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Direct Observation Approach for Medication Errors Detection in an Educational Hospital

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ABSTRACT

Background: Mistakes occur inevitably, but medication errors can cause catastrophic consequences such as death, which accentuates investigation through presumptive sources and possible solutions for the prevention of errors that took place before.

Methods: Twelve different medical wards of an educational hospital were analyzed using the direct disguised observation (DDO) method for administration step and chart review for prescription step. Each ward was randomly chosen, and the time at which the researcher presented oneself to each ward was contingent. The researcher observed the medicine continuously from the time prescribed by the physician until the drug finally entered the patient's body.

Results: Of 1350 dose of drugs, which were evaluated; 65% of data was collected in the morning shift (n=867), 28.6% in the afternoon shift, 6.4% of the night shift. About one-third of the physician orders were defective and did not contain all six parameters (drug name, dosage form, dose, measuring unit, administration route, and intervals of administration). Interpretation of the administration phase revealed 69% of drugs were erroneously administered due to errors detected as wrong route, omission, wrong dose, wrong time, and unauthorized dose.

Conclusion: Our findings exhibit errors in the pivotal stages of the therapy process. Clear instructions and protocols should be implemented for hospital technicians, nurses, and physicians to avoid irreparable detriments caused by medication errors.

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Introduction

Mistakes made by the treatment team in the process of diagnosis, treatment, presentation of test results, surgery, Procedures, and administration are considered medical errors (1). Many medical errors are not reported, which makes it more challenging to provide accurate statistics. However, experts believe that medical errors are likely to occur at all stages of health care delivery to the patients and may have a very high prevalence and a high mortality rate. Medication error is one of the most prevalent medical errors leading to morbidity and mortality worldwide. Medication error is any preventable event that may result in an improper use of the medication or adverse effects. About 20% of all medical errors are due to medication errors, of which 27%, 38%, 12%, and 11% are related to prescription, administration, distribution, and transcribing, respectively. Prescription is

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a complex process and requires the knowledge, decision-making, and proper functioning of the staff working in the hospital wards (2).

Anonymous self-reports (questionnaires), Incident reports, the critical incident technique, chart review, Computer-assisted monitoring, and direct observation are six common techniques for medication error detection. In the direct observation method, a trained observer accompanies the nurses during medication administration and records the details of the preparation and administration of each dose of the prescribed drugs. Then the notes are compared with the physician's orders. If the order is not carried out correctly, the administration error will be happening. As the nurses are unaware of the study's precise goal, the method is termed disguised direct observation. Although anonymous self-report and incident report techniques are low cost, the staff can report the errors if they are aware of the mistakes. The critical incident technique. Chart review can be used to detect prescribing, administration, or dispensing errors by evaluating laboratory tests, nurse notes, progress notes, medication orders, and any other helpful notes (1).

Implementation of prescription is an essential part of the patient's treatment and safety, and is a critical component of nurses' performances. Medication errors can cause severe problems in public health and safety risk for patients. Annually about 100000 people die in the United States due to medical errors, of which 7000 are related to medication errors. The financial cost of the medication is almost $ 77 billion a year. However, deaths due to breast cancer and deaths due to accidents are less than those due to medication errors (3).

In Iran, as in other countries, nurses may make mistakes due to inappropriate work shift hours (afternoon and graveyard shifts, graveyard shifts, graveyard, and morning shifts), long working hours and excessive responsibility of nurses, low work experience, and a small number of nurses to patient's ratio on graveyard shifts (4-6).

Medication errors are associated with a significant increase in the mortality of the patients and problems such as increased length of hospital staying and costs (7). Studies show that only severe and harmful events are reported due to medication errors, while errors that have caused poor symptoms may not be reported (8-11).

In recent years, studies on medication errors have become particularly important due to their impacts on increasing the patients' mortality rates and hospital costs (12). This type of study is not common in Iran and has been done mainly through clinical pharmacists. In the present study, the incidence rate of medication errors and possible causes of these errors in an educational hospital in Yazd, 2019, was evaluated to improve patients' safety by troubleshooting and eliminating the cause of errors.

Methods

From February 2019 to August 2019, all patients hospitalized in each of the internal, surgical, or intensive care units (ICUs) of an educational hospital in Yazd were eligible to include the study. All patients signed an informed consent form before participation in the study. All methods were carried out following regulations. This study was approved by the Ethics Committee of Yazd University of Medical Sciences (IR.SSU.REC.1399.311).

In this descriptive-analytical, prospective, and cross-sectional study, the incidence rate and type of medication errors were considered as primary outcomes. The data recorded for the study population included age and the gender of patient, possible cause, source of medication error (nurse or physician), type of error, the severity of the error, department source, and stage involved.

The researcher (pharmacist) was actively and continuously present in different wards of the hospital wards to identify medication errors during the administration stage. In this study, 12 clinical wards, including internal (3 of 12), surgical (5 of 12), and intensive care (4 of 12) units of an educational hospital in Yazd (all use the unit dose method for drug distribution), were selected through the DDO method to examine the types, prevalence, and possible causes of errors. In these wards, the process of prescription was not computerized, which means that physicians write their orders on patients' files, and nurses would transcribe them on separate sheets. We evaluated the medicine from the time prescribed by the physician and entered the patient's chart until it was given to the patient by the nurse and finally entered the patient's body.

The severity of the medication error was defined based on Neville's classification: Type A (serious), type B (major nuisance), type C (minor nuisance), and D (trivial) (2).

Administration Step

DDO Tanique was used to detect administration errors. Therefore, a trained pharmacist accompanied the nurses during medication administration and records the details of the preparation and administration of each dose of the prescribed drugs. Then the notes were compared with the physician orders. If the orders were not carried out correctly, the administration error would happen. The pharmacist was presenting in different shifts (morning, afternoon, and graveyard) in the relevant ward and the nurses were unaware of the study's precise goal.

The pharmacist accompanied the nurses up to 100 doses (dose: each prescribed medicine given to the patient as a single dose) were administered. These medicines are given to the patient, and if the nurse provides the patient with less than 100 doses during his/her shift (this can happen especially in the evening and night shifts), the researcher will select another nurse with the same selection method and accompanied him/her until the 100 doses were recorded. After recording the details of the doses that were administered in each ward, the researcher examined the patients' charts one by one to compare the details of the administered doses with what the physician prescribed.

Errors examined at this stage include overdose, under dose, omitted dose, wrong route (inject a subcutaneous drug intravenously, for example), wrong time (If the time given by the nurse to the patient is more than one hour different from the time specified in the patient's chart, it is considered as an error), wrong frequency, and unauthorized dose.

Prescribing step

To identify errors in prescribing step, chart review was applicate as follows: the researcher pharmacist was present in different wards of the hospital, and he referred to the patient's file every day after performing administration step. The physician's prescription is recorded in the order MD section of the data collection form. If any of the following were removed, the physician's prescription would be considered incomplete: drug name, dose, route, dosage form, Interval, unit, number.

Considering the two different stages of this research and the unknown nature of Yazd hospital environments in terms of error rate and the existence of different formulas for conducting such studies based on the previous studies (3, 4), the number of thousands of drug doses or error opportunities (100 in each ward) is a standard number for such studies were determined in each of two stages. The normality of data was assessed using the Kolmogorov-Smirnov test. The quantitative and qualitative variables are presented as means with standard deviation (SDs), medians with Interquartile range (IQRs), or as numbers (%). SPSS Statistics (v. 20) was used to perform the analyses and P-values < 0.05 were considered as statistically significant.

Results

During the study period, 459 cases, including 1350 doses of drugs, were collected for review in each of the administration or prescription steps. The mean (SD) age of the patients was 41.44 (20.55) years and 78.18% were male. As this educational hospital is the trauma center of Yazd city, most of the hospitalized patients were male who were referred to this medical center following a motor vehicle accident.

The mean number of years of nursing job experience in health care was 11.6 years (ranged: 7.0 months to 17.2 years). Most of the nurses had bachelor's degrees (BS) and three of them had master's degrees (MS). It appeared that nurses with longer work experience committed less error than nurses with shorter work experience (P = 0.041), but no significant difference between more and less educated nurses (P = 0.893).

All three shifts were included in the evaluation process: 65.0% in the morning (867 doses), 28.6% in the afternoon (381 doses), and 6.4% at night (85 doses). The rate of administration errors was higher for morning shifts as the most scheduled time for drug administration was at morning shifts.

The overall administration error in the current study was 69%; the most frequent error was wrong route (27%) and omission, wrong dose (under/over dose), wrong time, and unauthorized dose happened in 22%, 12%, 5% and 3% of cases, respectively (Figure 1).

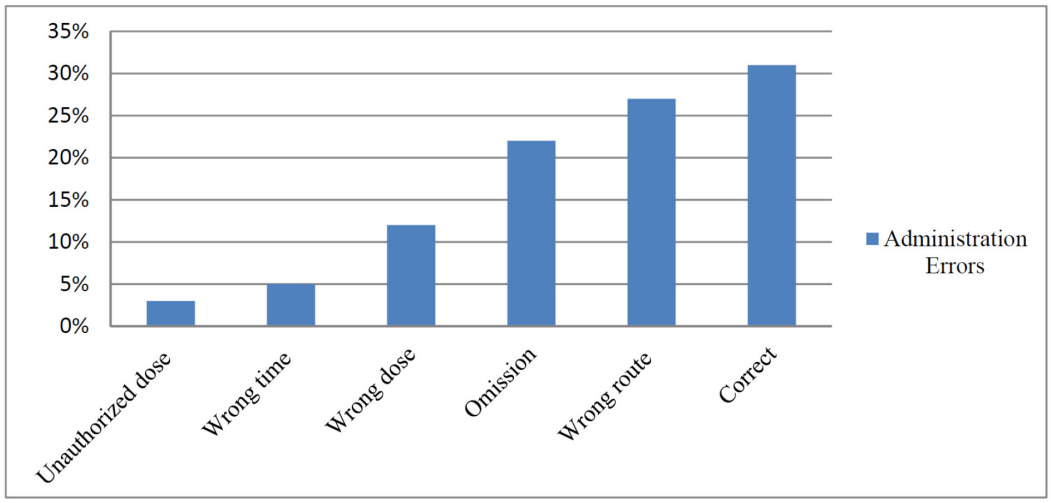

Figure 1. Administration error percentages.

Considering route of administration showed that the IV (61.2%), oral (27.5%), and topical (3.4%) routes were the most commonly involved, respectively. Most errors occurred in the cardiac ward followed by surgical ICU. Analysis of error type outcomes showed that all error were types C and D. Considering the outcome of error types, no significant differences were seen among different included wards (P = 0.113).

The study data at prescribing stage was evaluated in six parameters, which are P1: Route of administration; P2: Dosage form; P3: Dosage unit; P4: Frequency; P5: Medicine Name; and P6: Medicine dose.

As illustrated in Table 1, only 28.0% of the physicians' orders had all six parameters. 28.3% had five parameters, and 43.7% had four or fewer parameters. Of the six parameters, medicine name was present in all orders, and P6, P4, P3, P2, and P1 were the most abundant parameters. 28% of orders did not indicate the route of administration. Overall, in 72% of cases, the route of administration was indicated. 23% of orders did not indicate the dosage form. About 2% of orders did not indicate the dose unit, and in general, 98% of overdoses indicated the type of injection.

Table 1. Overall prescribing error frequencies

Number of order parameters	Frequency, N (%)	Cumulative Percentage, %
2	99 (7.34)	7.34
3	252 (18.66)	26.00
4	239 (17.70)	43.70
5	382 (28.30)	72.00
6	378 (28.00)	100.00
Total	1350 (100.00)	100.00

Discussion

This descriptive-analytical, prospective, and cross-sectional study was conducted to identify the common types of medication prescription and administration errors in an educational hospital in the center of Iran. The results illustrated that medication errors are common in this hospital. About one-third of drugs were erroneously administered and more than 70% of the physician orders were defective and did not contain all six parameters (drug name, dosage form, dose, measuring unit, administration route, and intervals of administration).

Medical errors are an essential challenge for the healthcare system worldwide. The most common known medical errors are injectable medication errors. Any negligence in the pharmaceutical process (prescribing, preparing, and giving medicine to the patient) is interpreted as a medical error, regardless of whether it has side effects for the patient or not (1-3).

Previous studies revealed that the administration step comprised 14.6 to 41% of all medication errors in adult wards (5, 6). The results of a review of medication errors prevalence showed that prescribing and administration errors were the most common errors among each population (5).

In general, the error rate in the current study was calculated at 69% during the drug administration step, which was much higher than the findings of Saghafi and Zargarzadeh (2014) who reported the error rates of 41.5 and 35 % in two educational hospitals of Isfahan. They also reported only one-third of the physician orders consisted of all six parameters (4), which was in line with the results of the current study (28% complete orders). Vaziri et al., in a systematic review and meta-analysis showed medication errors were the most common medical errors in Iran with a wide prevalence ranging from 10 to 80% (7), which confirmed the current result.

The range of medication error based on the DDO method reported being 3-72.5% (18). The results of a literature review in the field of medication errors occurrence in hospitals revealed that administration errors occurred the most (19). In another study by Fahimi et al., the rate of administration error in an intensive care unit of an educational hospital with the DDO method was 69 %. Although the rate of administration in the current study is along with Fahimi's study, the definition of administration error in this study was different (20).

There are various approved methods for medical errors detection including voluntary reporting, chart review, or direct observation of the medication process (13). There are significant variations in the different medical error detection methods. According to previous studies, the observation method is very sensitive to identifying administration medical errors (14).

In the current study, a DDO method was used mainly

due to the fact that the medical team would do their job exactly when they knew that their performances are under observation. Tissot et al., showed that the occurrence of administration error by a non-disguised observation technique in which nurses were aware of the details of the study was less than studies with the DDO method (15).

Until now, there is no standard definition and procedures to evaluate medication error, which makes it difficult to compare the results of studies. Few studies reported medication errors as opportunities for errors (16, 17).

As explained before the occurrence of the prescription error in the current study was high. Analysis of error type outcomes showed that all errors were types C and D and none of the nurses committed error type A, whereas Al-Harkan et al., revealed that error types B and C were the most common and few type A errors (0.14%) occurred in a large tertiary hospital in the Qassim region, Saudi Arabia (8).

Lack of standard treatment guidelines, computerized physician order entry, and supervision of clinical or hospital pharmacists in the wards were the main reasons for medication error occurrence. Other possible reasons were look-a-like drugs, physician's illegible handwriting, incomplete physician's prescriptions, low work experience especially in recently graduated staffs, and excessive workload due to labor shortage in the hospital wards (21, 22). Previous studies showed that the introduction of computerized physician order entry could reduce the rate of prescription errors and improve the overall patient outcome score (23).

As mentioned before, administration error (69%) occurred commonly in this hospital and one of the main reasons can be the lack of preparation and administration of medications in the presence of a pharmacist, while in the study of Kopp et al., pharmacists involved in medicine preparation (24). In comparison to different studies, wrong administration rates occur more than other types of errors.

Based on the result of the current study, the most common medication errors occur in the administration stage. Improvement in the prescription system (changing handwritten prescription to computerized physician order entry), writing and applying the standard treatment guidelines, supervision of clinical or hospital pharmacists in medicine preparation are the main approaches to decrease medication errors in hospitals.

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