Avoiding Medication Errors Caused by Nurses in the Emergency Department in Saudi Arabia

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***Abstract*—Background: Medication errors are pervasive in healthcare, especially in emergency rooms, with diverse causes that warrant critical investigation due to the potential repercussions for both patients and healthcare providers.**

Aim: This research explores nurses' perspectives on medication errors in the emergency department.

Methods: A descriptive cross-sectional design involved 96 nurses, using a questionnaire that covered demographic data and nurses' perceptions of error causes, reporting practices, and barriers.

Results: The average age of the nurses who participated in this study was 27.7 (3.4 years), with 7.3 (1.9) years of experience. Most nurses (85.4%) were women. The majority held bachelor's degrees (88.5%) and worked fixed shifts (54.1%), and 46.8% reported medication errors in the past year, primarily occurring once (68.7%). They reported no complications in 97.9% of errors.

Conclusion: Common error types included infusion rate errors, double dosing, and medication omission. Although errors are widespread, adverse consequences are infrequent, mainly occurring during prescribing and administration stages. Encouraging disclosure by nurses and fostering positive responses from hospital management are crucial for enhancing patient safety. Awareness of recovery mechanisms informs potential interventions to minimise overall safety.

***Index Terms*— Emergency Department, Medication Errors, Nurses.**

I. INTRODUCTION

One of the primary challenges in healthcare systems is the identification of drug errors and their causes [1,2]. Since the Institute of Medicine (IOM) raised awareness of human error in 2000, numerous initiatives have been undertaken to improve patient safety, including the epidemiological and etiological detection of pharmacological errors [3]. Studies have shown that drug errors, including pharmaceutical errors, side effects, failure to adhere to recommended treatment, and inadequate medication delivery, result in thousands of deaths in the United States each year. Additionally, these errors contribute to increased hospital expenses and longer lengths of stay, estimated at around two days and $2,000 to $2,500 per patient [4]. The emergency department deals with a high volume of predominantly unstable patients, demanding rapid decision-making. Due to the lack of ongoing patient care continuity and an inconsistent information system for comprehensive care, healthcare providers often face situations where treating patients occurs without adequate background information, leading to decisions made with limited insight [5,6]. As a consequence, there is a suggestion that the emergency department might be more prone to experiencing pharmacological errors compared to other hospital units.

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fatigue and exhaustion, followed by distractions from patients, colleagues, or events within the unit. Other identified causes included failure to cross-check the patient's name with the medication administration record (MAR), confusion arising from the similarity between two drug names, miscalculation of doses, incorrect prescription by physicians, improper setup or adjustment of infusion devices by nurses, confusion regarding the types and functions of infusion devices, illegible handwriting by physicians, and, lastly, poor-quality or damaged medication labels and packaging [6].

As evidenced above, the causes of medication errors vary widely, and it is vital that they be investigated due to their potential serious consequences for patients and healthcare providers. The aim of this study is to evaluate nurses' perceptions toward medication errors by quantifying their acknowledgement and understanding of how errors can be prevented.

II. METHODS

This study utilised a descriptive cross-sectional design. A convenience sampling method was employed, and included all eligible nurses available in the selected emergency department of a tertiary hospital in Saudi Arabia. The data collection tool was a self-made questionnaire, designed and adapted by the researchers based on literature reviews and scientific articles [7-9]. A medication error was defined as "any drug administered or prepared in a manner that deviates from the prescription chart, manufacturer's instructions, and hospital policy that can be prevented and could result in patient injury" [10].

Data were collected through a paper-based questionnaire given to all participants, consisting of two parts (available in both English and Arabic translation for each question). Part 1 covered demographic data, including age, gender, educational level, years of experience, and place of work in the hospital. Part 2 of the questionnaire consisted of variable questions about nurses' perceptions of the causes of medication errors, reporting medication errors, and perceptions of barriers to reporting medication errors. A pilot study was conducted in the study setting, surveying a targeted group of 10 nurses available in the emergency department during the study's initial phase. After collecting responses from these participants, the clarity and comprehensibility of the questionnaire were thoroughly reviewed to identify any issues that might impact the data collection process, allowing for refinement before administering it to the larger sample. The study period extended for two months, from April 1st to May 31st, 2023.

Data were analysed using the Statistical Package for Social Sciences (SPSS) Version 20. To address ethical concerns, the researchers explained the study's purpose to participants and assured them that their information would remain confidential. Additionally, the questionnaire was anonymous. Inclusion criteria for nurses in this study were at least six months in the emergency room and holding a bachelor's degree or higher. Data analyses were performed using descriptive statistics (frequency, mean, median, and standard deviation) and inferential statistics. *p*-values lower than 0.05 were considered significant.

III. RESULTS

The study included 100 nurses from the selected department, with 96 returning fully completed questionnaires, resulting in a response rate of 96%. The respondents had an average age of 27.7 ± 3.4 years and an average work experience of 7.3 ± 1.9 years. Of the participants, 59 nurses (61.4%) were married, and the majority, 82 nurses (85.4%), were women. 85 nurses (88.5%) held bachelor's degrees, while the remainder had advanced degrees. The participants reported an average monthly work extension of 83.4 ± 43 hours, with 52 individuals (54.1%) having fixed work shifts.

The study found that 46.8% of nurses reported incidents of medication errors in the past year. Of the 96 participants who reported medication errors, 66 (68.7%) had made such errors only once. The most commonly reported medication errors included infusion rate errors, administration of duplicate doses of medication, and medication omission. Further details outlining the types of medication errors are presented in Table 1. According to nurses' reports, the majority of medication errors (97.9%, totalling 94 incidents) did not result in complications.

Regarding the nurses' perceptions of the causes of medication errors, Table 2 shows that such errors could occur when the physician's writing on the doctor order form is difficult to read, when nurses do not receive clear instructions about certain drugs

when medication labels are damaged, and when the nurse incorrectly sets up or adjusts an infusion device.

A chi-square test showed no statistically significant relationship between demographic (age, gender, education) and occupational (type of establishment, work experience, monthly overtime hours) information and medication errors ($p > 0.05$).

IV. DISCUSSION

The majority of nurses in our study cited several causes of medication errors, including those arising from unclear information about specific pharmaceuticals, faulty set-up or adjustment of infusion devices, and dose miscalculation. This is consistent with Al Kassar's (2016) study, which reported that 90% of nurses agree that drug errors occur when nurses lack clear instructions about certain drugs, and 88% of nurses believe that drug errors occur when the nurse incorrectly sets up or adjusts an infusion device [11].

Notably, almost half of the participating nurses reported making medication errors. It is important to clarify that, while the majority of nurses identified various causes of medication errors, this does not imply that all participating nurses had personally committed medication errors themselves. The discrepancy in percentages may be attributed to the nature of responses in the survey, where nurses might acknowledge general causes of errors without necessarily admitting to their own direct involvement in such errors. In several studies, the percentage of medication errors committed by nurses ranged from 10% to 67% [12-14]. The significant difference in error rates between this study's findings and comparable findings in other countries may be attributed to unfavourable post-reporting reactions from peers, coaches, and managers [15], failure to follow up on medication, insufficient systemic registration and notification [16], patients' poor physical condition, unfavourable physical conditions, noise, and crowding [17].

Various strategies can be implemented to address medication errors among nurses in the emergency department. Firstly, it is crucial to ensure adequate staffing levels to reduce fatigue-induced errors. Additionally, the competency of nurses can be enhanced by providing ongoing training and education programs about medication safety, including dosage calculations and proper administration techniques.

The use of technology, such as computerised physician order entry (CPOE) systems and barcode scanning, can help to minimise errors by improving accuracy and reducing miscommunication.

Standardising medication procedures and protocols and introducing interdisciplinary collaborations among healthcare providers are also fundamental steps to prevent medication errors. Implementing a double-check system for high-risk medications and employing clinical decision support systems can enhance efficiency and identify potential errors before they occur. Furthermore, fostering an open culture where reporting of all medication errors is encouraged and creating an environment of continuous learning can help identify recurring patterns and implement corrective measures.

V. LIMITATIONS

Challenges faced by this study stemmed primarily from its relatively small sample size and the constraints imposed by the designated time frame. The decision to employ a convenience sampling method, while practical for the study's context, resulted in a limited number of participants. This constraint could potentially affect the generalisability of the findings to a broader population of nurses in emergency departments. The small sample size may not fully capture the diversity of experiences and perspectives within the nursing workforce.

Moreover, the fixed duration of the study, spanning two months, imposed time limitations on data collection and analysis. This temporal constraint may have influenced the depth and breadth of the insights gained. A more extended data collection period could have allowed for a larger sample size and a more comprehensive exploration of the factors influencing medication errors among nurses.

These limitations underscore the need for cautious interpretation of the study's results and the generalisation of findings to broader populations. Additionally, they highlight the potential for future research endeavours to address these constraints, perhaps through longitudinal studies with larger and more diverse samples to enhance the robustness and applicability of the conclusions drawn here.

VI. CONCLUSION

We conclude that medication errors are common in the ED, but seldom result in adverse events. Most medication errors occur during the prescribing and administering phases of the medication use process, and more than two-thirds of the nurses studied had a good perception of the causes of medication errors. There was no statistically significant relationship between the nurses' perception of the causes of medication errors and their characteristics. Multifaceted prevention strategies must be implemented to mitigate medication errors in the ED. These include improving nurse education and training, enhancing communication and teamwork, implementing robust medication reconciliation processes, and utilising technology-based tools to support medication administration processes. Nurse education programs should focus on improving medication calculation skills, enhancing knowledge of high-risk medications, and situational training in simulated environments. Additionally, clear and concise communication should be encouraged among healthcare team members to minimise misunderstandings and misinterpretations of medication-related information. Medication reconciliation, which involves systematically comparing a patient's medication order with all medications being taken, should be performed at every transition of care to ensure accuracy.

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VIII. REFERENCES

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Table 1. Types of Medication Errors.

Medication Error	**Number**	**Percent (%)**
Omission of medicine	6	6.25
Medication at the incorrect time	3	3.125
Incorrect Medication	5	5.20
Administration of two doses of medicine instead of one	10	10.41
Administering medication of one patient to another patient	4	4.16
Incorrect infusion rate	14	14.58

Table 2. Factors Affecting Medication Errors.

Factors Affecting Medication Errors	**Number**	**Percent (%)***
Large variety of drugs in the ward	2	2.08
Nurses are tired and exhausted	23	23.95
Similarities between drug names	11	11.45
Using some "rarely-used" drugs	2	2.08
Different medicinal dosages	9	9.375
Damaged medication labels	9	9.375
High patient-to-nurse ratio	6	6.25
Did not administer medication to patient on time	2	2.08
Nurse is distracted by another patient or co-worker	13	13.54
Physician's writing on the doctor order form is difficult to read	96	100
Device Handling Errors	7	7.29
Confusion between two drugs with similar names	4	4.16

*It is worth noting that respondents selected multiple factors affecting medication errors, resulting in the sum exceeding 100%.