

DRUG PRESCRIBING PATTERN AND PRESCRIPTION ERROR IN ELDERLY: A RETROSPECTIVE STUDY OF INPATIENT RECORD

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ABSTRACT

Background: Older people are potentially at greater risk of medication error. Gaining insight into the physicians prescribing pattern in order to identify prescribing problem is the fundamental step in improving the quality of prescription and patient care.

Objectives: To analyze drug use pattern and study elderly inpatient file for prevalence and frequency of occurrence of some predetermined prescribing errors.

Method: A retrospective study of elderly (65 years and older) inpatient record was conducted from April to June, 2010. WHO core drug prescribing indicator was used to evaluate prescription pattern. Prescription errors were categorized as errors in prescription writing and errors of commission (ignoring drug interactions, use of potentially inappropriate medication).

Results: A total of 305 medical files were studied. 211 were male and 204 were younger elderly (65- 74 years). 2985 drugs were prescribed (average exposure/ patient: 9.8). 84% of drugs were prescribed by generic name. Percentages of drugs prescribed from National essential drug list and WHO list were 75% and 55 % respectively. 1233 errors in prescription writing were identified. Route, ending date of therapy, and signature of prescribing doctor were most missed items (missing in 10.2%, 7%, and 12% of drug prescribed respectively). 5% of drugs names were written with unacceptable abbreviations while use of error prone abbreviations, symbols and dose designations was 0.27% per prescribed items. 145 patients were prescribed at least one potential inappropriate medication as determined by Beer's criteria. Medication prescribed to 88 elderly patients had at least one potential chance for drug-drug interaction.

Conclusion: Frequency of occurrence of prescription errors found during the study can be rated high. The prescription pattern and the prescription errors have indicated the need to establish proper system of recording and analyzing therapy before writing a prescription in order to promote rational drug therapy in elderly. Further comprehensive studies on medication error are necessary to anticipate the scale of problem and their economic impact.

Keywords: Elderly, Prescribing pattern, Prescription error, Beer's criteria.

INTRODUCTION

Medication errors are an unfortunate reality at hospitals. Approximately, 30% of problems occurring during hospitalization are related to medication errors¹. Errors are possible at any step of the care process, from medication selection to drug administration. Numerous studies have shown that patients admitted to hospitals are harmed as a result of medication errors, majority of which are errors in prescribing¹⁻⁴.

Medications are central to managing the health of older patients. Older people are potentially at greater risk of medication error than most other groups. Elderly people consume more medicines than the general population. The use of drugs in elderly patients is almost higher by a factor of three compared to non-elderly population⁵.

The higher incidence of chronic diseases and degenerative pathologies increases demand for prescription medicines to treat these conditions, and to provide quality of life and well-being, which renders older susceptible to the risk of polypharmacy and drug-related illnesses. Aging related pathophysiologic changes also make them more prone to medication error. The resulting altered pharmacokinetics and pharmacodynamics due to these changes, makes them more susceptible to the adverse effects of drugs⁶.

Despite the awareness that geriatric population are at increased risk for medication errors, little is known about the epidemiology of such errors in these groups. Moreover, the proportion of elderly population in Nepal, though low, is steadily increasing. The proportion of elderly persons aged 65 years and older was stated as 4.2% in the 2001 census⁷.

Gaining insight into physicians prescribing pattern in order to identify prescribing problem is the fundamental step in improving the quality of prescription and patient care. This study gives an insight into the prevalence of prescribing error in one of the

teaching hospitals of Nepal with an aim to determine the nature and types of medication prescribing errors in Nepalese setting together with the pattern of drug use in elderly.

METHODS

A retrospective study was conducted in medical ward of Dhulikhel Hospital (DH)-Kathmandu University Teaching Hospital (KUTH). A total of 305 medical record files of elderly inpatients aged 65 years and older was studied.

Data collection and data elements

Data collection occurred once for each patient. Patient parameters (name, age, gender, diagnosis, co-morbid condition/s, medication history and duration of hospitalization) and drug parameters (name of drug, strength, frequency, duration together with starting and ending dates, dosage form, and route of administration.) were extracted from medical record files using data collection sheet.

General prescription pattern

The following age categories were used as in study by Straand *et al* [8]; the younger elderly: 65-74 years and older elderly: 75+ years. Disease diagnosed and drugs prescribed to each patient were studied. Prescription of a single drug was counted as one, even if the same drug was prescribed in more than one instance during hospital stay. Following WHO prescribing indicators were assessed to evaluate the drug prescribing pattern:

- Average number of drugs per prescription.
- Percentage of drugs prescribed by generic name.
- Percentage of prescriptions with antimicrobial(s) prescribed.
- Percentage of prescriptions with injection(s) prescribed.
- Percentage of drugs prescribed from essential drug list.

Prescription error

Definition of prescription errors

The following definition for 'prescription error' was used during the study: "A clinically meaningful prescription error occurs when, as a result of a prescribing decision or prescription writing process, there is an unintentional significant reduction in the probability of treatment being timely and effective or increase in the risk of harm when compared with generally accepted practice"⁹.

Classification of prescription errors⁹⁻¹³

The errors were categorized as errors in prescription writing and errors of commission. Errors in prescription writing were further categorized as:

- Errors of omission (when rate or dose, concentration, dosage form, duration, frequency, route omitted and when prescriber signature missing)
- Abbreviated and non standard drug names
- Error prone abbreviations, symbols and dose designations
- Prescribing one tablet of drug when available in more than one strength of tablet
- Writing milligram when microgram was intended

While error in commission included: ignoring drug-drug interaction, potentially inappropriate medication use. Inappropriate medications were identified using Beers' 1997 explicit criteria. The Drug-Drug interactions were checked using Medscape drug interaction checker¹⁴.

Data analysis and result

Results were analyzed using Microsoft Excel 2007 and SPSS version 15.0 for windows. The error rate was calculated by dividing the number of errors detected by the total number of prescribed items. The chi-squared test for categorical variables was used to compare the characteristics of patient receiving and not receiving inappropriate medications. A probability value of less than 0.05 was considered statistically significant.

RESULTS

A total of 305 inpatient files were studied. 211 (69%) patients were male and 204 (67%) patients were younger elderly (65-74 years).

Most patients presented with acute medical problem on a background of chronic illness. BPH was the most common (17%) reason for hospitalization of elderly patients.

Prescription pattern

A total of 2985 (2155 during hospital stay and 830 on discharge) drugs were prescribed to 305 patients (average exposure of 9.8 ± 3.23 drugs/ patient). 84% of drugs were prescribed by generic name. More than half (55%) of drugs belonged to tablet dosage form. One hundred and eighty-seven different types of drugs were prescribed to elderly patients. Ranitidine was the most frequently prescribed drug (19% of all drugs) followed by Diclofenac (12%) and Ciprofloxacin (5%). The table 1 shows drug use indicators found from study.

Prescription error

Errors in prescription writing

The study found a total of 1233 errors in prescription writing. Table 2 shows types of error detected and their frequency of occurrence.

Patients who were prescribed more than 5 medications were 5.7 times more likely to receive a potentially inappropriate medication than those who were prescribed five or fewer medication. There was no association between gender and age in receiving potentially inappropriate medications (table 4).

Ignoring Drug-Drug Interaction

A total of 114 chances of potential drug-drug interactions were found, an average of 0.37 (95% CI: 0.29-0.45) drug interaction per patient. The drugs prescribed to 88 (29%) elderly patients had at least one chance of potential drug-drug interaction. The top 4 potential drug-drug interaction are shown in table 5.

Errors of commission

Potentially inappropriate medication use

At least one potential inappropriate medication was prescribed to 145 patients (53%) as determined by Beer's criteria. Of the 2985 drugs prescribed, 182 (6%) were potentially inappropriate for elderly. Diazepam was most the frequent inappropriate medication prescribed (table 3).

Table 1: Pattern of WHO core drug use indicator

Prescribing indicators	Findings
Average number of drugs per encounter	9.8
Percentage of drugs prescribed by generic name	84%
Percentage of encounters with an antibiotic prescribed	18%
Percentage of encounters with an injection prescribed	30%
Percentage of drugs prescribed from national essential drugs list	75%
Percentage of drugs prescribed from WHO essential drug list	55%

Table 2: Error in prescription writing (PI*: prescribed items)

Type of error	No. of error	Error rate/ PI*	Error rate/ 100 PI*	% total error
Errors of omission				
Rate or dose not mentioned	49	0.016	1.65	3.97
Frequency not mentioned	17	0.0057	0.57	1.37
Starting date not mentioned	21	0.007	0.7	1.7
Ending date not mentioned	203	0.068	6.8	16.4
Duration in discharge advice missing	99	0.03	3.3	8
Dosage form not mentioned	33	0.01	1.1	2.6
Route not mentioned	306	0.1	10.2	24.8
Prescriber signature missing	345	0.11	11.5	28
Abbreviated and non standard drug names	145	0.05	5	11.76
Error prone abbreviations, symbols and dose designations	8	0.0027	0.27	0.65
Prescribing one tablet of drug when available in more than one strength of tablet	6	0.002	0.2	0.49
Writing milligram when microgram was intended	1	0.0003	0.033	0.082
Total	1233	0.41	41.3	100

Table 3: Inappropriate prescribing as determined by Beer's criteria

Drug	Hospital stay			Discharge			Total
	I.D*	C.D*	Total ID	I.D*	C.D*	Total ID	
Diazepam	57	2	59	0	0	0	59
Ketorolac	54	0	54	0	0	0	54
Phenargan	41	0	41	0	0	0	41
Pentazocine	14	0	14	0	0	0	14
Other	6	3	9	2	3	5	14
Total	172	5	177	2	3	5	182

*ID: independent of diagnosis; CD: considering diagnosis

Table 4: Principal characteristics of study population taking inappropriate medication versus that not taking inappropriate medication

	Inappropriate medication use (N=145)	Appropriate medication use (N=160)	Odds ratio	95% confidence interval	P value	Statistical significance
Age (years)						
65-74	96	108	1			
75+	49	52	0.943	0.59-1.52	0.8113	No
Gender						
Male	103	108	1			
Female	42	52	1.18	0.72-1.92	0.504	No
Number of medications prescribed						
≤ 5	7	36	1			
> 5	138	124	5.72	2.5-13.0	<0.0001	Extremely

Table 5: Top 4 drug- drug interactions

No.	Drug combination	Occurrences
1	Meperidine Inj and Promethazine Inj	40
2	Ketorolac Inj and Diclofenac Inj	28
3	Gentamicin Inj and Cefotaxime Inj	5
4	Isoniazid Oral and Rifampin Oral	4

DISCUSSION

Polypharmacy, defined as the use of five or more medications, occurs in 20-40% of older people¹⁵. The prevalence of polypharmacy in 76 % of patients in our study is very high. In a study carried out by Joshi *et al*¹⁶ in one of the other teaching hospitals in Nepal the incidences of polypharmacy in elderly inpatients were found to be similar (73%). It is, however, essential to determine the potential benefits of polypharmacy in particular settings before dismissing it as entirely inappropriate. Though deprescribing is difficult, prescriber's feedback, pharmacist-led medication reviews, encouraging general practitioner to withdraw medication in older patients have been tried to reduce polypharmacy¹⁵.

Percentage of drugs prescribed by generic names in our study is higher than that reported in study done in College of Medical Sciences, Bharatpur, Nepal by Ghosh *et al*¹⁷ where it was about 23% and just over half (53.6%) of drugs were prescribed by generic names in the study by Joshi *et al*¹⁶. It is important that drugs should be prescribed in their generic names to avoid confusion. Although there are both advantages and disadvantages of generic prescribing, there is more to gain than to lose by this practice, especially in a teaching hospital which has a dual responsibility of providing patient service as well as medical education.

In retrospective study by Shanker *et al* in Manipal hospital in western Nepal among hospitalised elderly, Ranitidine (30%), Multivitamins, Amlodipine, Ipratropium and DNS were the most commonly prescribed drugs¹⁸.

In a study by Ghosh *et al*, percentage of drugs from essential drug lists of WHO and Nepal were 41.76% & 38.20% respectively, lower than in our study. Use of drugs from the essential drug list should be promoted for optimal use of limited financial resources, to have acceptable safety and to satisfy the health needs of the majority of the population¹⁷.

Rational drug prescribing is defined as the use of the least number of drugs to obtain the best possible effect in the shortest period and at a reasonable cost¹⁹. Since, WHO has recommended that average number of drug per prescription should be 2.0,²⁰ result of our study reflects polypharmacy. The recommendation by WHO is not applicable to inpatient. Since majority of elderly patient in our study have undergone surgery, and average length of stay was also higher (about 6) which mean more medication prescribed and administered. In such cases polypharmacy can be justifiable.

The study has shown a high tendency to omit necessary information (viz. date of starting a drug, signature of prescribing doctor, date of stoppage of drug) in the medical wards. Though such incidences were recorded, such variables were less frequent in our study than those reported in study by Joshi *et al*. Ideally, no information should be missed. A medication order is valid only if the medical officer enters all the required items. Any information that might be missed may result into occurrence of more serious error.

Though the frequency of occurrence is low, one of the major causes of medication errors is the use of potentially dangerous abbreviations in prescribing²¹. An abbreviation used by a prescriber may mean something quite different to the person interpreting the prescription. Although using abbreviations may seem to be a time saving convenience, use of abbreviations does not promote patient safety²². The study highlights the need to pay attention to prescription writing. Further important but simple directions that come out as priorities from this study are the necessity to print prescriptions and the need to record the route, frequency of administration, starting and stopping date of the drug should be rigorously enforced. The lack of frequency of administration and doctor's signature were the most critical areas in terms of prescription completeness, both accounted for more than 25% of the total error of omission. A systematic use of feedback together with the adoption of formats where spaces for prescription date, signature of the physician and route of administration are more emphasized would simplify the prescriber's task.

The inappropriate prescribing prevalence rate of 53% in this study is very high. The higher prevalence rate of inappropriate prescribing is of concern. Because significant numbers of prescription comes from junior medical doctors and medical intern, the most likely reason for such high prevalence of inappropriate prescribing may be the lack of awareness among prescriber of the list of inappropriate medication for elderly population. Unless the study is carried out in other hospitals where prescriber involved is more experienced, no such valid conclusions can be made at present. Nevertheless it is essential to make the prescriber, aware about appropriate/inappropriate medications to be prescribed and encourage them to follow it strictly for better health care to geriatric population at all the level of health care.

Ignoring drug-drug interaction can cause important injuries and clearly affect the process of treatment or even cause serious or fatal problems for the health of patient, thus evidencing the need of constant evaluation of these events in order to prevent them. The lack of hospital pharmacist in majority of hospitals of Nepal means many of drug interactions go unnoticed and might have led to innumerable harm and adverse reactions. Further research on the occurrence and consequences of drug interactions in both hospitalized and ambulatory patient shall shed a light on the dangerous implications of drug interactions.

Growth in the occurrences of prescribing error is expected to occur for two reasons. First, the number and potency of drug products being developed and used are increasing. Second, the elderly population, who consumes the greatest quantity of medications, continues to increase in number ⁷.

CONCLUSION

The drug prescription pattern suggests the need to establish rational drug therapy. Geriatric polypharmacy is prevalent. A high number of potential prescription errors were found. Whilst many of these were minor and unlikely to have had serious consequences, some were of potentially great significance and may represent only the tip of iceberg. The study has highlighted the need to pay attention to prescription writing and reduce the practice of inappropriate prescribing through provision of appropriate unbiased information to healthcare professional. Further comprehensive studies on medication error are necessary to anticipate the scale of problem and their economic impact.

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