Medication Errors by Nurses in the Public Wards of the Hospitals in Sabzevar, Iran

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A R T I C L E I N F O

ABSTRACT

Background & Objective: Medication errors by nurses are among the main causes of mortality across the world. The present study aimed to investigate the causes of medication errors by nurses in the public wards of the hospitals in Sabzevar, Iran.

Materials and Methods: This descriptive-analytical study was conducted on 96 nurses employed in the public wards of the hospitals in Sabzevar, Iran in 2015. Subjects were selected via random sampling. Data were collected through observation and using standard checklists of oral and injective medications based on the references of nursing services. Data analysis was performed in SPSS version 20 using Fisher's exact test, Chi-square, Kruskal-Wallis test, and ANOVA.

Results: The main cause of medication errors was the management of nursing services and lack of balance between nurses and patients. A significant difference was observed between the name of the hospitals and medication errors by nurses in using injective drugs (P=0.002). However, no significant difference was reported between work shift and medication errors by nurses (P=0.812).

Conclusion: As the hospital authorities confirmed the lack of personnel as the major cause of medication errors, this issue should be addressed through obtaining authorization from nursing organizations in the employment of nurses in healthcare systems.

Introduction

Patient safety is of paramount importance in the healthcare system of Iran (1). Nowadays, medical errors are considered to be significant challenges in the healthcare systems across the world, especially in developed countries, so that medical incidents are the eighth and fifth cause of mortality across the globe and in the United States, respectively (2). Researchers divide medical errors into two categories of structural errors (systematic and technical errors) and human errors (errors in treatment, data recording, medication, and diagnosis).

Medical errors may cause substantial damages to patients and healthcare systems (3). Furthermore, they may lead to mortality and disability in healthcare facilities (4). Although various patient safety protocols and technologies have contributed to the reduction of these issues, medical errors and incidents remain a significant challenge in health care (5, 6).

In general, medication errors refer to the predictable events induced by presenting or prescribing false medications to patients. Such incidents adversely affect professional nursing services and healthcare outcomes (7). The first report on medication errors was published in 1940, which has been adopted by many researchers (8). Reporting of medication errors in several hospitals in the United States and United Kingdom attracted the attention of researchers across the world (9).

According to statistics, medication errors affect 3-6.9% of patients. It has been estimated that a minimum of one death occurs every day in the hospitals in the United States due to medication errors (10). Moreover, medical malpractice cases, such as diagnosis, prescription, and consumption of medications impose an estimated financial burden of five million dollars on the teaching hospitals in the United States.

Nurses play a pivotal role in patient safety, and medication errors are considered to be the most predictable cause of death in hospitals. Therefore, this issue is associated with great anxiety in the nursing profession (1). Administration of drugs is one of the main tasks of nurses, which requires the use of sophisticated techniques, as well as the consideration of the maturity level, safety, and physical and mental conditions of the patient (8). In addition, nurses must be attentive and prepared, while having adequate knowledge and decision-making skills regarding the rules of drug administration (11).

In order to prevent medication errors, nurses often apply five key principles in the administration of drugs, including 'correct patient', 'correct drug', 'correct dose', 'correct mode', and 'correct time'. These principles have been shown to prevent and diminish medication errors in healthcare systems (12). Correspondingly, the most common detected mistakes in drug administration are errors in drug prescription, drug consumption at the wrong time, administration of a wrong dose, errors in drug density, false prescription, and drug administration to the wrong patient (7).

In the case of a medication error, nurses are more exposed to criticism than the other hospital staff. This is probably due to the responsibility of nurses for drug administration, which stresses on the role of these professionals in maintaining patient safety (13).

Despite the lack of documented reports on the rates of medical and nursing errors in Iran, it is conjectured that these errors are as alarming as western countries considering the massive number of legal complaints about the medical and nursing errors in Iran (14). In this regard, the most frequent cause of medical errors has been reported to be the illegible handwriting of the physician in the medical prescription (49%). As for nurses, some of the main influential factors in errors are writing the name of drugs in the patient's card/cardex (26%) and heavy workload (15).

With this background in mind and considering the problems caused by medication errors, the only effective approach to preventing such events seems to the full observance of the related principles by nurses. Conclusively, assessing the causes of nursing neglect could also diminish the risk of medication errors.

The present study aimed to propose some measures for promoting the correct methods of medication. It is hoped that our findings would optimize the use of these methods in hospitalized patients and subsequently decrease the rate of medication errors.

Materials and Methods

This descriptive-analytical, cross-sectional study was conducted in three hospitals in Sabzevar, Iran in 2015 after obtaining the required permit from Sabzevar University of Medical Sciences. Sample population consisted of 96 nurses, who were employed in Vasei Hospital, Dr. Beheshti Hospital, and Shahidan-e-Mobini Hospital and selected via random sampling.

In every work shift (morning, afternoon, and night), two nurses were assessed by nursing apprentices and hospital supervisors at the time of drug administration. Performance of the nurses was evaluated based on the standard checklist of drug administration about oral drugs (38 items) and injective drugs via intravenous cannula and volume expander sets (22 items). The checklist was in accordance with forms of nursing services, published under the supervision of the Nursing Organization in 2008. The items in the checklist were responded in a yes/no format. Complete performance of nurses was scored one (Yes), which was the maximum score in the checklist, and poor performance was indicated by score zero (No), which was the minimum score in the checklist.

The inclusion criteria of the study was having a bachelor's or master's degree in nursing, and observing negligence in nursing performance resulted in the dismissal of the responsible nurse from the hospital. The supervision was accomplished in accordance with the medication schedule of patients and only concerned the administration of oral and injective drugs as the most common nursing practices. In the next stage, the factors that prevented proper drug administration were identified in the nurses by the students and supervisors in the management section, public wards, and nursing stations.

Data on nursing organization and opinions of the nurses and supervisors were collected using the standard checklist. The validity of the checklist was confirmed by a panel of nursing experts at the School of Nursing and Midwifery, and its reliability was confirmed at the Cronbach's alpha of 0.80. Data analysis was performed in SPSS version 20 using Fisher's exact test, Chi-square, Kruskal-Wallis test, and ANOVA, and P-value of less than 0.05 was considered statistically significant.

Results

According to the information in Table 1, the checklist score of the nurses regarding the administration of oral drugs was 65.24%, while it was 67.19% regarding the administration of injective drugs, and nurses with average performance achieved the score of 65.92%.

Table 1. Ranking and Scores of Nurses in Administration of Oral and Injective Drugs

Ranking	%	Mean Score MZ+/-SD	Checklist
Average	65.24	24.79+/-5.69	Oral Drugs
Average	67.19	14.78+/-3.58	Injective Drugs
Average	65.92	39.55+/-8.45	Total

Table 2. Priority of Failure in Proper Medication in Viewpoint of Authorities and Supervisors of Hospitals

	Viewpoint of Authorities and Supervisors	First Priority N (%)	Second Priority N (%)	Third Priority N (%)
Factors Concerning Management	Lack of nursing personnel in proportion to hospitalized patients in wards	10 (41.66)	2 (8.33)	2 (8.33)
	Supervisory methods in wards	2 (8.33)	1 (4.16)	1 (4.16)
	Drug prescription methods	2 (8.33)	-	-
	Illegible handwriting of physician	3 (12.5)	1 (4.16)	-

	Illegibility of cardex	1 (4.16)	1 (4.16)	-
Factors Concerning Wards	Heat and warmth in wards	2 (8.33)	1 (4.16)	1 (4.16)
	Noise in wards	-	2 (8.33)	1 (4.16)
	Room conditions (e.g., light, physical space)	-	2 (8.33)	2 (8.33)
	Lighting of wards	-	1 (4.16)	4 (16.66)
	Heavy workload	-	1 (4.16)	1 (4.16)
	Classification of drugs in medicine chests	2 (8.33)	-	2 (8.33)
	Drug protocol of wards	1 (4.16)	1 (4.16)	2 (8.33)
Factors Concerning Nurses	Unwillingness toward nursing	-	-	1 (4.16)
	Lack of knowledge about medications	-	2 (8.33)	1 (4.16)
	Economic problems	1 (4.16)	1 (4.16)	3 (12.5)
	Family problems	-	3 (12.5)	1 (4.16)
	Emotional and psychological problems	-	-	-
	Lack of time	-	1 (4.16)	1 (4.16)
	Exhaustion due to workload	-	2 (8.33)	-
	Lack of experience	-	-	-
	Carelessness	-	1 (4.16)	-
	Lack of educational knowledge	-	1 (4.16)	1 (4.16)

Table 3. Important Priorities Regarding Negligence in Drug Administration in Viewpoint of Authorities and Supervisors of Hospitals

Priority	Factors Concerning Management	Factors Concerning Wards	Factors Concerning Nurses	Test	P-value
1	18	5	1	Fisher's exact test	<0.001
2	5	8	11	Chi-square	0.325
3	3	13	8	Fisher's exact test	0.05

Considering the wide range of the viewpoints proposed by the head nurses and supervisors in the hospitals, we have only mentioned the three main causes of medication errors. According to the information in tables 2 and 3, there was a significant difference in the first priority factors (P<0.001), so that the factors concerning management had the least important role, while inadequate nursing

staff in the hospitals was considered to be the most significant influential factor in the occurrence of medication errors. However, no significant difference was observed among the factors of the second priority (P=0.325). Moreover, a significant difference was noted among the factors of the third priority (P=0.05), so that the factors concerning management had the least significant effect on the occurrence of medication errors

Table 4. Correlation of Works Shift and Low Scores of Medication Errors in Oral and Injective Drug Administration

Drug Administration Mode	Work Shift	Mean Score	Test	P-value
Oral	Morning	50.33	Kruskal-Wallis	0.816
	Evening	49.14		
	Night	46.03		
Injective	Morning	46.33	Kruskal-Wallis	0.760
	Evening	51.33		
	Night	47.84		
Total			ANOVA	0.812

According to the information in Table 4, work shift and medication errors by nurses had no significant relationship in terms of the administration of oral drugs (P=0.816) and injective drugs (P=0.760). Furthermore, the results of ANOVA indicated no significant correlation between work shifts and nursing errors in medication (P=0.812).

Table 5. Correlation of Name of Hospitals and Low Scores of Medication Errors in Oral and Injective Drug Administration

Drug Administration Mode	Hospital	Mean Score	Test	P-value
Oral	1	51.44	Kruskal-Wallis	0.060
	2	52.69		
	3	34.50		
Injective	1	41.98	Kruskal-Wallis	0.002
	2	68.08		
	3	50.67		
Total	1	47.22	Kruskal-Wallis	0.091
	2	60.42		
	3	40.86		

According to the information in Table 5, name of the hospital and low scores of medication errors in the administration of oral drugs had no significant correlation (P=0.060). Similarly, no such correlation was observed between the low scores of injective drug administration and name of the hospital (P=0.002), so that the nurses

Discussion

According to the results of the present study, medical errors in the healthcare system cause substantial damage to patients and hospitals (16). As medical errors are considered to be an indication of the incapability of the hospital (17), the growing number of such incidents might be a threat to healthcare organizations.

According to the findings of Fry and Stratton et al., the rate of nursing errors is 67% and 33% in American and British hospitals, respectively (18), while this rate has been estimated at 5-50% in the hospitals in Iran; 64.5% of these incidents account for nursing errors (19). Furthermore, in a study performed in Middle-Eastern countries, the rate of medication errors was reported to be 9.4-80% at the time of medication orders (20). It is notable that the definition of medical errors, their assessment tools, and error reporting systems vary in different countries, which could affect the findings in this regard. Nevertheless, the results are correlated, indicating the high frequency of nursing medication errors in hospitals.

According to the current research, inadequate nursing staff in proportion to the hospitalized patients in wards was the most important cause of medication errors in the viewpoint of head nurses (41.66%). This issue might also involve the hospital management, representing a major challenge in the services provided by healthcare systems (21). Among the other causes of medication errors were the family problems

employed in hospitals one and two had the lowest and highest rate of medication errors, respectively. Considering the association of the name of the hospital and low scores of medication errors in the nurses, it could be inferred that there is no significant correlation between these parameters (P=0.091).

of nurses and lack of proper lighting in the hospital wards.

In a study by Shahroukhi et al., carelessness (41%), the main causes of medication errors were reported to be inadequate nursing staff in proportion to the hospitalized patients in wards (13.1%) and illegible handwriting of physicians and nurses (11.5%) (22). According to a study by Mosa-Alrezaee et al., the major causes of medication errors were inadequate nursing staff in proportion to the hospitalized patients, high variety of drugs, large number of patients with critical conditions, and heavy workload of nurses (23).

To the best of our knowledge, heavy workload of nurses in the hospitals in Iran requires nurses to perform multiple tasks within a short time. Negligence of the adverse effects of drugs may lead to irreparable damages to the health status of patients, while nurses are able to diminish the damage by up to 50% through adherence to the five principles of 'correct patient', 'correct drug', 'correct dose', 'correct prescription', and 'correct administration' (24).

According to the findings of the current research, there was no statistically significant difference between the medication errors by nurses and work shifts, which is in line with the study by Haji Babaee (25). However, the finding of other studies in this regard have indicated that night shifts may deteriorate the performance of nurses due to factors such as insomnia, poor concentration, physical activities, and

changes in the heart rate (26). Additionally, night shifts may increase the risk of nursing errors through disturbing the consciousness level of nurses (27).

In the present study, no significant difference was observed in the administration of oral drugs between the three hospitals. The third hospital had the minimum medication error rate, which could be attributed to the moderate workload of the nurses in the wards (i.e., few hospitalized patients), continuous and effective training of the nursing staff about the methods of drug administration, and high-quality supervision by the authorities.

According to the current research, there was a significant difference between the three hospitals in terms of the administration of injective drugs by nurses. The first and second hospital had the minimum and maximum rate of medication errors in using injective techniques, respectively, which could be attributed to the inadequate nursing staff in proportion to the number of the hospitalized patients, heavy workload of nurses, using injective drugs in the form of antibiotics, and lack of standard training for nurses. In an investigation by Phillips et al. in the United States, the most common causes of medication errors were reported to be human factors, such as inadequate knowledge and poor performance (65.2%) (28). Undoubtedly, the quality of medication is affected by constant training (29). In general, our findings indicated a significant difference between the administration of oral and injective drugs in the three studied hospitals.

Conclusion

Considering the increasing rate of medication errors in the administration of oral and injective drugs in the present study and the critical role of patient safety in effective treatment, special attention must be paid to this aspect of health care by the authorities and nursing managers in order to find proper solutions.

In the current research, the most important causes of medication errors by nurses were insufficient nursing staff, which requires the attention of hospitals authorities. For instance, a specific license could be issued for the recruitment of adequate nurses. Additionally, the knowledge and skill levels of nurses play a key role in the effective medication of patients. Nursing authorities and supervisors are also involved in the reduction of such errors by establishing training courses for nursing staff, providing booklets and posters, and distribution of educational aids in various hospital wards. Considering the high rate of medication errors in the hospitals in the current research, it is recommended that further investigation be conducted in this regard in order to prevent these adverse incidents.

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