

## Examination of Nurses' State Anxiety and Their Tendency to Medical Error at Different Working Hours

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### Abstract

**Objective:** This prospective, descriptive and cross-sectional study was implemented with the aim of comparing the state anxiety of nurses and their tendency for nursing medical error during day working and night shifts.

**Methods:** The study was conducted between 30 November 2012 and 30 May 2013 with 317 nurses in four different state hospitals. Data were collected using an Individual Identification Form, the Trait Anxiety Inventory and the Nursing Medical Mistake Scale.

**Results:** The Trait Anxiety Inventory and the Nursing Medical Mistake Scale were applied to the same nurses during their day and night shifts. It was determined that nurses experienced state anxiety during both day and night shifts. Work units, antidepressant use and caring for children affected the state anxiety experienced by nurses during day and night shifts. It was determined that the error tendency of most of the nurses was related to the administration of medication and transfusion, nosocomial infections and patient monitoring and equipment safety more during the night shift than during the day shift. It was found that the tendency of approximately half of the nurses to make mistakes in communication was twice as much on the night shift as on the day shift.

**Conclusion:** There was a difference in medical error tendencies and state anxiety between the day and night shifts. State anxiety and error tendencies were higher during the day shift.

**Keywords:** State anxiety; Medical error; Tendency, Nurse.

### Introduction

Nursing needs more mental health professionals than does other professions, because it deals with people [1-4]. Also, long working hours cause mental, emotional, social and health problems and depression in nurses [5-12]. The International Council of Nurses recommends that nurses work in eight-hour shifts. It has been pointed out that nurses are made to work overtime or long hours and this is considered as a human rights violation. This also severely threatens the health of nurses [13-15].

Researchers have found the sleep duration of nurses to be a significant predictor of the occurrence of errors [6]. In a study by Gao et al. the prevalence of anxiety symptoms in nurses was 43.4% [16]. Khan et al. reported that the prevalence of anxiety was 100% with a mean score of 61+10.70. Ocaktan et al. stated that the mean state anxiety score in nurses and midwives was 40.32+4.68. It was reported in one study that shift work was related to anxiety [7]. In another study it was concluded that the workload of 12-hour shifts had a negative physiological impact on hospital nurses [4]. Demir stated that state anxiety levels were found to be higher in nurses working constantly in day shifts compared to those working in day + night shifts [14]. Shift-work nurses reported significantly

higher anxiety [9].

Demir Dikmen et al. found that the level of tendency for medical mistakes was low among nurses [17]. Özata & Altuncan reported that the rate of medical errors among health staff was 6.2% and that the rate of witnessing by colleagues was 10.4% [18]. Linda et al. stated that the risk for making errors almost doubled when nurses worked 12.5 or more consecutive hours [19].

High rates of medical errors and injury by employees are a serious challenge in the healthcare industry worldwide. Currently, experts put the blame for many accidents and disasters on shift working [11,20-22]. Medication errors are the most common types of error which threaten patient safety [20,21,23].

### Data Collection Tools

Data were collected using a questionnaire. The questionnaire consisted of an individual identification form, the State-Trait Anxiety Inventory (STAI) and the Medical Errors Tendency in Nursing Scale (METNS).

In the individual identification form there were 17 questions relating to the descriptive characteristics of the nurses.

### Medical Errors Tendency in Nursing Scale (METNS)

The Turkish validity and reliability study of the Medical Errors Tendency in Nursing Scale (METNS) was conducted by Özata and Altunkan. The scale consists of five subscales and 49 items and includes the activities which nurses perform in patient care as a daily routine. These subscales are: Drugs and blood transfusion practices (18 items), Nosocomial infections (12 items), Patient monitoring and safety of materials (9 items), Falls (5 items), Communication (5 items) [18]. A high total score on the scale is interpreted as a lesser likelihood of making medical errors. The Cronbach's alpha coefficients of the subscales were quite high (0.82) in this study.

### The State-Trait Anxiety Inventory

Turkish adaptation and validity and reliability studies of the State-Trait Anxiety Inventory (STAI) were made by Le Compte [24]. The reliability coefficient of the State Anxiety Scale was found to be 0.804 for the measurement of the daytime shift and 0.853 for the measurement of the night shift.

Oral permission was obtained from nurses who attended to the study. The nurses were asked to complete the Individual Identification Form, the State Anxiety Inventory and the Medical Errors Tendency in Nursing Scale between 8 and 12 in the morning in the day shift. The same nurses were asked to complete the same forms a second time between 4 and 8 in the evening when they were working on the night shift. The forms were read individually by the researcher. Incomplete forms were excluded from the assessment.

### Ethical considerations

Approval to conduct the study was granted by the ethics committee of Adnan Menderes University. All the participants were informed by the first author about the purpose of the study. It was explained that participation was voluntary, and they were assured of confidentiality and anonymity in data gathering.

### Analysis of data

Mann-Whitney U, Wilcoxon and Kruskal-Wallis tests and correlation analysis were used in the analysis of data.

### Results

The age of the nurses who participated in the research was 20-29 years (11%), 30-39 years (60.3%), and 40 years and older (28.7%), 80.8% were married, and 78.9% of the nurses had children. It was found that 33.8% of the children of the nurses were looked after by a family member, 8.5% were looked after by caregivers, and 18.3% of the children were in a nursery or kindergarten, 18.3% of the children did not need to care. As for the nurses' level of education, 11.7% of the nurses were high-school graduates, 45.7% had an associate degree, 18% a bachelor's degree by distance learning, 22.1% had a bachelor's degree by full-time education, and 2.52% had a postgraduate degree, 81.4% of the nurses consumed caffeine, 38.5% of them smoked cigarettes, 17% drank alcohol, 18.6% took antidepressants and 68.8% loved their profession. 24% of the nurses had experienced at least one medical error during their career.

### Findings Regarding the Nurses' State Anxiety Score

40.7% of the nurses exhibited an intermediate level of anxiety and 59% a high level of anxiety during the day shift; in 50.2% anxiety

was at a medium level and in 49.2% it was at a high level during the night shift (Table 1).

Level of Anxiety	Score ranges	Anxiety on the day shift		Anxiety on the night shift	
		Number (n)	Percent (%)	Number (n)	Percent (%)
Low Levels	0-19	-	-	-	-
Intermediate Level	20-39	1	0.3	1	0.3
Medium Level	40-59	129	40.7	159	50.2
High Level	60-69	187	59.0	156	49.2
Panic	80 or more	-	-	1	0.3
<b>Total</b>		<b>317</b>	<b>100.0</b>	<b>317</b>	<b>100.0</b>

**Table 1:** Breakdown of anxiety levels experienced by nurses on day and night shifts.

### Factors Affecting the Anxiety of Nurses

It was found that age group, marital status, education level, the unit where they were working, having children, smoking, consuming caffeine, and drinking alcohol influenced state anxiety experienced during daytime and night shifts ( $p > 0.05$ ). The state anxiety scores of nurses whose children were cared for by a childminder was higher than those of children who were not cared for by a childminder ( $P = 0.04$ ). Nurses taking antidepressants were found to experience less anxiety in the day shift ( $p = 0.005$ ).

### Findings Related to a Medical Error Tendency

In the night shift, it was found in the Wilcoxon Test that the error tendency in drug and transfusion practices of nurses increased ( $p = 0.000$ ), the error tendency in nosocomial infections decreased ( $p = 0.000$ ), the error tendency in patient follow-up and material safety decreased ( $p = 0.000$ ), the error tendency in falls did not change ( $P = 0.016$ ), and the error tendency in communication did not change ( $p = 0.003$ ).

### Trends in Factors Affecting Nurses' Medical Errors

Having children, smoking, caffeine and alcohol consumption, taking antidepressants, love for the nursing profession, working unit, educational status and encountering cases of medical errors was found not to influence medical error tendencies experienced in daytime or night shifts ( $p > 0.05$ ).

### Age

Differences were found according to the age groups of nurses between the subscales and average scores of medicine and transfusions ( $P = 0.001$ ), hospital infections ( $P = 0.030$ ) during the day shift.

### Relation between Nurses' Medical Error Tendencies and Stable Anxiety Scores

A weak negative relationship was determined between the average anxiety and medical error tendency of medical and transfusion applications ( $P = 0.01$ ) and hospital infections ( $P = 0.006$ ) in the daytime shift. A weak positive relationship was determined between the averages of falls ( $P = 0.008$ ) and communication ( $P = 0.015$ ) in night shift anxiety and medical error tendencies in Spearman's Correlation Analysis (Table 2).

	Medical Error Tendency Points in Daytime Shift				
	Drugs and blood transfusion practices	Nosocomial infections	Patient monitoring and safety of materials	Falls	Communication
Anxiety score in day shift	r=-0.135 P=0.01	r=-0.154 P=0.006	r=-0.108 P=0.056	r=-0.47 P=0.40	r=-0.026 P=0.65
Anxiety score in night shift	r=-0.032 P=0.56	r=-0.14 P=0.81	r=-0.19 P=0.73	r=-0.040 P=0.47	r=-0.066 P=0.24
	Medical Error Tendency Points in Night Shift				
	Drugs and blood transfusion practices	Nosocomial infections	Patient monitoring and safety of materials	Falls	Communication
Anxiety score in night shift	r=0.067 P=0.236	r=+0.037 P=0.506	r=-0.035 P=0.539	r=+0.149 P=0.008	r=+0.136 P=0.015
Anxiety score in day shift	r=-0.121 P=0.31	r=-0.142 P=0.01	r=-0.110 P=0.051	r=-0.159 P=0.005	r=-0.136 P=0.01

**Table 2:** The relation between nurses' medical error tendencies and stable anxiety scores.

## Discussion

The average working period of nurses was found to be  $15.69 \pm 7.20$  years, their monthly number of shifts were found to be approximately  $6.43 \pm 1.82$  and their monthly overtime to be  $11.84 \pm 16.63$  hours. In a study, Saksvik-Lehouillier and his colleagues found no statistically significant difference in the tolerance of working in shifts between nurses who had recently started the night shift and ones who had experience of the night shift, and it was also found that being in a young age-group was related to nurses' high tolerance of the shift-work [12]. It is suggested that the high tolerance to shift working among the nurses in our study was because most of them were young.

## State Anxiety

It was found out that 40.7% of the nurses in the day shift experienced state anxiety at a medium level, 50% of them experienced it at a high level, 50.2% of the nurses on the night shift experienced anxiety at a medium level, 49.2% of them experienced it at a high level, and 0.3% of them experienced it at the highest level. Khan et al. reported that the anxiety prevalence was 100% with a mean score of  $61 \pm 10.70$ , and the prevalence of mild, moderate, severe and very severe degrees of anxiety was 55.6%, 39.3%, 4.6% and 0.6% respectively [25]. In a study by Gao et al. it was detected that 43.4% of nurses working in state hospitals experienced symptoms of anxiety, and that there was a connection between effort at work and reward factors [16]. In our study, it was detected that all of the nurses (100%) experienced middle-level and high-level anxiety both on day and night shifts. This rate is the same as that in Khan et al.' study, but higher than the rate in Gao et al. study.

In a study, Demir found that the nurses working on night shift experienced a high level of anxiety and work stress, and those who worked continuously on the day shift had higher state anxiety scores than those who worked day and night shifts [14]. In our study, it was found that 59% of the nurses experienced high level anxiety while working on the day shift, and 49.2% experienced it while working on the night shift. Our study, in which a large

number of the nurses experienced high-level anxiety, corresponds more to the result of the study by Demir.

## Factors Affecting Anxiety

It was found that on night shifts, the nurses whose children were taken care of by baby-sitters experienced the highest anxiety levels and those whose children were taken care of by one of their family members experienced the lowest state anxiety levels. This is an expected result. A child being looked after by a family member will enable a nurse to go on night shift at ease because of the trust she has in her family members. In a study by Yilmaz et al. It was found that the children of 32.4% of the midwives and nurses were looked after by a family member, and the state and continuous anxiety levels of the mothers who thought their children were at risk ( $X=43.1 \pm 7.9$ ) was higher than that of those who thought that their children were not at risk ( $X=37.6 \pm 8.4$ ) [26]. Our study was in accord with that of Yilmaz.

The fact that nurses used antidepressants did not affect the state anxiety experienced on the night shift, but did affect the state anxiety experienced on the day shift. For the nurses who used antidepressants to experience low-level anxiety is an expected situation. In a study which Ardekani et al. conducted in Iran among 1195 nurses who worked shifts, it was found that 45.4% of the nurses had mental disorders and that this situation was more common among female nurses, and also that there was a significant connection between anxiety and shift working [7]. In a study conducted by Selvi et al. it was found that medical personnel working on night shift showed more psychiatric signs than those who worked on the day shift, and that somatization from the sub-scale SCL-90-R, obsessive-compulsive disorder, sensitivity, anxiety, paranoid thoughts sub-scales and general symptom index points were significantly higher [9]. It was found in the study by Gosvani that, compared to daytime workers, neurotic disorders occurred five times more in those working in a three-shift system, and 16 times more in those who continuously worked at night. High-level depression was reported in shift workers, especially in females [11]. Ardekani et al. determined in a study conducted with 1195 healthcare professionals in 2008 that the individuals who worked on night shift experienced other psychiatric disorders such as anxiety, somatization and depression more often [7]. In our study, it was demonstrated that nurses' use of antidepressants did not affect their state anxiety experience on the night shift, but did affect the state anxiety experienced in day-time work, and nurses who used antidepressants experienced lower-intensity anxiety in day-time work.

## The connection between anxiety scores and other features

A weak negative connection was found in Spearman's Correlation Analysis ( $p < 0.05$ ) between nurses' working years, overtime hours and anxiety points on day-shift. As the nurses' working years and overtime hours increased, their anxiety scores in day-time work decreased. In a study by Cebeci et al. it was found that long working hours had a significant ( $p < 0.05$ ) and low-level positive ( $r = 0.139$ ) correlation with the communicative sub-dimensions [23]. The results of Cebeci are in accord with the results of this study. In our study, it was determined that as the working years of the nurses on day-shift increased, their tendency to make mistakes such as drug and transfusion application ( $p = 0.001$ ), hospital infections ( $p = 0.003$ ) and falls ( $p = 0.04$ ) decreased. This fact is related to the experiences of the nurses and is an expected result.

A weak but positive connection between the sub-scale of overtime and falls has been found ( $p=0.02$ ). It has been pointed out that as the working period in hospitals increased, more care was taken in patient falls.

### **Tendency to Make Medical Mistakes**

The increase of total points is interpreted as a decrease in the nurses' tendency to make mistakes. Analyses were made with the Wilcoxon Test, and the differences were found to be significant: the nurses' mistake disposition scores increased on night duties in comparison with day duties in drug and transfusion application ( $p=0.000$ ), while the mistake points in hospital infections and the mistake points in patient monitoring and material safety decreased ( $p=0.000$ ), and falls ( $p=0.016$ ) and in the communication sub-level ( $p=0.003$ ), the mistake making score did not change. In a study by Demir-Dikmen et al. it was found that the disposition of nurses to make mistakes was low [17]. In our study, it was found that the nurses' mistake making disposition was lower in drug and transfusion applications on night duties ( $p=0.000$ ). This might be related to the fact that making mistakes with drugs is the most commonly-seen type and the most threatening one for the patients' safety, or it might be related to the silence and lack of activity during night shift work, or it might be due to working alone. Nurses are generally held legally responsible when they do not conform to the basic standards of drugs or when they do not follow the relevant directives.

In a study by Özçetin et al. it was determined that the increase in the number of patients per nurse extended the period of the so-called patients' stay in hospital and therefore the frequency of hospital infections increased [27]. On the other hand, it was found in our study that the disposition to make mistakes in Hospital Infections on the night-shift was high ( $p=0.0000$ ) This might be due to the fact that nurses try to perform invasive procedures faster since the number of patients increases at night.

It was found that nurses' disposition to make mistakes on night shifts in patient monitoring and instrument safety is high ( $p=0.000$ ). Utilization of inappropriate instruments or wrong selection of them might cause nurses legal problems and lead to patients getting hurt. This can be related to the smaller number of nurses and the greater workload on night shifts. Tutuarima et al. pointed out that falls could be prevented by evaluating the risks for every patient, informing the patient and his relatives about the reasons for falls and the measures to be taken, and improving the physical atmosphere of the department (e.g. provision of sufficient electricity) [28].

Zencirci et al. and Demir-Dikmen et al. found that patients getting injured due to falls was one of the most-seen complaints and problems which nurses experience in hospitals [3,17]. The stability of the disposition to make mistakes in Falls ( $p=0.016$ ) and Communication ( $p=0.003$ ) during day shift and night shift may be related to the existence of patients' needs to communicate, and it may also be related to the hospital management taking necessary measures.

### **Factors Affecting the Disposition of Nurses to Make Mistakes**

It has been pointed out that factors such as nurses having children, their cigarette, caffeine and alcohol consumption, or whether or not they like their jobs do not affect the medical disposition to

make mistakes experienced on day and night shifts. The difference between the average scores on the sub-scales of the medical disposition to make mistakes on day and night shifts according to the nurses' marital status, their child-care problems and their education were not found to be significant ( $p>0.05$ ). In a study by Cebeci et al. no statistically significant difference was found between the nurses' total scores according to their sex, their weekly hours of work, or their overtime working hours [23]. Our study is in accord with this study as well.

### **Age**

It has been stated that there was a difference between the average scores of the sub-measurements in medicine and transfusion applications ( $p=0.001$ ) and hospital infections ( $p=0.030$ ). In a study by Demir-Dikmen et al. it was stated that the disposition to make mistakes of nurses who had little work experience was distinctively high [17]. In the study by Cebeci et al. it was found that there was no statistically significant difference in nurses' ages among the total scores ( $p>0.05$ ) [23]. Our study is in agreement with that of Demir-Dikmen but differs from Cebeci's study.

### **The Unit Where Nurses Work**

In our study, according to the units in which the nurses worked, among the sub-measurements of medical disposition to make mistakes on night shifts, the difference between the average scores was significant in Patient Monitoring and Instrument Safety ( $p=0.02$ ) and Falls ( $p=0.03$ ); however, the difference between Drug and Transfusion Application, Hospital Infections and Communication was found not to be significant. The disposition to make mistakes in surgical clinics was lower. In the study by Demir-Dikmen et al. it was found that the nurses' disposition to make mistakes in surgical clinics was significantly high [17]. Özata and Altuncan found that among the types of medical mistakes, when they were evaluated in terms of surgical and interior clinics, only wrong drug application and application of drugs in wrong places was higher in surgical clinics than in interior clinics [18]. In a retrospective study by Ertem et al. it was reported that medical mistakes occurred at the highest rate (43.6%) in surgery units [29]. In a study by Aygin et al. in which surgery nurses were used as examples, it was pointed out that most of the surgery nurses did not have adequate knowledge of premedication drugs and their side-effects [30]. These results are in agreement with the results of our study.

### **Education Level**

According to the education levels of the nurses who participated in the study, the difference between the average scores on the Sub-Scale Disposition of Medical Making Mistake Measurement was not significant ( $p>0.05$ ). In the study by Demir-Dikmen et al. no statistically significant difference was identified between the scores of disposition to make mistakes according to the nurses' education levels [17]. On the other hand, Cebeci et al. found in their study that there was no statistically significant difference between the total scores and the school from which the nurses graduated [23]. Our study is in agreement with these two results.

### **Relationship between the Disposition to Make Mistakes and the Anxiety Score**

From the sub-scales of day-shift anxiety and disposition to make medical mistakes, a weak negative relationship was identified in Spears man's Correlation Analysis, which was performed between

the average scores of drug and transfusion application ( $p=0.01$ ) and hospital infections ( $p=0.006$ ). On the day-shift, as the state anxiety of the nurses increased, so did the disposition to make mistakes in drug and transfusion applications and hospital infections.

In Spearman's Correlation Analysis, a negatively relationship was identified between the scores of night-shift anxiety and Falls ( $p=0.008$ ) and Communication ( $p=0.015$ ) among the sub-scales of disposition to medical mistake making. On night shifts, as the state anxiety of the nurses increased, so did the disposition to make mistakes in fall and Communication.

In a study by Mayo and Duncan it was stated that 46.5% out of 983 nurses made a mistake in drug selection and it was suggested that there were many reasons affecting the occurrence of these mistakes but that they mostly resulted from insufficient knowledge, inadequacy of communication and time, working at night, working in the early hours of the day, working with staff who had little experience, an increase in the workload, and fatigue [31].

### Suggestions

This study has shown that the state anxiety rate is 100% among our nurses, who are located in an important situation for health practices in this country, and this anxiety increases their medical error tendencies.

- The medical error tendencies and anxieties of nurses were determined to differ between day shift and night shift. In order to properly provide for the health needs of everyone, the reasons which affect our nurses psychologically should be addressed. In this context, the following may be appropriate:
- Organizing social activities to reduce anxiety levels
- Organizing quality training programs to prevent medical errors, and instead of punishment, rewards should be applied to those who inform managers about medical errors. Thus, the level of medical errors can be properly determined.
- Regulating nurses' working hours so as not to increase the tendency to anxiety and medical errors.
- Not ignoring one of the duties of health care services, which is to provide employee satisfaction such as housing and nursery care, convenient social support and studies to improve economic conditions.
- Regulating nurses' working hours so as not to increase the tendency to anxiety and medical errors.
- Putting experienced and inexperienced nurses together on the same shifts
- Researching the state and continuous anxiety of nurses separately for day and night
- Creating an employee health unit in hospitals and carrying out regular checks on the health of nurses working shifts
- Repeating the study with different samples.
- Repeating this study with nurses not working on night shifts
- Arranging nurses' working hours so as not to increase anxiety

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