40	225	15.09	1 (reference)	
	75-84	152	12	140	7.89	2.074 (1.052- 4.088)	0.035
	85 ≤	63	4	59	6.34	2.622 (0.902-7.622)	0.076
Gender	Male	218	29	189	13.3	1 (reference)	
	female	262	27	235	10.3	1.335 (0.764-2.333)	0.309
No of medication	≤ 6	305	47	258	15.4	1 (reference)	0.0013
	6 >	175	9	166	5.14	3.36 (1.6-7.03)	
Length of stay	≤ 5	198	32	166	16.16	1 (reference)	
	6-10	207	20	187	9.66	1.802 (0.992-3.272)	0.052
	11 ≥	75	4	71	5.33	3.421 (1.166-10.035)	0.025
No of diagnosis	1	54	14	40	25.92	1 (reference)	0.175
	2	150	26	124	17.33	1.669 (0.795-3.502)	P < 0.0001
	≥ 3	276	16	260	5.79	5.687 (2.579-12.541)	

The prevalence of inappropriate medications was reported to 32 physicians, and their feedback was obtained (Table 3).

Table 3: Physician's response to various types of suggestions

Suggestions	Accepted	Not accepted	Percentage
Further information is required for taking a clinical decision	20	12	62.5%
ADR monitoring should be done	24	8	75%
Specific laboratory test should be done	19	13	59.375%
Use drugs with caution	25	7	78.125%
The drug should be avoided	6	26	18.75%
Drug dosing should be changed	18	14	56.25%

Discussion

One of the important safety concerns in prescribing practice especially for old people is inappropriate prescription [20]. The inappropriate prescription is a major concern in countries like India which have a lot of population and logically there are a lot of geriatric patients among them that may suffer inappropriate prescription which causes health issues to the patients and increases the financial burden of the treatment for the patient and the society.

Inappropriate prescribing for older patients in other countries has been well-documented with the estimated prevalence ranging from 11% to 43% [21]. Our study showed a low value of PIM in the range of PIMs documented in other countries, but still, it is an issue of concern because 11.66% is considered a high value for inappropriate prescription especially for geriatric patients who are more vulnerable to inappropriate prescription comparing to young patients.

Different factors can lead to the difference in the prevalence of PIP in different countries and among those factors are demographic characteristics of patients, disease status of the patient, the

difference in prescribing patterns, physician specialities, sample size and drugs which are marketed in different counties [21].

The results of our study showed the average of 11.66% of prevalence of PIM, 15.09% was for the age group of 65-74, 7.89% for the age group of 75-84 and 6.34% for the patients who were in the age group of ≤ 85 years. This is showing that the prevalence of PIM has decreased with ageing. Our result regarding the decrease of the prevalence of PIM with ageing was supported by one study which had been performed in Brazilian outpatient setting [22].

Based on our results males had a higher rank of getting PIM (13.3%) comparing to females (10.3%), but gender was not found to be a predictor of getting a PIM in our study because the difference between two groups was not statistically significant (P = 0.309).

Considering the number of medications, higher prevalence of PIM was found to be for the group with having ≤ 6 medications (15.4%) followed by the group of having seven or more than seven medications (5.14%).

Length of stay in hospital was the fourth variable which was considered in our study. The results showed the highest prevalence for the group with ≤ 5 days stay in the hospital (16.16%). The next group was found to be the group of 6-10 days stay in the hospital (9.66%), and the lowest prevalence was for the patients with 11 ≤ days stay in the hospital (5.33%).

Based on our findings, patients with three diagnoses had the lowest prevalence of PIM (5.79%) followed by patients with having two diagnoses (17.33%), and the highest prevalence was found to be for the patients of having one diagnosis (25.92%).

In this study, we found digoxin as the most common PIM (25%) followed by spironolactone (19.64%); Indomethacin and Diazepam were the next PIMs (8.92%); Nifedipine, Amitriptyline, Dicyclomine and Ranitidine were the next drugs (5.35%). Nitrofurantoin, Promethazine, Amiodarone, Metoclopramide were next, and finally, Fluoxetine got the lowest rank of PIMs (1.78%). The similarity in the prescription of inappropriate medication can be seen in another study which had been done in India [21].

Predictors of potentially inappropriate medication

The effect of five possible predictors that may increase the chance of getting a PIM was assessed. The predictors we considered were the age of the patient, sex of the patient, length of stay in the hospital, number of drugs prescribed and number of diagnoses.

In our study, age was found to be a predictor of getting a PIM. The odds ratio of getting a PIM for

the age group of 75-84 was found to be 2.074 (p = 0.035), so our study shows that being in the age group of 75-84 is the predictor of getting a PIM.

Our study showed that gender is not a predictor of getting a PIM (p = 0.309). Some medications were found to be a strong predictor of getting a PIM. Having more than 6 medications comparing with having 6 medications or less gives the odds ratio of 3.36 (p = 0.0013) which indicates that being in the second group (medication > 6) increases the chance of getting PIM more than three times.

Based on our data analysis, length of stay in hospital was a predictor for a PIM. Odds ratio of getting a PIM with staying 6-10 days in hospital compared with staying ≤ 5 days was estimated to be 1.802 (p = 0.052) which was not statistically significant; However, staying in the hospital for 11 days or more increases the chance of getting a PIM more than 3 times (odds ratio of 3.421, p = 0.025). Having 3 or more disease was found to be a strong predictor of getting a PIM (odds ratio = 5.687, p < 0.0001)

Feedback of the physicians to suggestions

The percentages of the acceptance of the suggestions given by the researcher to the physicians were not very high. The low acceptance rate can be due to various reasons: first, suggestions were given to the physicians, but alternative options were not given. This might be the reason for low acceptance. The second reason for physicians' resistance to accepting the suggestions may be the fact that the suggestions were given by the fifth-year student of pharmacy, so the physicians might feel that the students' knowledge was very low compared to their knowledge. Therefore, the lack of acceptance might be originated from the lack of acceptance of the students' knowledge level by physicians. Third: clinical pharmacy is a new subject of study in India and clinical pharmacists are not well accepted in Indian setting by the physicians, so Lack of credence on a pharmacist as a clinical expert might lead to this result. Fourth: some physicians do not have faith in explicit criteria when making a clinical decision, and they rely on their professional judgment.

Still, there may be other reasons for the low acceptance percentage of suggestions given to the physicians. This study only estimated the acceptance rate of the physicians and did not analyse the reason behind that. Other studies in future should analyze this issue because it can be very helpful in building up a good rapport between the physicians and pharmacists which finally can end up in better clinical care to patients.

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