



## EVALUATION OF PRESCRIPTION WITH POLYPHARMACY AMONG GERIATRIC POPULATION IN A TERTIARY CARE HOSPITAL: A PROSPECTIVE CROSS SECTIONAL STUDY

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### ABSTRACT:

**Background:** Elderly populations are the largest consumers of prescribed drugs and are the most vulnerable groups in our society. Prescribing for older patients presents many unique challenges, particularly with respect to variables such as polypharmacy, altered pharmacokinetic and pharmacodynamics responses. This study was carried out to evaluate the appropriateness of prescription in geriatric population by using medication appropriateness index

**Method:** This Prospective, observational cross-sectional study was carried out in 100 patients for 6 months at Vijaya Hospital, Vadapalani. The study participants included inpatients of either gender, age greater than 65 years and patients receiving more than 4 medications. The outpatients, patients with cancer and HIV were excluded from the study. Data was collected in data collection form and each drug in a prescription was analysed and scored by using Medication Appropriateness Index questionnaire (MAI).

**Results:** Out of 1012 drugs prescribed among 100 patients, a total of 912 drugs (90.12%) were considered to be appropriate whereas 100 drugs (9.88%) were considered to be inappropriate. The major category of inappropriate prescribing encountered in our study was ineffective medications (5.03%) for different conditions based on Beers criteria. Prescription analysis of the drug chart indicate, the drugs with least expensive alternative comprises 1.08% followed by impractical directions (0.69%), drug-disease interactions (0.39%), unnecessary duplications (0.39%) and incorrect directions (0.19%). The mean MAI score of inappropriate prescribing per drug was  $0.02 \pm 0.23$  and score per patient was  $0.22 \pm 0.55$ .

**Conclusion:** The data from the present study shows that 9.88% of drugs prescribed were inappropriate. A clinical pharmacist can reduce the frequency of inappropriate prescribing by regular medication chart review and thereby reducing polypharmacy

**Keywords:** Elderly population; MAI; polypharmacy

### INTRODUCTION

Geriatrics is defined as those over 65 years of age; there has been a steady increase in the number of elderly people<sup>1</sup>. Treating the elderly is the most challenging part to the physicians and can be obtained only through multidisciplinary approach. Geriatric population suffers from multiple co-morbidities and can be hospitalized several times, so there is an increased occurrence of polypharmacy and there by contribute more drug related issues. Elderly populations are more sensitive to the effect of a drug and the biggest problem is the lack of literatures and also the manufacturers do not include the elderly population in the clinical trials. It can lead to more drug interactions and adverse drug reactions<sup>2</sup>.

Prescribing for older patients presents many unique challenges, particularly with respect to polypharmacy, altered pharmacokinetic and pharmacodynamics responses, balancing the risk of harm and long term therapeutic benefit, paucity of robust scientific evidence for use of commonly prescribed medications in older, frail patients with limited life expectancy<sup>3</sup>. Polypharmacy is considered as the main problem in the elderly who usually takes 4-5 drugs daily. The elderly patients suffer from multiple comorbidities which require adequate dosing of medications<sup>4</sup>.

Appropriateness of prescription is defined as the outcome of process of decision making that maximizes net health gains within society's available resources".

The common method for assessing appropriateness or inappropriateness is implicit professional judgment and explicit criteria. Implicit judgment can subject to reviewer variations; they have greater validity and time consuming, depend on the user's knowledge and attitudes<sup>5</sup>. Inappropriate prescription can result in adverse drug reaction and treatment failure<sup>6</sup>. Prescribers must ensure that people take the appropriate medicine at the correct dose; thereby minimizing risks of adversity<sup>7</sup>. Hence this study was undertaken to evaluate the appropriateness of prescription in geriatric population by using medication appropriateness index and to describe the pattern and safety of the inappropriate drugs in the evaluated prescriptions.

### Methodology

This was a Prospective, observational cross-sectional study conducted in 100 patients for a period of 6 months at Vijaya Hospital, Vadapalani, and Chennai. The study included inpatients of age greater than 65 years, either gender and on more than 4 medications as participants. Outpatients, patients with cancer and HIV were excluded from the study. The study was approved by the Ethics committee of Vijaya Hospital, Vadapalani.

Data was collected in data collection form which included demographic details, and each drug in a prescription was analysed and scored by using Medication Appropriateness Index questionnaire (MAI). MAI is a 10 item validated questionnaire which addresses indication, effectiveness, dosage, accuracy, practicability of direction, drug interaction, duration and cost of the therapy. The score for each item ranges from 1 to 3. Each drug in prescriptions was analysed by using MAI criterion and scores were summated. A maximum score of 18 signifies maximum inappropriateness; minimum score of 0 indicate appropriateness. The complete instruction to use the tool was obtained from the author.<sup>5</sup>

All the data was input in Microsoft excel for statistical analysis. The study involved descriptive analysis to represent the data as frequencies, percentages, mean and standard deviation wherever applicable.

### Result

During the study period 100 prescriptions were screened. Among them 60 (60%) were males and 40 (40%) were females. The mean age of the study population was  $73.33 \pm 6.55$  (65 – 94 years).

The elderly patients presented with cardiovascular diseases (28.7%), followed by endocrine diseases (21.07%), CNS diseases (11.4%), respiratory disorders (10.3%), infectious disease (9.57%), gastro intestinal disease (7.66%), renal disease (3.83%), nutritional

imbalance (1.91%), hepatic disease (0.76%) and others (4.59%).

There were about 12% of the patients with 7-10 comorbidities, 47% with 4 to 6 comorbidities and 41% with 1 to 3 comorbidities. With the observed comorbidities, 68% of prescriptions contain either 8 to 15 drugs, 32% of prescriptions had 5 to 8 drugs and 5% of prescriptions had greater than 15 drugs

The major categories of drugs in the prescription are summated in table 1

**Table 1:** Categories of Drugs Prescribed

S.No	Drug category	Number of drugs	Percentage (%)
1	Gastrointestinal drugs	118	11.6
2	Cardiovascular drugs	238	23.5
3	Antimicrobial agents	128	12.6
4	CNS drugs	78	7.70
5	Respiratory drugs	64	6.32
6	Drug acting on blood and blood forming agents	85	8.39
7	Analgesics and anti-inflammatory drugs	62	6.12
8	Anti-diabetic agents	55	5.43
9	Anti-thyroid agents	47	4.64
10	Anti-gout agents	5	0.49
11	Anti-hyperlipidemia agents	54	5.33
12	Anti-epileptics	2	0.19
13	Vitamins and minerals	56	4.54
14	Others	20	1.97

About 26.28 % of these drugs were administered parentally and 73.71% of them were through non parenteral route.

Out of 1012 drugs, a total of 912 drugs (90.12%) were considered to be appropriate whereas a total of 100 drugs (9.88%) were considered to be inappropriate based on MAI. The frequency of inappropriateness is described in table 2

**Table 2:** Frequency of Inappropriateness

Questions	Patients with inappropriate MAI criterion (n=100)		Drugs with inappropriate MAI criteria (n=1012)	
	n	%	n	%
Is there an indication for the drug?	1	1	1	0.09
Is the medication effective for the condition?	42	42	51	5.03
Is the dosage correct?	19	19	20	1.97
Are the directions correct?	2	2	2	0.19
Are the directions practical?	7	7	7	0.69
Are there any clinically significant drug-drug interaction?	0	0	0	0
Are there any clinically significant drug disease interactions?	4	4	4	0.39
Is there unnecessary duplication with other drug?	4	4	4	0.39
Is the duration of therapy acceptable?	0	0	0	0
Is this drug least expensive alternative compared to others of equal utility?	11	11	11	1.08

Most encountered inappropriate categories of medication was ineffective medication (5.03%), followed by incorrect dosages (1.97%), least expensive alternative

(1.08%), impractical directions (0.69%), drug disease interactions (0.39%), duplication of drugs (0.39%), incorrect directions (0.19%), and drugs without indication (0.09%).

Most encountered inappropriate categories of medication was ineffective medication (5.03%). All the prescriptions were evaluated for the effectiveness according to beers criteria 2015 in MAI tool and is represented in the table 3

## Effectiveness

**Table 3:** Ineffective medications based on beers criteria

Drugs	Indications	Number Of patients (n=100)	Concerns	Alternatives
Alprazolam Clonazepam Lorazepam Zolpidem	Sedatives	9 9 2 4	Older adults have increased sensitivity to benzodiazepines All benzodiazepines increase risk of cognitive impairment, delirium, falls and fractures	Melatonin 3mg half an hour before sleep at night Low dose doxepin: 3-6 mg half an hour before sleep at night <sup>8,9</sup>
Quetiapine	Antidepressant	3	Increased risk of cerebrovascular accident and greater rate of cognitive decline and mortality in patients with dementia Highly anticholinergic, sedating and cause orthostatic hypotension	Mirtazapine 7.5 mg/day at night time increase by 7.5-15 mg/day no more frequently than 1-2 weeks. Not to exceed 45 mg/day <sup>10</sup> Fluoxetine 10 mg/day Citalopram 10 mg/day <sup>11</sup>
Amitriptyline		3		
Prazosin Clonidine	Antihypertensive	5 2	High risk of orthostatic hypotension, not recommended for routine treatment of hypertension	Lifestyle modifications Thiazide diuretics, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers <sup>12</sup>
Trihexyphenidyl	Parkinson disease	2	Not effective for Parkinson disease. Anticholinergic effects	Carbidopa/levodopa initially 25mg/100mg thrice daily Pramipexole: 0.125 mg thrice daily initially Ropinerol: 0.25 mg thrice daily for one week initially Titrate the dose according to individual response <sup>12</sup>
Nitrofurantoin	Urinary tract infection	3	Potential for pulmonary toxicity, hepatic toxicity and peripheral neuropathy	Ciprofloxacin: acute uncomplicated: 250 mg twice daily for 3 days. Mild/moderate: 250 mg PO q12 hours or 400 mg IV q12 hours for 7-14 days Severe or complicated: 500 mg PO q12 hours Trimethoprim: 100 mg twice daily for 3 days <sup>12</sup>
Nifedipine	Antihypertensive	1	Potential for hypotension, risk of precipitating ischemia	Amlodipine: initially 2.5 mg daily Maximum 10 mg daily <sup>13</sup>
Indomethacin Ketorolac	Pain	1	More likely to have adverse CNS effects, increased risk of gastrointestinal bleed in older adults	Mild-moderate pain: Acetaminophen 500 mg - 1 g 4-6 hourly Celecoxib: initially 400 mg, followed by 200 mg twice daily Ibuprofen: 200-400 mg 4-6 hourly <sup>12</sup>
Hydroxyzine	Antihistamine	1	Antihistamine, strong	Cetirizine (5mg OD)

### Dosage

Incorrect dosage accounted for the second most common cause for inappropriateness accounting for about 1.97% of the prescription analyzed. Drugs with incorrect dosages was observe with azithromycin among patients with community acquired pneumonia (n=2) and pantoprazole (n=2) given for gastric irritation.

### Direction to the patients

Drugs with incorrect directions included sevelamer which should be taken with meals and Bethanecol to be taken one hour before food or 2 hours after the food. For both the drugs directions was not mentioned in the prescription.

### Practicability of Direction

This Practicability of Direction assesses whether the directions for use are practical, so the patient appropriately take or a caregiver may appropriately administer the medication. This reflects the potential for patient adherence without sacrificing efficacy. Major drugs with impractical direction was with Ivabradine which was given as 5mg half a tablet twice a day instead of 2.5mg tablet twice a day and doxofylline was given to as 400 mg half a tablet twice a day instead of 200 mg twice a day.

### Drug Interaction

Drug disease interactions were observed in 0.39% of the prescription, represented in table 4 which should be avoided as per beers criteria.

**Table 4:** Drug-disease interaction

Drugs	Diseases	Comments
Theophylline	Insomnia	Use of theophylline in insomnia can cause CNS stimulant effects. So it should be avoided as per beers criteria
Bethanecol	Parkinson's disease	It can worsen the symptoms of parkinsonism and also have cholinergic property
Trihexyphenedyl Ranitidine	Delirium	Have potential to induce or worsen delirium as per Beers criteria

### Duplication

About 0.39% of the prescriptions had duplication of drugs and was commonly observed with Proton pump inhibitors

### Cost of the therapy

A drug is more expensive if it costs at least 10% more than the average cost/charge of alternatives of equal utility. According to patients condition about four drugs as ramipril, Zolpidem, silodosin and pantoprazole could have been altered.

### Discussion

The prime focus of the study was to assess the appropriateness of the prescriptions with polypharmacy in geriatric population.

The drugs prescribed in each prescription were evaluated and it was found that 68% of the prescription had 8 to 15 drugs. The average number of drugs per elderly patients was  $5.56 \pm 0.93$ . Use of four or more medications is considered as polypharmacy which was observed in our study due to different co-morbidities. Poly pharmacy cannot be deemed inappropriate as it is more important to evaluate its benefits in specific settings. When the number of co-morbidities increases there will be an increase in the number of prescribed drugs which might leads to inappropriateness in prescribing.

The major categories of drugs in the prescription were drugs acting on cardiovascular system (23.5%), antimicrobial agents (12.6%), and gastrointestinal agents (12.6%) reflecting the predominance of cardiovascular disease among our study population were as in a study conducted by Senthilvel et al 13 the major categories of drugs in the prescriptions was drugs on Gastrointestinal system (21.3%), Antimicrobial agents (15.8%) and Cardiovascular system (13%).

Inappropriate use of medication is a common problem that often leads to increased risk of adverse drug events, health care utilization, mortality and morbidity. It should be avoided in elderly to reduce the problems related to drugs as well as their adverse effects. MAI is an implicit criterion where decisions are made based on the professional judgment. This judgment takes account of context of individual patients and easily incorporates newer evidence into assessment. Hence this tool was used for assessment of prescriptions

The result of our study showed that only 9.88% of the drugs prescribed were inappropriate for one reason or the other based on MAI. This was less as compared to the study conducted by Mukta M Chowta et al 14 which reported 17.5% of inappropriate medications.

The major category of inappropriate prescribing encountered in our study was ineffective medications (5.03%) for different conditions based on Beers criteria. The drugs with inappropriate prescribing was with Sedatives (n=24), antidepressants (n=6), antihypertensive (n=7), anti-Parkinson agents (n=2), analgesics (n=2) and antihistamines (n=1) which was lower when compared to the study conducted by Kumar et al 15 reported inappropriate prescribing (45.41%) with analgesics, antidepressants and vasodilators

Incorrect dosages (1.97%) were the second most commonly encountered type of inappropriateness with

the prescriptions in our study population, as compared to other studies. It varied between 6.7% to 11.48 %<sup>5,15</sup> A study by Phillip et al<sup>16</sup> concluded that incorrect dosing was the most common type of medication error resulting in patient death.

Prescription analysis of our study population according to MAI, the drugs with least expensive alternative comprised 1.08% followed by impractical directions (0.69%), drug-disease interactions (0.39%), unnecessary duplications (0.39%) and incorrect directions (0.19%). The extent of inappropriateness was a minimal one, as the mean MAI score of inappropriate prescribing per drug was  $0.02 \pm 0.23$  and score per patient were  $0.22 \pm 0.55$ . The average length of stay among the study population was found to be  $5.52 \pm 3.68$ . The therapeutic classes involved in the inappropriate prescribing differ from one study to another. These observations may have important implications with regards to the need for improving prescribing practices by the implementation of protocols and hospital guidelines that could result in cost savings and less adverse effects.

### Conclusion

The data from the present study shows that 9.88% of drugs prescribed were considered to be inappropriate and 90.12% of drugs were considered appropriate. Polypharmacy was high but unavoidable in these patients. A clinical pharmacist can promote rational drug therapy and reduce the frequency of inappropriate prescribing by regular medication chart review, discuss with the physician about drugs and suggest a better and safer alternative for proper clinical decision making on right choice of a drug. This will ultimately reduce the cost of therapy, adverse drug reactions, morbidity, mortality and it can also improve the quality of life of the elderly population.

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