

A study on prescribing errors in in-patients of a corporate tertiary care hospital in North India

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ABSTRACT

Background: Prescribing errors are a subset of medication errors which have a potential for grave harm to the patient. Identification and acknowledgement of such errors can ameliorate much of this danger. Studies of prescribing errors are sparse in India. Such studies, whatever have been conducted, mainly focus on the out-patients or the patients on discharge. Hence, this study was undertaken to study the prescribing errors in prescriptions generated for patients admitted in wards of a corporate hospital in North India.

Methods: The prescriptions for in-patients admitted in wards were analyzed for different types of prescribing errors in individual drug orders and prescription as a whole.

Results: The prescribing error rate was found to be 3.3% in this study. Of all errors, errors leading to delays in patient care (i.e. Errors of prescription writing) (54.54%) and erroneous copying of the prescription to the drug chart by junior/resident doctors (Transcription errors) (31.31%) were found to be the major causes of prescribing errors in this study. Of the former category, prescribing a wrong strength (24.24%) and illegible drug orders (12.12%) were the most numerous error subtypes. Errors leading to sub-optimal patient care (i.e. Errors of decision making) were least identified of which Therapeutic duplication (12.12%) was the most common subtype.

Conclusions: The error rate found in this study is comparable to the data available from developed countries. However, there are significant differences in the occurrences of error subtypes found in this study as compared to the studies of the west.

Keywords: Indian, In-patients, Medication errors, Prescribing errors, Prescription errors, Transcription errors

INTRODUCTION

Medication errors are errors related to medication use for patient care. These errors can be introduced anywhere from the point of generation of the drug order by the physician, to dispensing of the drug by the pharmacist to the administration of the drug by the nurse.

A medication error is termed prescribing error, “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”.¹

Prescribing errors pose a significant concern in patient care.² Prescription error rates for hospital inpatients have been reported to be as low as 0.4-1.9 % according to old estimates, to as high as 7-14.7% of all drug orders according to new ones in the developed world.³⁻⁹ Not only can these errors increase the cost of treatment and length of hospital stay for the patient, but also mortality rate.¹⁰⁻¹¹

The prescription error estimates in Indian context are largely lacking probably due to non-uniform prescription practices. Very few studies in India have focused on prescribing errors per se and those which have, have been undertaken on out-patients and patients being discharged. The error rates in estimated by these studies stand at staggering 65-90%.^{12,13}

This study was undertaken with the aim of finding prescribing errors in drug orders for in-patients of a corporate tertiary care hospital of North India and evaluating them in a similar way as done in studies on in-patients in the developed world.

METHODS

Study area and workflow description

This study was conducted in a corporate tertiary care hospital in North India. The prescriptions for patients admitted in general wards of the hospital were considered for the study. In this hospital, the consultant or doctor-in-charge writes the prescription order for the patient admitted in ward in the daily notes of the patient. The individual drug orders from this prescription order are copied to designated spaces of the drug chart in the patient's file by a junior or resident doctor. The drugs for the patients are ordered from the pharmacy by the nurses according to the drug chart.

Inclusion and Exclusion Criteria

Only the prescriptions and drug orders in drug charts, which were written for the patients admitted in the general wards of the hospital during routine rounds, were considered for this study. Drug orders for such patients arising out of any emergency were not included.

Data Collection

Prescriptions and drug charts which met the inclusion criteria were considered for this study and the same were collected for a period of one month. The collected prescriptions and drug charts were segregated into individual drug orders. The drug orders were scrutinized for the presence of errors. If prescribing error was identified, it was classified according to type and subtype for further analysis and inference.

Terms used for this study

Prescription

A physician's order for medications for a patient written by him/her in the daily doctor notes which ended up on the drug chart was considered a prescription.

A prescription could have one or more drug orders. Only and only medication order part of the prescription was considered. Presence or absence of other parts of the

prescription (viz. symbol Rx) was not taken into consideration to maintain focus of this study.

Drug order

Individual order for a single drug from the prescription was considered a drug order.

Prescribing error

Any error identified in drug order, prescription or drug chart of the patient's file which could jeopardize either timely administration of drugs or judicious and optimal use of drugs in accordance with the condition of the patient was considered a prescribing error.

Transcribing error

Any error in copying prescription order into the drug chart by the junior or resident doctors was termed transcription error.

Classification of prescribing errors:

Classification of prescribing errors given by Dean et al,¹ has been used in a modified form in this study. The errors were classified on whether they lead to delay in following the instruction by the doctor for the drug (Errors in prescription writing) or injudicious and sub-optimal use of the drug for the given patient (Errors in decision making). In addition, transcribing errors, which though can result in any of the above two types of errors, were considered as a separate entity for this study. The classification and types of errors considered for the study are listed in Table 1.

RESULTS

In this study 50 general ward beds were covered for the study during which 223 patients were allocated those beds at some point during the course of the study. 840 prescriptions were collected amounting to 2925 drug orders. The drug orders and prescriptions were scanned for errors as per the study criteria. 99 prescribing errors were identified.

Inferring from the above data, each general ward bed was occupied by 4.46 patients in a month on an average with an average stay of 6.73 days. Average number of prescriptions for each general ward patient was 3.76 and average number of drug orders per prescription stood at 3.48 per prescription. Prescribing error rate was found to be 3.3% in this study.

More than half of all prescribing errors were identified due to errors in prescription writing ie errors causing delays (n=54; 54.55%). Transcribing errors was the next big error group identified at n=31 (31.31%). Errors in decision making leading to suboptimal treatment were the least in count (n=14; 14.14%) (Figure 1, Table 2). Of the errors in prescription writing, ambiguous drug orders made up the bulk (n=33; 33.33%) followed by illegible drug orders (n=12; 12.12%) and incomplete drug orders (n=9; 9.09%). Almost

all the errors in decision making were due to therapeutic duplication (n=12; 12.12%). However, 2 (2.02%) orders within the scope of inappropriate drug errors were identified (Figure 2, Table 2). Considering the individual error subtypes, most of the prescribing errors (n=24; 24.24%)

were found to be due to discrepancy in the strength for the drug ordered (Error subtype 1.2.3; Table-2, Figure-3). Next in numbers were the individual transcribing errors at n=18 (18.18%) and n=13 (13.13%) respectively for error subtypes 3.1.2 and 3.1.1 (Table 2, Figure 3).

Table 1: Classification of Prescribing Errors used in this study. Errors are primarily classified as to whether they cause delay in administration or cause sub-optimal treatment. Transcribing errors, although can cause either of the above two types of errors, are attributed in this study only to the erroneous copying by junior or resident doctors and hence considered as a separate category. The scope of error denotes the scenarios considered for the error type.

| Broad Category | Error Type | Scope |
|--|---------------------------------|---|
| 1. Errors causing delays (Errors in prescription writing) | 1.1. Incomplete drug order | A drug order lacking in one or more of the following: 1.1.1. Dosage form 1.1.2. Drug name 1.1.3. Strength (for drugs available in more than one strength) 1.1.4. Dose 1.1.5. Route of administration 1.1.6. Frequency of administration |
| | 1.2. Ambiguous drug order | A complete drug order which cannot be either fulfilled by pharmacist or carried out by nursing staff. Scenarios include: 1.2.1. Writing a dosage form for a drug which is unavailable 1.2.2. Writing a drug name which is unavailable 1.2.3. Writing a strength of a drug which is unavailable 1.2.4. Writing a route of administration which is not in agreement with the dosage form 1.2.5. Writing different frequencies of administration in the same drug order |
| | 1.3. Illegible drug order | Any drug order of which any part is: 1.3.1. Could not be read 1.3.2. Difficult to be read or understood 1.3.3. Could be read leading to dispensing or administration in a manner other than intended |
| 2. Errors causing suboptimal treatment or harm (Errors in decision making) | 2.1. Contraindicated drug order | A drug order given in spite of: 2.1.1. Documented allergy of the patient to that drug 2.1.2. Contraindication to that drug for the patient's given clinical condition |
| | 2.2. Inappropriate drug | A prescribed drug which is: 2.2.1. Inappropriate for the patient's renal or hepatic function provided that better alternatives exist 2.2.2. Totally unrelated to the patient's given clinical condition 2.2.3. Prescribed with an incompatible diluent (for drugs to be infused) |
| | 2.3. Inappropriate dose | A drug prescribed in a dose which is: 2.3.1. High or low for the drug's daily dose range for any condition 2.3.2. High or low for patient's renal function |
| | 2.4. Therapeutic duplication | A prescription order which contains more than one: 2.4.1. Drug orders / Brands containing the same ingredient drugs 2.4.2. Drug orders / Brands containing different ingredient drugs of the same category, whereby mechanism of action of drugs is same or similar |
| 3. Errors caused due to erroneous copying of prescription by junior or resident doctor | 3.1. Transcribing Error | Errors in copying prescription to the drug chart by junior or resident doctor causing: 3.1.1. Delay in administration 3.1.2. Suboptimal treatment or harm |

Table 2: Incidence of different types of errors. Those error types, for which no error was identified, have been omitted from the table.

| Broad error category | Error type | Error sub-type (refer Table-1) | Incidence (n) | Incidence % |
|--|--|---|---------------|-------------|
| Errors causing delays (Errors of prescription writing) (n=54; 54.54%) | Incomplete drug order (n=9; 9.09%) | No dosage form mentioned (1.1.1) | 1 | 2.02% |
| | | No strength mentioned (1.1.3) | 6 | 6.06% |
| | | No frequency mentioned (1.1.6) | 1 | 1.01% |
| | Ambiguous drug order (n=33; 33.33%) | Wrong dosage form (1.2.1) | 3 | 3.03% |
| | | Wrong drug name (1.2.2) | 2 | 2.02% |
| | | Wrong strength (1.2.3) | 24 | 24.24% |
| | | Wrong route (1.2.4) | 3 | 3.03% |
| | | Wrong frequency (1.2.5) | 1 | 1.01% |
| | Illegible drug order (n=12; 12.12%) | Unreadable drug order (1.3.1) | 8 | 8.08% |
| | | Difficult to read (1.3.2) | 2 | 2.02% |
| Misunderstood drug order (1.3.3) | | 2 | 2.02% | |
| Error causing suboptimal treatment (Errors of decision making) (n=14; 14.14%) | Inappropriate drug (n=2; 2.02%) | Unrelated drug order (2.2.2) | 1 | 1.01% |
| | | Wrong diluent (2.2.3) | 1 | 1.01% |
| | Therapeutic duplication (n=12; 12.12%) | Drug molecule duplicated (2.4.1) | 9 | 9.09% |
| | | Drug category duplicated (2.4.2) | 3 | 3.03% |
| Errors of copying prescription by the junior or resident doctor (n=31; 31.31%) | Transcribing error (n=31; 31.31%) | Transcription leading to delay (3.1.1) | 13 | 13.13% |
| | | Transcription leading to suboptimal Tt. (3.1.2) | 18 | 18.18% |

Prescriptions containing more than one drug order or brands with same ingredient drugs (Error subtype 2.4.1) and illegible handwriting wherein a part of a drug order was totally unreadable (Error subtype 1.3.1) were also significant contributors to the error numbers at n=9 (9.09%) and n=8 (8.08%) respectively (Table-2, Figure-3). Many error subtypes were not identified in this study especially those pertaining to errors in decision making while some were identified in low incidences ranging from n=1 to n=5 (Table-2, Figure-3).

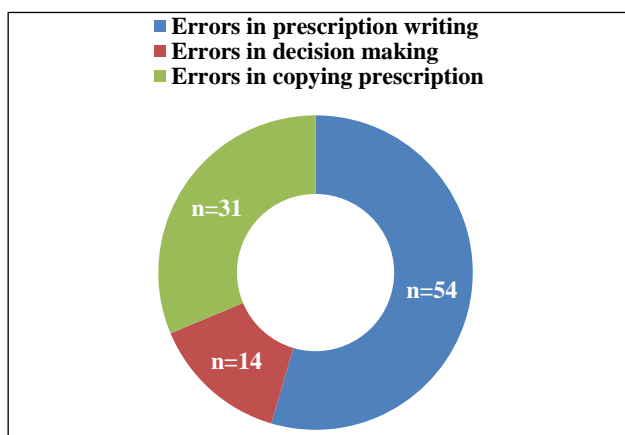


Figure 1: Prescribing error incidence. Errors in prescription writing and Transcribing errors constituted about 85% of all errors.

DISCUSSION

The decision to include prescriptions generated in general ward only was taken considering it to represent worst case scenario. This assumption was made on the basis of these patients requiring lesser time and thought process from the physicians during general rounds given their better overall health.

This study considers transcribing errors as a separate entity as compared to the classification suggested by Dean¹ because in this hospital the source of all transcribing errors was resident or junior doctors. Considering these errors as a separate entity in this setup was prudent as the remedial action of these errors would have specific set of prescribers as target for remedial action.

The prescribing error rate of 3.3% found in this study falls in the range of other such studies done on in-patients wherein the error rate has been reported from 1.5% to 15%.^{8,14-16} The reported prescribing error rates in studies done on out-patients have been much higher i.e. 65% or greater.^{12,13,17-19} The reason for such stark contrast in studies done on in-patient's vs out-patients is that latter also look into the additional variables such as super inscription, diagnosis, anthropometric data, symbol Rx, duration of the treatment etc. which drives the prescribing error rate northwards.

The error patterns of this study quite match with those of other studies on prescribing errors. The most common errors in this study are those which lead to delay in treatment i.e. errors in prescription writing. The studies of Ryan et al, and Ridley et al, also indicate similar pattern. When adjusted to criteria of this study, studies done on out-patients also report errors in prescription writing as the major contributor for errors.^{8,12,16-19} Also, this study is in agreement with illegibility as a cause of prescribing error (12.12%) with the studies of Ryan et al, (9.6%) and Mohan et al, (13.3%).^{8,12}

The error sub-type identified in this study to be the largest contributor of prescribing errors was mentioning strength for a drug which was not available in the market. Hitti et al, have mentioned this error in their study but not others.¹⁷ Probably those authors included this error in the broader classification of errors in prescription writing and probably this error was not significant in those studies.

This error can be commonly presumed to be associated with those drugs, the oral and parenteral doses of which differ viz., ciprofloxacin, ranitidine etc. However, in this study, such association was not found, and this error spanned various drugs pointing to sheer carelessness while prescribing.

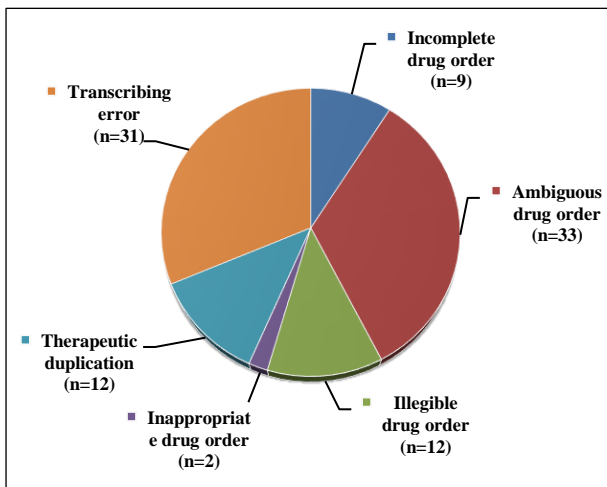


Figure 2: Error incidence by error type. Ambiguous drug orders and Transcribing errors were responsible for around 65% of all Prescribing errors.

This study also contrasts with other studies when errors in decision making are considered especially the incidence of inappropriate dose error. This difference is explained by the criteria of this study which considered the overall dose range of a drug for any indication rather than formulary specified dose for a particular diagnosis. Another difference was that this study did not evaluate omissions, i.e. patient's long term home medications missing in their prescriptions or if a drug was omitted even when indicated. This results in such errors being significant contributors in western studies^{7-9, 15, 16, 19} but lacking in this study. Therapeutic duplication has been reported by various

authors in their study but the incidence in their study is quite low ranging from 1 to 6.4% contrasting with 12.12% in this study.^{7,8,16,17} Most of these errors in this study were due to prescribing of different brands containing the same ingredient drugs. Few cases were due to the same category drugs being prescribed in the same prescription. This error subtype in this study was largely identified in scenarios, where a team of prescribers was involved in the patient healthcare rather than a single prescriber.

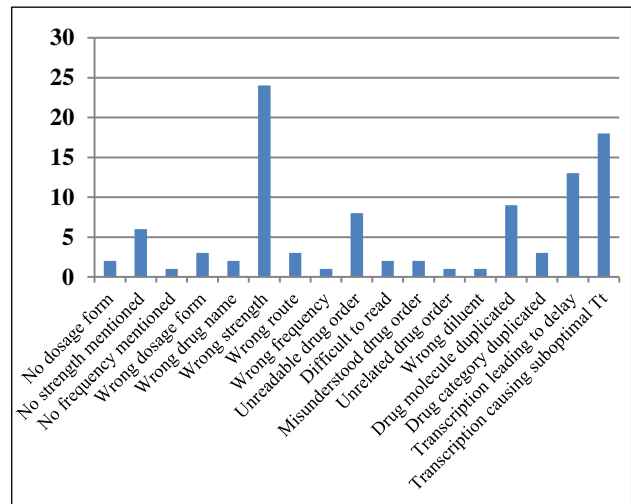


Figure 3: Incidence of individual error subtypes. Mentioning an unavailable strength along with transcription errors were the most common subtypes.

Lastly, transcription errors have been acknowledged by many studies and their incidence in western studies is reported to be low ranging from 1-4.6%.^{8,14,16} This again is in contrast with this study, where transcription errors were one of the most common errors encountered. One reason for this anomaly is that the prescribers in the west, probably, are more sincere in writing their prescriptions themselves in the drug chart rather than the junior or resident doctors as was the case in this study.

Other outcomes of this study

Although out of scope of this article, the authors would like to highlight the benefits of this study's data collection and analysis. The data on errors helped identify error prone prescribers. The hospital management was provided this data which then planned counselling meetings with these prescribers so as to bring down such occurrences. Also, sensitization sessions of all prescribers were planned by the hospital management for errors arising due to illegible handwriting and therapeutic duplication citing examples from this study.

Since transcribing errors by junior or resident doctors was a significant contributor of total prescribing errors, hospital management included sensitization on these errors in the orientation class on induction of junior or resident doctors in the hospital.

Scope of further research

Further studies in India on the lines of this study, not only encompassing non-critical inpatients as this study, but also critical and outpatient populations can help collect the statistics of prescribing errors in India which, as of now, is sparse. Also, such studies open the avenues of similarly patterned studies of the impact of interventions on prescribing errors after the primary study has identified the gaps and interventions have been applied. Another area of study would be expanding scope of such studies to include dispensing and administration errors along with prescribing errors to have a clearer picture of medication errors overall.

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Ethical approval: Not required

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