Research Article

Perceptions of Clinical Nurses About the Causes of Medication Administration Errors: A Cross-Sectional Study

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Abstract

AIM: This study was conducted to determine the perceptions of nurses about the causes of medication administration errors and the rates of reporting errors made or witnessed by them.

METHOD: This methodological, descriptive, multicenter, and cross-sectional study sample of this study included 590 clinical nurses working in an inpatient setting in Turkey. The data were collected using the Medication Administration Error Reporting Survey, which is a self-report questionnaire.

RESULTS: In the study, it was determined that insufficient number of nurses, heavy workloads, and illegible medication orders of physicians were the most common causes leading to medication errors as stated by the nurses. Moreover, 26.1% of the nurses reported that they had made an medication error, and more than half of the nurses reported that they had witnessed medication errors. It was found that 68.8% of medication errors were not reported.

CONCLUSION: It is important to determine the nurses' perceptions about the causes of medication errors to prevent repetition of medication errors and to establish standards for medication safety. Therefore, it may be recommended to reduce workloads of nurses and develop methods to increase the rate of reporting medication errors.

Keywords: Hospital, medication errors, nurse, perception

Introduction

A medication error (ME) is an error that occurs during a process that begins when a clinician prescribes a medication and ends when the patient actually receives the medication (https://psnet.ahrq.gov). A medication administration error (MAE) is an ME that occurs during the medication administration process (Baraki et al., 2018). MEs, which threaten patient safety, are one of the current problems of healthcare systems (You et al., 2015). MAEs are reported to be a type of error leading to the highest rates of mortality and morbidity in patients among other MEs (Feleke et al., 2015; National Patient Safety Agency, 2014).

It is estimated that in the United States, 1.5 million people are affected by MAEs annually. Approximately 7.6 of 1,000 outpatients and 1.2 of 1,000 inpatients die every year because of MAEs (Salami et al., 2019). Studies have revealed that the most common

types of MEs are wrong dose (53.7%), wrong administration time (32.6%), and wrong patients (30.5%) (Baraki et al., 2018). Healthcare personnel more frequently make MEs when they work under heavy workloads (Salami et al., 2019). The most common causes of MEs include communication problems, prescribing, and employee factor (Acheampong et al., 2016).

It is crucial to know the causes of errors to prevent MAEs in terms of patient safety and to plan appropriate interventions (Keers et al., 2013). In the World Health Organization (2016)'s list on factors affecting the MEs, the reasons associated with healthcare professionals are more prevalent (World Health Organization, 2016). In a systematic review, it was stated that the causes of MEs included high perceived workload, inadequate written communication, and problems related to supply and storage of medicines (Keers et al., 2013). The most common causes of MEs perceived by nurses include

insufficient number of nurses in each shift and administration of drugs with similar names or labels (You et al., 2015). Although it is very important to know the causes of the MAEs, the national error reporting system established in 2016 in Turkey does not include the causes of errors. To date, a total of 128.510 errors have been reported to the Safety Reporting System established in 2016 in Turkey, and 4,402 of these errors are MEs (Ministry of Health-Safety Reporting System, 2017). Approximately one-third of the working hours of a nurse include medication administration (You et al., 2015). MAEs are one of the common problems encountered by nurses, and the rates of errors widely vary from country to country (Anderson & Townsend, 2010). Although MAEs are one of the problems frequently experienced by nurses, there is a limited number of studies on this subject in Turkey (Alemdar-Küçük & Aktaş-Yaman, 2013; Cebeci et al., 2015; Toruner & Uysal, 2012).

In the literature review, few studies were found on MEs of nurses in clinical settings. There are no precautions and guidelines for the prevention of MEs in Turkey. Because there are only a limited number of studies on this subject and the reporting system has been newly established, MAEs made by nurses are not well known.

This study focused on determining the perceptions of nurses about the causes of MAEs and their rates of reporting errors made or witnessed by them in the hospital. The study would contribute to the development of solution proposals to prevent errors and provide readers with information about the situation in different countries.

Research Questions
1. What are the perceptions of nurses about the causes of MAEs?
2. What is Turkish validity and reliability of the survey to be used?
3. What are the statuses of nurses to make, witness, and report MEs?

Method

Study Design
This methodological, descriptive, cross-sectional, and multicenter study was conducted between April 23, 2013 and August 1, 2013.

Sample
The population of the study included 1,830 nurses working at 4 different hospitals (university, state, training & research, and private). It was seen in the study using simple random sampling method at an acceptable significance level of 5% and a confidence interval of 99% that minimum 488 nurses could be adequate to represent the population. Although the stratified sampling method was used to identify nurses to be included in the study from the 4 hospitals, the purposive sampling method was employed to determine the number of nurses to be included in the study from the hospitals' clinics. The number of the participants was increased to obtain homogeneous layers. The sample included 590 nurses. When weighting was done on the basis of the number of nurses working in the hospitals, the sample included 590 nurses. Furthermore, 265 nurses from Hospital A, 164 nurses from Hospital B, 117 nurses from Hospital C, and 44 nurses from Hospital D were included in the study. It was determined that 590 nurses included in the study provided an effect size level of 0.45 and a sampling power of 0.95.

The inclusion criteria for nurses were determined as follows: Providing direct patient care, having a working experience of minimum 1 year, and agreeing to participate in the study.

Data Collection Tools
The study was conducted using a self-report questionnaire. The data collection tool includes 2 parts. Whereas the first part consists of the Medication Administration Error Reporting Survey, the second part consists of personal information form. The Medication Administration Error Reporting Survey was developed by Wakefield et al., (1998) from Iova University. Additional questions have been added in line with expert opinions and consensus. The survey was a 6-point Likert-type scale (1: I strongly disagree, 2: I reasonably disagree, 3: I somewhat disagree, 4: I somewhat agree, 5: I reasonably agree, 6: I strongly agree). The questionnaire includes 5 sub-scales as follows: individual, communication, pharmacy, packaging, and system. Higher score indicates that the level of nurses' agreement on the causes of MEs is higher. The 6-point Likert-type scale questionnaire was grouped to include 3 points-to make the statistical evaluation more meaningful and easier by taking statistical counseling during the data evaluation process. The expression "I strongly-reasonably disagree" was replaced with

the expression "disagree," the expression "I somewhat agree-disagree" with the expression "unstable," and the expression "I reasonably-strongly agree" with the expression "agree." The participants were asked to recall the MEs that they experienced during the past month. This questionnaire identifies/measures nurses' perceptions about the causes of MAEs.

The personal information form includes the data related to demographic characteristics (age, sex, duration of working in the hospital, service, duration of working in the service, position in the service, working hours, weekly working hours, number of patients receiving care during daytime, and educational background) as well as the status of making, witnessing, and reporting an ME.

Validity and Reliability of the Questionnaire
For the validity and reliability of the questionnaire, the language validity was performed first. A total of 3 experts (1 faculty member and 2 lecturers) translated the questionnaire from English to Turkish. Back translation from Turkish to English was performed by a certified translator and interpreter. The experts compared the translation with the original version of the questionnaire and made the proposed corrections, and a consensus was reached. To evaluate the content validity (language and content) of the questionnaire, opinions and suggestions were obtained from 9 experts. The validation was performed using the Kendall's coefficient of concordance (Kendall's Wa=0.225, p=0.001).

Whereas explanatory factor analysis was performed for construct validity, Cronbach's alpha coefficient was calculated for reliability. Results of the factor analysis of the questionnaire revealed that 5 sub-scales were formed. The Cronbach's alpha coefficient of the overall questionnaire was found to be 0.92 according to the specified results of the internal consistency analysis. The lowest Cronbach's alpha coefficient was found to be 0.91 for the items, whereas the highest Cronbach's alpha coefficient was 0.92 for them.

Study Procedure
A total of 40 nurses determined using the stratified sampling method were subjected to preliminary application to evaluate the comprehensibility of the questionnaire after the necessary permissions for the application of the questionnaire were

obtained. The questionnaire was finalized after the preliminary application, and these questionnaires and the nurses responding to these questionnaires were not included in the study. The researcher personally introduced the study to his/her colleagues in the hospitals and gave the questionnaire package by explaining the purpose and process of the study for potential participants. The package included an introduction letter, an informed consent form, and a questionnaire. The informed consent form and completed questionnaire were obtained from each participant separately. The researcher informed the participants that the names of the hospitals or the participants would not be disclosed, their privacy would be paid attention to, and access to the questionnaire would strictly be controlled by the researchers. After the questionnaires were delivered to the nurses, the researcher visited the hospitals twice a week and collected the questionnaires.

Statistical Analysis
The data were analyzed using Statistical Package for the Social Sciences Statistics 16.0 (SPSS Inc.; Chicago, IL, USA) package program, The Kendall's coefficient of concordance for validity and reliability, explanatory factor analysis for construct validity, and Cronbach's alpha coefficient for reliability were used. Numbers and percentages for sociodemographic characteristics of the nurses and their mean scores for the sub-scales of the causes of MAEs questionnaire were calculated. The data were evaluated under "descriptive and hypothesis analysis." Frequency, percentage (%) distributions, means, and standard deviations were examined in the descriptive analysis. Correlations between the data were analyzed using the Pearson's Chi-square test (χ^2) in the hypothesis analysis. According to the result obtained, the Bonferroni post-hoc test was performed to determine the group causing the difference in the analyses.

Ethical Considerations
The study was approved by the human research and ethics committee of the Akdeniz University (B.30.2AKD.0.20.05.05). Informed written consent was obtained from the participants. In addition, written permission was obtained from the related departments of the hospitals. The researcher also obtained written permission from Wakefield DS for using the survey. Names of the institutions in which the study was conducted

were not disclosed, the information obtained and the identity of the participants were kept confidential, and the principles of Declaration of Helsinki were met.

Results

Characteristics of the Nurses

In this study, it was found that most of the nurses (44.9%) were working in the university hospital, 27.8% in the research hospital, 19.8% in the state hospital, and 7.5% in the private hospital. The nurses were mainly female (89.5%) and young (age, 31.4±7.12 years). More than half of the nurses had a bachelor's and higher degree. The mean working duration of the nurses was 5.73 years (minimum: 1, maximum: 31 years). Majority of the nurses were working between 40 and 48 hours per week and were responsible for the care of 1 to 10 patients (Table 1) ($p<0.05$).

Perceptions of Clinical Nurses About the Causes of MAEs

Table 2 shows the nurses' perceptions about the causes of MAEs. The nurses stated that the most common causes of MAEs were inadequate number of nurses working in each shift (5.25±1.39), their heavy workload (5.17±1.51), illegible medication orders of physicians (4.85±1.49), frequent substitution of drugs (4.77±1.46), unclear medication orders of physicians (4.38±1.58), use of verbal orders by physicians instead of written orders (4.35±1.52), different medications having similar appearance (4.18±1.65), insufficient in-service training on new medicines provided to nurses (4.22±1.60), and similar packaging (4.16±1.60) and names (4.17±1.60) of medications (Table 2).

Rates of Reporting MEs Made and Witnessed by the Nurses

It was found in the study that whereas 154 (26.1%) of the 590 nurses made an MAE, 329 (55.8%) witnessed an MAE. The rate of nurses who witnessed an ME was higher than the rate of nurses who made an ME. The nurses did not report the errors they had made (68.8%) and witnessed (72.6%) (Table 3). It was determined in the study that the reporting rates of the nurses with a bachelor's and higher degree (18.7%) were higher than the rates of the nurses who graduated from high schools (14.5%) and had an associate degree (8.9%), and there was a significant correlation between the nurses' rates

Table 1

Demographic Characteristics of the Nurses (n=590)

Variables	n	%
Hospital		
University	265	44.9
Research	164	27.8
State	117	19.8
Private	44	7.5
Gender		
Female	516	87.5
Male	74	15.5
Age (n=588) *	Mean: 31.4 (min.:19,max.:60)	
19-24	111	18.8
25-29	142	24.1
30-34	129	21.9
35-39	132	22.4
40 and ↑	74	12.5
Educational level		
High school	76	12.9
Associate's degree	112	19.0
Bachelor's degree and above	402	68.1
Clinical career (years)	Mean: 5.73 (min.:1, max.: 31 years)	
1	116	19.7
2-5	255	43.2
6-10	105	17.8
11 years and ↑	114	19.3
Weekly working hours		
40-48 h	485	82.2
49-59 h	90	15.3
60 and ↑	15	2.5
Number of patients provided care		
Between 1 to 10	225	38.1
Between 11 to 20	164	27.8
Between 21 to 30	87	14.7
31 and ↑	113	19.2

*All questions about personal characteristics are answered.

of witnessing MAEs and level of education (p=0.007, χ^2=10.068) (Table 4). After the Bonferroni test, it was found that this difference was owing to the fact that nurses with a master's degree witnessed MAEs at a higher rate (p=0.01).

Table 2
Nurses' Perceptions of Causes of Medication Errors

Items	Subscale	Causes of Errors	Agree n (%)	Unstable n (%)	Disagree n (%)	Mean±SD
23a.	S	Inadequate number of nurses in each working shift	484 (82.0)	57 (9.7)	49 (8.3)	5.25±1.39
36.	**	Workload of nurses is excessive	471 (79.8)	61 (10.3)	58 (9.8)	5.17±1.51
4.	C	Physicians' medication orders are not legible	419 (71.0)	104 (17.6)	67 (11.4)	4.85±1.49
13.	C	Frequent substitution of drugs (i.e., cheaper generic for brand names)	397 (67.3)	127 (21.5)	66 (11.2)	4.77±1.46
5.	C	Physicians' medication orders are unclear	350 (59.3)	139 (23.6)	101 (17.1)	4.38±1.58
8.	C	Physicians use verbal orders instead of written orders	322 (54.6)	167 (28.3)	100 (16.9)	4.35±1.52
2.	P	Different medications look alike	305 (51.7)	168 (28.5)	117 (19.8)	4.18±1.65
16.	C	Nurses are not provided with sufficient in-service training on new medicines	303 (51.4)	178 (30.2)	109 (18.5)	4.22±1.60
3.	P	The packaging of many medications is similar	291 (49.3)	187 (31.7)	112 (19)	4.16±1.60
1.	P	The names of many medications are similar	289 (49)	187 (31.7)	114 (19.3)	4.17±1.60
7.	C	Abbreviations are used instead of writing the orders out completely	282 (47.8)	186 (31.5)	122 (20.7)	4.10±1.62
15.	C	Many patients are on the same or similar medications	273 (46.3)	220 (37.3)	97 (16.4)	4.12±1.42
6.	C	Physicians change orders frequently	272 (46.1)	227 (38.5)	91 (15.4)	4.20±1.45
34.	**	Units where nurses work are frequently changed	241 (40.8)	191 (32.4)	158 (26.8)	3.77±1.69
14.	C	Poor communication between nurses and physicians	234 (39.7)	228 (38.6)	128 (21.7)	3.92±1.52
19.	C	Nurses get pulled between teams and from other units	206 (34.9)	226 (38.3)	158 (26.8)	3.69±1.63
18.	C	Nurses on this unit have limited knowledge about medications	204 (34.6)	203 (34.4)	183 (31.0)	3.56±1.66
9.	PHM	Pharmacy delivers incorrect doses to this unit	200 (33.9)	232 (39.3)	158 (26.8)	3.68±1.59
17.	C	On this unit, there is no easy way to look up information on medications	194 (32.9)	168 (28.5)	228 (386)	3.36±1.80
31.	**	There are no written protocols and procedures for medication administrations	175 (29.7)	219 (37.1)	196 (33.2)	3.45±1.67
22.	I	Nurses are interrupted while administering medications to perform other duties	174 (29.5)	148 (25.1)	268 (45.4)	3.14±1.84
24.	I	All medications are not administrable to all patients at the specified time	171 (29.0)	184 (31.2)	235 (39.8)	3.24±1.74
29.	I	Patients are off the ward for other care	166 (28.1)	243 (41.2)	181 (30.7)	3.46±1.56
27.	I	Equipment malfunctions or is not set correctly (e.g., IV pump)	158 (26.8)	253 (42.9)	179 (30.3)	3.44±1.57
10.	PHM	Pharmacy does not prepare the medication correctly	151 (25.6)	222 (37.6)	217 (36.8)	3.30±1.60
23b.	**	Nurses are inadequate in terms of quality (professional knowledge)	143 (24.2)	193 (32.7)	254 (43.1)	3.07±1.68
35.	**	Nurses do not have sufficient knowledge about patients	142 (24.1)	215 (36.4)	233 (39.5)	3.18±1.67

Table 2
Nurses' Perceptions of Causes of Medication Errors (Continued)

Items	Subscale	Causes of Errors	Agree n (%)	Unstable n (%)	Disagree n (%)	Mean±SD
12.	PHM	Pharmacists are not available 24 hours a day	141 (23.9)	156 (26.4)	293 (49.7)	2.93±1.73
30.	I	The 'right principles' (right drug, right dose, right patient, right time, right route, right administration form, right registration, right response) are breached in medication administrations	135 (22.9)	179 (30.3)	276 (46.8)	2.95±1.73
32.	**	Records for medication administrations are incomplete	134 (22.7)	237 (40.2)	218 (36.9)	3.14±1.60
11.	PHM	Pharmacy does not label the med correctly	127 (21.5)	217 (36.8)	246 (41.7)	3.06±1.59
20.	I	When scheduled medications are delayed, nurses do not communicate the time when the next dose is due	116 (19.7)	145 (24.6)	328 (55.6)	2.67±1.70
28.	I	Nurse is unaware of a known allergy	105 (17.8)	161 (27.3)	324 (54.9)	2.68±1.64
33.	**	Nurses lack skills in medications administration	103 (17.5)	183 (31.0)	304 (51.5)	2.75±1.61
26.	I	Errors are made in the Medication Kardex	79 (13.4)	196 (33.2)	315 (53.4)	2.65±1.54
25.	I	Medication orders are not transcribed to the Kardex correctly	7 (13.1)	140 (23.7)	373 (63.2)	2.38±1.59
21.	I	Nurses on this unit do not adhere to the approved medication administration procedure	65 (11.0)	98 (16.6)	427 (72.4)	

*I: Individual; C: Communication; ** The Errors reasons questionnaire does not include these items.
Note. PHM: Pharmacy, P: Packaging, S:System

Discussion

This is one of the several studies on nurses' perceptions about the causes of MAEs in Turkey. In this study, the rates of reporting errors made or witnessed by nurses were determined. This study can be compared with studies conducted in other countries. Medication administrations that affect patient safety and quality of healthcare services are an important responsibility of nurses (You et al., 2015). In this study, causes of MEs were defined under 5 categories (individual, communication, pharmacy, packaging, and system). It was found from the analysis that the survey was compatible with its original version (Wakefield et al., 1998).

In this study, it was determined that inadequate number of nurses working in each shift and their heavy workloads were perceived as the causes of errors at the highest rate. It was observed that these errors were caused mostly by the system. When these results are compared with the literature, it can be seen that the causes of MEs in various national (Alemdar-Küçük & Aktaş-Yaman, 2013; Toruner & Uysal, 2012) and international (Farzi et al., 2016; Kang et al., 2016; You et al., 2015) studies include inadequate number of nurses and heavy workload of nurses. In a study involving 9 countries in Europe, it was found that increased workload of nurses increased the likelihood of mortality by 7% (Aiken et al., 2014). In a previous study, it was reported that 42.9% of MEs were made during night shifts, and the cause for MEs was heavy workload (Salami et al., 2019).

There is a critical correlation between the increasing number of nurses per bed and survival rates and the quality of care (Duffin, 2014). It is seen that the number of nurses/midwives per 100,000 people was 802 in the WHO European Region; this number was 251 in Turkey in 2013 (Genel & Kaçmaz, 2016). Manpower planning for nurses should be performed accurately to maintain patient care in hospitals in a qualitative, safe, and uninterrupted way (Türkmen, 2015). Insufficient nursing staff and high nurse-to-patient ratio in Turkey are among the reasons for increasing MEs. Nursing workforce

planning for improving the nurse-to-patient ratio is an important issue in Turkey and in all over the world (Türkmen, 2015).

In this study, it was determined that physicians' illegible and unclear medication orders and the use of verbal orders instead of written orders were among the causes of nurses' MEs other than the individual factors. When the literature was examined, illegible medication orders (Farzi et al., 2016) and illegible or unclear physician orders (Petrova et al., 2010) were reported as the causes of MEs. The use of electronic medication management systems has been found to be effective in reducing these errors (Choo et al., 2014; Radriquez-Gonzalez, 2015). After completion of the research, an electronic medication record system was started to be used in the university hospital in which the study was conducted.

The results of this study revealed that frequent substitution of drugs and different medications having similarity in various aspects were among the main causes of errors experienced by the nurses. Various studies have reported that the causes of MEs perceived by nurses were attributed to similarity of drug packages (Maiden et al., 2011) and drugs and labels

(You et al., 2015). Medication lists show similarity in appearance, pronunciation, and spelling within the context of the Medication Safety Guideline published by the Turkish Ministry of Health, which includes resources for nurses (Ministry of Health, Medication Safety Guideline, 2018). In this study, it was found that the rate of nurses witnessing an ME was 2 times greater than the rate of nurses who made an ME. There are studies indicating that the rate of witnessing an ME is higher than the rate of making an ME (Cebeci et al., 2015; Kagan & Barnoy, 2013). It was determined in this study that more than half of the nurses did not report the MAEs they had made and/or witnessed. It was determined in the study by You et al. (2015) that nurses did not report MAEs they had made and/or witnessed because of the evaluation of MEs as a criterion for the quality of nursing and because of fear of accusation. It was found in the literature reviews that the reasons for not reporting MEs were that nurses did not find the MEs made to be important enough to be reported and some did not admit that they made an ME (Petrova et al., 2010). The other reasons were fount to be fear of accusation (52.95%), loss of confidence (50.45%), and disciplinary investigation (45%) (Toruner & Uysal, 2012).

In this study, it was found that the error reporting rates of the nurses with a bachelor's and higher degree were higher than the rates of the nurses who graduated from high school and had an associate degree. A significant correlation was determined between the nurses' rates of witnessing MAEs and level of education. The results of the literature support the results of this study. It was determined in the study by Lin and Ma (2009) that the rates of reporting MEs were higher in trained and senior nurses providing holistic care than other nurses. Cebeci

Table 3

Nurses' Rates of Making, Witnessing and Reporting Medication Errors (n=590)

Status of Making and Witnessing Medication of Errors		n (%)	Reporting n (%)
Witness	Yes	329 (55.8)	90 (27.4)
	No	261(44.2)	239 (72.6)
Error	Yes	154 (26.1)	48 (31.2)
	No	436 (73.9)	106 (68.8)

Table 4.

Comparison of Nurses' Rates of Making, Witnessing and Reporting Medication Errors with Their Levels of Education (n=590)

	Making an error		Witnessing an error		Reporting	
	Yes	No	Yes	No	Yes	No
Education level	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
High school	18 (23.7)	58 (76.3)	35 (46.1)	41 (53.9)	11 (14.5)	65 (85.5)
Associate's degree	24 (21.4)	88 (78.6)	52 (46.4)	60 (53.6)	10 (8.9)	102 (91.1)
Bachelor's degree and above	112 (27.9)	290 (72.1)	242 (60.2)	160 (39.8)	75 (18.7)	327 (81.3)
	χ^2=2.143	p=0.342	χ^2=10.068	p=0.007*	χ^2=6.292	p=0.43**

**p<0.05

et al., (2015) found that student nurses' rate of reporting MEs that they made in clinical settings was 38.3%, and most of them (72.2%) were corrected by academic nurses before such errors reached to the patients. The reason behind the rates of making, witnessing, and reporting MEs of the nurses with a bachelor's and higher degree being higher may be that their knowledge on medication administrations allowed them to recognize the errors and that they were aware of the importance of reporting errors. The results of national and international studies have reported that MEs are not reported or the rates are extremely low because of many reasons.

Consequently, the Safety Reporting System was established by the Turkish Ministry of Health in 2016 to create a standard reporting system at a national level, to detect the causes of MEs, and to provide patient safety and quality medical care by taking necessary precautions. Although it was seen that the number of reportings at the national level in all the hospitals was 4,402 in 2016, this number was 10,016 in 2017 (Ministry of Health-Safety Reporting System, 2017). Private credentials of the person who made the notice, being able to make any notice at any place and time through the Internet, and establishment of a system through which making notice is easy without fear of being seen by administrators or colleagues indicate the importance of reporting MEs in Turkey. This study is also important in terms of showing the data before the establishment of the reporting system.

Study Limitations

Limitations of this study include relatively low desire of the nurses to participate in the study. There may also be more complex types of MEs (for example, unauthorized drug error, monitoring error) that are not described in this study. Follow-up studies are needed to reveal all aspects of MEs. Furthermore, because this study focuses exclusively on nursing perspectives, the complex and multifaceted causes of MEs may not have fully been investigated.

Conclusion and Recommendations

Consequently, one of the perceptions determined in this study was that inadequate number and heavy workload of nurses increased the rate of making errors. This situation is important in terms of revealing that inadequate number of nurses is one of the causes for increasing the MEs in the hospitals in this study and Turkey in general. Another important

finding showed that the errors were caused by some deficiencies in the system. Unclear and illegible physician orders indicate the need for system-related arrangements, such as electronic registration systems. These results have suggested that leaders of healthcare system should invest in technology along with manpower. Some important points were identified in this study in terms of clinical aspects. Nurses perform medication administration, requiring intensive attention and information, during most of their working hours. Practices for preventing MEs may be important for hospital managers as well because these errors threaten patient safety, prolong hospital stay, and consequently, increase health expenditures. The study results have suggested that increase in employment of the nurses with a bachelor's and higher degree by hospitals may increase the rates of reporting MEs. It can be recommended to conduct randomized controlled studies on this subject owing to the difference between the reporting rates and level of education.

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