Original Article

Evaluation of Inpatients Medication Prescribing Practice at Ibrahim Malik Teaching Hospital: A Descriptive Cross-sectional Study

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Abstract

Introduction: Prescribing errors account for almost 50% of medication errors and represent the eighth leading cause of death in the US. The current study aimed to evaluate inpatient prescribing practice by assessing adherence to prescription-writing guidelines and identifying the frequency and severity of drug-drug interactions (DDIs) and drug-disease interactions (DDSIs). **Methods:** An observational-descriptive cross-sectional study was conducted among inpatient wards in Ibrahim Malik teaching hospital, Khartoum, Sudan. Total coverage sampling was performed and the sample size consisted of 132 prescriptions containing a total of 700 prescribed drugs. The data were collected from patients' files, and the completeness of prescriptions was assessed according to national and international guidelines. Drug interactions were checked by the interaction checker of www.drug.com. **Results:** The overall prescription completeness was 0%, and the completeness of both prescriber data and medication data were 1.5%, (0.4% for Intravenous [IV] and 0.6% for non-IV drugs), respectively. The most missing elements of the prescription were duration and qualification. Moreover, only 25% of the prescribed drugs were written in the Prescription and Medication Administration Record or drug chart, but the rest were written elsewhere within the patient's file. The prescriptions containing DDIs and DDSIs were 49.2% and 46.2%, respectively, ranging from major (9.1%), moderate, (40.9%), and minor (28%) for DDIs, major (30.3%), moderate (33.3%), and minor (0.8%) for DDSIs. The highest percentage of drug interactions was found in the internal medicine ward. Diabetes was significantly associated with both DDIs ($P = 0.003$) and DDSIs ($P = 0.031$). **Conclusion:** The findings of this study reflect a real problem in prescribing practice, as no prescription was considered to be complete, and nearly half of the patients were exposed to DDIs and/or DDSIs.

Keywords: Drug-disease interactions, drug-drug interactions, Ibrahim Malik teaching hospital, prescribing errors, prescription completeness

Introduction

Medication error is defined as "any preventable event that may cause or lead to inappropriate medication use or patient harm." Such events may be related to professional practice, healthcare products, procedures, and systems, including prescribing.[1] Prescribing is the most important tool used by physicians to cure illness, relieve symptoms and prevent future diseases.[2] Prescribing errors occur during the process of decision-making and prescription writing by physicians.[3] Prescribing errors account for almost 50% of medication errors, which is the eighth leading cause of death in the United States, with more than 98,000 mortality annually.[4,5] In general, they are mainly of two types, errors of omission and errors of the commission.[6] Thus, to decrease the incidence of prescribing errors, the prescription should follow standards in writing. However, there is no global standard for prescriptions, and every country has its regulations and has its standards for the minimum information required for a prescription.[7]

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Pharmacists have critical roles in reducing prescription errors and their potential harm, which have been highlighted in several studies.[8,9] Moreover, pharmacists make significantly fewer prescribing errors than doctors. Furthermore, pharmacist intervention can reduce drug-related prescription errors, so the pharmacist and clinician need to work together to reduce overall prescription errors.[10] Thus, embedding independent pharmacist prescribers with more integrated roles in the multidisciplinary team is strongly recommended.[8,10]

Assessing the drug prescribing and use practice is an essential step in the medication process and reduces prescribing errors and their harmful consequences.[11] Few studies have been conducted to measure drug use practices and assess medication errors in Sudan.[12] Thus, the importance of this study came from its being the first study that aims to evaluate the whole situation of inpatient prescribing practice in Sudan in terms of assessing prescribing errors and identifying the frequency and severity of drug-drug interactions (DDIs) and drug-disease interactions (DDSIs).

Methods

Study design and setting

This study was an observational descriptive hospital-based cross-sectional study. It was carried out at Ibrahim Malik Teaching Hospital, Khartoum State, Sudan. The study population was patients admitted to the 5 inpatient wards. The data collection was done from May to July 2019.

Participants and study size

Total coverage sampling was performed, in which medical records for all admitted patients in 5 inpatient wards were included. The sample size consists of 132 prescriptions containing a total of 700 prescribed drugs. The 132 prescriptions were collected as follows: 33, 24, 16, 24, and 35 from internal medicine, neonates, obstetrical and gynecological, pediatrics, and orthopedic surgery wards, respectively.

Variables

Medical records were reviewed, and the following information was extracted: prescriber information, demographic characteristics, clinical data, and drug information.

Data sources/measurements

The data were collected from patients' files in the five inpatient wards through a data collection sheet. The primary data consists of the patient's demographics and clinical data (name, age, gender, length of stay, ward, unit, diagnosis, and comorbidities), prescriber information (name, qualification, and signature), and the prescribed drug regimens.

The secondary data are about the characteristics of the prescription in terms of its completeness and the presence of drug interactions, it includes the following (drug generic name, dose, frequency, duration, dosage form, route of administration, and rate of intravenous [IV] infusion [if present]). The prescription was assessed for its completeness using a checklist that was designed according to the WHO guidelines of good prescribing practice,[7] the national prescribing guidelines produced by the federal ministry of health, Sudan,[13] and NHS guidelines for prescribing medicines for inpatient use.[14] Overall prescription completeness was assessed individually by determining both medication and prescriber information completeness.

The data collection sheet also assessed the presence of both DDIs and DDSIs. DDIs and DDSIs were checked by the interaction checker of www.drug.com.

Statistical analysis

Data were analyzed by Social Sciences (SPSS) for Windows, version 23.0 software (Armonk, NY, USA: IBM Corp) for performing descriptive statistics and statistical analysis. Descriptive statistics on count were summarized to generate the frequency tables. Continuous data were numerically summarized in terms of mean, standard deviation, and median. Statistical analysis will be carried out through Chi-square tests to determine the association between variables. All statistical tests were considered statistically significant when $P < 0.05$.

Ethical consideration

The Ethical Approval (FPEC-27-2018) to conduct the research was taken from the Ethical Committee of the Faculty of Pharmacy, University of Khartoum. The permission was taken from the administration of Ibrahim Malik Teaching Hospital before starting data collection. Due to the retrospective design of the study, informed consent was waived, and all collected information were also assured of confidentiality and privacy by giving a code to each patient, the patient's identifiers were not being registered.

Results

A total of 132 prescriptions from five wards of the hospital were reviewed. As shown in Table 1, 48.5% of patients were males and 51.5% were females. The age mean was 28 ± 26.44 years, and the most prominent age group (28%) was elderly patients (>65 years). The mean length of their stay in the hospital was 9.34 ± 19.75 days and ranged from 1 to 201 days. With regard to comorbid diseases, diabetes mellitus was the most frequent comorbid disease (12.80%), followed by hypertension (6.8%) [Table 1].

In the 132 enrolled prescriptions, a total of 700 drugs were prescribed. The prescriptions were assessed based on the completeness of both medication and prescriber information. The overall prescription completeness was 0%. Regarding the prescriber information, the prescriber's name and signature, and qualification were only written in 36.4%, 17.4%, and 3% of the prescriptions, respectively [Table 2].

Concerning the medication information, the drug dose, frequency, duration of use, dosage form, and route of administration were included in 78.7%, 88.6%, 9.1%, 83.9%, and 82.1% of the prescribed medication, respectively [Table 3]. The percentage of drugs written by generic name was 51.4%,

Table 1: Patients' demographics and clinical characteristics (*n*=132)

Variables	Frequency (%)
Gender	
Female	68 (51.5)
Male	64 (48.5)
Age categories	
Neonates	39 (29.5)
Children	13 (9.8)
Young adults	20 (15.2)
Mid-age adults	23 (17.4)
Old adults	37 (28)
Average (years) (mean±SD)	28±26.44
Length of stay (days)	
Average (mean±SD)	9.34±19.75
Range (minimum-maximum)	1-201
Number of medications (medicines)	
Average (mean±SD)	5±2.37
Range (minimum-maximum)	1-12
Wards	
Medicine	33 (25)
Neonates	24 (18.2)
Obstetrics and gynecology	16 (12.1)
Pediatrics	24 (18.2)
Surgery	35 (26.5)
Comorbid diseases	
Hypertension	9 (6.8)
Diabetes mellitus	17 (12.8)
Asthma	2 (1.5)

SD: Standard deviation

Table 2: Prescriber information (*n*=132)

Variable	Completeness Frequency, *n* (%)
Name	48 (36.4)
Qualification	4 (3)
Signature	23 (17.4)

Table 3: Drug information (*n*=700)

Variable	Completeness Frequency, *n* (%)
Dose	551 (78.7)
Frequency	620 (88.6)
Duration	64 (9.1)
Dosage form	587 (83.9)
Route of administration	575 (82.1)
Drug by generic name	360 (51.4)
Rate of intravenous infusion (*n*=235)	115 (48.9)

and the rate of drugs prescribed by IV infusion was included in 48.9% of prescriptions [Table 3]. Furthermore, 33 (25%) of the prescription were written in Medication Administration Record (PMAR) or drug chart, whereas the rest (75%) were written in a random place within the patient's file.

The percentages of prescription-containing DDIs and DDSIs were (n = 65, 49.2%) and (n = 61, 46.2%), respectively, which indicated that around half of the patients were exposed to both types of drug interactions. The total number of DDIs among the prescriptions with DDIs was 103, and the severity ranged from major 9.1%, moderate 40.9%, and minor 28%. Moreover, the number of DDSIs among the prescriptions with DDSIs was 85 the severity ranged from major 30.3%, moderate 33.3%, and minor 0.8% [Table 4]. Most DDIs and DDSIs were present in the medicine ward (46.2%). Statistically, diabetes was the most comorbid disease that is significantly associated with both DDIs and DDSIs with P values were 0.003 and 0.031, respectively. Whereas, hypertension was only significantly associated with DDSIs [P = 0.008, Table 5].

Discussion

National guidelines state that "a standard prescription should include three components: prescriber's data, patient's data, and medication's data." Because our study is conducted in inpatient settings, we only focused on both prescriber's data and medication data.[15] The overall prescription completeness was 0% as there is no complete one. Our findings are similar to the most recent study conducted in Sudan which stated that only one prescription was considered ideal with no error encountered.[16] These results also do not differ from a previous study done in Sudan which concluded that the quality of drug prescriptions written by our hospital doctors is seriously deficient.[17] Completion of the essential elements, prescriber data, and medication data were only found in 1.5% of medications, which also highlighted the bad practice in the hospital. These findings are in contrast to the South African hospital that indicated last year 77% of prescriptions had the essential elements.[18]

According to the NHS prescribing of medicines for inpatient use, instructions about the route, dose, and frequency must be specific, and the intended duration of treatment should be stated.[14] Also, it stated that all prescriptions for medicines for administration to inpatients must be written on the Trust-approved PMAR card.[14] In our findings, only 25% of the prescribed drugs were written in the drug chart but the rest were written elsewhere within the patient's file. This also reflects that there is no auditing for prescribing practice, and no one guides the prescribers for the proper placing of medication orders. NHS Medicines Policy state that "Prescription for injectable medicines must specify the rate of administration,"[19] in this study, the rate of IV infusion was stated in 48.9% of prescriptions.

The dose and frequency were filled in 78.7% and 88.6% of the prescriptions, respectively. In a similar study done in Eritrea last year 2020, dose and frequency were 83.7% and 87.7%, respectively.[20] Furthermore, the route of administration should be specified as the dosage form does not always indicate the route of administration.[20] The route and dosage form were found to be 82.1% and 83.9%, respectively. Relative to other

studies, we found a difference between route and dosage in which the percentage of the route is more than that of the dosage form as in the study done in Yemen 73.82% and 44.12%, respectively,[21] and that done in Eritrea 81.33% and 19.72%, respectively.[22] Moreover, 51.4% of the medicines were written using their generic name, which is higher than previous reports from Sudan that only19.5% were prescribed in the generic name,[17] and 38.83% reported in South Africa[18] and lower than previous study from Nepal (84%).[23] Unless they have a valid reason to do otherwise, prescribers should always use generic names when prescribing because generic drugs are safe, and accessible and offer an affordable substitute to the highly expensive branded drugs.[20]

All prescriptions should be signed by the prescriber and the prescriber's name should be stated also the qualification.[13,20] In the current study, the prescriber's name, qualification, and signature were as follows 36.4%, 3%, and 17.4%, respectively. These percentages are lower than the findings of three studies done in Africa (South Africa,[18] Eritrea,[20] and Ethiopia[24]). A study that aims to systematically investigate the literature on the extent of medication errors and the factors contributing to them in African hospitals concludes that the most commonly reported types of medication errors were prescribing errors, occurring in a median of 57.4% of all prescriptions. Major contributing factors for medication errors reported in these studies were individual practitioner factors (e.g., fatigue and inadequate knowledge/training) and environmental factors, such as workplace distraction and high workload.[25]

A systematic review that identified the causes and factors associated with prescribing errors in hospital inpatients showed that prescribing errors are often multifactorial, with several active failures and error-provoking conditions often acting together to cause them. Causes were grouped according to Reason's model of accident causation into active failures, error-provoking conditions, and latent conditions. The active failure most frequently cited was a mistake due to inadequate knowledge of the drug or the patient. Skills-based slips and memory lapses were also common. Where error-provoking conditions were reported, there was at least one per error. These included lack of training or experience, fatigue, stress, the high workload for the prescriber, and inadequate communication between healthcare professionals. Latent conditions included reluctance to question senior colleagues and inadequate provision of training.[26]

One study that aim to determine the extent of irrational drug use and contributing factors in Sudan recommended that training and implementation strategies be combined with the distribution of national treatment guidelines in the future. Such strategies, as well as interventions to address inadequacies in prescribing or medication use, should be multifaceted. For optimal effect, programs to address rational drug use should involve academics and governmental and partner organizations working in concert to address the continued problems of irrational drug use in Sudan and elsewhere on the African continent.[27]

DDIs are an important subgroup of adverse drug events which are highly prevalent in patients receiving multiple-drug treatment.[28] While DDSIs are situations where pharmacotherapy may hurt patients' comorbidities.[29] In Sudan, there are limited studies that assessed the drug interactions in hospital settings, a previous study showed that 14% contained potential DDIs with different degrees of seriousness, ranging from minor 1.8%, moderate 8.4% to severe 3.9%,[16] another study indicated the DDIs between chemotherapeutic and chronic medications were 8% of the total identified DDIs in cancer patients.[30] In the current study, nearly half of the patients who came to the hospital were exposed to both DDIs (49.2%) and DDSIs (46.2%). This high percentages reflect a real problem in prescribing practice. Most of the patients are exposed to moderate DDIs, while most of them are exposed to both major and moderate DDSIs. Similar findings were observed from a previous study that conducted in Italy to assess DDIs which also showed high prevalence of moderate DDIs and DDSIs.[23] Moreover, the higher percentage of interactions were observed in the internal medicine ward, which may be due to the fact that

Table 4: The prevalence, type (drug-drug and drug-disease interactions), and severity of drug interactions (*n*=132)

Type of interaction	Severity of interaction	Interactions Frequency, *n* (%)
Drug-drug interactions	Major	12 (9.1)
	Moderate	54 (40.9)
	Minor	37 (28)
Drug-disease interactions	Major	40 (30.3)
	Moderate	44 (33.3)
	Minor	1 (0.8)

Table 5: Association between comorbidities and presence of drug-drug interactions and drug-disease interactions (*n*=132)

Variables	*n* (%)	Drug-drug interactions		*P*	Drug-disease interactions		*P*
		Yes, *n* (%)	No, *n* (%)		Yes, *n* (%)	No, *n* (%)	
Hypertensive patients	9 (6.8)	7 (5.3)	2 (1.5)	0.076	8 (6)	1 (0.7)	0.008
Nonhypertensive	123 (93.1)	58 (43.9)	65 (49.2)		53 (40.1)	70 (53)	
Diabetic patients	17 (12.8)	14 (10.6)	3 (2.3)	0.003	12 (9)	5 (3.7)	0.031
Nondiabetic	115 (87.1)	51 (38.6)	64 (48.4)		49 (37.1)	66 (50)	
Asthmatic patients	2 (1.5)	2 (1.5)	0	0.148	1 (0.75)	1 (0.75)	0.914
Nonasthmatic	130 (98.4)	63 (47.7)	67 (50.7)		60 (45.4)	70 (53)	

this specialty rely mostly on medication dependent modality of management. A cross-sectional study that conducted in Egypt found that internal medicine showed high rates of problems 10% compared to other specialties.[31]

In fact, many causes can explain this unaccepted incidence of DDIs and DDSIs, first, there is a real lack of updated drug information resources, and when they are available the healthcare staff is either not aware of them or not trained to use them, secondly, in many cases the process of medication reconciliation not done so home medications will be ignored and this increases the chance for occurrence of both interactions types, furthermore lack of effective communication between different members of the healthcare team lead to such types of medication irrational use. It is well established that using technologies such as electronic medical records and barcode systems will significantly enhance the rational prescribing process, for the time being with our limited resources state alternatives such as checklists, and redundant memos can help to standardize this process.

The current study has some limitations. Firstly, it was a single-institution study, so the result cannot be generalized to other hospitals. Secondly, the sample size was small due to the short time for data collection. Thirdly, due to the cross-sectional design of the study, the clinical consequences of these drug interactions were not assessed. Thus, further multicenter prospective studies are urgently required. Despite these limitations, the findings of the current research are interesting as it is the first study that evaluated both types of errors, errors of commission, and errors of omission in Sudan. In addition, it provides the current situation of prescribing practice in Sudanese hospitals and highlights the need for the implementation of national policies regarding the prescribing practice in Sudanese hospitals.

Conclusion

The study concluded that nearly half of the patients who came to the hospital were exposed to both DDIs and DDSIs. The overall prescription completeness was 0%, and completion of the essential elements, prescriber data, and medication data were only found in 1.5% of prescriptions. These findings reflect a real problem in prescribing practice in Sudanese Sudan.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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