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Full Length Research Paper

Prescription Errors Prevalent in Four Units of a University Teaching Hospital in Nigeria

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Errors in prescription in medical practice are a source of adverse events that can be prevented. This study aimed at assessing the prevalence of prescription errors and predisposing factors in four units (medical out-patient, general out-patient, wards, accident and emergency) of the University College Hospital (UCH) Ibadan. Twelve error descriptors developed from literature review were used to review the 1866 prescription sheets randomly selected from the pharmacy points for the year 2006 while 10 in-depth interviews were conducted to identify the predisposing factors. Dispensing practices were also observed for detection and correction of prescription errors. A total of 1424 (76.3%) prescription errors were detected which comprised illegitimacy (52.2%), omission (23.7%), style (18.5%), wrong dose (4.9%) and irrational prescription (0.8%). More of the errors (33.6%) were found among the prescriptions from the wards while only 10% of the errors were detected and corrected during the process of dispensing. The in-depth interviews revealed that workload and non-conducive work environment adversely affected productivity of prescribers and dispensers. Regular in-service training for prescribers and dispensers, equitable distribution of workload and institution of a quality assurance mechanism for monitoring the drug use system in this institution is advocated.

Key words: Prescription error, health workers, drugs.

INTRODUCTION

A medication is a pharmaceutical product used in or on human body for the prevention, mitigation, diagnosis and/or treatment of disease or for the modification of physiological function (Helper and Segal, 2003). It is has also been described as medicinal product that contains a compound with proven biological effects, plus excipients or excipients only; it may also contain contaminants; the active compound is usually a drug or prodrug, but may be a cellular element (Aronson and Ferner, 2005). When prescribed for a patient, the intent is to improve the patient's quality of life by curing a disease, reducing or eliminating the symptoms of a disease, arresting or slowing a disease process, or preventing a disease or its symptoms from appearing in the first place.

A medication error, defined as a failure in the treatment process that leads to, or has the potential to lead to, or harm the patient (Ferner and Aronson, 2006; Aronson, 2009) can occur at any step of the medication use process starting from choosing a medicine (irrational, inappropriate, and ineffective prescribing, under-prescribing and over-prescribing); writing the prescription (prescription errors, including illegibility); manufacturing the formulation to be used (wrong strength, contaminants or adulterants, wrong or misleading packaging); dispensing the formulation (wrong drug, wrong formulation, wrong label); administering or taking the drug (wrong dose, wrong route, wrong frequency, wrong duration); monitoring therapy (failing to alter therapy when required, erroneous alteration) (Aronson, 2009). Although medication errors can occasionally be serious, they are not commonly so and are often trivial.

Prescribing and administering errors are two most frequent types of medication errors. While 48% of the former can be intercepted, only 2% of the latter can be intercepted (Bates et al., 1995). The precise frequencies of medication errors are not known but has been said to vary from 39% (Leape et al., 1998) and 74% of all Medication errors (Fortescue et al., 2003) in specific settings. The method of detection can affect the estimated frequency (Kozer et al., 2006). Most errors go unnoticed in the error iceberg (Chief Pharmaceutical Office, 2004); of

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those that are detected a minority actually result in adverse drug reactions (ADRs), or at least serious ones. In a United Kingdom hospital study of 36200 medication orders, a prescribing error was identified in 1.5% and most (54%) were associated with the choice of dose; errors were potentially serious in 0.4% (Dean et al., 2002). Similarly in six Oxford hospitals the most common errors on prescription charts were writing the patient's name incorrectly and writing the wrong dose, which together accounted for 50% of all errors (Audit Commission, 2001). A similar magnitude was found in a US study where 1.7% of prescriptions dispensed from community pharmacies contained errors (Flynn et al., 2003). In another US study of about 900 medication errors in children, 30% were prescription errors, 25% were dispensing errors and 40% were administration errors (Miller et al., 2006). In a hospital study of 192 prescription charts, only 7% were correctly filled; 79% had errors that posed minor potential health risks and 14% had errors that could have led to serious harm (Ritland et al., 2004).

Furthermore, there are evidences that the death rate from medication errors is increasing. From 1983 to 1993 the numbers of deaths from medication errors and adverse reactions to medicines used in US hospitals increased from 2876 to 7391 (Phillips et al., 1998) and from 1990 to 2000 the annual number of deaths from medication errors in the UK increased from about 20 to just under 200 (Audit Commission, 2001). These increases are not surprising. In recent years, hospitals worldwide have witnessed an increase in the number of patients seen, new drugs have emerged that are increasingly difficult to use safely and effectively, medical care has become more complex and specialized, and the population has aged, factors that tend to increase the risk of medication errors (Maxwell et al., 2002). It is therefore important to detect medication errors, whether important or not, since doing so may reveal a failure in the treatment process that could on another occasion lead to harm.

A broad definition of prescribing error had been documented to include errors in decision making and errors in prescription writing (Calligaris et al., 2009; Dean et al., 2000). Prescribing errors involving decision making include a wrong choice for the patient (due to allergies, interactions between two drugs, presence of liver or renal failure, wrong molecule, dose or route of administration). Prescription errors in prescription writing on the other hand involve illegibility, ambiguous abbreviations, lack of an important piece of information such as date of prescription, dose, route, and frequency of administration (Lesar et al., 1997). Based on this broad definition, our study was delimited to the latter which can be more easily determined and detected through prescription sheet review.

The aim of this study was to therefore analyze the quality of prescriptions on the prescription sheets selected from four pharmacy points of the University College Hospital, Ibadan. The prescriptions were evaluated for legality (consisting of the name of patient, date, prescription number, and whether signed by the prescriber) and for type of error such as no dose, no duration, interactions, unspecified dosage and illegible writing as well as the number of times each of the errors occurred.

MATERIALS AND METHODS

Study design

The study was cross-sectional in design. It was set out to review prescriptions and observe dispensers in order to identify specific types of prescription errors prevalent in the University College Hospital, Ibadan, the magnitude and the potential causes.

Description of study area

The University College Hospital, Ibadan (UCH) is a tertiary institution in Oyo State, South West Nigeria. It was opened in November 26th, 1957. It is the premier teaching hospital in Nigeria and provides health care for people from all works of life. There are fifty four service and clinical departments in the hospital which run seventy five consultative outpatient clinics a week. There are over one hundred and twenty five consultants who conduct the clinics with the resident doctors. All doctors in UCH have integer number which makes it easy to trace them. The hospital is run by the Chief Medical Director through the coordinated efforts of vital areas as administration, pharmacy, nursing, medical, social welfare, engineering, instrument and laundry services. The pharmacy department is headed by the Deputy Director of Pharmaceutical Services. As at the time of this study, there were sixty five pharmacists made of thirty eight registered and twenty seven interns. There are nine pharmacy points where dispensing of drugs take place. These are medical outpatient (MOP), general outpatient (GOP) which includes the staff clinic, accident and emergency (A & E), a satellite pharmacy on each of the four floors for the wards, dental center, and the psychiatric clinic. The last two were not operational at the time of this study.

Study population

The study population consisted of purposively selected dispensers (pharmacists) and medical registrars.

Sampling technique

A systematic sampling technique was used in the selection of the prescription sheets that were analyzed. The prescriptions between year 2000 and 2006 were considered and using the simple random sampling method (balloting), the year 2006 was chosen and the prescriptions for that year was called for. There were a total of 1940 prescriptions from the four departments for that year and 1866 representing 96.2% of all the prescriptions were eligible to be analyzed. Those left out were not readable.

Instruments for data collection

Pretested in-depth interview guide and observation checklist were used for data collection. The in-depth interview guide was used to collect data from the representatives of the different cadres in the pharmacy department and the doctors (registrars and senior registrars) from each of the department where the prescriptions

analyzed were generated. This was done to collect information on their knowledge and experiences about prescription error, the effect of welfare / workload on the workers, environment (micro and macro) policy issues and their recommendations for improvement of medication safety. The pretested observation checklist was used to observe the types of information about drug use that was passed on to the patients and how medication errors from prescription were avoided. Trained pharmacy interns under the authors' supervision collected the data while the observations at the pharmacy points were carried out by the authors.

Data analysis

The quantitative data was analyzed using the statistical analysis system (SAS) software. Descriptive statistics like frequency distribution, percentages and graphic presentations were used to describe data. Qualitative data (in-depth interview and observations) were analyzed manually. The transcripts were read several times teasing out the thematic areas that could not be obtained from the prescriptions as well as to explain some of the findings from the prescription review. The data from the observations were analyzed for the types of errors that were avoided during dispensing procedures.

RESULTS

Types and magnitude of prescription error

A total of 1866 prescriptions were reviewed and 1424 (76.3%) prescription errors were identified. The errors consisted of prescription error of illegitimacy (52.2%), omission (23.8%), style (18.8%), wrong dose (4.9%) and irrational use of drugs (0.8) (Figure 1). The prevalence of these errors was highest in the wards (33.6%) followed by general outpatient (GOP) (24.6%), medical outpatient (MOP) (23.4%) while accident and emergency (A & E) had (18.4%). The in-depth interview affirms this volume of error. Causes of these errors as enumerated by respondents were "Lack of drug knowledge by prescribers, and no update information about drugs that keep on changing". One of the registrars said 'workload makes us tired''. A pharmacist said that errors sometimes arise when transferring drug orders from case files to prescriptions while another respondent said "medication error is caused by lookalike and sound alike drugs". Of the 1866 prescriptions reviewed, errors were detected and corrected on only 26 (1.8%) prescriptions in the pharmacy.

Prescription error of illegitimacy

Illegitimacy errors are prescriptions that contain no date and age. It constituted 52.2% of the total errors identified. Analysis showed that this type of error occurred more in MOP (31.2%), followed by GOP (29.9%) with the A & E having the least (10.1%) (Table 1). Broken down into specifics, errors of no age topped the list of errors with 82.4%, followed by that of 'no date' (17.6) (Table 2).

Error of omission

Error of Omission occur when information essential to filling the prescription such as, dose, dosage form and/or dosage frequency are not specified on the prescription. There were 337 (23.7%) errors of omission in the 1866 prescriptions screened. Wards contributed half of the sources (51.6%) of error of omission followed by A & E (27.9%). The least of the error is from MOP with 5.6% (Table 1). Of the different types of errors of omission, error of no duration was the most prevalent (48.1%) (Table 2). The aforementioned finding is corroborated by a senior registrar who said "it is common among all prescribers. Sometimes I forget to put duration on my prescriptions" A senior pharmacist said that "recently it has been on the increase of about 20%".

Error of style

This refers to illegal abbreviations and illegible writing. Out of a total 263 errors, illegal abbreviation was 244 (92.8%) while illegible writing was 19 (7.2%). This error occurred more in A&E (30.0%) followed by MOP (26.0%) while GOP and the wards each had 22.0% (Table 1). Specifically, error of incorrect abbreviation was highest in the Accident and Emergency unit (30.3%) (Table 2).

Error of wrong dose

There were 70 (4.9%) errors of wrong-dose in 1866 prescriptions. Wards contributed 40.0% of this prescription error while the GOP had the least (28.6%) (Table 1). Wrong dosage error is made up of under-dosage (62.9%) and over-dosage errors (37.1%). The prevalence of under-dosage was higher on the Ward prescriptions (47.7%) while GOP had the highest prevalence of over-dosage (30.7%) (Table 2). The reason for this type of error was summarized in the statement of one of the registrars interviewed who said that "we have dual responsibilities, to pass our exams and also attend to patients. We are always stressed and so we cannot afford not to make mistakes".

Error of irrational use of drugs

Error of irrational use of drug which is a prescription that is not appropriate to meet the clinical requirements of the patients constituted 0.8% of all errors observed. It is made up of poly-pharmacy (54.5%) and PRN (Latin abbreviation 'for use when necessary' (45.5%)). Frequency of error of irrational use analysis showed that it occurred more in MOP 5 (45.5%), followed by wards 4 (36.4%) while A & E had 2 (18.1%). GOP had zero occurrences.

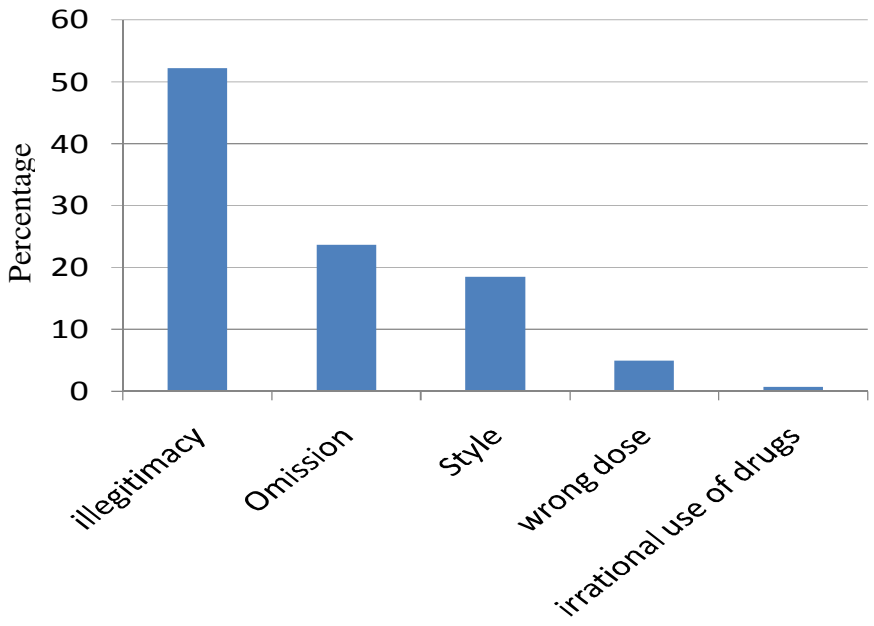

Figure 1. Types of prescription errors identified from the 1866 prescription reviewed.

Table 1. Frequency of prescription errors across departments.

Type of error	Frequency of errors across departments				
	Medical outpatient	General outpatient	Wards	Accident and emergency	Total
Illegitimacy	232 (31.2)	222 (29.9)	214 (28.8)	75 (10.1)	743
Omission	19 (5.6)	50 (14.8)	174 (51.6)	94 (27.9)	337
Style	68 (25.8)	58 (22.1)	58 (22.1)	79 (30.0)	263
Wrong dose	9 (12.9)	20 (28.6)	28 (40.0)	13 (18.5)	70
Irrational uses of drugs	5 (45.5)	0 (0.0)	4 (36.4)	2 (18.1)	11

Medication error and non-medication error

The prescription errors were further divided into those that could easily result into medication error and those that could not. Out of the 1424 prescription errors identified, 681 (47.8%) had the potential of leading to medication error while 743 (52.2%) could not. Ward prescriptions had the highest (18.5%) prevalence followed by Accident and Emergency (A & E) department (13.2%).

The different groups of drugs mostly affected by prescription error

Of the 1424 errors identified 562 (39.5%) were linked to specific drug products. A total of 34 drug items were mostly affected by prescription errors. These are grouped into seven classes. Intravenous Infusions accounted for 29.0% of all prescription errors while non-steroidal anti-inflammatory drugs were responsible for as low as 1.0% of the errors (Table 3). Artesunate Combination Therapy (ACTs) represented by Coartem® was observed to be the most prescribed antimalarial in line with the new national treatment guideline for malaria. Of the 73 errors affecting antimalarial drugs 60 (82.1%) are in connection with wrong dose. Multivitamins, commonly prescribed as routine drugs was grouped along with the analgesics – paracetamol and acetylsalicylic acid (ASA). Most malarial prescriptions go along with these drugs. Prescribers were found to abbreviate them thereby referring to paracetamol as PCM and acetylsalicylic acid (aspirin) as ASA and multivitamin as MVT. Of the 100 errors associated with this group of drugs, 90.0% belonged to illegal abbreviation, 8.0% to no dose while 2.0% to PRN (when necessary).

Observation at pharmacy points

Six dispensing sessions were observed and it was

Table 2. Details of error types across departments.

Types of error	Frequency across departments			
	Medical outpatient	General outpatient	Wards	Accident and emergency
Illegitimacy				
No age (n = 612)	30.4	31.2	26.8	11.6
No date (n =131)	35.1	23.6	38.2	3.1
Omission				
No dose frequency (n = 55)	9.1	20.0	0.0	70.9
No dose (n =100)	1.0	12.0	68.0	19.0
No dosage form n = 8)	25.0	25.0	50.0	0.0
No duration (n =162)	6.8	8.0	63.0	22.2
No strength (n =12)	0.0	100.0	0.0	0.0
Style				
Incorrect abbreviation (n = 244)	24.5	22.5	22.5	30.3
Illegible writing (n = 19)	42.1	15.8	15.8	26.3
Wrong dose				
Under dosage (n = 44)	4.5	27.3	47.7	20.5
Over dosage (n = 26)	27.0	30.7	27.0	15.3

Table 3. Groups of drugs affected by prescription error.

Drug categories affected by prescription error	Total error	Frequency (%)
Intravenous infusions	162	29
Analgesics + routines*	100	18
Anti-infectives	97	17
Antimalarials	73	13
Emergencies/	67	12
NSAID**	8	1
Others***	55	10
Total error	562	100

*NSAID- Non Steroidal Anti Infective Agent. **Routines: These are group of drugs that are not meant for any specific ailments. They are prescribed as a routine in combination with specific drugs. An example is multivitamins. ***Others are drugs that are not classified in any of the drug categories.

revealed that it was in the area of patient information that the pharmacy points failed to adhere to the protocol of prescription filling. Patients were not given the name of drug at all during the six sessions observed. Only the dosage strength and frequency of administration were given. Critical information required by the patient not given were time and duration of use, expected side effects and expected benefits. It was only in one of the sessions observed did the patient have the opportunity of receiving special counsel. Finally the patients were also not obliged to ask question nor any form of interaction encouraged. All the pharmacists and the doctors interviewed were of the opinion that the workload is heavy at the UCH and seriously affecting their productivity.

According to the head of the pharmacy “there are no technicians so the pharmacists do everything including pushing drug trolleys, around the hospital. We therefore don’t have enough time to counsel patients”. We have to close some pharmacy delivery points so as to cover 24 h”.

DISCUSSION

This study has demonstrated a wide range of different types of errors (0.8 to 52.2%) associated with prescriptions from a hospital setting. This is not too far from previous studies which have shown wide variation in

prescription error rates from less than 1 to over 40% (Dean et al, 2000; Miller et al., 2006). The reasons for these variations relate mainly to study design. The lowest rates have been in studies that focused on clinically significant problems such as documented by Runciman et al. (2003) and interventions made by pharmacist while the highest rates were found in studies that included minor errors and where there were strict criteria as to what constitute an error. This study has considered anything that is wrong with the prescription as an error starting from "no date" (represented by error of illegitimacy) to error of wrong dose. This accounts for the high error rate. In a Swedish study, a 42% error rate was reported, but nearly 70% of these 'errors' were due to the indications for medication not being included on the prescription (Claesson et al., 1995).

The types of prescription errors documented in this study were consistent with the findings of studies carried out by Runciman et al (2003) in Australia, Oshikoya and Ojo (2007) in Nigeria and Rivas et al. (2010) in Spain where errors identified included omission of dosage and administration route, dosage, duration of drug use, errors of over-dosage and under-dosage. The grouping of prescription errors into those that could lead to medication errors and those that could not was also in line with the findings of Dean et al. (2002). These may represent deficiencies in the prescription system that might increase the risks of more serious errors taking place. Under dosage may not be as serious as over dosage but most resistances to potent drugs of yesteryears were linked to this. A typical example is the chloroquine. It is therefore very important to be sure of dosage before the new antimalaria artemisin combination therapy (ACTs) is prescribed to patients in order to avert the type of resistance seen in chloroquine use.

The grouping of prescription errors into those that could lead to medication errors and those that could not is comparable to the findings of Dean et al. (2002) who classified errors into 'potentially serious' and 'not serious'. These minor errors represent deficiencies in the prescription system that might increase the risks of more serious errors taking place (Nadeen et al., 2001). Only 1.8% of the prescription errors were intervened and corrected by the pharmacists. This was probably due to the crowd at each of the pharmacy points that overwhelmed the number of pharmacists on duty at each time of the observation. This is in conformity with Dean etal. (2002) who reported that pharmacist identified and rectified a prescription error in 1.5% of all medication orders written in their study. In the US, pharmacists identify and prevent prescribing errors in 0.3 to1.9% of all inpatient medication and administration of medications (Lesar et al., 1997). Prescription error is a proxy indicator of medication error and it is difficult to determine how much of prescription errors actually resulted into medication error. It is therefore important that errors are corrected at the pharmacy point before they can result into medication error. Enforcement of therapeutic standard also at pharmacy point also goes a long way to reduce errors such as illegal abbreviations and legitimacy of a prescription.

Conclusion

Prescription errors are common in the drug use system of the University College Hospital, Ibadan, as demonstrated by this study. Even though relatively few of the errors detected in this study were serious, it might increase the risks of more serious errors taking place. This has highlighted the need to improve the knowledge of prescribers and dispensers on drugs, prescription writing and communication with patients as well as putting in place a monitoring system to track, evaluate and prevent errors in the drug use system of the hospital.

One difficulty in detecting errors is that those who make them fear disciplinary procedures and do not want to report it (Handler et al., 2004). The establishment of a blame free, non-punitive environment can obviate this (Lehmann et al., 2007). The reporting of errors, including near-misses, should be encouraged, using error reports to identify areas of likeliest occurrence and simplifying and standardizing the steps in the treatment process. A medication error reporting system should be readily accessible, with clear information on how to report a medication error, and reporting should be followed by feedback; detection may be improved by using a combination of methods (Handler et al., 2007). The starting point therefore is to be aware that error is possible and take steps to minimize the risks.

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