Research Paper

Prescription errors in cancer chemotherapy: Omissions supersede potentially harmful errors

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Received: 10-09-2014 **Revised: 17-10-2014** **Accepted: 15-11-2014**

ABSTRACT

Objective: To estimate the frequency and type of prescription errors in patients receiving cancer chemotherapy. **Settings and Design:** We conducted a cross-sectional study at the day care unit of the Regional Cancer Centre (RCC) of a tertiary care hospital in South India. **Materials and Methods:** All prescriptions written during July to September 2013 for patients attending the out-patient department of the RCC to be treated at the day care center were included in this study. The prescriptions were analyzed for omission of standard information, usage of brand names, abbreviations and legibility. The errors were further classified into potentially harmful ones and not harmful based on the likelihood of resulting in harm to the patient. Descriptive analysis was performed to estimate the frequency of prescription errors and expressed as total number of errors and percentage. **Results:** A total of 4253 prescribing errors were found in 1500 prescriptions (283.5%), of which 47.1% were due to omissions like name, age and diagnosis and 22.5% were due to usage of brand names. Abbreviations of pre-medications and anticancer drugs accounted for 29.2% of the errors. Potentially harmful errors that were likely to result in serious consequences to the patient were estimated to be 11.7%. **Conclusions:** Most of the errors intercepted in our study are due to a high patient load and inattention of the prescribers to omissions in prescription. Redesigning prescription forms and sensitizing prescribers to the importance of writing prescriptions without errors may help in reducing errors to a large extent.

Keywords: Chemotherapy, errors, prescription

INTRODUCTION

Medication error is a failure in the treatment process that leads to or has the potential to lead to harm in the patient.[1] Errors can be broadly classified into errors in planning the treatment and errors in execution of correctly planned treatment.[2] Prescription writing involves planning in the form of making a diagnosis and choosing appropriate medication to be delivered to the patient and writing or printing it on a paper in a standard format. Prescription errors could be minor and harmless or may be major errors that could result in life-threatening problems. It is estimated that about 1–2% of patients in the hospitals of United Kingdom and United States of America are harmed by medication errors, most of which are due to errors in prescription.[3] The prescription error rates reported in Indian studies range from17.6% to 44.18%.[4,5] Prescription errors can occur due to omissions, wrong choice of drugs

Access this article online	
Quick Response Code:	Website: www.jpharmacol.com
	DOI: 10.4103/0976-500X.155484

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or the dose, brand name prescribing, inaccuracy in writing and poor legibility of handwriting.[6] Prescription errors can vary in severity from minor omissions to major faults like irrational prescribing, inappropriate prescribing, under or over prescribing due to wrong judgment or lack of expertise in the prescriber.[7,8]

Cytotoxic drugs that are used in cancer chemotherapy are well known for their wide range of toxicities due to their narrow therapeutic index. Prescription errors involving anticancer treatment could result in potentially harmful effects[9] and/or diminished anticancer response in cancer patients and further worsen their quality of life. Many of the anticancer drugs are administered in day care centers and patients are discharged after receiving their dose. Therefore, extra care needs to be taken while prescribing the correct drug and calculating the correct dose to be administered to the patient. The Regional Cancer Centre (RCC) attached to our hospital caters to the needs of cancer patients from the neighboring South Indian states. Every day, around 200 patients visit the RCC and approximately 40 patients receive chemotherapy as outpatients in the daycare center and are managed by five to eight clinicians each day. With such a large number of patients to be catered to, errors are likely to happen. In order to assess and improve the quality of care provided in the day care center of the RCC, we decided to estimate the prevalence, type and severity of prescription errors in patients receiving cancer chemotherapy at the day care unit of the RCC of our hospital.

MATERIALS AND METHODS

This was a cross-sectional study involving the prescription records of cancer patients visiting the RCC as outpatients from June to September 2013. The study was conducted in the day care center of the RCC of a tertiary care teaching hospital in South India.

During the 4-month period, the investigator visited the RCC Day Care Centre and examined the previous day's doctor's prescription orders. The prescriptions were handwritten on standard printed prescription order sheets that were common for all the patients attending the multi-speciality hospital. Digital photographs of the prescription orders were taken and filed. It was compared with the standard protocol guidelines prepared by the team of medical oncologists working at the RCC. This manual contains the protocols routinely followed in the RCC for the treatment of common cancers and is in accordance with the standard treatment guidelines recommended by international cancer societies. The prescriptions were analyzed for different errors like errors in omission, number of prescriptions containing brand names of drugs, abbreviations and legibility of the prescriptions. These errors were further classified into potentially harmful ones and those that were not, based on the likelihood of the errors resulting in harm to the patient. A margin of 5% on either side of the dose of drug that should have been prescribed was permitted and only those that were above this cut-off were considered as errors. Pre-medication was considered complete when drug name, dose, route and time of infusion were all mentioned. The pre-medication in general consisted of hydration with normal saline, ondensetron as antiemetic at a dose of 8 mg i.v. for adults and 4 mg or 2 mg i.v. for children, dexamethasone 4 mg or 20 mg and ranitidine 50 mg i.v. For agents like cisplatin, all the four pre-medications were repeated even after anticancer chemotherapy. The omissions in pre-medication were confirmed with the medical oncologist. Under the sub-heading "others," omission of adjuvant drugs like morphine as analgesic, laxatives to get relief from morphine-induced constipation and antiemetics were included. Errors were considered potentially harmful if there was omission or error in the mention of name, pre-medication, dosage form, dose, unit, diluent, route of administration, time of infusion or the usage of non-standard chemotherapeutic drug abbreviations. Errors not considered potentially harmful were those that would not have serious consequences for the patient, like the omission of age, diagnosis, usage of brand names, standard abbreviations or abbreviated pre-medication drug names. Even frequency was not considered harmful as majority of the prescriptions contained parenteral drugs that were to be administered only once.

The nurses and physicians were informed about the objectives and purpose of the study prior to starting the study.

The consistency of data collected and entries made into the datasheet were checked by a second investigator. The errors were evaluated after consultation with a medical oncologist.

All the prescriptions were analyzed by two investigators for prescribing errors. In total, 1500 prescriptions were analyzed for prescription errors. Total number of errors (expressed as no. of errors/no. of patient records observed for treatment), types of errors, number of potentially harmful errors and adequacy of prescriptions were analyzed. The Institute Scientific Advisory Committee and the Research Ethics Committee approved the study.

RESULTS

A total of 1500 prescriptions were analyzed for prescription errors. The age, designation and experience of the prescribers at the RCC varied, which included residents and junior and senior faculty of the departments of medical oncology and radiotherapy. Patients with different cancers, like cancers

of breast, ovary, colon, stomach, lung, tongue and larynx, osteosarcoma, cholangiocarcinoma, acute myeloid leukemia, acute lymphoblastic leukemia, Hodgkins lymphoma, non-Hodgkins lymphoma and Ewings sarcoma received chemotherapy treatment at the day care center.

A total of 4253 prescribing errors were found in 1500 prescriptions (283.5%), of which 47.1% were due to omissions. Brand names accounted for 22.5% and 23.3% of the errors were due to abbreviations in pre-medication [Table 1].

Common drugs prescribed by brand names were ondansetron (Emeset), ranitidine (Rantac), chlorpheniramine (Piritone), pheniramine (Avil), promethazine (Phenargan), dexamethasone (Dexona), omeprazole (Omez) and furosemide (Lasix). None of the anticancer drugs were prescribed under a brand name, although abbreviations were used. The standard abbreviations used were Ara-C (cytarabine), Vp-16 (etoposide), G-CSF (granulocyte-colony stimulating factor), L-Asp (l-asparaginase), MTX (methotrexate), VCR (vincristine), 5-FU (5-fluorouracil) and VBL (vinblastine).Non-standard abbreviations were used in 28 prescriptions. Common non-standard abbreviations used for anticancer drugs were pacli (paclitaxel), carbo (carboplatin), cyclo (cyclophosphamide), gemcite (gemcitabine) and doce (docetaxel).

Incompleteness of the prescription with regard to omission of patient's name, age, diagnosis, pre-medication and details of cytotoxic drugs such as dosage form, drug name, units of the dose, diluent, route and time of administration are shown in Figure 1. Prescriptions without diagnosis and incomplete pre-medication accounted for majority of the omissions. There was only one prescription without the mention of patient's name and 182 without the age.

Incomplete pre-medication was prescribed in 556 prescriptions. Error per prescription was calculated to be 2.8 (total errors/1500). Of the 4253 errors, 496 (11.7%) errors were potentially harmful [Table 2]. Potentially harmful errors per prescription were found to be 0.3 (total potentially harmful errors/1500).

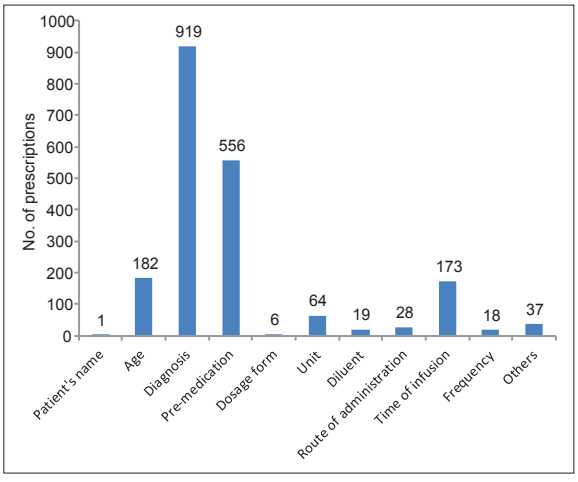

Figure 1: Distribution of omissions in prescriptions of cancer chemotherapy

There were two prescriptions for oral morphine where the frequency was wrongly mentioned as 8th hourly but the correct usage should be 4th to 6th hourly.

Pre-medication details that were considered potentially harmful were when dose was not mentioned or pre-medication was not prescribed at all when needed.

DISCUSSION

The prescription error rate was 2.8 per prescription (283.5%), which was mainly attributed to errors in omission and usage of brand names for pre-medication. Our results are comparable to a study reported from Sudan, where 97.2% of the prescriptions had incomplete information, trade names were used in 85.3% and incorrect abbreviations were used in 37.2% of the prescriptions.[10] Although the use of brand names may not be considered an error by many clinicians, we

Table 1: Types of prescription errors and their frequency

Prescription error type	Frequency of errors (out of 4253 total errors) *N* (%)
Missing information	2003 (47.1)
Brand names	958 (22.5)
Prescriptions with abbreviations in	
Pre-medication	992 (23.3)
Anticancer drugs	244 (5.7)
Pre-medication and anticancer drugs	8 (0.2)
Poor legibility (overall)	33 (0.8)
Drug dose unclear or wrongly written	15 (0.4)

Note: 1500 prescriptions were analyzed for errors. One prescription may have more than one error

Table 2: Distribution of potentially harmful prescription errors

Prescription error type	No. of errors (%) *N*=496
Patient's name missing	1 (0.2)
Pre-medication (incomplete or absent)	162 (32.7)
Dosage form missing	6 (1.2)
Non-standard cytotoxic drug abbreviations	28 (5.7)
Dosing error in anticancer drug	15 (3.0)
Omission of units of dosage	64 (12.9)
Missing information on diluent to be used	19 (3.8)
Missing information on route of administration	28 (5.7)
Missing information on time of infusion	173 (34.9)

have included it under errors because it is our hospital policy to write prescriptions only by generic names as recommended by the Medical Council of India.[11] When omissions and brand names in prescriptions were excluded in the analysis, the error rate dropped to 30.4%. This is high considering the fact that published studies on medication errors from France and United States involving chemotherapeutic agents report error rates ranging from 0.04% to 7.1%.[12-15] The lower incidence of medication errors in these studies in comparison with this study is because in these studies the authors did not include omissions and brand names. Moreover, in these studies, either computerized prescriptions were used or hand-written prescriptions were entered into a local database and validated by a physician and/or a pharmacist thus reducing most of the errors. In the present study, prescribing brand names and incomplete pre-medication accounted for majority of the prescribing errors. There are not many studies in India that have reported the prescription errors of anticancer drugs, although many studies involving prescription audits of other groups of drugs have been reported.[7,8,16] One study from South India has reported drug–drug interactions involving anticancer drugs but does not mention the error rate of the prescriptions studied.[17] However, in our study, all the drugs were given parenterally as part of a protocol and there were no clinically relevant drug interactions in any of the prescriptions.

In this study, 47.9% of the errors were due to omissions and poor legibility. This is higher than that reported by Slama *et al*., where 8.3% of the prescription errors were due to incomplete or unreadable prescriptions.[18] In another study performed at a Swiss University hospital where the hand-written prescriptions were categorized based on the legibility, bad readability was reported as high as 52% of the prescriptions, of which 4% were unreadable.[19] However, the frequency of poor legibility was only 0.8% in our study. The wide variation in the frequencies between our study and the others is probably because there is a high degree of subjectivity in considering what is legible and what is not.

Brand names were used for pre-medication drugs and not for anticancer drugs in most of the prescriptions. Pre-medication was often prescribed without the mention of all details like the dose, route and the intravenous fluid in which it has to be reconstituted. The prescribers attributed the incompleteness of the prescriptions with respect to pre-medication to the time constraint and the heavy patient load in the outpatient department. Moreover, the assumption that the pre-medication would any way be provided by the nurse on duty as a part of the routine procedure could have led to a decrease in its priority. This is a dangerous practice as in case the routine staff nurses are changed or on leave and substituted by another nurse, unfamiliar with the pre-medication, serious harm could result. Time constraint or hurried prescribing could also explain the missing information on the prescription, like patient details, diagnosis, time of infusion, route (rarely) and usage of abbreviations. The dosage form was mentioned in almost all prescriptions, but was always abbreviated, although it did not account for any errors in administration. A few errors were also found in mentioning the units, such as gram/milligram/microgram/IU. The fact that drugs are dispensed by a trained pharmacist and administered by nurses who are aware of the details of drug dosing also could have led to the doctors paying less attention to writing it properly. But, they could become a potential cause for medication administration errors.

Potentially harmful prescription errors in our study were 11.7%, which are due to incompleteness in the pre-medication and omission of units of the drug dosages. In the study by Gandhi *et al*., these errors were classified as potentially high-risk adverse drug events and accounted for 2.5% of the prescription orders.[14] According to a systematic analysis, the methods of measuring the severity of prescription errors was found to be varied and diverse.[20] Many studies have estimated potential rather than the actual harm.[14,21,22] The advantage of reporting potential harm, as in this study, is that even in the absence of actual harm to the patient, judgments can be made about the severity, with the only disadvantage being the subjectivity in assessment.

Although there are many studies on medication errors across the globe, there is no uniformity in the methods used to assess medication errors, resulting in a wide range of error rates reported.[23] Some of these errors are self-reported and some are obtained by active surveillance. As a result, the frequency of the errors will depend on the methodology used to collect information on medication errors and its accuracy, patient population, the work load of the health care providers involved, hospital systems in place and the definition of errors by the authors.

Most of the prescription errors identified were due to time constraints, hurry, lack of attention to details and carelessness. Errors were more due to lack of attention than of knowledge, which is reflected in less number of errors regarding dose and diluents in the prescriptions. The limitation of this study was the inability to assess the appropriateness of anticancer drug or dose used due to lack of diagnosis in many of the prescriptions. One of the suggestions for reduction of the prescription errors would be the use of computerized physician order entry (CPOE) with the patient particulars like name, age, sex filled by a staff other than the oncologist so as to reduce the work load on prescriber and pre-medication details appearing as default when a particular anticancer drug is prescribed. Combining CPOE and computerized decision support systems (CDSS) have been recommended so as to reduce prescription errors where lack of knowledge or experience of the prescriber is the major cause of errors.[24] In addition, bar coding and use of automated dispensing machines can

further reduce other medication errors, like transcription and administration. Redesigning the hospital systems while making use of modern technology may help in reducing prescription errors and eventually reducing medication errors in the long run.[25]

In this study, a high frequency of omissions or incomplete prescriptions as well as potentially harmful prescription errors has been found, which is mainly due to time constraints and lack of adequate attention by the prescribers. It is assumed that with feedback of errors to the prescribers and redesigning the prescription forms, especially suited to cater to the patients getting treated at the day care center of the RCC, could help in reducing the errors to a large extent in addition to introduction of CPOE in the future. Moreover, further studies are needed to assess the more serious prescription errors like use of suitable drug/regimen, appropriate dose and errors in administration, and put in place a robust intervention to prevent them.

ACKNOWLEDGMENT

This study was financially supported by the ICMR-STS 2013, New Delhi.

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How to cite this article: Mathaiyan J, Jain T, Dubashi B, Reddy KS, Batmanabane G. Prescription errors in cancer chemotherapy: Omissions supersede potentially harmful errors. J Pharmacol Pharmacother 2015;6:83-7.
Source of Support: Nil, **Conflict of Interest:** None declared.