

Original Research Article

Analysis of degree of errors in handwritten medication prescriptions in Rafha, Saudi Arabia

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Sent for review: 22 February 2018

Revised accepted: 18 May 2019

Abstract

Purpose: To assess the prevalence of handwritten prescription errors in Rafha Central Hospital in Saudi Arabia, and to determine the most predominant type of prescription error.

Methods: A cross-sectional study was carried out on randomly selected samples of hand-written prescriptions in out-patient and in-patient pharmacies of Rafha Central Hospital over a five-month period (October 2016 to February 2017). A data collection sheet specially designed for this purpose was used to collect relevant information. The collected prescriptions were analyzed for the presence of prescription errors based on prescription parameters defined by the World Health Organization (WHO) and current guidelines published in British National Formulary (BNF). Descriptive statistics and Microsoft Office were used for processing and analyzing the data collected.

Results: Overall, 1019 prescription errors were identified. More than half of the total errors (610; 60 %) were associated with missing patient's information. Moreover, the parameters related to drug and prescriber information were absent in 204 (20 %) and 5 (0.4 %) prescriptions, respectively. In addition, 200 (19 %) miscellaneous errors related to date, legible handwriting and directions for patients were identified.

Conclusion: This study discovered errors in hand-written prescriptions. A majority of the prescriptions did not adhere to accepted guidelines. The most common errors are absence of generic names of drugs, non-indication of duration of therapy or prescriber's contact address, and absence of patient's weight. Moreover, illegible handwriting was obvious in a substantial number of prescriptions.

Keywords: Prescription errors, Prescriber, Handwriting, Drug generic name

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INTRODUCTION

Prescription error has been defined as *any avoidable event that might cause or result in harm or unsuitable medication to patient when the medicine is with the consumer, patient or healthcare professional* [1]. Numerous types of

clinical errors occur due to a number of factors which have been studied in depth in the literature [2]. The Institute of Medicine has characterized three kinds of medical errors: underuse (not prescribing when benefit is probable), overuse (prescribing when benefit is improbable) and misuse (mistake or error in prescription) [3,4].

Medical errors are the foremost causes of death, and they result in 44,000 annual casualties in United States of America (USA), with the likelihood of the annual casualty figure reaching 98,000 [5,6]. These errors cost the USA a staggering sum of \$29 billion annually [6]. Studies carried out in Australia [7], Canada [8] and New Zealand [9] have shown that the incidence of adverse events in these countries was similar to that in USA [10]. According to a separate study in the USA, medical errors are ranked third amongst the foremost causes of death. Studies have revealed that 106,000 deaths occurred every year from the adverse effects of medications, relative to the number of annual deaths from hospital infections (80,000), needless surgeries (2000), hospital medication errors (7000), and miscellaneous errors (20,000) [11,12].

Research has shown that most medical errors are avoidable [13]. A Harvard University study has recommended the need to involve engineers specialized in healthcare so to improve the current medical errors [14]. Lately, the taxonomies of medical errors were studied and sorted according to developmental process, granularity and domain specificity [15]. It has been suggested that while designing safety assessment procedures of sociotechnical systems, human factor considerations should be included [16]. So far, the application of systems engineering and human factors in patient safety has been very scanty, and there is ambiguity regarding what it means to apply these principles [17]. The present study was conducted to assess the occurrence of prescription errors in paper form at Rafha Central Hospital in Saudi Arabia, and to determine the most prevalent type of these errors.

EXPERIMENTAL

Study site and period of survey

Rafha is a town in the north of Saudi Arabia, close to the border with Iraq. Rafha Central Hospital was selected for collecting data over a five-month period (October 2016 to February 2017).

Study design

A cross-sectional study was carried out on random samples of hand-written prescriptions in out-patient and in-patient pharmacies, without informing the physicians.

Data collection

Five hundred prescriptions were randomly collected for a period of five months. A data collection sheet specially designed for this purpose (attached in appendix) was used to collect relevant information. The collected prescriptions were analyzed for the presence of prescription errors, based on prescription parameters defined by World Health Organization [18] and current guidance published in British National Formulary (BNF) [19]. The data were evaluated using an analysis sheet containing all essential parameters defined by the WHO and BNF for writing prescriptions. These parameters included prescriber's information (name and signature), patient's information (name, age, gender, weight and address/telephone number); drug-related information (drug brand/generic/mixed name, strength, dose frequency, route of administration, duration and quantity of prescribed drugs), and miscellaneous information (directions for drug use by patients, legible handwriting and prescription date). Every prescription was screened to check if it met the criteria for good prescription writing by providing information on all the parameters stipulated in the analysis sheet.

Statistical analysis

Microsoft office and Descriptive Statistics were used for processing and analyzing the data. Statistical analysis was carried out with computational software Microsoft Excel 2010.

RESULTS

In this study, a total of 500 prescriptions were analyzed for prescriber's information, patient information, drug information, and miscellaneous information. Five prescriptions (1%) were found to lack prescriber's signature (Table 1). However, the prescriber's names were indicated in all the prescriptions collected.

Table 1: Errors in prescriber information

WHO/BNF parameter	Present	Absent
Name	500 (100 %)	0 (0 %)
Signature	495 (99 %)	5 (1 %)

Table 2 shows results of analysis of patient's information. Prescriptions that lacked name, gender, and age were few, and comprised 3.8, 11.2 and 10.2 %, respectively. In contrast, a large number of prescriptions (96.8 %) did not contain information on patient's weight. Table 3

shows the results of analysis of the prescriptions with respect to drug information. It was found that 177 (35.4 %), 273 (54.6 %) and 50 (10 %) prescriptions had generic, brand and mixed names, respectively. In 102 prescriptions (20.4 %), the drug names were not legible owing to unreadable handwriting. Analysis of strength, duration of therapy and route of administration revealed that these parameters were absent in 138 (27.6 %), 18 (3.6 %), and 9 (1.8 %) prescriptions, respectively. Moreover, 18 prescriptions (3.6 %) lacked medication doses. Nevertheless, most of the prescriptions (479, 95.8 %) stipulated drug frequency.

Table 2: Patients' information on prescription

WHO/BNF Parameter	Present	Absent
Name	481 (96.2%)	19 (3.8%)
Age	449 (89.9%)	51 (10.2%)
Weight	16 (3.2%)	484 (96.8%)
Gender	444 (88.8%)	56 (11.2%)

Table 3: Medication information on prescription

WHO/BNF parameter	Present	Absent
Brand name	177 (35.4%)	323 (64.6%)
Generic name	273 (54.6%)	227 (45.4%)
Mixed name	50 (10%)	450 (90%)
Unreadable handwriting	102 (20.4%)	398 (79.6%)
Strength of drug	326 (65.2%)	138 (27.6%)
Dose of drug	482 (96.4%)	18 (3.6%)
Route of administration	482 (96.4%)	18 (3.6%)
Frequency of drug	479 (95.8%)	21 (4.2%)
Duration of drug	491 (98.2%)	9 (1.8%)

Table 4: Miscellaneous information on prescription

WHO/BNF parameter	Present	Absent
Date of prescription	494 (98.8 %)	6 (1.2 %)
Legible handwriting	419 (83.8 %)	81 (16.2 %)
Direction for patient	387 (77.4 %)	113 (22.6 %)

A large number of deficiencies were observed with respect to directions for drug use to patients (Table 4). This was absent in 113 prescriptions (22.6 %). Date was present on 419 prescriptions (83.8 %), but 81 prescriptions (16.2 %) were not written in legible handwriting. Overall, a total of 1019 prescription errors were found (Figure 15). Approximately, more than half of these errors were related to non-indication of patient's information. On the other hand, prescriber-related information and drug-related information were absent in 5 prescriptions (0.4 %) and 204 prescriptions (20 %), respectively. The number of

miscellaneous-type errors (date, legible handwriting and directions for patients) was 200 (19 %).

DISCUSSION

In this study, 500 prescriptions were analyzed based on prescription writing criteria set by World Health Organization [18] and British National Formulary [19]. Prescriber information on prescriptions is essential because it aids the pharmacist to communicate with the physician/prescriber when explanations concerning the prescribed drug are required. The results of the study revealed that all the prescriptions analyzed contained complete prescriber's information, except only five prescriptions in which the prescribers' signatures were absent. These errors in prescriber information are smaller in number to that reported by Irshaid and coworkers who found that 16.7 and 18.1 % prescriptions lacked prescriber name and prescriber signature, respectively [20]. Complete patient information on prescription is vital because it aids the pharmacist to check the prescription by asking the patient questions when necessary. Patient age and weight are used in the determination of dose, and they are applied by the pharmacist to check if the dose written is in order. In the current study, patient weight was absent in almost all prescriptions (96.8 %). This finding is consistent with the reports of Vaishali and *et al.* [21] and Irshaid *et al* [20] who found no information on patient's weight in the prescriptions they analyzed.

Furthermore, age is an important factor in the selection of correct medications because several drugs are not prescribed for some groups of patients such as pediatric and geriatric patients. The present study showed that patient's age was absent in only 10.2 % of prescriptions. This finding is similar to that of Balbaid *et al* [22]. Some medicines are given only to one gender. Therefore, it is important to include the patient gender on prescriptions. The current findings revealed that 11.2 % prescriptions did not indicate the gender of the patient. Similar results have been reported in earlier studies by Vaishali *et al* [21], and Balbaid *et al* [22] who discovered that 10 and 4.1 % of prescriptions, respectively, lacked patient gender. However, the results of the present study differ from that of Irshaid *et al* [20] who reported that 48.7 % prescriptions did not contain information on sex of the patient.

The results of the present study reveal that 35.4, 54.6 and 10 % of prescriptions had brand, generic and mixed (i.e., both brand and generic)

names of medications, respectively. This is at variance with the finding of Anuja *et al* [23] who revealed that only 7.4 % prescriptions of pediatric outpatient department had generic names on them. In a study by Irshaid *et al* [20], brand name, generic name, and mixed names were present in 50.1, 15.1 and 28.3 % of prescriptions, respectively.

Owing to rigorous promotional campaign by pharmaceutical enterprises, frequent prescription of drugs using brand names was observed in the present study. Nonetheless, medications prescribed with generic names are helpful in that they provide the pharmacist with the option of dispensing either the efficacious brands or the more economical brands. In this study, 20.4 % of the prescriptions analyzed were illegible. It is important to indicate the strength of a medication in a prescription, especially when the medication is available in a variety of strengths.

The present study revealed that the strength of medication was absent in about 27.6 % of the prescriptions analyzed, a finding similar to those of Vaishali *et al* [21], Irshaid *et al* [20] and Stubbs *et al* [24] who reported that 26.8, 52.8 and 3.6 % of prescriptions, respectively, did not indicate drug strength.

Drugs should be given to patients at the appropriate doses for safe and optimal effects. Hence, it is prescriber's responsibility to correctly write the drug dose on the prescription. The current study showed that only 3.6 % of prescriptions failed to provide information on dose, or were not clear as to dose. This is at variance with some previous results [21,22].

Some medications are administered through multiple routes. In this case, it is vital to state the route of choice for the patient. The present study found that only 1.5 % of prescriptions failed to indicate route of administration. This is in agreement with a previous report [24]. The duration and frequency of therapy are vital features of a prescription. It was discovered that a small percentage of prescriptions (1.8 %) did not indicate the duration of therapy. In earlier studies, Khaja *et al* [25] and Vaishali *et al* [21] found that 18.5 and 26.2 % of prescriptions, respectively, did not stipulate the duration of therapy. In the current study, a small number of prescriptions lacked dosing frequency (4.2 %). Similar findings have been reported in earlier investigations [22,25].

Furthermore, the current study revealed that 1.2 % of prescriptions did not indicate date. This is consistent with the findings of Francois *et al* and

Balbaid *et al* [22] who reported that date was missing in 4.5 and 8.7 % of prescriptions, respectively. However, > 50 % of prescriptions lacked date in a study of prescriptions (of antibiotics) carried out in an Italian hospital. Illegible prescriptions may lead to fatal injuries and they constitute major causes of fatality. In the present study, 16.2 % of prescriptions were not readable. Similar problems have been reported by other investigators [22]. It is vital to include the directions for patients such as follow-up advice or specific time for taking the medicine in a prescription. In the present study, 22.6 % prescriptions did not contain these directions. In the study by Vaishali *et al* [21], 50 % of prescriptions lacked patient instructions, while none contained follow-up advice.

Numerous proposals have been postulated by researchers around the world on how to improve writing of prescriptions. A study carried out in Holland in an intensive care unit (ICU) reported that the participation of pharmacists contributed to reduction of prescription errors. Other schools of thought recommended the use of e-prescribing system to decrease errors [24,25]. Indeed, studies have shown that e-prescribing systems significantly lowered prescription errors [22,23]. Thus, it is necessary to train prescribers on standard prescription rules. In addition, e-prescription system should be introduced, and pharmacists should be involved in all steps of the medication process with respect to evaluation of prescriptions. These recommendations will significantly improve the quality of prescription writing and help reduce errors.

Limitations of the study

This study investigated the errors present in handwritten prescriptions in only one hospital (public sector). The study should have been widened to include other hospitals. In addition, a comparison between public sector hospitals and private hospitals with respect to prescription errors would provide a broader information.

CONCLUSION

This study exposes some prescription writing errors. A majority of the prescriptions did not adhere to appropriate guidelines. The most prevalent errors are absence of information on drug generic name, duration of therapy and patient's weight. Furthermore, a substantial percentage of prescriptions were written in illegible handwriting. Educational and training programs are needed for prescribers concerning appropriate writing of prescription. Execution of appropriate error reduction approaches such as

appreciating the pharmacists' role at all stages of the medication process, use of software which caution on incidence of errors, introduction of computer-based prescription order entry systems, and error reporting may significantly improve prescription writing, while reducing the associated errors.

DECLARATIONS

Acknowledgement

The authors would like to thank the management of Rafha Central Hospital for their cooperation during this research.

Conflict of interest

No conflict of interest is associated with this work

Contribution of authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Manal Naif Aljuraissy collected the data. Maria Abdul Ghafoor Raja supervised the study and analyzed the data. Muhammad Wahab Amjad and Nawaf Mohamed Alotaibi wrote the manuscript.

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