ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES Knowledge to Innovation

Vol 8, Issue 6, 2015

ISSN - 0974-2441

Research Article

DRUG UTILIZATION PATTERN AMONG GERIATRIC PATIENTS IN A TERTIARY CARE TEACHING HOSPITAL

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Received: 28 July 2015, Revised and Accepted: 29 September 2015

ABSTRACT

Objectives: The objectives of this study are to assess the prescribing pattern in geriatrics, analyze the prescriptions using World Health Organization (WHO) core prescribing indicators, and to assess the appropriateness of prescriptions using Beers criteria 2012.

Methods: This retrospective drug utilization review study was conducted for a period of 6-month. Prescriptions of in-patients above 65 years were collected and documented. Collected data were then analyzed with the WHO core prescribing indicators and 2012 American Geriatrics Society Beers criteria for potentially inappropriate medication use in older adults.

Results: A total of 205 in-patient prescriptions were collected. The majority of patients (73.66%) were in the age group of 65-74 years. The most commonly found comorbidities were hypertension and diabetes mellitus. Average number of drugs per prescription was 9.09. Percentage of encounters with an antibiotic and injection prescribed were 81.46% and 95.12%, respectively. A total number of drugs prescribed by its generic name were 235 (12.60%). Among 1865 medicines prescribed, 1215 (65.15%) were prescribed from National List of Essential Medicine (NLEM). Gastrointestinal agents (17.28%) were the most frequently prescribed class of drug followed by cardiovascular drugs (17.14%). Based on 2012 Beers criteria, 66 (32.19%) prescriptions were found inappropriate.

Conclusions: Our study suggests that current practice in our hospital is associated with greater polypharmacy and inappropriate medication use. Prescribing from NLEM was fair. Use of injectables and antibiotics were high. Drugs prescribed in generic name were low. In future, multidisciplinary approach should be endorsed for rational drug use in the geriatric population.

Keywords: Drug utilization, Geriatrics, Beers criteria, National List of Essential Medicine, World Health Organization core prescribing indicators.

INTRODUCTION

Drug utilization research was defined by World Health Organization (WHO) in 1977 as "the marketing, distribution, prescription and use of drugs in society; with special emphasis on the resulting medical, social and economic consequences." The assessment of drug utilization is important for clinical, educational, and pharmacoeconomic purposes [1]. Drug utilization research provides insights into different aspects of drug use and drug prescribing such as pattern of use, quality of use, determinants of use, and outcomes of drug use [2]. Drug utilization becomes essential for elderly care, although, the incorrect use of medicines is one of the greatest problems experienced by this population. It is important to realize that inappropriate use of drugs represents a potential hazard to patients and an unnecessary expense. This necessitates a periodic review of the pattern of drug utilization to ensure safe and effective treatment [3].

Geriatrics

Geriatrics is the branch of general medicine concerned with the clinical, preventive, remedial, and social aspects of illness in the elderly [4]. However, knowledge about the efficacy and safety of many drugs is often sparse for the elderly because they are generally excluded from clinical trials. Adverse drug reactions (ADR) in the elderly are in fact often caused by inappropriate prescribing. ADRs in the elderly have been characterized as "a major modern epidemic." The control of this epidemic demands insight into physicians' drug prescribing patterns because the identification of the quantity and the type of prescribing problems are the fundamental first steps in trying to improve the quality of prescribing [5].

Prescribing indicators

Aiming to evaluate the conditions of the services offered to the population concerning medication, the WHO developed medication use indicators, including prescribing indicators. Prescribing indicators allow the therapeutic actions taken in similar institutions to be ascertained, enabling subsequent comparison of parameters between them and to evaluate the populations' medication needs and determine the most frequently used medications in a given place. In addition, these indicators allow identification of the prescription profile and quality of services offered to the population. The prescription indicators are as follows:

Medication average per medical prescription

Through this indicator, it is possible to investigate polypharmacy, a major factor contributing to drug interactions and adverse reactions.

Percentage of medication prescribed with generic name

This indicator allows the calculation of the number of prescriptions in which the drugs are prescribed with the generic name. Thus, it is possible to control drug costs in the health service due to the fact that the drugs of general references are more expensive.

Percentage of prescribed drugs from list of essential drugs

Besides controlling costs, the essential drugs list guarantees the treatment of principal diseases of the population.

Percentage of prescribed antibiotics

This indicator aims to evaluate the use of antibiotics in excess, a practice which contributes to bacterial dissemination and resistance.

Percentage of prescribed injectable drugs

This indicator aims to evaluate the injectables in excess because their administration may have serious consequences when prescribed or applied wrongly such as difficulty for case reversion in the event of anaphylactic reactions, and adverse reactions.

Beers criteria

The Beers List, sometimes referred to as the Beers criteria, was developed by a group of 12 clinicians with expertise in geriatrics led by Dr. Mark Beers. The 2012 American Geriatrics Society (AGS) Beers criteria is an important and improved update of previously established criteria widely used by healthcare providers, educators, and policy-makers as a quality measure [6].

The aim of this study was to analyze general medication utilization patterns using WHO core prescribing indicators and the occurrence of some predefined inappropriate drug prescribing according to Beers criteria2012 method in geriatric patients, in a tertiary care teaching hospital.

Objectives

The objective of the study is the drug utilization pattern among geriatric patients in a tertiary care teaching hospital and analyzing the prescription with WHO core prescribing indicators and 2012 AGS Beers criteria for potentially inappropriate medication use in older adults.

METHODS

A retrospective drug utilization review study was conducted in the medicine, surgery, urology, and orthopedics wards of a tertiary care teaching hospital in Davangere for a period of 6-month. Patients above 65 years of age of either sex were enrolled in the study. Patients on ventilators or seriously ill patients requiring intensive care unit admission were excluded.

Ethical issues

The ethical clearance for the study was obtained from Institutional Ethical Committee of Bapuji Pharmacy College, Davangere.

Study procedure

The study was carried out by regular visits to various in-patient departments and case sheets from patients above 65 years of age were collected. The relevant data collected from case sheets were properly documented in a separate data collection form. The obtained data were then analyzed for average number of drugs per prescription, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed, percentage of drugs prescribed from National List of Essential Medicine (NLEM), distribution of comorbidities, category wise distribution of drugs (taking into consideration the number of active ingredients in a multidrug formulation), and the appropriateness of the prescriptions using Beers criteria, 2012.

RESULTS

A total of 205 prescriptions were collected, out of which 134 (65.36%) were males and 71 (34.64%) were females. The majority of the patients were in the age group of 65–74 years (n=151, 73.66%) followed by 75-84 years (n=39, 19.02%), 85–94 years (n=14, 6.83%), and 95–105 years (n=1, 0.49%). Out of 205 patients, 27.80% had just one comorbidity, 22.93% had two comorbidities, 14.63% had three comorbidities, 3.42% had four comorbidities, 1.46% had five comorbidities, and 29.76% were without any comorbidity. The most commonly found comorbidity was hypertension and diabetes mellitus followed by respiratory disease, ischemic heart disease (IHD), and cardiovascular accident (CVA). A total of 1865 drugs were prescribed to the study population. Minimum number of drugs prescribed in a prescription was 3 and maximum were 18. An average number of drugs prescribed were found to be 9.09 per prescription. Depending on the number of drugs prescribed, prescriptions with 5-10 medicines were considered as polypharmacy and with more than 10 medicines as high polypharmacy. Of the 205 prescriptions, 194 (94.64%) were prescribed with more than 5 medicines. Polypharmacy and high polypharmacy were found in 125 (60.98%) and 69 (33.66%) prescriptions, respectively. Number of prescriptions encountered with antibiotic was 167 (81.46%). Average number of antibiotics per prescription was found to be 1.65. Most of the drugs were prescribed by oral route (n=937, 50.24%) followed by injectables (n=822, 44.07%), inhalations (n=94, 5.04%), and others (n=12, 0.65%). The percentage of encounters in which an injection prescribed was 95.12%. Total numbers of drugs prescribed by its generic name were 235 (12.60%) and the drugs given by its brand name were 1630 (87.40%). It was found that most of the generic drugs were prescribed by more than one brand name. Among 1865 medicines prescribed, 1215 (65.15%) were prescribed from NLEM and 650 (34.85%) were prescribed out of NLEM. A total of 2100 drugs were prescribed taking into consideration the number of active ingredients in a multidrug formulation.

Gastrointestinal agents (17.28%) were the most frequently prescribed class of drugs followed by cardiovascular drugs (17.14%), anti-infectives (17%), respiratory agents (13.09%), analgesics and anti-inflammatory agents (11.47%), vitamins, minerals, and fluid replenishers (7.43%), anti-diabetic agents (4.81%), corticosteroids (3.43%), central nervous system drugs (3%), blood and blood modifying agents (1.93%), anti-neoplastic agents (0.38%), hormones and antihormones (0.33%), immunologicals, sera, and vaccines (0.09%), and others (2.57%) [Table 1].

The list of ten most frequently prescribed drugs are given in Table 3.

Out of 205 prescriptions, 66 (32.19%) were found inappropriate as described by 2012 AGS Beers criteria for potentially inappropriate medication use in older adults [Table 2].

DISCUSSION

In our study, out of 205 cases, 134 patients (65.36%) were males and 71 patients (34.64%) were females. This study also revealed a male predominance over female similar to a study conducted by Shah and Mehta [1].

In our study, the most commonly found comorbidity was hypertension and diabetes mellitus followed by respiratory disease, IHD, and CVA. This finding was similar to the study conducted by Gopinath *et al*. [4]. Our study revealed polypharmacy in geriatric patients with an average of 9.09 drugs per prescription which is higher than similar studies conducted by Taskeen *et al*. where the average drugs per prescription were 6.07 and of Kumar *et al*. where the average drugs per prescription were 6.33. In our study, more than five drugs were prescribed in 94.64% cases which are similar to the study conducted by Jhaveri *et al*. [5,7,8]. The percentage encounters in which antibiotics were prescribed was 81.46% which is very high compared to what the WHO standard (20.0-26.8%) derived to be ideal. It was also higher than that found in another study conducted by Gopinath *et al*. where only 63% of patients received antibiotics. Average number of antibiotics per prescription was 1.65. This finding suggests that antibiotic prescribing needs to be regulated. The high percentage of antibiotics prescribed in our study setting may be due to cultural beliefs about antibiotics, the patient expectation to receive antibiotics, or prescribers' belief that the therapeutic efficacy of antibiotic is low [4].

Most of the drugs were prescribed through oral route (50.24%), followed by injectables (44.07%) which are connected to a study conducted by Jhaveri *et al*. [7]. The percentage of encounters in which an injection prescribed was 95.12% which is higher than the recommended range of WHO (13.4-24.0%). Possible reasons for the high use of injections could be: (i) Beliefs and attitudes of patients and health professionals about the efficacy of injections versus oral medications, (ii) our study setting is a tertiary care hospital where patients with serious conditions are treated, an injectable form produce a faster onset of action. Injections are very expensive compared to other dosage forms and require trained personnel for administration.

A large number of prescriptions drugs were prescribed by brand names where less expensive generic equivalents are available. Only 12.60% of medicines prescribed were generics. This finding is similar to those of

Taskeen *et al*. but falls short of the WHO recommendation of 100% [5]. This could be because the prescribers are more conversant with the brand names than generic names of the drug products. Furthermore, pressure from the medical representatives of the branded products to prescribe their own brand may have contributed immensely to this high rate. Prescribing by generic name allows flexibility of stocking and dispensing various brands of a particular drug that are cheaper than and as effective as proprietary brands. From our study, we found that more than half of the drugs (65.15%) prescribed here were from the NLEM, which was a higher percentage than studies of Thiruthopu *et al*. in South India and Jhaveri *et al*. where poor adherence to the list is seen [7,10]. There is a need to educate and encourage the doctors to prescribe only essential medicines to the extent possible so as to ensure rational use of medicines in geriatric patients.

Table 1: Distribution of drugs according to therapeutic classification

Drug class	Frequency	Percentage
Gastrointestinal agents	363	17.28
Cardiovascular drugs	360	17.14
Anti-infectives	357	17
Respiratory agents	275	13.09
Analgesics and anti-inflammatory agents	241	11.47
Vitamins, minerals and fluid replenishers	156	7.43
Anti-diabetic agents	101	4.81
Corticosteroids	72	3.43
CNS drugs	64	3
Blood and blood modifying agents	40	1.93
Anti-neoplastics	8	0.38
Hormones and anti-hormones	7	0.33
Vaccines, sera and immunologicals	2	0.09
Others	54	2.57

CNS: Central nervous system

Table 2: The 10 most frequently prescribed drugs

Name of the drug	Frequency
Pantoprazole	163
IV fluids	101
Paracetamol	95
Salbutamol+Ipratropium bromide	69
Ceftriaxone	68
Ondansetron	52
Tramadol	50
Insulin	49
Diclofenac	48
Amlodipine	46

IV: Intravenous

17.28% of the total drugs prescribed in the study were for gastrointestinal conditions followed by cardiovascular drugs (17.14%), anti-infectives (17%), respiratory agents (13.09%), analgesics, and anti-inflammatory agents (11.47%), etc. These findings were different from the study conducted by Shah *et al*. in Gujarat where cardiovascular drugs were prescribed the most, followed by antimicrobial agents, drugs acting on the gastrointestinal system, and vitamin supplements [2]. Gastrointestinal agents were the most frequently prescribed therapeutic class of drug even though the prevalence of gastrointestinal diseases was very low in our study. The frequent explanation given is gastrointestinal prophylaxis to inhibit gastric acid secretion and chances of nausea and vomiting in a majority of the cases. Our study found that Pantoprazole was the most frequently prescribed drug, but previous studies of Shah *et al*. and Kumar *et al*. show Ranitidine as the most frequently prescribed drug [2,8].

When analyzing in accordance with Beers criteria, out of 205 prescriptions, 66 (32.19%) were found as inappropriate which is higher than the similar study conducted by Veena *et al*. where 21.69% prescriptions were found potentially inappropriate [9]. The reasons for inappropriate prescribing may be partly due to the relatively weak evidence-based guideline for appropriate prescribing in the elderly patients and existence of particulars justifying exceptions to the rules in individual persons. Inappropriate medication use in patients, 65 years and above has been linked to many ADRs; poor physical functioning, and excess health care use. Interventions could target more appropriate drug selection by a physician to the elderly patients [5].

CONCLUSION

To conclude, this study provides insights into the patterns of drug use and appropriateness of prescriptions based on Beers criteria, 2012. The assessment of WHO core indicators helped to improve the prescribing pattern and even to minimize the cost burden of patients. The percentage of drugs prescribed from NLEM was fair; use of injections and antibiotics was high. The percentage of prescribing by generic name was low, and efforts to encourage prescribing by generic name

Table 3: Potentially inappropriate drugs prescribed as per Beers criteria, 2012

Drugs	Frequency	Concern
Benzodiazepines		
Alprazolam	13	Older adults have increased sensitivity to benzodiazepines and decreased metabolism.
Chlordiazepoxide	1	In general all benzodiazepines increase risk of cognitive impairment, delirium, falls,
Diazepam	1	fractures and motor vehicle accidents in older adults
Antispasmodics		
Atropine	1	Highly anticholinergic, uncertain effectiveness
Scopolamine	4	
Dicyclomine	3	
First-generation antihistamines		
Chlorpheniramine	13	Highly anticholinergic; clearance reduced with advanced age; increased risk of
Hydroxyzine	1	confusion, dry mouth, constipation and other anticholinergic effects or toxicity
Promethazine	1	
Diphenhydramine	1	
Others		
Prazosin	7	High risk of orthostatic hypotension; not recommended as routine treatment of hypertension; alternative agents have superior risk or benefit profile
Digoxin (>1.25 mg/day)	1	In heart failure, higher dosages associated with no additional benefit and may increase risk of toxicity; decreased renal clearance may lead to increased risk of toxic effects
Liquid paraffin	8	Potential for aspiration and adverse effects; safer alternatives available
Amitryptilline	3	Highly anticholinergic, sedating, and cause orthostatic hypotension
Insulin sliding scale	8	Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting

should be initiated. The average number of drugs per prescription was high. Our study suggests the current prescribing practices in the hospital associated with greater polypharmacy and inappropriate medication use.

A regular medication chart review by the clinical pharmacist can reduce the frequency of prescribing drugs without indications and thereby reducing polypharmacy. It will also reduce the cost of the therapy which will ultimately benefit the patients. Continuous medical education with a focus on rational drug use and evidence-based medicine should form part of the program of the hospital. In future, a multidisciplinary approach should be taken involving physicians, nurses and, pharmacists. They have to work as a team for bringing out rational drug use in the geriatric population.

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