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Medication Errors: Reported Prescription Faults and Prescription Error

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ABSTRACT

The present study aimed to evaluate the trends of prescription errors that did not caused any harm to the patients and the prescription errors that were identified before reaching to the patients in the year 2017 at a tertiary care hospital in Kingdom Saudi Arabia. Simple random sampling and sampling based on prescription errors that were identified, documented, and reported before reaching the patients in the first three quarters of 2017 were performed in present observational retrospective study. Descriptive analysis with D'Agostino & Pearson omnibus were applied for normality testing at 95% CI through one-sample t-test to compare the prescription errors that did not cause harm to the patients and were identified before reaching the patient in the first quarter (Q1), the second quarter (Q2), and the third quarter (Q3) of 2017. Total number of prescription errors that did not caused harm to the patients were 1,601 in Quarter 1 further decreased to 1,422 in Quarter 2 and then increased to 1,710 in Quarter 3 of 2017. Furthermore, the total number of prescription errors that did not cause harm to the patients were 1,601 in Quarter 1 further decreased to 1,422 in Quarter 2 and then increased to 1,710 in Quarter 3 of 2017. The current study revealed that prescription errors were common in the tertiary Hospital, Taif, Saudi Arabia. Therefore, educating the prescribers to reduce prescription errors through seminars, conferences, and workshops is essential. Also, a joint training exercise for the pharmacist and doctors would minimize the prescribing errors.

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INTRODUCTION

A single specific definition of medication error is not prevalent (Lisby *et al.*, 2010). The United States National Coordinating Council for Error Reporting and Error Prevention defined that "any preventable event may result in or lead to inappropriate drug use or injury to the patient while the drug is being controlled by a healthcare professional, patient, or consumer (Alanazi *et al.*, 2019). Such events may relate to professional practices, healthcare products, procedures, and systems, including prescription drugs, call to order, product labeling, packaging, composition, distribution, management, education, monitoring, and use." This broad definition explicates that errors can be prevented at different levels. A medication error is also defined as a delayed or reduced effective treatment or an increase in the risk of drug-related detrimental effects (Dean *et al.*, 2000).

Medication errors are classified by different methods as follows: (1) The sequence of the drug use, such as description, dispensing, administration, or monitoring; (2) The types of errors, such as inappropriate medication, dose, frequency, or

route; (3) The occurrence of the errors as a mistake during the planning procedures (knowledge-based or rule-based) or while performing appropriately planned actions (verb-based known as "faults") or memory errors; (4) Severity. However, due to the lack of substantial evidence supporting a specific method for defining the errors, the classification is based on the purpose (Ferner and Aronson, 2006).

Medication errors may occur in hospitals or clinics, and although these are rarely fatal, the safety of the patient and the quality of healthcare is greatly affected. Mistakes in prescribing are defined as prescription errors that occur in the event of a significant unintentional decrease in the possibility of timely treatment, reduced efficacy of the drug, or an increased risk of damage caused by the drug as compared to that during regular practice (Silva, 2009).

These medication errors may occur at any step while providing healthcare services. Several studies have shown that prescription errors are largely responsible for the admission of the patients to the hospitals. The World Health Organization also suggested that the rational use of the drugs requires appropriate dosage at a reasonable cost according to the clinical needs of the patients. Thus, several key indicators, such as prescribing indicators, indicators of patient care, and indicators of health facilities, were established. Drug prescribing indicators included several drugs prescribed for each outbreak, a proportion of generic drugs, the rate of injection, antibiotic prescription, and prescription drugs (World Health Organization, 1993; Lu *et al.*, 2011; Silva, 2009).

The incidence of medication error varies according to patient type, education, patient load, medical review procedures, employee awareness, and involvement in healthcare. Therefore, prescriptions should be examined proactively to reduce these errors. Prescription errors are simple or severe due to improper description or misjudgment or inappropriate prescription. Previous studies have indicated that 15–21% of the prescriptions contain at least one error description. Together, such prescription errors contribute to about 11% of the error-related adverse events (Meyer, 2000; Moyen *et al.*, 2008; Taylor *et al.*, 2005).

A medication error is common among patients at hospitals, especially sick children, and those requiring multiple forms of pharmacotherapy or has severe illnesses. These errors are more detrimental to children than to the adult population. This phenomenon could be attributed to the various age groups, different stages of physiological development, inability to communicate the adverse or side effects of medication, and skill and knowledge of the medical personnel caring for the pediatric population (Evans, 2009; Kaushal *et al.*, 2004).

Medication errors may occur at different levels of patient care effectuated by both the medical staff and paramedics; nurses are prone to a considerable number of mistakes. Although medical staff and paramedics in intensive care units (ICUs) are professionally competent, 52.5% of errors are noted (Woldie *et al.*, 2011; Gladstone, 1995; Mayo and Duncan, 2004). Thus, to reduce these medication errors, information technology can be utilized; for example, electronic prescription greatly reduces the chance of such errors as they are sent directly to the pharmacy, which has immediate benefits, such as improved clarity, completeness, and no writing errors (Camire *et al.*, 2009; Fijn *et al.*, 2002; Mitka, 2009). Several studies have shown that electronic prescriptions can reduce errors by >50% and improve the safety of the patient (Bates, 1998). These computerized systems are based on the inclusion of all necessary information about the patient, history about medical conditions, selection of appropriate drugs, and baseline clinical information. However, the system performs erroneously in the case of omission of any information, which is the common cause of incorrect computerized prescription. In addition, selection of incorrect drug or inaccurate dosage, failure to adjust for other clinical conditions of the patients, including that of renal and hepatic dysfunction, and allergies are also responsible for errors in computerized prescriptions (Lesar *et al.*, 1997). Thus, conventional systems *vs* advanced systems need to be elucidated further. Since the process of prescribing and administering drugs in most hospitals worldwide is yet a handwritten scheme, the description in the prescriptions and accurate spelling of the medicines and abbreviations is essential (Ash *et al.*, 2004; Nightingale *et al.*, 2000).

The Saudi Arabian Ministry of Health defined medication errors as follows: "any preventable event that may cause or lead to inappropriate use or patient harm while the medication is in the control of the health care professional, patient, or consumer" (Alsaidan *et al.*, 2018). The Saudi government constitution requires the implementation of free healthcare services. The Ministry of Health provides these services through primary healthcare centers throughout the Kingdom (Albejaidi, 2010). The Saudi healthcare system is ranked 26^{th} by the WHO. Quality improvement is an integral part of the healthcare programs in Saudi Arabia, and hence, changes are imperative due to the high cost and the public pressure to improve the health services (AL-Ahmadi and Roland, 2005). However, there is no

record of drug or prescription errors in the primary healthcare centers, while 2–15% of the incidents have been documented in public hospitals (Keers *et al.*, 2014).

Thus, the present study aimed to evaluate the trends of prescription errors that were not harmful to patients and those that were caught before reaching the patients in and the first three quarters of 2017 at a tertiary hospital in Taif, Saudi Arabia.

METHODS

In the present study, the prescription error was defined as any preventable event that may cause or lead to inappropriate medication or patient harm while the drug is under the control of the healthcare professional or the patient.

Study design

Observational retrospective design measured the prevalence of prescription errors. All reviews of prescriptions performed by experienced healthcare professionals were accentuated by straight interviews from prescribers as sources of information.

Sampling

The study sample consisted of two types:

Type 1: The first type was a simple random sample, consisting of 5% of the total number of prescriptions from each month in 2017 (the first three quarters). The prescriptions (de-identified data, i.e., no name or data that identifies the patient) were reviewed separately by two pharmacists. All prescription errors were identified and documented. Two pharmacists cross-checked the documented prescription errors to ensure validity.

Type 2: The other sample included all prescription errors that were identified, documented, and reported before reaching the patients.

Data analysis

Descriptive analysis with D'Agostino & Pearson omnibus (for normality testing) at 95% CI further by one-sample t-test (P-value, two-tailed, α=0.05) was performed to compare the prescription errors that did not cause harm to the patients and were identified before reaching the patient in the first quarter (Q1), the second quarter (Q2), and the third quarter (Q3) of 2017. (GraphPad Prism, V 5.02, San Diego, CA, USA).

RESULTS

A total of 5,340 prescription errors were identified in the analyzed samples in the first three quarters of 2017 (January through September). The total number of prescription errors was 1,892 in Quarter 1 (January through March), which decreased to 1,608 in Quarter 2 (April through June) and increased to 1,840 in Quarter 3 (July through September) (Table 1).

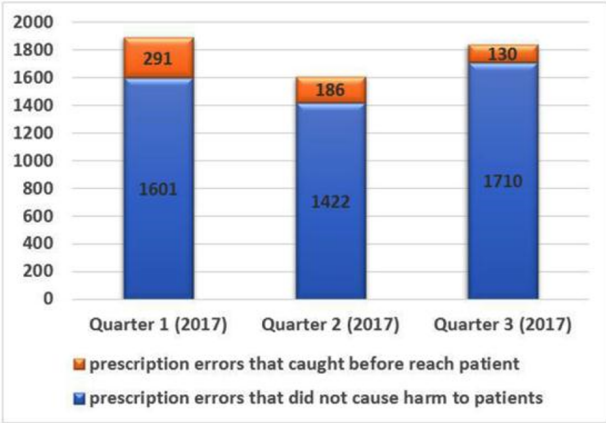

Figure 1: Comparison of total prescription errors in the first three quarters of 2017

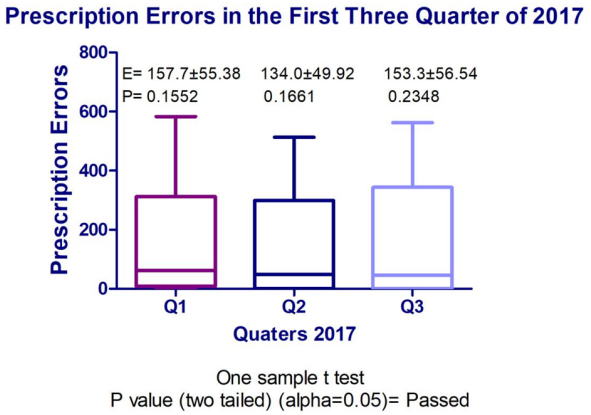

Figure 2: A descriptive analysis of prescription error in all quarters using D'Agostino & Pearson omnibus (for normality testing) at 95% CI by one-sample t-test (P-value, two-tailed, α=0.05)

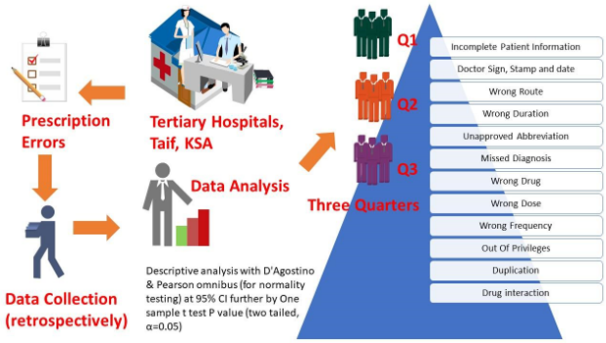

Figure 3: Flow chart illustrating the research process

Six categories emerged while analyzing the pre-

Table 1: Prescription Errors by Category in the First Three Quarter of 2017

	Quarter 1 (2017)	Quarter 2 (2017)	Quarter 3 (2017)	Total
Incomplete Patient Information	16	9	33	58
Doctor's Sign, Stamp, and Date	7	5	59	71
Wrong Route	377	317	318	1012
Wrong Duration	302	269	386	957
Unapproved Abbreviation	583	513	562	1658
Missed Diagnosis	316	309	352	977
Wrong Drug	2	0	1	3
Wrong Dose	146	88	34	268
Wrong Frequency	79	59	92	230
Out Of Privileges	44	39	1	84
Duplication	13	0	2	15
Drug Interaction	7	0	0	7
Total	1892	1608	1840	5340

scription errors, and none caused any harm to the patients: (1) incomplete information, (2) doctor's sign, stamp, and date, (3) wrong route, (4) wrong duration, (5) unapproved abbreviation, and (6) missed diagnosis. The comparison of these categories during the study period revealed that unapproved abbreviations had the maximum number of prescription errors (n=1,658), followed by the wrong route (n=1,012). Interestingly, missed diagnosis and wrong duration categories had a similar total number of prescription errors (977 and 957, respectively), while incomplete patient information had the lowest total number of prescription errors (n=58) (Table 1). However, no statistically significant difference was detected between the numbers in these categories of prescription errors (P>0.05).

Furthermore, the total number of prescription errors that did not cause harm to the patients was 1,601 in Quarter 1 that decreased to 1,422 in Quarter 2 and then increased to 1,710 in Quarter 3 of 2017 (Figure 1).

On the other hand, six categories were identified while analyzing the prescription errors that were caught before reaching the patients. These involved the wrong drug, wrong dose, wrong frequency, out of privileges, duplication, and drug interaction. The wrong dose had the highest number of prescription errors (n=268), followed by (n=230) wrong frequency, while wrong drug had the minimal number of prescription errors (n=3) (Table 1 and Figure 2). Intriguingly, the numbers between these categories of prescription errors differed significantly (descriptors are illustrated in Figure 2).

DISCUSSION

The present observational retrospective study was conducted in a tertiary hospital at Taif, Saudi Arabia. The study compared the prescription errors that did not cause harm to patients with prescription errors that were caught before reaching the patients in the three quarters of 2017 (Figure 3). We observed that the majority of the errors occurred due to unapproved abbreviations (1658, 31%), followed by the wrong route of administration (1012, 19%). These results were in agreement with those from the study by Gimenes *et al.*, wherein 91.3% of the prescriptions contained acronyms and abbreviations. The lowest number of errors was ascribed to the wrong drug prescription, followed by drug interaction. The Academy of Managed Care Pharmacy stated that one of the major causes of the therapeutic drug problem is incorrectly prescribed medication. The number of patient deaths resulting from drug errors increased from 198,000 in 1995 to 218,000 in 2000. The cost of these errors is more than $177 billion annually for the US economy.

In the current study, incomplete information was detected in 1% (n=58) of the prescriptions, while the doctor's sign, stamp, and date were missing in 1.3% (n=71) prescriptions; these numbers were significantly lower than that demonstrated in the study by Gimenes *et al.* (2011). In this study, wrong route error was common (19% (n=1012), and the percentage was similar to that found by Gimenes *et al.* (2011). Also, the wrong duration and missed diagnosis contributed to 18% (n=957) and 18.3% (n=977) errors, respectively. Intriguingly, a large number of medical malpractice cases arise from

misdiagnosis or delayed diagnosis of an illness, medical condition, or injury. When a doctor's erroneous diagnosis leads to incorrect treatment, delayed treatment, or no treatment, the patient's condition can become morbid and may lead to mortality. The promising approaches that would include tools specifically focused on identifying the diagnostic errors and encouraging patients and the doctors to voluntarily report the errors are imperative (Graber, 2013).

Furthermore, wrong dose and wrong frequency errors were 5% (n=268) and 4.3% (n=230), respectively. A multinational study demonstrated that the frequency of dose errors was significantly lower than the frequency of management time errors and dose omission errors (Valentin *et al.*, 2009).Conversely, in five ICU studies, the direct observation of error revealed that wrong dose error could be designated as one of three most frequent errors, while administration duration and dose deletion errors were observed less frequently in these studies (Fahimi *et al.*, 2008; Kopp *et al.*, 2006; Tissot *et al.*, 1999). Although these errors were not detrimental to patient health, they indicated a flawed hospital system, which could lead to grave errors in the future that might then impact the patients' safety. These errors could largely be attributed to the overall incompetence of the hospital organization in monitoring the medication administration, patient follow-up, and staff training. Preventive measures to counteract these system failures could minimize the errors in the ICUs.

About 78.5% (n=4193) of the prescription errors were found to not cause any harm to the patient throughout the three quarters of 2017. On the other hand, 11.4% (n=607) were caught before reaching the patients, which is a low proportion as compared to that estimated by a query of the Pennsylvania Patient Safety Reporting System (PA-PSRS) database July 2015 through June 2017 in Hematology and Oncology Clinics Outpatient Department. Thus, 53.7%, i.e., more than half prescription errors, reached the patients (Banasser *et al.*, 2017). Thus, the use of technology solely might not be sufficient to eradicate the errors, and an intervention tool combining the use of the computerized systems and traditional documentation inculcating the accurate patient and chemotherapeutic information should be developed. Previous studies have proposed several policies to counteract the prescription errors as follows: (1) promoting the education of pharmacists and prescribers in prescribing the medication accurately while using appropriate abbreviations if any; (2) incorporating electronic alerts in clinical practice and medical archives that would provide accurate dosage at the time of prescription; (3) utilizing prescription tools for guiding the medication, for example, STOPP/START and Beer's criteria; (4) implementing a multidisciplinary team for the healthcare, especially for an elderly patient (de Araújo *et al.*, 2019).

Despite that Saudi Arabia is one of the richest countries of the Middle East with rapid advancements in healthcare services, the revenues primarily generated from oil export is not sufficient to supplement all the free healthcare needs of the Kingdom. Thus, continued dependence on traditional medicine does not abrogate the risk of epidemic in the local population as well as the pilgrims. The Saudi Arabia Ministry of Health is developing new strategies with the aid of other governmental bodies, such as referral hospitals, security forces medical services, army forces medical services, National Guard health affairs, Ministry of Higher Education hospitals, ARAMCO hospitals, Royal Commission for Jubail and Yanbu health services, school health units of the Ministry of Education, and the Red Crescent Society, to counteract these challenges (Almalki *et al.*, 2011).

Interestingly, the privatization of public hospitals has been anticipated as an adaptable approach to reform the healthcare system of Saudi Arabia. It is speculated that granting autonomy to the hospitals would accelerate the decision-making and reduce the expenditure, thereby improving the overall healthcare services. However, such a reform might create clashes in the integrated system of traditional medicine and public hospitals unless the infrastructure is upgraded at all levels.

CONCLUSION

The current study revealed that prescription errors were common in the tertiary Hospital, Taif, Saudi Arabia. Therefore, educating the prescribers to reduce prescription errors through seminars, conferences, and workshops is essential. Also, a joint training exercise for the pharmacist and doctors would minimize the prescribing errors.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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