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Research Article

REDUCING THE MEDICATION ERRORS USING ELECTRONIC PRESCRIPTIONS

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Abstract:

Background: Medication errors are the main reason of the adverse events in a healthcare setup and it is a major concern of the healthcare institution as it affects the quality of the care. The objective of the study is to evaluate frequency, type and severity of medication prescribing errors in computerized prescriptions at the pharmacies in King Salman Armed Forces Hospital, Northwest Region, Tabuk, Kingdom of Saudi Arabia.

Methods: It was a retrospective observational study conducted at Armed Forces Hospital Tabuk Saudi Arabia during the period of six months (i.e. Jan 2018 to June 2018). A sample of 592 properly intervened prescriptions by the senior pharmacists was included in the study. All the data was entered in SPSS v.21. Demographic and prescription related information was presented in tabulated and graphical form by using their frequencies and percentages. Chi Square test was applied to find any association between prescribing error severity and prescription related information in the prescription forms. Level of significance was taken as 0.05 ($p \leq 0.05$).

Results: Of 592 prescriptions, 64.4% were taken from outpatients. Majority of the prescriptions were from Internal Medicine department. Weight (81%) and diagnosis (39%) were the major missing details from the prescription. 393 (66%) of the prescriptions were having dose related errors (under/over dose) while 247 (42%) were having frequency related and 36 (6%) were route of administration related drug errors. On the basis of consequences caused by a drug error, 55% of the errors in our study were minor error, 42% moderate and 3% were serious. A statistically significant association was reported between prescribing error severity and prescription source ($p=0.001$) and specialty of physician ($p=0.002$).

Conclusion: Results of this study demonstrate that adding another protecting layer in the process of medication dispensing by using a reliable design support system will be very useful for better patient safety and outcome. Moreover, pharmacy intervention remains the key for quality improvement and patient safety in medication management.

Keywords: Medication Error, Electronic Prescription, Prescribing Error Severity, Saudi Arabia

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INTRODUCTION:

A main reason of the adverse event in a health care setup is “medication errors” and it particularly affects the Quality of care. One third of all the medical errors in a medical facility belong to Medication errors [1]. It is a serious issue which challenges the goals of a healthcare set up by causing harm and damage to the patient [2]. A prescribing error is a failure in the process of writing a prescription by a physician and this failure resulted in some wrong instructions for the standard features of prescription [3]. The “Standard features” of a prescription included Identity of the individual, drug identity, preparation, dose, the route, frequency, timing and period of administration [4]. Medication errors are different to an adverse drug reaction [5]. And all the steps involved in the process of medical utilization including prescribing, medication orders, packaging, taxonomy, dispensing, monitoring, using instructions and administration are inclined to error [6]. The quality of healthcare has increased by the inclusion of Electronic prescription system for medication in healthcare set up. The electronic prescription for the medication has reduced the medical errors by up to 50% [7-8]. The literature showed that 72% of the errors were started with prescription and 15% were observed in the administration [9].

Prescription creation is a primary step in the medication process; so for the detection of the errors and prevention of the patients from its effects, it is essential for the pharmacist and nurses to review the orders and prescriptions [10]. In a systematic review at Saudi Arabia which determined the incidence and prevalence of different types of prescribing errors in adults, it was confirmed that the country has a very high incidence rate of medication errors and it ranges from minor to major [11]. The differentiation of errors from minor to serious is subjects to their adverse effect on the health of the patient. The literature showed that the increasing incidence of medication errors is a matter of concern for the healthcare set ups of the whole world [12,13]. It was also reported by the Lewis PJ (2009) in his systematic review in UK that in the secondary healthcare setups the prescribing medication errors were a common practice [12]. Medication errors in the developing countries including Saudi Arabia are still under reported. These errors can cause significant harms to the patients such as adverse drug event (ADE). The overall incidence of adverse drug events and their effects in Saudi Arabia are still unknown [14]. The objective of our study is to evaluate frequency, type and severity of medication prescribing errors in computerized prescriptions at

the pharmacies in King Salman Armed Forces Hospital, Northwest Region, Tabuk, Kingdom of Saudi Arabia.

METHODOLOGY:

It is a retrospective observational study conducted at Pharmacy Department, King Salman Armed Forces Hospital Tabuk, KSA during a period of six months (i.e. Jan 2018 to June 2018). Approval for the study was obtained from the Research Ethic Committee of the hospital. By using Simple Random Sampling techniques, a sample of 592 prescriptions was collected for the study. Medication orders generated in the computer during the operational hours of pharmacy between these six months were intervened and detailed reviewed by the senior pharmacist. Only those prescriptions were included in the study which were properly intervened by the senior pharmacist and appropriately documented their comments in the system. Any prescription, whose intervention was not clearly written, was excluded from the study. British National Formulary and Dipiro’s Pharmacotherapy were used as standards to substantiate correct intervention by the pharmacist. The interventions and comments of the pharmacists were reviewed for respective error and classified in three categories of Error Severity on the bases of seriousness of harms results due to the medication error. Prescription errors were classified as (a) Minor error which has non-significant/potential inconvenient for patients, (b) Significant error has potential significant risk/injury for patients, (c) Serious error has potential serious/fatal risk for patients. All the data was entered in SPSS v.21. Demographic and prescription related information was presented in tabulated and graphical form by using their frequencies and percentages. Chi Square test was applied to find any association between prescribing error severity and prescription related information in the prescription forms. Level of significance was taken as 0.05 ($p \leq 0.05$).

RESULTS:

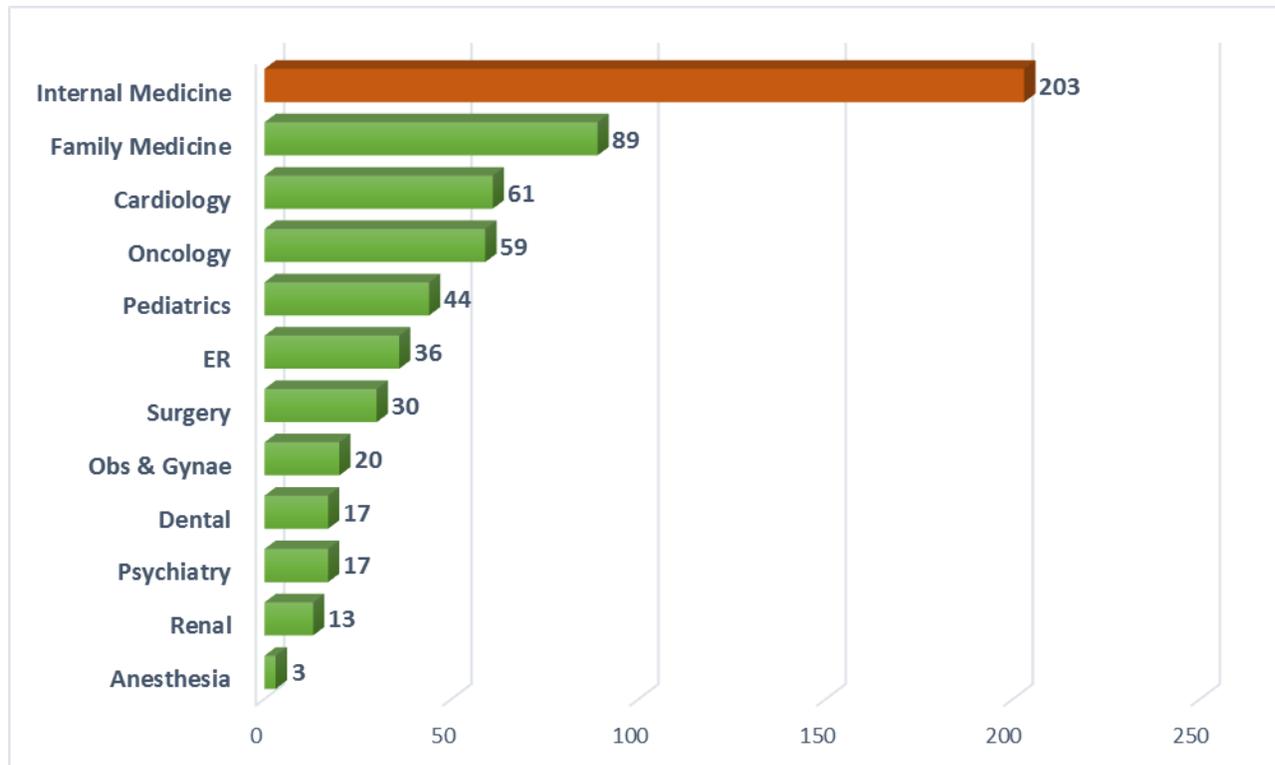
A total number of 592 prescriptions were included in the study. Of these, 64.4% of the prescriptions were taken from Outpatients. 38.5% of the prescribing physicians were Registrars, while 37.7% and 23.8% were Consultants and Senior Registrars respectively. In the thorough review of the prescriptions, several deficiencies were reported in the patients’ detail on the prescriptions. (481) 81% of the prescriptions were missing the weight of the patients and other major missing patients’ details on the prescription were diagnosis (39%), age (29%) and gender (25%). Detailed results are presented in Table 1.

Table-1: Prescription related information

| (a) Prescription details | | | |
|---------------------------------|----------------------|------------|-------------|
| | | Frequency | Percentage |
| Prescription source | Inpatient | 211 | 35.6% |
| | Outpatient | 381 | 64.4% |
| | Total | 592 | 100% |
| Designation of Physician | Consultant | 223 | 37.7% |
| | Senior Registrar | 141 | 23.8% |
| | Registrar | 228 | 38.5% |
| | Total | 592 | 100% |
| | (b) Patients Details | | |
| | Yes | No | Total |
| Prescription Number | 589 | 3 | 592 |
| Patient name | 591 | 1 | 592 |
| Hospital number | 590 | 2 | 592 |
| Department/Unit/Station written | 527 | 65 | 592 |
| Gender | 442 | 150 | 592 |
| Age | 426 | 166 | 592 |
| Weight | 111 | 481 | 592 |
| Diagnosis | 359 | 233 | 592 |

The leading number of prescriptions was from Internal Medicine (34%) department. Family Medicine and Cardiology were the other departments which having higher number of prescriptions (i.e. 15% and 10.1% respectively) in our study. Number of prescription by each specialty is presented in Figure. 1.

Figure-1: Specialty of prescribing physician



In Drug Related Errors, 393 prescriptions were having dose related errors. Of these, 81% were improper dosage and in 19% prescription, dose was omitted. Frequency related drug errors were found in 247 prescriptions. Of these 55% were having improper frequency and in remaining prescription, frequency was missing. Drug errors related to Route of transmission were found in 36 prescriptions. And of these, 67% prescriptions were not having any route

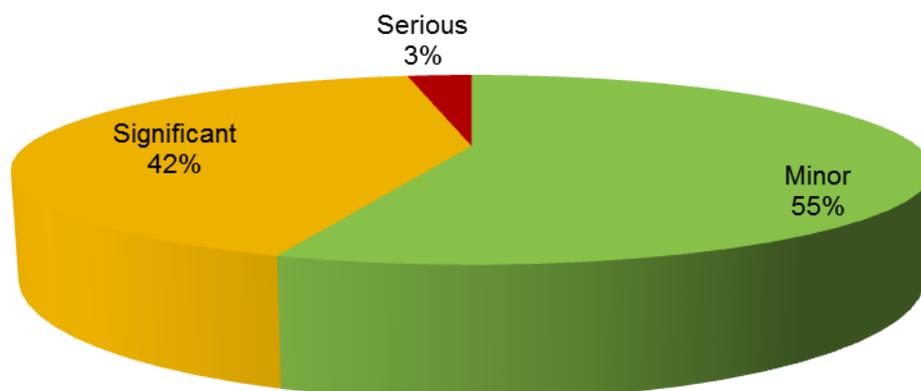
of transmission and other 33% were having inappropriate route of transmission. Frequencies of drug related errors are presented in Table 2. Duration of the therapy is another parameter observed in the prescription. In this regard, 92% of the prescriptions were having proper duration of therapy. Frequency of duration of therapy and some other drug related parameters in the prescription is presented in the Table 2.

Table-2: Drug related Information on Prescription

| (a) Drug related Errors | Improper | Omitted | Total |
|---|-----------------|------------------|--------------------|
| Dose (Under dose/Over Dose) | 317 | 76 | 393/592 |
| Frequency | 136 | 111 | 247/592 |
| Route of administration | 12 | 24 | 36/592 |
| (b) Duration of therapy specified | Correct | Incorrect | Not written |
| | 547 | 17 | 28 |
| (c) Other parameters | Yes | No | Not written |
| Drug without indication | 11 | 576 | 5 |
| Drug Interaction specified | 4 | 583 | 5 |
| Adverse drug reaction specified | 33 | 554 | 5 |
| More appropriate and/or available alternative therapy | 199 | 390 | 3 |
| Allergy status mentioned | 44 | 538 | 10 |
| Status: CVS/Respiratory system/ Lung/Kidney | 41 | 540 | 11 |
| H/O intake of other medicine | 288 | 293 | 11 |
| Refill mentioned | 328 | 262 | 2 |

On the basis of seriousness of harms caused by the drug errors, they were classified in three categories of Prescribing Error Severity. 328 of the prescription interventions addressed the Minor medication errors. The other two higher severity categories were Significant Errors and Serious Errors were reported 247 and 17 respectively. Percentage of the categories of prescribing error severity is presented in Figure 2.

Figure-2: Prescribing Error Severity



When the drugs which were involved in the medication errors were classified by ATC classification system, the prescriptions which were having drugs for Alimentary Tract and metabolism were amongst the highest medication errors. Results of the Drugs involved in medication errors are presented in Table 3.

Table-3: Drugs involved in medication error (ATC Classification System)

| Drugs involved in medication error (ATC Classification System) | Frequency | Percent |
|--|------------|-------------|
| Alimentary tract and metabolism | 108 | 18.2% |
| Blood and blood-forming organs | 34 | 5.7% |
| Cardiovascular system | 60 | 10.1% |
| Dermatological | 50 | 8.4% |
| Genito-urinary system and sex hormones | 9 | 1.5% |
| Systemic hormonal preparations | 14 | 2.4% |
| General anti-infectives for systemic use | 60 | 10.1% |
| Antineoplastic and immunomodulator agents | 59 | 10.0% |
| Musculoskeletal system | 24 | 4.1% |
| Nervous system | 61 | 10.3% |
| Antiparasitic products, insecticides and repellants | 3 | 0.5% |
| Respiratory system | 13 | 2.2% |
| Sensory organs | 22 | 3.7% |
| Various | 75 | 12.7% |
| No ATC code | 0 | 0% |
| Total | 592 | 100% |

Chi Square test was applied to determine the association between the prescribing error severity and prescription source, Designation of Physician and Specialty of the Physician. Minor and Significant errors were reported significantly higher in outpatient prescriptions ($p=0.001$). No significant association

was reported in designation of physician and prescribing errors ($p=0.267$). And a statistically significant association was found between prescribing errors and Specialty of the Physician ($p=0.002$). Detailed results of the statistical analysis are presented in Table 4.

Table-4: Prescribing error severity in relation to different prescription information

| | Prescribing Error Severity | | | p-value |
|---------------------------------|----------------------------|-------------|---------|--------------|
| | Minor | Significant | Serious | |
| | 328 | 247 | 17 | |
| Prescription Source | | | | |
| Inpatients | 100 | 99 | 12 | 0.001 |
| Outpatient | 228 | 148 | 5 | |
| Designation of Physician | | | | |
| Consultant | 117 | 102 | 4 | 0.267 |
| Registrar | 130 | 92 | 6 | |
| Senior registrar | 81 | 53 | 7 | |
| Specialty of Physician | | | | |
| Internal Medicine | 127 | 68 | 8 | 0.002 |
| Surgery | 17 | 13 | 0 | |
| Pediatrics | 18 | 26 | 0 | |
| Family Medicine | 56 | 32 | 1 | |
| Oncology | 32 | 25 | 2 | |
| Obstetrics & Gynecology | 12 | 8 | 0 | |
| Psychiatry | 6 | 11 | 0 | |
| Dental | 10 | 7 | 0 | |
| Cardiology | 19 | 36 | 6 | |
| Renal | 5 | 8 | 0 | |
| Anesthesia | 2 | 1 | 0 | |
| ER | 24 | 12 | 0 | |

DISCUSSION:

Medication errors can be a reason of serious health problem which are related to the social and financial consequences on the lives of the patients, healthcare professionals and health care organization and these errors can lengthen the period of hospitalization and affects the treatment [7,15].

In our study, patients' weight (81%) and diagnosis (39%) in the prescription were amongst the leading missing details of the patient. The findings are comparable with the study conducted in Pakistan in 2015, which reported a missing of weight in 80% of the prescription and 37% missing information of the diagnosis of the patient. [16]

The most common prescribing drug related error in our study was incorrect dose (66%) followed by error in the frequency (42%) and route of administration (6%). The trend of the drug related errors is similar with the literature [17-18]. But the percentage of incorrect dose and drug frequency is higher than the literature and it is an apprehension for the pharmacy practice and should be addressed. The findings were contradictory to a study conducted in Muscat focused on outpatient pharmacy prescription, which reported route of administration error as 26% followed by incorrect dose error 20% [19].

In our study, duration of therapy was properly mentioned in 92% of the prescriptions. Duration of therapy was missing in 5% of the prescription. The missing percentage of duration of therapy was

reported very high in the literature as compared to our study [16,20]. However a study from Bahrain reported 18.5% of the prescriptions were missing the duration of therapy, a more comparable finding with our study [21].

In calculating the severity of the prescribing errors, 55% of the interventions of our study were addressing the minor errors. 42% and 3% were reported as significant (moderate) and Serious (major) errors respectively. The trend is similar to the study of Al Rahbi HA et al, but the percentages of minor errors were reported 72.3% in that study [19]. A study from Pakistan reported moderate errors (36%) as the highest prescribing error in their study followed by major minor (16.7%) and major errors (13.7%). [16] Classification of the drugs involved in medication errors by ATC Classification System shown that the prescriptions which were having drugs for Alimentary tract and metabolism (18.2%) were amongst the highest medication errors. Similar findings were reported by Nassali H (2014) [22] Results of the statistical tests showed that there was a significant association between prescribing error severity and prescribing source ($p=0.001$). Outpatient prescriptions were higher in number for minor and significant (moderate) errors. It was the indication of the fact that these patients were seen at the outpatient clinics and have to leave from the hospital after the consultation. While in the case of inpatients, nurses and other medical staff was providing the continuous services and monitoring to the admitted patients and it decreases the chances for error. The results of a study by Bishop TF. et al (2011) were in support for the findings of our study²⁰. A statistically significant association was reported in in prescribing errors severity and specialty of the physicians ($p=0.002$). Highest number of all types of errors was reported in the prescription from Internal medicine. Similar results were reported by Nassali H (2014) [22].

CONCLUSION:

Results of this study demonstrate that adding another protecting layer in the process of medication dispensing by using a reliable design support system will be very useful for better patient safety and outcome. Moreover, pharmacy intervention remains the key for quality improvement and patient safety in medication management.

RECOMMENDATION:

- A reliable clinical design support system implementation is highly recommended.
- Enforce the pharmacy intervention activities
- Encourage clinical pharmacist's

involvement in the care plan for the patients.

- Use the data analysis of the intervention wisely to improve the service provided.

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