*Original Research Article*

## EVALUATION OF MEDICATION ERROR IN INTENSIVE CARE UNIT IN YEMENI HOSPITALS

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**ABSTRACT:**

**Background:** There is scarcity of data about medication errors in the Yemen, hence this study was conducted to detect the medication errors in the medication use process such as prescribing, and administration.

**Method:** A prospective case based observational study of medical and paramedical personnel prescribing and administration of drugs was carried out in ICUs of three tertiary hospitals in Yemen.

**Results:** 87.5% (n=783) of prescribing errors, 12.41% (n=111) of prescription errors were detected for the total 894 errors registered. patients were hospitalized for 216.6±14.0 days and were on Mean±SD of 18.3±21.3 medications per day. The most common physician associated medication error was of incomplete orders (61.7%), monitoring drug errors (50.5%), over dose errors (44.3%)

**Conclusion:**  Use of information technology systems may be versatile strategy to prevent medication errors and improve patient safety.

**Keywords:** Medication Error, Intensive Care Unit, Yemeni Hospitals

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## INTRODUCTION

Compared to the general hospital units, administration of dosage forms in intensive care units (ICU) is highly complex. There are several reasons for the higher frequency of medication errors (MEs) in ICU wards. First, in comparison with the patients in other hospital units, ICU patients generally need more medications [1]. Second, most of drugs in an ICU are administered intravenously. Drugs prepared for intravenous injection require calculations [2]. Third, because ICU patients are mostly in a low consciousness state, they are unable to report harmful effects [2]. Fourth, compared to other patients, ICU patients are, in general, weaker physiologically. The aforementioned reasons cause ICU patients to be considered highly vulnerable to MEs [2]. MEs are defined as any preventable event that may cause or lead to an inappropriate medication use or patient harm while medication is in control of a health care professional, a patient or a consumer [3]. In providing a dose of medication to a hospitalized patient 80-200 step must be taken [4]. There is the potential for an error to occur at any of these steps. At any hospital, there are four broad stages in drug therapy. These stages include prescribing, transcribing, dispensing and, administrating [5]. The objective of this study was to show the frequency of MEs in an ICUs of three tertiary hospitals.

## METHODOLOGY

A prospective case based observational study of medical and paramedical personnel prescribing and administration of drugs was carried out .This study was conducted at ICUs of three tertiary hospitals in Yemen namely Al-Gomhory (Taiz), Al-Gomhory hospital (Sanaa) and Al-Wahdh (Mabar).This study duration was from 3/2011 to 7/2011.

A random sample of 70 cases was observed from each hospital. Daily rounding of all patients in the aforementioned ICU was completed in the morning on a daily basis and the decision regarding the management of the patients were primarily made at time.

Medication orders were handwritten by physicians. In every shift, one nurse was responsible for transcribing the physician's orders. There were no clinical pharmacy services and unit dose packaging available at the unit.

The MEs were detected using the disguised-observation technique. The physicians and nurses were not aware of the research goal. The observer was a trained pharmacy student. The student was trained for a week at ICU to learn the principles of observation methods in ICU. The morning and afternoon shifts in the study was equally observed. The observer was responsible to attend in the rounds and then read patient's written order(s) and to shadow the nurse as he/she prepared and administered medications. During every shift of observations, the observer was directed to follow-up on only one patient. The outcome of research was not taken into account if the patient was discharged from ICU or expired less than 24 h from the time of ICU admission.

All of the relevant data including patient information, physician orders, medications name, medications dose, time and administration of medication were entered on a form that was designed for this particular study. The data was validated via independent clinical pharmacist to insure the quality and accuracy. Errors were classified according to ASHP classification [5].

Statistical analysis was performed with the help of Graph pad prism version 6. Along with percentages to know how many percentages of patients have experienced medication error, p values of observations in chi square test have been determined to know the level of statistical significance, while keeping 0.05 as criteria.

## RESULTS

The results are based on information collected on 210 cases collected over 4 months of study. The age ranges of patients were from 20 to 89 years. The Mean±SD ages of the patients were 43.41±17.32 years.

On average, patients were hospitalized for 216.6±14.0 days and were on Mean±SD of 18.3±21.3 medications per day.

A total of 894 medication errors were reported among 210 cases, with the rate of 87.5% prescription errors and nurses related error of 12.41%. Among the observed medication errors the error breakup were categorized as follows: the most frequent physician associated medication error was of incomplete orders (61.7%), monitoring drug errors (50.5%), over dose errors (44.3%), table 1.

When we compared the physician associated medication error rate among the three hospitals the significant error difference was observed with almost all of errors observed except contraindication error.

Similar comparison of nurses related MEs among three hospitals was found to be statistically significant, table 2.

**Table 1: Comparison of Physician associated medication errors among the three hospitals of Yemen**

| S. no | Type of Errors | Number of medication errors Al-Gomhory,Taiz | Number of medication errors Al-Gomhory ,Sanaa(%) | Number of medication errorsAl-Wahdah,Thamar(%) |
|---|---|---|---|---|
| 1 | Contraindication errors | 11(15.7) | 17(24.3) | 22(31.4) |
| 2 | Side effect errors | 10(14.3) | 20(28.6) | 24(34.3) |
| 3 | Drug-drug interaction errors | 2(2.9) | 17(24.3) | 34(48.6) |
| 4 | Overdose errors | 37(52.9) | 21(30) | 50(50) |
| 5 | Underdose errors | 20(28.6) | 25(35.7) | 10(14.3) |
| 6 | Rate errors | 10(14.3) | 38(54.3) | 40(57.1) |
| 7 | Administration technique error | 1(1.4) | 25(35.7) | 35(50) |
| 8 | Monitoring drug errors | 23(32.9) | 42(60) | 41(58.6) |
| 9 | Incomplete order errors | 27(38.6) | 57(81.4) | 46(65.7) |
| 10 | Frequency errors | 8(11.4) | 21(30) | 24(34.3) |
| 11 | Incorrect preparation errors | 6(68) | 19(27.1) | 15(21.4) |

**Table 2: Comparison of Nurses related medication errors among the three hospitals of Yemen**

| S. no | Type of Errors | Number of medication errors Al-Gomhory,Taiz | Number of medication errors Al-Gomhory ,Sanaa(%) | Number of medication errorsAl-Wahdah,Thamar(%) |
|---|---|---|---|---|
| 1 | Wrong time error | 4 | 25 | 35 |
| 2 | Omission error | 7 | 5 | 35 |

## DISCUSSION

Unfortunately, in Yemen the importance of MEs and reporting of such incidences is not given the deserved attention. Additionally, MEs are costly to the patients and their families [5]. The number of investigations in the area of MEs is limited [6-11] thereby, there is a need to further investigate the MEs. Direct disguised observations were used for the study of MEs. Direct observation method has proven records of being a reliable way to investigate MEs [12]. Reports form a study which has been conducted in 36 hospitals and skilled nursing facilities indicate that the percentage of errors were significantly higher when nurses were unaware of the study [12]. Since there are many MEs and multiple definitions of errors, it is challenging to detect all forms of ME [13]. The range or MEs in the studies with direct observation approach is 3.3-72.5%

[14]. In this study we observed ME rate of 87.5%, which lies within the range observed by other studies. In our study the nurses related ME was observed to be 12.41%.

In other study the frequency of MEs due to administration, prescription was 43.1%, 24.1%, respectively. The frequencies of administration error were much higher than prescription and transcription error which is consistent with Krahenbuhl melcher *et al.* [15]. Since the majority of prescriptions are administered by a single nurse, the administration procedure is prone to errors due to limited system check [16].

In other MEs studies about errors in preparation and administration of intravenous medications, consistent with our study, the most common error was in administration stage [8, 10]. This was observed when nurse had enough time to administer medications to patients.

Prescription error was reported by previous study [10] to be 41.1% which is much lesser than ours of 87.5%. This relatively big difference can be due to lack of consideration of indication error in this study.

Van den bemt *et al.* [17] studies observed MEs 70.2% administration errors. That hospital had conditions similar to the conditions at the hospital under this study in terms of lack of protocols for the preparation and administration of parentral medications and unit dose packaging distribution system.

Therefore, because only one trained person was in charge of reading prescription and was better familiar with doctors' hand writing and symbols used and because the person was responsible for potential errors, reading prescriptions was done with higher care.

At the ICU that we studied each nurse at each shift who was responsible for giving medicaitons to patients was also responsible for reading prescriptions and up keep of patients file.

Although in our study the majority of errors (87.5%) did not result in any serious damage to patients, it is important to note that if MEs are not corrected and if errors are allowed to occur, they have the potential to cause serious medical issues. Therefore, one should not simply shrug off these errors even if they do not cause serious harm to patients.

Necessary steps must be taken to prevent the occurrence of these errors. We faced several limitations in the course of this study. It is possible that observer may not record all MEs in the course of the study.

Previous research and results of our direct observation-based studies proves that occurrences of errors in direct observation method compared with volunteer-based reporting are more accurate [12, 14]. Another limitation is lack of any standard for determining MES. As a result we were not able to investigate all errors. Observer's lack of access to interview patients to find out status of their health was among other limiting factors. The lack of access was due to patients being unconscious. Medication history of patients, help identify drug related errors. Errors such as drugs interactions, allergic reactions to drugs or, instructions not to take a drug(s) can be identified through medical/drug history of a patient. However, if such information is not recorded in patient's file the incomplete information creates a limitation. Other limiting factors in this study included inability to collect data during midnight shifts

## CONCLUSION

Normally, ICU patients have complex physical issues; therefore, even small error(s) may cause severe harm to them or may even result in their death. Preventing the vital MEs is a must and is only possible through investigations. Another effective tool in reducing medication error is to have a group of physicians, nurses and, pharmacists routinely investigate and discuss past episodes of medications errors in order to

find ways to prevent such errors from occurring again. Also, increasing the number of nurses, reducing their responsibility and having protocols for intravenous infusion, can decrease MEs.

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