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# Underreporting of medication errors in nursing students: a threat to patient safety

Mozhgan Kalantarzadeh[1*], Maryam Hosseinnejad [2]

[1]MSc, Department of Medical Surgical, Faculty of Nursing and Midwifery, Islamic Azad University, Kerman Branch, Kerman, Iran.
[2]MSc, Department of Community Health Nursing, Faculty of Nursing and Midwifery, Islamic Azad University, Kerman Branch, Kerman, Iran.

*Corresponding Author*:
Mozhgan Kalantarzadeh
Address: Dept. of Medical Surgical, Faculty of Nursing and Midwifery, Islamic Azad University, Kerman Branch, Kerman, Iran.
Email: klntr@yahoo.com
Tel: 03413210043
Fax: 03413201770

## Abstract

Medication errors (MEs) are among the most prevalent health errors threatening patients' safety and are regarded as an index for determining patients' well-being in hospitals. The purpose of this study was to explore the ME reporting rate and causes of underreporting among the nursing students in the city of Kerman.

In this cross-sectional study, 90 nursing students in the seventh and eighth semesters of Kerman University of Medical Sciences and Islamic Azad University of Kerman were selected. Data collection tool was a researcher-made questionnaire consisting of three parts: 1) demographic information, 2) types and causes of medication errors, and 3) causes of underreporting. Data analyses were performed by descriptive statistics and inferential statistics. The SPSS 16 statistical software was used in this study and $P$ values less than 0.05 were considered significant.

According to the data, 66.7% of the nursing students in this study had made MEs, and the rate of underreporting was calculated at 40%. The most important causes of MEs were illegible data cards and prescriptions, and the major reasons for underreporting were fear of low evaluation scores, reprimand and punishment. There was no statistically significant relationship between demographic characteristics and underreporting of MEs in nursing students ($P > 0.05$).

Findings of this study showed that the rate of MEs is high among nursing students and that medication errors are a major problem in the field of nursing. Patient safety and MEs are two important topics in health care, and recognition of the factors contributing to the latter may decrease their frequency and consequently improve patient safety and the quality of care.

**Keywords:** *medication errors, nursing students, reporting, patient safety*

*Introduction*

Medication errors (MEs) are a significant threat to patient safety (1); they are the most common medical errors and among major challenges to the health system (2). Twenty one percent of all severe accidents in hospitals are related to medication errors (3). The consequences are rather serious, as 5% of all MEs are fatal, while about 50% are preventable (4). The consequences include disability, physical or mental injuries, long-term hospitalization and death (5). An annual 1.5 million patients are harmed due to MEs, and the associated costs are estimated at 3.5 billion dollars per year (6). The American Institute of Medicine defines error as the failure to fully implement the actions planned or application of a defective method to achieve a purpose (7). A large number of health care providers, including doctors, pharmacists and nurses, make medical errors. Nurses play a key role in the implementation of medication orders, and are therefore responsible for the greater portion of MEs (8). Nurses are the second group facing with MEs because they play an important role in the administration, preparation, and distribution of medication orders in hospital (9). Medical errors are either the result of health care providers' wrong approach, or their erroneous performance. Execution of physicians' orders is a main component of nurses' duties and an important part of the healing process and patient care (10). The rate of MEs made by both nurses and nursing students is rather high. Hence, identifying such errors and their causes is of utmost importance for the safety of patients. Numerous studies have revealed the risk factors and causes of medication errors made by students to be lack of adequate pharmacological information, drug miscalculation, lack of attention to dosage and errors in transcribing medication to the kardex or drug cards (11, 12). One strategy to reduce MEs is to report them, but various studies point to the fact that the reporting rate of medication errors is low (13).

Most students believe that clinical errors can put the patient's life at risk; however, they generally do not take the issue seriously, and in many cases try to keep them covered (14). As shown by several studies, students do not report their medication errors due to fear of being blamed by doctors, nurses, patient's relatives and trainers, as well as concerns about accusations of incapability, possible impact on their evaluation scores, and legal issues (11, 15). The philosophy behind the safety culture in modern health care perceives errors as a sort of system failure and defect. Based on this culture, health care organizations are changing their practice of blaming the individual to identifying the underlying risk factors (16). Many health care organizations agree that blame and punishment would not reduce MEs. The overall approach to medication errors is determined by the culture of justice and fairness prevalent in the system. In a fair and just culture a balance is established between the need for disciplinary action and the need to learn from errors (17). In such an environment, employees can report their errors easily and without fear of blame (18). Nevertheless, several studies indicate that despite the myriad benefits and ethical aspects of error detection and reporting, nurses and nursing students may hesitate to report their errors in order to protect themselves from penalties and administrative laws (19).

Even though it is inevitable for nursing students to make MEs, they are often preventable. Therefore, it seems necessary to study the factors underlying these errors in order to take systematic measures in minimizing or preventing them. Since reporting medication errors can prevent their recurrence and preserve patient safety, identifying the causes and reporting barriers appears to be essential. It should be noted that once nursing school graduates enter the work force, they will make up the majority of the medical staff in health care centers (20). Seeing as this topic has not been investigated in the Kerman province so far, the present study was conducted with the aim to determine the causes of medication errors and factors affecting underreporting of MEs from the nursing students' perspective in Kerman.

*Method*

This descriptive study was conducted on a total of ninety nursing students in the seventh and eighth semesters of Kerman University of Medical Sciences and Islamic Azad University of Kerman. These students were selected between February and November 2013. Data collection tool was a researcher-made questionnaire that had been prepared and adjusted based on literature review and scientific papers (1, 7, 12).

The questionnaire consisted of three parts. The first part collected demographic information (age, sex, marital status, and work experience at the same time as attending nursing school) and contained questions related to medication errors (their frequency, witnessing other students make these errors, and reporting them). The second part pertained to factors affecting medication errors including human and organizational factors and drug-related factors. The third part examined factors influencing the underreporting of medication errors. The validity of the questionnaire was confirmed using content validity method and the opinions of 10 academic members familiar with the subject, and their modifying and corrective comments were applied. The test-retest method was used to confirm the reliability of the questionnaire. For this purpose, a group of ten nursing students who met the research subject criteria were inter-

viewed and tested in two stages with a ten-day interval using the questionnaire. After data collection, the internal consistency of the last two questionnaires was determined at 0.83 and 0.86 respectively.

After determining the validity and reliability of the data collection tool, the questionnaire was distributed among the participants. The purpose of the study and instructions on how to complete the questionnaire were explained to the participants, who were assured of confidentiality and anonymity. They were also told that the results of the study would not be used for evaluations in the internship program. Data were analyzed using SPSS 16 (SPSS, Inc., Chicago, IL, USA) at an alpha level of 0.05. Descriptive statistics (frequency, mean, median, standard deviation) and inferential statistics (Chi-square, $t$-test and Mann-Whitney $U$ test) were generated for variables.

### Results

The majority of the students (84.4%) were female. The mean age of the students was 22.56 ± 1.37, with a minimum of 20 and a maximum of 28 years old. Of all participants 74.7% were married, and 11.1% were employed in health care centers while attending nursing school.

Of the 90 students who participated in the study, 60 students (66.7%) had made MEs. The rate of underreporting of medication errors by nursing students was 40%. According to the students, the main factor contributing to medication errors was illegible prescriptions, and the least significant one was infrequent use of certain medications (Table 1). The results of the $t$-test showed that from the students' point of view, most medication errors were due to human and organizational factors ($P$ = 0.0001). Among the human factors affecting underreporting of MEs, "fear of the impact of MEs on student evaluation" and "fear of being blamed by the instructor and the ward nurses" were the most significant ones (Table 2).

**Table 1 - Distribution of the frequency of factors affecting medication errors by nursing students in the city of Kerman in 2013**

| Factor | | High No. (%) | Moderate No. (%) | Low No. (%) | Never No. (%) | Mean | SD |
|---|---|---|---|---|---|---|---|
| **Human and organizational factors** | Discouragement and apathy towards the nursing profession | 47 (52.2) | 23 (25.6) | 14 (15.6) | 6 (6.7) | 3.23 | 0.949 |
| | Overwork and fatigue | 51 (56.7) | 26 (28.9) | 9 (10) | 4 (4.4) | 3.38 | 0.842 |
| | Performing other tasks at the same time as administering medication | 53 (58.9) | 25 (27.8) | 12 (13.3) | 0 (0) | 3.46 | 0.721 |
| | Inadequate training | 56 (62.2) | 19 (21.1) | 10 (11.1) | 5 (5.6) | 3.40 | 0.897 |
| | Presence of patients' relatives | 14 (15.6) | 25 (27.8) | 37 (14.1) | 14 (15.6) | 2.43 | 0.937 |
| | Inadequate supervision | 35 (38.9) | 6 (6.6) | 25 (26.7) | 4 (4.4) | 3.03 | 0.917 |
| | Lack of pharmacological information | 47 (52.2) | 34 (37.8) | 6 (6.7) | 3 (3.3) | 3.39 | 0.760 |
| | Illegible kardex | 54 (60) | 28 (31.1) | 7 (7.8) | 1 (1.1) | 3.50 | 0.691 |
| | Illegible prescriptions | 58 (64.4) | 26 (28.9) | 4 (4.4) | 2 (2.2) | 3.56 | 0.689 |
| **Drug-related factors** | Use of abbreviated names | 32 (35.6) | 41 (45.6) | 15 (16.7) | 2 (2.2) | 3.14 | 0.773 |
| | Similarities in drug names | 33 (36.7) | 39 (43.3) | 15 (16.7) | 3 (3.3) | 3.13 | 0.810 |
| | Similarities in packaging | 23 (25.6) | 37 (41.1) | 26 (28.9) | 4 (4.4) | 2.88 | 0.846 |
| | Infrequent use of certain medications | 7 (7.8) | 27 (29.9) | 42 (46.7) | 14 (15.6) | 2.30 | 0.827 |
| | Identical or similar packaging for different doses | 15 (15.6) | 39 (43.3) | 26 (28.9) | 11 (12.2) | 2.62 | 0.894 |

**Table 2 - Distribution of the frequency of human factors affecting underreporting of medication errors**

| Questions | High No. (%) | Moderate No. (%) | Low No. (%) | Never No. (%) | Mean | SD |
|---|---|---|---|---|---|---|
| Fear of the impact of MEs on student evaluation | 56 (62.2) | 23 (25.6) | 5 (5.6) | 6 (6.7) | 3.43 | 0.875 |
| Fear of being perceived as incompetent and untrustworthy as a nursing student | 53 (58.9) | 8 (8.9) | 23 (25.6) | 6 (6.7) | 3.37 | 0.905 |
| Fear of non-cooperation of ward personnel with the student in the following days | 38 (42.2) | 35 (38.9) | 10 (11.1) | 7 (7.8) | 3.16 | 0.911 |
| Fear of the patient noticing the ME and his/her negative attitude toward nursing students | 35 (38.9) | 37 (41.1) | 12 (13.3) | 6 (6.7) | 3.12 | 0.885 |
| Fear of being blamed by the instructor and ward nurses | 56 (62.2) | 21 (23.3) | 6 (6.7) | 7 (7.8) | 3.41 | 0.898 |
| Fear of legal issues after reporting | 46 (51.1) | 24 (26.7) | 15 (16.7) | 5 (5.6) | 3.23 | 0.925 |
| Too much concern on the part of the nursing instructor regarding medication | 26 (28.9) | 41 (45.6) | 19 (21.1) | 4 (4.4) | 2.99 | 0.828 |
| Focus of the nursing instructor and head nurses on persons responsible for MEs, regardless of other factors involved | 40 (44.4) | 27 (29.9) | 15 (16.7) | 8 (8.9) | 3.10 | 0.984 |
| Insignificance of some MEs, such as those involving medications with no side effects | 24 (26.7) | 40 (44.4) | 20 (22.2) | 6 (6.7) | 2.91 | 0.870 |
| Lack of a clear definition for the term "medication error" | 16 (17.8) | 42 (46.7) | 26 (28.9) | 6 (6.7) | 2.76 | 0.825 |
| Forgetting to report MEs | 12 (13.3) | 33 (36.7) | 28 (31.1) | 17 (18.9) | 2.44 | 0.949 |

There was no significant relationship between MEs and gender, age, marital status, work experience at the same time as attending nursing school, and the items on the questionnaire pertaining to factors affecting medication errors or underreporting ($P > 0.05$).

**Discussion**

The results of this study showed that on average, nursing students reported 60% of medication errors to trainers. In other studies, including one conducted on nursing students in Tehran and another similar study in Arak, these rates were reported to be 46.6% and 72.2% respectively (11,15). The same rate was 32.7% in a study by Ross et al. (21).

It is clear that a low prevalence of MEs is considered desirable by authorities; however, it should be noted that minimizing the difference between the number of errors and the reporting rate is extremely important. Studies show that nowadays MEs are among the main problems in health care environments and most importantly, the management and prevention of these errors depend on detailed reporting. Executives and instructors should not focus on the undesirable consequences of such reports and simply apply punishment; they must use their means to eliminate the obstacles in the way of reporting and attempt to compensate the damages and resolve the complications caused by nursing errors as much as possible (1,7). For this purpose, Aristotle's views can be applied to foster the principle of honesty among nursing students as

a virtue. In this manner, students can be encouraged to view the reporting of MEs as a moral task in the patient's best interest aimed at maximizing benefits (11).

Among the factors affecting the incidence of MEs in nursing students, illegibility of doctors' prescriptions is worth mentioning. In a study on the opinions of educators about MEs and their causes and solutions, nearly all participants agreed that bad writing and illegible prescriptions and drug instructions in the kardex or drug card are the major causes of MEs in nursing students. They also believed that inadequate pharmacological information and incorrect drug calculations are other important factors contributing to the incidence of MEs (22). In several studies with nurses as samples, illegible prescriptions have been reported among the most important risk factors for MEs (23 - 25). Shulman et al. and Kopple et al. argue that computerized physician order entries would lead to reduced medication errors and improved patient outcome (26, 27).

In this study, insufficient training (62.2%) was identified as one of the most common causes of MEs. In a similar study, 39.47% of nursing students believed that the credit hours dedicated to pharmacological theory is insufficient and theoretical education on the subject is not in conformity with the students' practical needs (28). Therefore, increasing the credit hours of pharmacology, keeping education consistent with the practical

needs of students, and offering more extensive training on common drugs used in various wards can be effective preventative measures. Given that "Nursing Principles and Skills" is a course that contains many important topics, little time is allocated to medicinal topics and related subjects. Nevertheless, increasing the students' pharmacological knowledge has been introduced as an important strategy to reduce medication errors and patient harm (29, 30).

In this study, performing other tasks at the same time as administering medication was identified as one of the most important factors affecting MEs (58.9%). Based on a systematic review by Mansouri et al., inadequate knowledge about medications was the most common reported contributory factor for MEs in Iran (31).This can be due to various overlapping assignments and functions expected from nursing students because of nursing staff shortage in the wards, which leads to increased workload, burnout lack of focus and frequent medical errors. In several studies with nurses as samples, high workload has been reported as one of the main reasons for medication errors (32, 33).

Fear of being blamed by the instructor was among the reasons for underreporting of MEs in the present study and another one by Kohestani et al. (15). According to Sanagoo et al. (2012), nursing students' typical reaction to MEs is to "hide" them. Disclosure of medical errors has been associated with anger in physicians, nurses, patients' relatives and trainers, as well as a sense of guilt, fear of low evaluation scores, blame and peer embarrassment (14). In the review by Aronson et al., personal fears have been stated as major perceived barriers (34). In several studies it was demonstrated that fear of being reprimanded and punished is the most frequent barrier (35-37).

In the present study, similarities in drug names (36.07%) and use of abbreviated names (35.6%) were reported as the most important medicinal factors affecting the incidence of MEs. In a study by Ghasemi et al., 87.2% of the nurses stated that similar labels and packaging were a major cause of MEs. They also believed that pharmaceutical companies and regulatory institutions should monitor the process of naming and packaging drugs with more care, especially in the case of dangerous drugs such as potassium chloride, magnesium sulfate, etc. since errors in their usage can lead to severe injuries and even death (38). Quoting John, Kohestani et al. writes that the American Heart Association (2005) has described one of the most important causes of MEs in cardiac intensive care unit to be the similarities in the names of medicines such as Amrinone, Amiodarone, Dobutamine and Dopamine (12). Berman's study showed that 25% of medication errors are due to confusion about medications with similar names, and 33% are the result of similar packaging and labeling (39). Enguidanos and Brumley also reported the use of medical abbreviations as one of the most important causes of medication errors (25). Thus, avoiding the use of less common abbreviations can be effective in reducing the incidence of errors (40).

It would be ideal if medical errors did not occur in the first place, but when they do, the manner in which they are handled is of utmost importance (19). Many health care organizations agree on avoiding blame and punishment as a strategy to reduce medication errors (17). An individual, non-systematic approach to human error and the blaming culture reflect the weakness of the system, and will counteract positive, resolving measures. Therefore, proper communication between teachers and students, avoiding negative reactions in case of medication errors, and encouraging the students to report errors will have positive and useful outcomes.

### Conclusion

This study demonstrates that medication errors are a major problem among nursing students, particularly during the internship period. While it may be inevitable for nursing students to make MEs, all individual and system-related factors involved in their occurrence must be identified. Thus, appropriate changes and modifications can be made in the education system in order to develop an efficient strategy for reporting and acquire a systematic approach (rather than an individual one) toward the error to prevent future medication errors. The role of nursing trainers is very important in minimizing and preventing MEs, especially in higher semesters. Moreover, educational content should be designed carefully in order to reduce such errors, even though many of them are negligible and may not cause any serious harm to the patients. Reporting medication errors must be considered a moral duty as it is in the patient's best interest and can maximize health care benefits and improve patient safety. Through positive reactions to the reporting of MEs, nursing trainers can handle the issue more appropriately and use these reports as a powerful tool for studying the whole process through analysis of causes and effects.

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