

Impact on the outcome of pharmacotherapy of senior Indian inpatients: A pharmacist led intervention

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Abstract

It is well known that due to physiological changes, elderly patients are prone to suffer from Drug-Related Problems (DRPs). By the year 2040, the elderly will account for 14% of total global population. Since the elderly population will increase, it is expected that the DRPs will also increase. To determine the potentially inappropriate prescription(s), understand risk factors and study the impact of providing regular feedback to the clinicians on the inappropriate medications prescribed to the elderly inpatients using the Modified Updated Beers Criteria 2003. A 3 year long term prospective interventional study included 1972 elderly inpatients (60yrs or above) at a public teaching hospital. Regular feedback was provided to the clinicians and the changes effected in the therapy were documented. The average age of the patients was 68.03±0.16 yrs. On an average, each patient had 2 diagnoses & was prescribed 7 drugs. Of 1972 patients, 285 (15%) patients were identified to have at least one inappropriate medication. The most common inappropriate drugs were administration of anticoagulant therapy with aspirin or Clopidogrel (22.2%), Amitriptyline (18.5%), Digoxin (9.8%), Amiodarone (8.7%) and Chlorphenaramine (7.3%), followed by Promethazine & Ferrous Sulfate (4.9%). The risk factors for the inappropriate prescription were age over 70 yrs, more than 5 medications prescribed, longer stay in the hospital and multiple diagnoses. The extent of inappropriateness in the first, second and third year of the study was 19%, 18% and 7%, respectively. There was a significant improvement in the inappropriateness in third year, when compared from the first 2 years of the study. Some illustrative instances where the drug(s) was discontinued or the use decreased, in the third year, are anticoagulant therapy with Aspirin or Clopidogrel (4.6% to 0.46%), Amitriptyline (3.3% to 1.3%), Digoxin (2.1% to Nil), Promethazine (1.05% to Nil), and use of Anticholinergic agents in obstructed bladder (0.52% to Nil). These results have demonstrated that it is possible to reduce inappropriateness of pharmacotherapy in elderly patients through provision of relevant unbiased information to healthcare professionals. Reinforcement of the feedback is a possible route to sustain the improvement.

Key words: Elderly; Inappropriate drugs; Beers criteria 2003, India

INTRODUCTION

By 2040, the world is projected to have 1.3 billion older people—accounting for 14% of the total.^[1, 2] According to the data projected by United Nation, the Indian elderly population will rise to 21.2% of total by 2050 from 7.2% estimated in 1995. Globally, this will witness a rise to only 16.5% in 2050 from 12.4% in 1995.^[3]

The elderly, often, have chronic medical conditions and they require multi-drug treatment. Because of the unfavorable anatomic and physiologic function changes, elderly patients are prone to suffer from drug-related problems. The advancement in medical technology has added extra length in life as well as improved the quality of healthcare. However, the problems associated with

pharmacotherapy have also increased.^[4]

Inappropriate medication use in elderly population has long been an issue of healthcare quality along with over and under use of medication. The major factors which contribute to changes in the drug use patterns among elderly are increasing age, availability of new classes of drugs, and changes in physicians' prescribing habits. The findings from United States and other countries showed a higher prevalence rate (up to 49%) for inappropriate medication among elderly.^[5, 6] Like their counterparts in other countries, Indian elderly are also not immune from receiving potentially inappropriate medications. The earliest study from the country has reported 18% inappropriateness among Indian elderly patients^[7] Although the reported prevalence is lower

when compared to other countries, this is one of major issues of concern. It was, therefore, relevant to conduct a long term study to determine the potentially inappropriate prescription(s), understand risk factors and study the impact of providing regular feedback to the clinicians on the inappropriate medications prescribed to the elderly inpatients.

METHODOLOGY

Participants and Data source: This prospective study was conducted at a public teaching hospital for a period of three years. The patients admitted to three medicine wards and one cardiac care unit were randomly enrolled in this study and followed until discharge. The patients recruited in the study were 60 yrs. or more and were prescribed drugs for duration of five days or more. For each patient, a study form was completed at admission and updated daily until the discharge from the hospital. The information on age, sex, diagnosis, prescribed drugs, dose, formulation, route of administration, frequency and duration of therapy was obtained from the case records. Spread over the three consecutive years, a total of 2037 prescriptions were captured. However, 65 records did not match the inclusion criteria and the results are based on the prescriptions of 1972 patients.

Problem Identification: The potentially inappropriate medications were identified according to the Modified Updated Beers Criteria 2003.^[8] The Updated Beers criteria 2003 is applicable to the general population above 65 yrs. of age, regardless of level of frailty or place of residence. However, in this study, the cutoff age was 60 yrs. and, hence, the criteria was termed "Modified Updated Beers Criteria 2003" (now onwards, Beers Criteria 2003). This tool is an internationally accepted criteria for assessment of inappropriate prescribing practices in the elderly patients.^[9,10] Finally, the International Classification of Disease (ICD-10)^[11] was used to code the diagnosis. Regular feedback was provided to the clinician(s) for every identified inappropriateness to resolve the problem and improve the pharmacotherapy.

Statistical analysis: The results are presented as average±SEM & percentages. The variables such as age, number of drugs and number of diagnosis were expressed as frequency and percentage of the respective totals. The potential risk factors in the logistic regression equation were age, gender, number of medications prescribed, number of diagnosis and duration of treatment in the hospital. Odds Ratio was used to determine the risk factor for the inappropriate prescriptions. Statistical

significance was determined at 95% level of confidence. The data was analyzed using Sigma Stat version (2) software.^[12]

RESULTS

The results were based on the data of 1972 patients. The male and female patients were in ratio of 3:2 {(n≥1206):(n≥766)}. The average age of the patients was 68.03±0.16 yrs. The demographic profile of patients is given in table I.

On an average each patient had 2 diagnoses & was prescribed 7 drugs. Nearly one third (34%) of the patients received less than five medications; about half of the patients (54%) received medications between 6-10 and approximately 12% of patients received more than ten medications concurrently. It should be noted that the distribution of the number of drugs prescribed to patients in this study followed a normal gaussian distribution. The number of the patients suffering from multiple disorders was 61%. The most commonly noted disorder among elderly, classified on the basis of ICD-10, was the 'circulatory system disorders' (66.6%). This was followed by 'endocrine disorders' in the second rank (28.2%) & 'respiratory system disorder' in the third place (18.3%) (Table II).

Prescribing of Potentially Inappropriate Medication:

Of 1972 patients, 285 (15%) patients were identified to have at least one inappropriate medication. The Beers Criteria 2003 classifies two types of inappropriateness with respect to drugs. The first one is the prescription of drug(s) which should be avoided, in general, to the elderly because of the risk of adverse effect and second is the use of the prescription drugs whose dose is considered as higher than normal for elderly & those drugs avoided in specific disease condition. The most common inappropriate drugs identified in 285 cases (who were prescribed inappropriate drugs according to the first list of Beers criteria 2003) were Amitriptyline (18.5%), Digoxin (9.8%) and Amiodarone (8.7%). The recommended dose of Digoxin for elderly patients in Beers criteria is 0.125mg. But, it was observed that the dose in use was nearly four times the recommended dose (i.e. 0.5mg) in patients. In several instances, the clinician chose to revise the dose based upon the feedback provided by the investigator. The rank order of inappropriateness in descending order was: Chlorpheniramine>Promethazine>Iron>Clindinium>Fluxetine>Dicyclamine>Diazepam>Diphenhydramine>Pentazocine>Indomethazine>Doxazosine>Piroxicam>Thioridazine>Biscodyl Hydroxyzine>Oxybutyrine. The second kind of inappropriateness depends upon the

Table I: Age and Gender Wise Distribution of Patients

Sl.no	Characteristics	Number of patients (n=1972)	
1	Age	60-69 yrs	1166 (59.1%)
		70-79 yrs	608 (30.8%)
		80-89 yrs	173 (8.7%)
		90-99 yrs	23 (1.2%)
		Over 99 yrs	2 (0.1%)
2	Gender	Male	1206 (61.2%)
		Female	766 (38.8%)

Table II: Top Five Disorders on the basis of ICD-10

Sl.no	Class of Disease	Number of patients & proportion (%)
1	Circulatory System Disorder	1301 (66.6%)
2	Endocrine Disorder	555 (28.2%)
3	Respiratory System Disorder	361 (18.3%)
4	Digestive System Disorder	333 (16.8%)
5	Genitourinary System Disorder	234 (11.9%)

Figure I: Changes in prescribing-Impact of provision of regular feedback

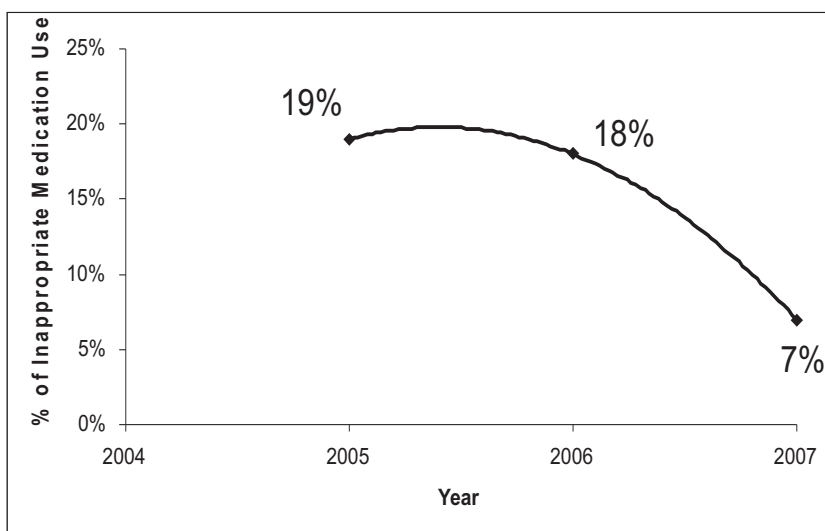


Table III: Prevalence of inappropriate drug use (IDU) by sample characteristics

Sl.no	Variable	Total no. of patients	Patients with IDU	Prevalence of without IDU	Odds ratio (95% confidence interval)
1	All	1972	285	1687	15%
2	Age				
	60-69 yrs	1166	145	1021	1(reference)
	70-79 yrs	608	102	506	1.42 (1.07-1.89) (0.98-2.05) (p≥.008)
	≥ 80 yrs	198	38	160	1.61 (1.11-2.52) (.98-2.85) (p≥0.009)
3	Sex				
	Men	1206	165	1041	1(reference)
	Women	766	120	646	1.17 (.90-1.52) (.83-1.65) (p≥.12)
4	No. of medication				
	1- 5	684	56	628	1(reference)
	6-10	1061	156	905	1.93 (1.38-2.7) (1.25-2.9) (p≥0)
	11 or more	227	73	154	5.32 (3.53-8.0) (3.13-9.04) (p≥0)
5	Length of treatment				
	≤ 5 days	1211	166	1045	1(reference)
	6-10 days	636	99	537	1.16 (-.88-1.53) (.81-1.67) (p≥0.15)
	≥11 days	125	20	105	1.20 (.7-2.04) (.6-2.37) (p≥.27)
6	No of Diagnosis				
	Single	763	91	672	1(reference)
	Double	738	109	629	1.28 (.94-1.74) (.86-.91) (p≥0.061)
	Triple	385	68	317	1.52 (1.11-2.26) (1-2.51) (p≥0.006)
	Multiple	86	17	69	1.82 (.98-3.34) (.83-3.96) (p≥0.034)

the diagnosis or conditions. The most frequently encountered instance was administration of anticoagulant therapy with aspirin or using a combination of Aspirin and Clopidogrel (22%). It was observed that the prescribed dose of aspirin was higher than recommended in patients; hence, it was revised to the recommended level by the physician. It was also found that in a few patients, the inappropriate administration of anticoagulants caused bleeding. Another common situation noted was the use of anticholinergic agent in patients having bladder outflow obstruction. Some other less common instances were use of metoclopramide in parkinson's patients, use of prazosin in incontinence and use of sodium chloride in heart failure.

Out of total inappropriate prescription, 241 prescriptions identified as potentially inappropriate prescriptions had a "high severity" potential as defined by the Beers Criteria 2003.

Risk Factors: The risk factors responsible for the inappropriate prescriptions were also studied. Inappropriate drug use was more common in the patients of more advanced age (over 70 yrs) as compared to the patients of age group 60-69 years ($p \geq 0.008$). A higher prevalence was detected in the elderly patients with increasing number of medications and longer hospital stay. Fourthly, the inappropriate drug use was more prevalent in the patients having multiple diagnoses. The effect of variables on the inappropriate drug use is depicted in Table III.

Impact of Provision of Regular Feedback: The extent of inappropriateness in the first, second and third year of the study was 19%, 18% and 7%, respectively (fig I). There was a significant improvement in the inappropriateness in third year, when compared from the first 2 years of the study. This demonstrated that the feedback provided by the investigator(s) was being pursued and the clinicians were certainly cautious in prescriptions to elderly. Some noteworthy examples of the changes in clinical practice are as follows: Anticoagulant therapy with Aspirin or Clopidogrel (reduced from 4.6% to 0.46%), Amitriptyline (use decreased from 3.3% to 1.3%), Digoxin (from 2.1% to Nil), Promethazine (changes from 1.05% to negligible), and use of Anticholinergic agents in obstructed bladder (from 0.52% to Nil).

DISCUSSION

This 3 year study has confirmed that the prevalence of inappropriate drug prescribing among Indian elderly

patients is not very high. Only 15% of 1972 patients prescriptions were found to be inappropriate according to the modified updated beers criteria 2003. This finding matches very well with reports from other countries.^[13,14,15] The level of inappropriateness identified in similar studies from France^[16], Finland^[17], Croatia^[18] Cuyahoga^[19] and Taiwan^[20] ranges between 21-40% which is certainly alarming. The results of a retrospective study on 493,971 patients in USA has shown an increased inappropriate prescribing to the tune of 49%.^[5]

It is not wise to compare the extent of inappropriateness on a head to head statistical basis. This reasoning is based upon fact that there is possibility of variation in prescribing pattern(s), availability of drug(s) in hospital formulary, morbidity profile(s), sickness of patient(s) and physician(s) prescribing behaviour. The most common instances contributing to inappropriate usages were administration of anticoagulant therapy with aspirin or Clopidogrel (22.2%), Amitriptyline (18.5%), Digoxin (9.8%), Amiodarone (8.7%) and Chlorphenaramine (7.3%), followed by Promethazine (4.9%) & Ferrous Sulfate (4.9%). This pattern is in agreement with the results from other countries.^[20,21]

The use of drugs like propoxyphen^[22,23,24], ticlopidine^[25,9], long acting benzodiazapenes^[26,27], muscle relaxants, calcium channel blockers^[28] was not so common in the patients of this setting. This is an important difference in the pattern of inappropriateness between Indian elderly inpatients and patients from other countries.

This study did not only determine the extent of inappropriateness but also the responsible risk factors. The finding of this study shows similarity with other published results in connection to the risk factors (older age, increased number of medication, longer hospital stay and multiple numbers of diagnoses) identified for the inappropriate prescribing.^[10,18] The result of this study demonstrated that as the number of medications in the regimen increased the likelihood of an unnecessary medication also increased (Odds Ratio: 5.32; CI: 3.53-8). This finding is consistent with study which showed association of polypharmacy with the inappropriate prescribing.^[29]

One of the most important objectives of this study was to assess the impact of providing regular feedback to the clinicians on the inappropriate medications prescribed to the elderly patients, based on Modified Beers Criteria 2003. The inappropriate drug use in the first, second and third year of the study was 19%, 18% & 7% respectively.

While the first two years had a nearly matching inappropriate drug use, the third year study registered a steep decline in inappropriate prescribing (18% compared to 7%). The steep decline in the inappropriate drug use can be very well understood because the intervention applied was purely educational in nature. It can be argued that the first two years were largely utilized for sensitization of the clinicians. And, this sensitization started bearing fruit in the third year of the study. This observation also reiterates the fact that the clinicians had started pursuing the feedback provided by the investigators on individual inappropriate drug use. In essence, this study has provided evidence for a pharmacist led intervention producing a beneficial impact on the outcome of pharmacotherapy of Indian elderly inpatients.

CONCLUSIONS

These results have demonstrated that it is possible to reduce inappropriateness of pharmacotherapy in elderly patients through provision of relevant unbiased information to healthcare professionals. Reinforcement of the feedback is a possible route to sustain the improvement.

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