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# **MEDICAL ERRORS IN NURSING EDUCATION: SCOPE, CAUSES, AND CONSEQUENCES**

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**Abstract:** Medical errors pose a significant threat to patient safety and quality of healthcare services. This study addresses the widespread issue of medical errors, encompassing medication errors, hospital-acquired infections, inadequate patient monitoring, falls, communication breakdowns, and the use of inappropriate materials. Medical errors result from a range of factors, including carelessness, lack of experience, and failure to follow protocols. These errors have far-reaching consequences, leading to prolonged treatment, increased healthcare costs, emotional distress, and additional complications. Moreover, they erode the morale and motivation of healthcare professionals, undermine patients' trust in healthcare providers, and generate dissatisfaction with the healthcare system. While various safety measures have been implemented, medical errors remain common in healthcare settings worldwide. This study investigates the prevalence and impact of medical errors and underscores the need for robust strategies to enhance patient safety.

**Keywords:** medical errors, patient safety, healthcare, medication errors, hospital-acquired infections, patient monitoring, healthcare communication, healthcare quality.

## **1. Introduction**

Due to complexity of health care, medical errors have been experienced during the care. Considering the patient safety, it is stated that the most frequently encountered errors during nursing services is due to medication errors, hospital infections, lack of patient monitoring, falls, lack of communication, and the use wrong or inappropriate material.<sup>[1]</sup>Medical error is an adverse and unexpected occurrence involving sudden deaths, serious physical and psychological injuries or the risk thereof caused by an accidental failure during the health care provided to the patient.<sup>[2]</sup>It is known that medical error applications occur due to carelessness, lack of job experience, and disregarding orders and regulations.<sup>[1,2,3]</sup>Medical errors cause longer period of treatment, additional cost and emotional damage as a result of treatment of new injuries or complications and increasing drug expenditures.<sup>[6]</sup>Moreover, medical errors result in loss of moral and motivation of health professionals, patients' distrust in healthcare personnel and public Dissatisfaction with health system.

Medical errors have become an increasing problem in health care each passing day and it is determined that they are frequently encountered all over the world.<sup>[6,8,9]</sup>Despite many safety measures taken in hospitals, human

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mistakes occur commonly in healthcare services. The frequency of the medical errors was not known adequately till 1990s; however, today it is known that there are many patients who die or suffer because of medical errors.<sup>[10]</sup> According to the report of The Institute of Medicine in the United States of America, nearly 98000 patients die due to the preventable medical errors every year in the USA.<sup>[11]</sup> In addition, considering the data obtained from the Centers for Disease Control and Prevention in the USA, medical errors are the third leading cause of death.<sup>[12]</sup> The dimensions of the medical errors are not clearly known in our country but it is considered that they have parallels with the other countries in the world.

Although medical errors which are considered key to patient safety are an important issue of concern for all of the healthcare staff, it is of great importance for the nurses who spend more time with patients.<sup>[14,15]</sup> Nurses are the healthcare staff who play the key role in the care of patients due to their duties and being the first line who meets the patients and deals with their all problems among the healthcare staff.<sup>[9]</sup> Moreover, nurses are frequently exposed to the medical error risks when compared to other Professional groups because of the reasons like plenty of dependent and independent functions, variety, and ongoing health care of their patients.<sup>[10]</sup> Medical errors or medical malpractices are performed not only by the healthcare staff but also by the students who will perform this profession in the future. Because nursing students have lack of experience and make an effort to learn the profession, they are at risk of committing errors. Thus, although it is nearly impossible to reduce the effect of medical errors caused by the healthcare staff while giving health services, it is predicted that these errors and risks will be reduced to minimum if the patient safety culture in hospitals is developed and implemented and also adopted by the whole staff.

### **1.1. Purpose**

When the literature is examined, it is found that there are very few studies carried out to identify the medical errors committed by nursing students. This study aims to identify the nursing students' medical errors, determine the fields in which their tendency levels of making mistakes are higher and take necessary precautions against this.

### **1.2. Research Questions**

This study aims to answer the following research questions:

1. How do students act in case of a medical error?
2. Under which conditions do students make errors?
3. What importance do students give to medical errors?

## **2. Material and Methods**

### **2.1. Research Design and Setting**

This study has a descriptive cross-sectional design with the intention of evaluating the medical errors committed by the nursing students. The data were collected between February 15 and March 15, 2018 in the Nursing Department of Faculty of Health Sciences in Muğla Sıtkı Koçman University.

### **2.2. The Population and Sampling of the Study**

The study population was composed of a total of 460 nursing students, 223 of them studying in the 3rd grade and 247 of them studying in the 4th grade in the Nursing Department of Faculty of Health Sciences in Muğla Sıtkı

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Koçman University. The study was carried out with 450 3<sup>rd</sup> and 4<sup>th</sup> year students who accepted to take part in the study before the sampling group was chosen.

### **2.3. Data Collection Tools**

A self-report questionnaire including socio-demographic characteristics of nursing students designed by the researchers in line with literature and “Medical Error Tendency Scale in Nursing” (METS) developed by Özata and Altunkan and whose reliability and validity was performed by the same authors were used as data collection tools.<sup>[9]</sup>

Both the questionnaire form and the scale consisted of 49 items and 5 sub-scales which explored the activities nursing students performed in patient care as daily routine. The nursing students were asked to choose the most suitable answer for each item in the scale. It is interpreted that if the total scores increase, the nursing students’ tendencies to commit medical errors are low, but if the scores decrease, it means that the tendency to commit medical errors is high. The lowest total average score obtained from the scale is 1 and the highest score is 5. The scale is a 5-point Likert-type scale and assessed as follows: 1: Never, 2: Rarely, 3: Occasionally, 4: Usually, 5: Always. The lowest score obtained from the scale is 49 and the highest score is 245. The scale’s internal reliability coefficient (Cronbach Alpha) was found to be 0.95. The Cronbach Alpha value of the scale was found to be 0.953 in the study. The internal reliability of the scale’s sub-dimensions were found 0.900 for the sub-dimension of “Medication and Transfusion Practices”, 0.875 for the sub-dimension of “Prevention of Infections”, 0.838 for the sub-dimension of “Patient Monitoring and Material-Equipment Safety”, 0.852, for the sub-dimension of “Fall Prevention”, and 0.779 for the sub-dimension of “Communication”. The results exhibit that both the scale and its sub-dimensions have adequate reliability (Cronbach Alpha >0.70).

### **2.4. Limitations of the Study**

Because the study is carried out with the 3<sup>rd</sup> and 4<sup>th</sup> year nursing students studying at a single institution, the results cannot be generalized for all nursing students. Moreover, the study data were only gathered from the statements of nursing students and another limitation of the study is the lack of findings based on observation because there was no finding based on observation,

### **2.5. Data Analysis**

The Statistical Packages for Social Sciences (SPSS, Version 24.0) was used for data analysis. Frequency, percentages and averages were used to evaluate the data related to personal qualities and Cronbach alpha coefficient and unpaired t test were used to evaluate the descriptive qualities. As a result of normality test, because the distribution was normal, parametric tests were used and data were interpreted.

### **2.6. Ethical considerations**

Prior to data collection, an approval was obtained from Muğla Sıtkı Koçman University Scientific Research and Publications Ethics Committee (Protocol no:170022). Permission to use of the Medical Error Tendency Scale was obtained from Musa Özata. The study conformed to the principles outlined in the Helsinki Declaration. Verbal consent was obtained from each student who agreed to participate after they were informed about the study content.

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### 3. Results

With regards to age, the students participating in the study range between 18 and 28 years of age, with the average being  $21 \pm 1.36$  years. 74.4% of the students are female and 52.7% of them study in the 3rd grade. The training students got to prevent medical errors was presented in Table 1. Considering this, it is revealed that 92% of the students got training on “prevention of hospital-acquired infections”, 89.6% of them took training related to “patient monitoring”, and 79.8% of them took training on “equipment safety” and 78.2% of them on “falls” and % 80.2 of them on “communication”. During the practices, 21.8% of the nursing students reported that they had lack of practical skills during their practices. When they were asked about the measures taken during this improper practices, 68.4% of them stated that they informed the ward nurse, 21.4% of them informed the supervisor instructor, and 12.2 % of them did not inform anybody ( $p < 0.05$ )(Table1).

**Table 1: Distribution of the people according to their demographic characteristics (n=450)**

Characteristics		n(%)
Gender	Female	335(74.4)
	Male	115(25.6)
Age	20-21	276(61.4)
	Above 22-23	174(38.6)
Age		$21.35 \pm 1.15$
Grade	3 <sup>rd</sup> grade	237(52.7)
	4 <sup>th</sup> grade	213(47.3)
Training*	Prevention of Hospital Infections	
	Patient Monitoring	414(92.0)
	Equipment Safety	403(89.6)
		359(79.8)
	Falls	352(78.2)
	Communication	361(80.2)
Status of committing med errors	Yes	98(21.8)
	No	352(78.2)
Measures during the improper practices**	Informing the ward nurse	66(68.4)
	Taken Informing the lecturer in charge	21(21.4)
	Informing the doctor	5(5.1)
	Informing the patients' relatives	6(6.1)
	Those closely monitoring the patient	6(6.1)
	Those who do not report	12(12.2)
	Others	19(19.1)

\*More than one answer \*\* n=98 and more than one answer

It was found that there was a statistically significant difference between the 3<sup>rd</sup> year and 4<sup>th</sup> year nursing students' education and METS total scores in terms of the sub-dimensions of “medication and transfusion practices”,

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“prevention of hospital infections” and “patient monitoring and equipment safety” total average scores ( $p<0.05$ ). Moreover, it was detected that the total average scores of the 4<sup>th</sup> year students from the METS and its sub-dimensions are higher than the 3<sup>rd</sup> year students. (Table 2).

A statistically significant difference was revealed between the student genders and METS total average scores in terms of the sub-dimensions of “medication and transfusion practices”, “prevention of hospital infections” and “patient monitoring and material-equipment safety” total average scores ( $p<0.05$ ). Besides, it was detected that the total average scores of the female students from the METS and its sub-dimensions are higher than the male in the class (Table 2).

It was found in the study that among the METS total average scores of the students who were responsible for medical errors during the clinical practices when compared to the students who did not commit medical errors, there was a statistically significant difference between the scale’s sub-dimensions of “medication and transfusion practices” and “prevention of hospital infections” total average scores ( $p<0.05$ ). It was revealed that the METS and total average scores of sub-dimensions for the students who did not commit medical errors are higher than those who committed errors (Table 2).

**Table 2: Comparison of students’ tendency to medical error average scores and their demographic characteristics**

Variable	Sub-Dimension					Total of Tendency To Medical Errors
	Medication and Transfusion Administration	Prevention of Hospital Diseases	Patient Monitoring and Equipment Safety	Prevention of Falls	Communication	
<b>Gender</b>						
Female	4.48±0.42	4.43±0.48	4.04±0.63	4.49±0.56	4.42±0.65	4.37±0.45
Male	4.33±0.52	4.19±0.62	4.06±0.68	4.30±0.62	4.29±0.69	4.23±0.53
t	2.97	4.29	-.22	3.02	1.85	2.70
p	.004*	<.001*	.823	.053	.780	.013*
<b>Grades</b>						
3rd grade	4.37±0.48	4.28±0.57	3.94±0.69	4.37±0.59	4.33±0.70	4.26±0.50
4rd grade	4.51±0.41	4.47±0.47	4.15±0.58	4.51±0.55	4.44±0.61	4.41±0.43
t	-3.268	-4.048	-3.468	-2.546	-1.733	-3.573
p	.006*	.002*	.011*	.118	.137	.006*
<b>Status of committing medical errors</b>						
Yes	4.30±0.51	4.21±0.63	3.97±0.70	4.42±0.59	4.38±0.67	4.26±0.52

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No	4.47±0.43	4.41±0.50	4.06±0.63	4.44±0.58	4.38±0.67	4.35±0.46
t	-3.327	-3.275	-1.230	-.311	-.037	-1.773
p	.036*	<.001*	.145	.630	.825	.033*

M: mean; SD: Standard Deviation; t: independent t-test; \* $p < .05$ .

When the findings obtained from the research were evaluated, it was determined that the total average scores from the METS were 4.34±0.48.

When the sub-scales of the scale were examined, the total average scores for “Medication and Transfusion Administration” was 4.44±0.45, and with the average being 4.37±0.53 for “Prevention of Hospital Infections” 4.04±0.65 for “Patient Monitoring and Equipment Safety” , 4.44±0.58 for “Fall Prevention”, and 4.39±0.66 for “Communication” (Table 3).

**Table 3: Medical error tendency scale (METS) in nursing and sub-dimensions total average scores**

METS dimension	sub Number of Items	Range distribution Min-Max	Average Scores $\bar{X} \pm SD$	Distribution of item ranges MinMax	Average Item Score * $\bar{X} \pm SD$
Medication and Transfusion Administration	18	50-90	79.95±8.18	2.78-5	4.44±0.45
Prevention of Hospital Infections	12	28-60	52.43±6.36	2.33-5	4.37±0.53
Patient Monitoring and Equipment Safety	9	15-45	36.39±5.80	1.67-5	4.04±0.65
Fall Prevention	5	9-25	22.20±2.88	1.80-5	4.44±0.58
Communication	5	8-25	21.92±3.13	1.60-5	4.39±0.66
<b>NMET total</b>	<b>49</b>	<b>144-245</b>	<b>212.90±22.37</b>	<b>2.76-5</b>	<b>4.34±0.48</b>

\* Each item has a score of 5.

## 4. Discussion

It is important to minimize medical errors to ensure patient safety. Within this context, this study is one of the limited number of studies carried out to determine the nursing students' tendency levels of committing medical errors during the clinical practices and to be a role model in their training intended to remove the deficiencies. When the results obtained from the study were examined, the total average score from METS was found to be 4.34±0.48. These findings show similarity to the findings of the previous studies carried out with the nurses. Because the highest score that can be obtained from the scale is 5.00, it can be stated that the nursing students' tendencies to make medical errors were low. Due to the research on the sustainability of the quality improvements in the hospital where the research was carried out, it is considered that the training given to the student nurses



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about patient safety and medical errors must have contributed to this result. However, it must not be forgotten that this may have led student nurses to have a tendency to hide their mistakes by responding positively to the questions and thus, they may have shown a tendency towards committing mistakes at lower levels. Thus, Natan et al [2017] in their study determined that although it was compulsory to report medication errors, the nurses provided misinformation and even nursing students did not report one-quarter of the medication errors.<sup>[1]</sup> Kiegaldie et al [2016] in their study carried out with junior doctors and nurses found that 94% of them strongly agreed that a serious medical error should be disclosed to patients / their family and junior doctors 89.6%, 43/48) and junior nurses (76.9%, 40/52) believed that minor error should be disclosed.<sup>[19]</sup> It was determined in this study that 21.8 % of the nursing students made medical errors and 6.1% of them informed the patients and their family.

Nursing academic staff and clinical nurse's act as a role model to maintain nursing students' confidence and competence and to develop nursing process for the safe medication management. Students' safe applications are based on their nurse mentors' skills and knowledge near the bedside and their role models.<sup>[20]</sup> There are 18 items included in the scale's sub-dimension of "Medication and Transfusion Practices" and the total average score is  $4.44 \pm 0.45$ . This result reveals that the nurses' tendency to commit errors related to medication and transfusion administration is low. The highest score obtained from this sub-scale's items are "I feel certain that I give medication to the correct patient" and I pay attention to give IV, IM and SC injections from the correct area" ( $4.87 \pm 0.42$ ,  $4.87 \pm 0.38$ ) and the lowest score was obtained from the item "I know the adverse effects of the drugs and I administer them considering their side effects ( $3.60 \pm 0.98$ ). These results are similar to the other studies carried out with nurses.<sup>[6,10]</sup> The role of the nurses with medication administration is not only to administer drugs as they are prescribed.<sup>[6]</sup> Lack of knowledge about the adverse effects of drugs and lack of monitoring of the medication administration after giving drugs cause the patient to die or get injured.<sup>[6,10]</sup> Reid and et al [2009] inform that of the reported 13.3% of the adverse effects depending on medication, 04% of this side effects result in deaths.<sup>[21]</sup>

According to the data of Office of Quality and Accreditation in Health within the Ministry of Health in Turkey in 2016, it was reported that 33% of the medication errors were due to the nurses.

The sub-dimension of "Prevention of Hospital Infections" in the scale consists of 12 items. The lowest score obtained from the sub-scale of "Prevention of Hospital Infections" in the scale was  $4.37 \pm 0.53$ ). It was determined that the highest score from the sub-scale of "Prevention of Hospital Infections" was obtained from the item "I pay attention to discard contaminated materials into appropriate waste containers and bags in the medical care service where I work" ( $4.66 \pm 0.58$ ) and the lowest score was obtained from the item "I check the patients having a catheter inserted everyday" ( $3.98 \pm 0.97$ ). As the student nurses compose the scope of the research and they are in the hospital only during their internships, it is considered that they may have given low points to the item "I check the patients having a catheter inserted everyday". Hospital infections are important because they cause prolonged hospital length of stay, an increase in mortality/ morbidity and longer period of treatment.<sup>[6]</sup> When compared to other health staff responsible for health care, nurses have an active role in the development, transmission and prevention of infections as they constantly interact with the patients.<sup>[22]</sup> The sub-dimension of "Patient Monitoring and Equipment Safety" in the scale consists of 9 items. The highest score obtained from this sub-scale's item "I keep

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a good record of all monitoring on specific time and days ( $4.40 \pm 0.75$ ) and the lowest score was obtained from the title “I control all equipment running in the medical care service every day and I report the breakdowns” ( $3.46 \pm 1.24$ ). This result is parallel to the other research results.<sup>[6,101]</sup> While it was detected that student nurses’ tendencies to errors were generally low, it was determined that the sub-scale with the highest level of tendency to errors was patient monitoring and equipment safety ( $4.04 \pm 0.65$ ). Because students are in the hospital setting during their internships and the clinics where they work change constantly, they may have evaded from taking responsibility for patient monitoring and equipment safety and thus they may have caused their error tendencies to increase. Inadequate monitoring and assessment of patients’ conditions are one of the most important problems that lead the nurses come face to face with legal situations.

There are 5 items in the sub-dimension of “Prevention of Falls” in the scale. One of the highest scores in the scale was obtained from the sub-scale of “Prevention of Falls” ( $4.44 \pm 0.58$ ) (Table 2). The highest score in this subscale was obtained from the item “I pay particular attention whether or not there are bed side rails and they are closed” ( $4.53 \pm 0.67$ ), the lowest score was obtained from the item “I inform the patient and the family about the causes of falls and the measures to take” ( $4.20 \pm 0.82$ ). Falls are an important patient safety problem in health care institutions all over the world. Falls in hospital setting cause serious problems like physical injury, loss of functions, increasing costs, and prolonged hospital length of stay and they occur frequently.

“Communication” sub-scale consists of 5 items and the total average score is  $4.39 \pm 0.66$ . The highest score in “communication” sub-scale was obtained from the item “I keep record of all information about the patient’s treatment and care in the nursing observation form” ( $4.57 \pm 0.65$ ) and the lowest score was obtained from the item “I immediately record the doctor’s request via verbal orders or phone calls in the nursing observation form” ( $4.21 \pm 1.17$ ). Medical errors may occur due to lack of communication between doctors or nurses. Medication errors due to lack of communication are important because they are preventable.<sup>[23]</sup> The result of the study carried out by Topçu and et al [2017] reveal that 59.3% of the nurses committed errors via verbal orders and 42.2% of them made errors while reading written orders.<sup>[23]</sup> The study carried out by Cebeci and et al [2015] demonstrates that 22.5% of the nurses reported medication errors due to lack of documentation and 38% of them reported communication failures.<sup>[22]</sup> The clinical visits carried by the bedside of the patient are important to reduce lack of communication due to the presence of doctors, nurses, student nurses, and clinical educator.<sup>[24]</sup> A nurse and a clinical educator have a responsibility for encouraging nursing students to ask their questions and worries.<sup>[25]</sup> Supervisors of clinical educators and nurses should work to remove students’ fears of reporting medication errors and also develop a system for this.

When the student nurses’ medical error tendency scores were compared to their grades, it was determined that the total average score the 3rd year students got from the scale was  $4.26 \pm 0.50$  and the 4th year students’ total average score was  $4.41 \pm 0.43$ . It was detected that the 4th year students’ medical error tendency scores were significantly low ( $t = -3.573$ ,  $p = 0.006$ ). It is considered that because the 4th year students spent more time in clinical environments for their internships than the 3rd year students and they had more knowledge than the 3rd graders, their medical errors tendencies may have reduced.

The study carried out by Alan and Khorshid [2016] with the nurses revealed that as the working experience increases, it has a positive effect on the sub-scale average scores with “Medication and Transfusion



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Administration”, “Hospital Infections”, “Patient Monitoring and Equipment Safety”, and “Falls”.<sup>[13]</sup> The study conducted by Dikmen and et al [2014] revealed that nurses with less working experience had higher significance level of medical error tendency.<sup>[3]</sup> The results of these studies are compatible with our research.

When the total average score obtained from the scale was examined with regard to gender, it was  $4.26 \pm 0.52$  with the female students and  $4.23 \pm 0.53$  with the male students and it was determined that there was a statistically low significant result with the female students ( $t=2.700$ ,  $p=0.013$ ). This result can be explained with the fact that there are more female students than male students. Although no significant differences regarding gender were detected with the other studies carried out with nurses, when the results of this study were examined, it was found that women’s medical error tendency average scores were lower than men’s scores.

It was determined that 21.8% of the student nurses committed medical errors before. When their status of making errors and their tendencies to medical errors were compared, it was determined that those who experienced medical errors had significantly higher level of tendencies to medical errors ( $p<0.05$ ) and it was revealed that the difference resulted from the sub-scales of “Medication and Transfusion Applications” and “Prevention of Hospital Infections”. Their status of committing errors is parallel to the other study results.<sup>[2,8]</sup> It is considered that student nurses committing medical errors and having more tendencies to medical errors require training. In this context, the training intended for patient safety must be viewed.

## 5. Conclusion

In line with the results obtained from the research, it can be stated that student nurses’ tendencies to commit medical errors is low. The research findings exhibit that students had the lowest tendencies to errors in the “Patient Monitoring and Equipment Safety” sub-scale and their highest level of tendencies to errors were in the “Falls” and “Medication and Transfusion Administration” sub-dimension. Considering the findings obtained from the study, it was detected that the male nurses and the students studying in the 3rd grade had higher tendencies to medical errors. Moreover, it was detected that there was a statistically significant difference between the students’ status of committing medical errors and METS, “Medication and Transfusion Administration”, and “Prevention of Hospital Infections” sub dimensions total average scores. Nursing is an important occupational field in terms of error identification, reporting, and disclosure in patient care. Accordingly, training given to the nurses during their undergraduate studies is quite important to reduce the tendencies to medical errors in the future. Patient safety should be involved as a separate course in the nursing curriculum with the intention of preventing medical errors made by the students and students should internalize them.

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