

The Nursing Workforce in Critical Care Units in University and Private Hospitals in Turkey

Türkiye'deki Üniversite ve Özel Hastanelerdeki Yoğun Bakım Ünitelerinde Hemşire İş Gücü

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Abstract

Objective: The purpose of this study was to assess the present status of the nursing workforce in Turkish university and private hospital intensive care units.

Material and Methods: This study was a descriptive survey. A total of 1416 nursing staff members in the intensive care units of 144 Turkish hospitals participated in this study. Data were collected by mail and analyzed using descriptive statistics.

Results: In this study, 89.4% of nursing staff members were nurses; 66% had a bachelor's degree and 0.5% had a master's degree. Of the participants, 48.6% had not received any critical care-related training, 68.9% had been in the workforce between 0.1 to 5 years, and 30.2% had worked in the intensive care unit for 1 year or less. According to calculations based on data provided by the ICUs that responded to the relevant questions, the average turnover rate was 31.3% in the first year and 100% over the 5 years preceding the survey. The nurse-to-patient ratio was 1:4 in university hospitals and 1:2 in private hospitals. Daily working hours varied from unit to unit, with 89.6% of participants working for more than 8 hours per day.

Conclusion: The findings indicate that the quality and quantity of nursing staff in Turkish university and private hospital intensive care units fall short of the minimum national or international standards. (Yoğun Bakım Derg 2014; 5: 5-10)

Key words: Critical care, nurses, workforce, intensive care unit

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Özet

Amaç: Çalışma, Türkiye'deki üniversite ve özel yoğun bakım ünitelerinde hemşire iş gücü ile ilgili mevcut durumu ortaya koymak amacıyla yapıldı.

Gereç ve Yöntemler: Tanımlayıcı tipteki çalışmaya, Türkiye'deki 144 yoğun bakım ünitesinde görev yapan 1416 hemşirelik çalışanı alındı. Veriler posta yoluyla toplandı, analizinde tanımlayıcı istatistikler kullanıldı.

Bulgular: Hemşirelik çalışanlarının %89,4'ü hemşiredir; %66'sı lisans, %0,5'i yüksek lisans mezunudur. Katılımcıların, %48,6'sı yoğun bakım ünitesine özel hiçbir eğitim almamıştır, %68,9'unun toplam çalışma süresi 0,1-5 yıl arasında olup %30,2'sinin yoğun bakımda çalışma süresi bir yıl ya da bir yılın altındadır. İlgili soruya yanıt veren yoğun bakım ünitelerinden elde edilen verilerle yapılan hesaplamalara göre, hemşire devir hızı ortalama araştırmanın yapıldığı tarihten önceki bir yılda %31,3, beş yılda %100'dür. Hemşire-hasta oranı, üniversite hastanelerinde 1:4, özel hastanelerde 1:2'dir. Günlük çalışma süreleri ünitelere göre farklılık göstermekte olup, katılımcıların %89,6'sı günde 8 saatten daha uzun süre çalışmaktadır.

Sonuç: Bu çalışmanın sonuçları, Türkiye'deki üniversite ve özel yoğun bakım ünitelerinde hemşire iş gücü sayısı ve niteliğinin hem ulusal hem de uluslararası standartlara ulaşamadığını göstermektedir. (Yoğun Bakım Derg 2014; 5: 5-10)

Anahtar sözcükler: Yoğun bakım, hemşire, iş gücü, yoğun bakım ünitesi

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Introduction

Patients in critical care or intensive care units (ICUs) are at greater risk for pharmaceutical and medical errors than patients in other units. Critical care nurses have significant responsibilities in ensuring patient safety and preventing errors (1). Recently, critical care nursing associations in developed countries and the World Federation of Critical Care Nurses (WFCCN) have developed standards for ICU nursing practice and critical care nurse training (2-6). The main objective of these standards is to take the necessary steps to ensure quality care and patient safety in ICUs (5). However, the worldwide nursing shortage, which has also been documented in Turkey, is a significant problem and is particularly salient within the field of critical care nursing (6-8).

Background

Studies indicate that the nursing staff affects patient care outcomes. It has been reported that assigning one patient above the prescribed number to an intensive care nurse increases patient mortality rates by 9% (9), the risk of nosocomial pneumonia by 7%, pulmonary failure by 53%, unplanned extubation by 45%, and other medical complications by 17% (10). An Australian study found that more than half of the unexpected incidents and errors in ICUs were caused by inexperienced nurses and were attributable to nursing staff shortages, as well as inadequate support and supervision provided to new recruits (11). Another study reported that when the proportion of certified critical care nurses in ICUs increased, the incidence of patient falls decreased (12).



One of the standards developed for critical care nursing concerns the nurse-to-patient ratio. According to the standards of the Australian College of Critical Care Nurses and the British Association of Critical Care Nurses, the recommended nurse-to-patient ratio is 1:1 for critical patients and patients receiving mechanical ventilation in ICUs and 1:2 for high-dependency patients (2, 4). The recommended ratio in the United States is a maximum of two patients (1:2) per ICU nurse according to the American College of Critical Care Medicine (3). The Ministry of Health in Turkey set the standard nurse-to-patient ratio to be 1:4 for ICUs (without patient dependency levels) in 2008 (13).

Another standard developed for ICUs concerns the training of critical care nurses. WFCCN published its standards on critical care nursing education in August 2005, which included specialized training for critical care nurses (6). In Turkey, training courses designed for critical care nurses started in the 1990s, and relevant educational standards were first established by the Ministry of Health in 2003 (14). Additional regulations for critical care nurses, developed in 2007, were last updated and integrated into critical care standards in 2012. Accordingly, nurses working in neonatal ICUs are required to attend a neonatal resuscitation program (NRP), in addition to critical care training (15, 16).

In the literature, we found two studies regarding the nurse staffing in ICUs in Turkey. One of these studies is a commission report by the Turkish Medical Association about high mortality rates in neonatal ICUs in 2005. According to this report, each nurse was assigned two to six infants on mechanical ventilation. The nurses had no specialized training in neonatal critical care. They had long working hours, and the nurse turnover rate was high (7). Another study of note is the 2006 report of the Turkish Society of Pediatric Emergency and Intensive Care Medicine, according to which almost half of pediatric ICUs (46.7%) did not have specialized critical care nurses, and nurses attended to an average of 4.5 patients per shift (8). The aim of this study was to evaluate the training and experience levels of the ICU nursing workforce in Turkey.

Material and Methods

Sample

This was a descriptive study in Turkey. As military and public hospitals refused to participate in this survey, we conducted the study in university and private hospitals. We identified the hospitals with ICUs by checking the Ministry of Health Annals of Inpatient Treatment Institutions and web pages of hospitals, and by making telephone enquiries. The directors of the nursing and medical administration of all private hospitals and university hospitals included in this study were mailed copies of the survey questionnaire, along with permit letters explaining the purpose of the study. The response rate was 36.2%. As a result, 144 ICUs at 20 university and 18 private hospitals consented to participate in this study.

Data collection instrument

The investigators developed a two-part data collection tool based on the existing literature. (6,13,15). A pilot run of the tool was done in six adult and pediatric ICUs and three neonatal ICUs, after which the tool was revised. The first part consisted of 13 questions on the management of the nursing workforce-i.e., roster systems within the units; total

daily and weekly working hours; overtime hours; number of patients cared for during weekdays, weekend days, and night shifts; presence of experienced nurses during the shifts; and the rate of nurse turnover in the 1, 2, and 5 years preceding the survey. The second part consisted of 8 questions concerning gender, basic nursing education levels, and critical care training.

Data collection

The directors of the nursing and medical administration of the hospitals were asked to fill out the questionnaires with the head nurse of each ICU. They were also asked to return the completed survey questionnaires by mail and were notified that postage would be paid upon delivery to the recipient. Questionnaires were re-sent to the hospitals that had not responded to the initial request after approximately 4 months. Data were collected between January 2009 and January 2010.

Statistical analysis

Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) 18 software was used to analyze the data. Numbers, percentages, and means were used for data evaluation.

Results

Participants

Out of a total of 144 ICUs¹ that participated in the study, 104 were at university hospitals and 40 were at private hospitals. Out of a total of 1416 nursing staff members² that worked in these ICUs, 82.8% worked in university hospitals and 17.2% worked in private hospitals. Female nursing staff constituted 92.3% of participants from university hospitals and 81.5% of those working in private hospitals. Bedside nursing staff constituted 91.2% of all participants (Table 1).

Educational level of participants

We found that 89.1% of the ICU nursing staff graduated from nursing schools, and the remaining nurses were qualified as midwives, emergency medical technicians, or paramedics. Only 0.5% reported having a master's degree, and 66% had a bachelor's degree; 13.9% had nursing diplomas (associate degree), and 19.6% was a vocational high school graduate (Table 1).

Orientation training was received by 46.6% of the participants upon employment in an ICU, and 15.2% reported having a critical care nursing certificate recognized by the Ministry of Health. Only 10.4% of participants both had a critical care nursing certificate and received ICU orientation. Nearly half (48.6%) of the participants had not received any ICU training (Table 2).

Professional experience of participants (length of employment)

We found that 30.2% of the participating ICU nursing staff had critical care experience of 1 year or less, and only 10.3% of participants had more than 9 years of experience. Overall, the professional experience (ICU plus other nursing positions) of 68.9% of the nursing staff was 5 years or less. For the total years of professional experience, the percentages were 17.3% with 5.1 to 10 years of experience, and only 13.8% had been in the profession for over 10 years (Table 3). According to calculations based on data provided by ICUs who responded to the relevant questions, the survey results indicated that on average, 31.3%

¹18 Coronary Care Unit, 13 Cardiovascular Surgery ICU, 6 Brain Surgery ICU, 8 Medical ICU, 16 Reanimation Unit, 6 Neurological ICU, 6 Surgical ICU, 10 Pediatric ICU, 33 Neonatal ICU, and 28 General (mixed) ICU

²135 Coronary Care Unit, 126 Cardiovascular Surgery ICU, 90 Brain Surgery ICU, 120 Medical ICU, 178 Reanimation Unit, 46 Neurological ICU, 72 Surgical ICU, 112 Pediatric ICU, 300 Neonatal ICU, and 237 General (mixed) ICU nurses

Table 1. Characteristics of intensive care nursing staff

Hospital type	University		Private		Total	
	n	%	n	%	n	%
Nursing staff						
Sex						
• Female	1083	92.3	198	81.5	1281	90.5
• Male	90	7.7	45	18.5	135	9.5
Title						
• ICU head nurse	99	8.4	26	10.7	125	8.8
• Bedside nursing staff	1074	91.6	217	89.3	1291	91.2
Educational level						
• Vocational high school graduates	155	13.2	123	50.6	278	19.6
• Associate degree	179	15.3	18	7.4	197	13.9
• Bachelor degree	832	70.9	102	42.0	934	66.0
• Master science of nursing	7	0.6	--	--	7	0.5
Graduated Schools						
• Nursing	1088	92.8	174	71.6	1262	89.1
• Midwives	59	5.0	12	4.9	71	5.0
• Other (emergency medical technicians, paramedics, anesthesia technicians, etc.)	26	2.2	57	23.5	83	5.9
Total	1173	82.8*	243	17.2*	1416	100.0*
*Row percentage; ICU: intensive care unit						

Table 2. Intensive care unit training status of nursing staff by orientation and/or certification programs

Hospital type	University		Private		Total	
	n	%	n	%	n	%
Educational program						
ICU certification program* ICU orientation program	119	10.2	28	11.5	147	10.4
Only ICU certification program	67	5.7	2	0.8	69	4.8
Only ICU orientation program	379	32.3	133	54.8	512	36.2
Did not participate in any educational program	608	51.8	80	32.9	688	48.6
Total	1173	100.0	243	100.0	1416	100.0
*ICU certification program denotes the 320-hour specialized critical care nurse training program approved by the Turkish Ministry of Health. Successful candidates receive a certificate of completion. ICU: intensive care unit. 1) Orientation program was received by 46.6% (10.4%+36.2%) of the participants. 2) Critical care certificate was received by 15.2% (10.4%+4.8%) of the participants.						

of ICU nursing staff left their jobs in the first year, 47.9% left in the first 2 years, and 100% left in the 5 years preceding the survey (Table 4).

Nurse-to-patient ratios and presence of experienced nursing staff during shifts

The number of patients per nursing staff per shift varied between 3.81 and 4.34 at university hospitals and between 2.18 to 2.47 at private hospitals (Table 5). According to the respondents, 67.4% of ICUs always had one or more experienced nurse during night and weekend shifts, while 18.8% reported that they often did and 4.9% reported rarely doing so.

Daily and weekly working hours of the participants

Participating ICUs had varying daily shift durations (three 8-hour shifts, two 12-hour shifts, one 8-hour plus one 16-hour shift, one 6-hour plus one 18-hour shift, or one 10-hour plus one 14-hour shift). In addition, we found that units usually used different shift patterns for their weekday and weekend shifts. In this context, 58.3% of ICUs had one 8-

plus one 16-hour shift, 18.8% had 12-hour shifts, and 10.4% had 8-hour shifts or one 10-hour and one 14-hour shift. Total working hours were 40 hours per week in 38.2% of the ICUs and over 48 hours per week in 9.7% of the ICUs (Table 6).

Discussion

This study was conducted in order to assess the current status of the Turkish nursing workforce in ICUs. The reference to standards in this discussion is based on the ICU standards set by the Turkish Ministry of Health in 2007-2008, because these standards were in force during the period covered by this study.

Education levels and professional experience of participants

One of the most important findings of the study was the scarcity of nursing staff with critical care training, experience, and competence. On average, the education level of 3.3 out of 10 nursing staff members was

Table 3. Participants' total professional experience and total intensive care unit experience

Hospital type	University		Private		Total	
	n	%	n	%	n	%
Professional experience						
ICU experience						
≤6 months	201	17.1	37	15.2	238	16.8
7-12 months	151	12.9	38	15.6	189	13.4
1.1-3 years	354	30.2	69	28.4	423	29.9
3.1-6 years	243	20.7	49	20.2	292	20.6
6.1-9 years	95	8.1	33	13.6	128	9.0
>9 years	129	11.0	17	7.0	146	10.3
Total professional experience						
≤5 years	822	70.1	154	63.4	976	68.9
5.1-10 years	185	15.8	60	24.7	245	17.3
>10 years	166	14.1	29	11.9	195	13.8
Total	1173	100.0	243	100.0	1416	100.0
ICU: intensive care unit						

Table 4. Turnover rates of intensive care unit nursing staff by hospital type

Turnover rate Hospital type	Within 1 year preceding the survey			Within 2 years preceding the survey			Within 5 years preceding the survey		
	n*	X	SD	n*	X	SD	n*	X	SD
University (n=104)	80	31.9	21.7	56	48.7	33.2	36	112.8	101.1
Private (n=40)	23	29.1	19.1	16	45.1	20.8	10	55.7	31.9
Total (n=144)	103	31.3	21.1	72	47.9	39.7	46	100.0	93.4
*Calculations are based on data provided by ICUs that responded to the relevant question. ICU: intensive care unit; X: arithmetic mean; SD: standard deviation									

Table 5. Number of patients per nursing staff by shift and by hospital type

Shift	Hospital type	University (n=100)*		Private (n=30)*		Total (n=130)*	
		X	SD	X	SD	X	SD
Weekday-	day shift	3.81	1.65	2.30	0.74	3.46	1.62
Weekday-	night shift	4.30	1.78	2.47	0.94	3.87	1.79
Weekend-	day shift	4.15	1.87	2.18	1.08	3.69	1.91
Weekend-	night shift	4.34	1.91	2.20	1.06	3.84	1.96
*Calculations are based on data provided by ICUs that responded to the relevant question. ICU: intensive care unit; X: arithmetic mean; SD: standard deviation							

below the level of a bachelor's degree, and 8.5 out of 10 nursing staff members did not have a critical care nursing certificate. More than half of the ICU nursing staff had not received orientation training. Approximately 1 out of 10 employees in university hospital ICUs and 3 out of 10 employees in private hospital ICUs were emergency medical technicians, paramedics, or midwives with no nursing education who were working with the same authority and performing the same tasks as critical care nurses. In addition, the number of Master in Nursing Science nurses, who can play an important role in initiating changes in this field, was very low.

According to international standards, every ICU patient should be cared for by competent, professional nurses trained in critical care, and

critical care nurses must receive training in the field before taking sole responsibility for any ICU patient (4). According to the WFCCN, critical care nurses should, upon graduation from a general nursing program, receive specialist training from a university or an equivalent educational institution (6). The ACCCN recommends that at least 50% (optimally, 75%) of nursing staff in ICUs be qualified nurses (2). According to critical care standards published by the Turkish Ministry of Health in its 2007 report, critical care nurses should have completed these training recommendations within 1 year of the publication of the standard (15). A comparison of these standards with the actual levels of basic professional education and training acquired following graduation found by this study reveals that critical care nursing staffs are underqualified. This jeopardizes the patients' right to safe patient care practices, as evidenced by studies that indicated an association between patient outcomes and the level of nurse training and education (12, 17). It has been reported that a high proportion of nurses with graduate degrees or higher within nursing teams leads to decreased patient mortality¹⁷, and a high proportion of RN-BSN nurses leads to a decrease in unexpected incidents, such as skin breakdown (12).

Another noteworthy result of the survey is the inadequate amount of experience found in ICU nursing staffs. In both private and university hospitals, almost 3 out of 10 nursing staff members had 1 year of critical care experience or less, and only 6 out of 10 had a maximum of 3 years of experience. In addition, nursing staff turnover was very high at 1, 2, and 5 years preceding the study. But these results can not be general-

Table 6. Scheduled daily and weekly working hours for intensive care unit nursing staff

Working hours	University hospitals		Private hospitals		Total	
	n	%	n	%	n	%
In a day						
3 X 8 hours/day	8	7.7	7	17.5	15	10.4
2 X 12 hours/day	17	16.3	10	25.0	27	18.8
8+16 hours/day	79	76.0	5	12.5	84	58.3
10+14 hours/day	-	-	15	37.5	15	10.4
24 hours/day	-	-	3	7.5	3	2.1
In a week						
40 hours/week	48	46.2	7	17.5	55	38.2
41-45 hours/week	28	26.9	9	22.5	37	25.7
46-48 hours/week	24	23.1	14	35.0	38	26.4
>48 hours/week	4	3.8	10	25.0	14	9.7
Total	104	100.0	40	100.0	144	100.0

ized to all ICUs, because the response rate of the relevant questions gradually decreases according to year number. Furthermore, more than half of the nursing staff surveyed had 5 years or less professional experience in this study. A Turkish study on neonatal ICUs also reported high nurse turnover (7). In contrast, O'Brien-Pallas et al. (18) reported that the mean rate of nurse turnover was 9.49% in a study of medical and surgical units, and in a study conducted in the United States, the average national nurse turnover rate was reported as 21.3% (19). Studies indicate that high nurse turnover rates result in high staffing costs, low patient satisfaction levels, and increased workload and decreased productivity levels of nurses (18, 20). The results of the current study show that Turkish ICUs have very high levels of nurse turnover; thus, retention strategies need to be implemented urgently.

Nurse-to-patient ratios

Another noteworthy finding of the current study is that the ratio of the number of patients per nurse was higher than that recommended by international standards. The nurse-to-patient ratio in university hospitals (average 1:4) was higher than in private hospitals. This is undoubtedly better than the ratios revealed by the Turkish Medical Association's Commission Report on neonatal ICUs (where the ratio of nurses to infants on mechanical ventilation was up to 1:6 in weekend and night shifts) and the Turkish Society of Paediatric Emergency Medicine and Intensive Care Medicine (1:4.5) (7, 8). However, failure to attain optimum nurse-to-patient ratios, compounded by high nurse turnover rates, can have even more serious consequences, because ICU patients are under the care of nurses who are both insufficient in number and inadequately trained. Nursing and hospital administrators should therefore give careful consideration to these staffing issues and take appropriate measures to achieve the required nurse-to-patient ratios while seeking progressive solutions to the problem of nurse retention.

In order to ensure patient and staff safety, the recommended nurse-to-patient ratio in ICUs in many countries is 1:1 or 1:2 (2, 4, 21). A 4-year prospective study on pediatric ICUs by Marcin et al. (22) revealed that unplanned extubations were 4.24 times more prevalent where the nurse-to-patient ratio was 1:2 than where it was 1:1. Cho et al. (23)

undertook a study of 1365 critical care nurses in South Korea to examine the association between nurse staffing and nurse-rated quality of patient care and job outcomes. Regression analyses indicated that nurses who cared for two patients or less at a given time provided patient care that was 3.26 times higher in quality than those who tended to three or more patients.

Daily and weekly working hours of participants

One of our findings was that total weekly working hours in two out of three ICUs were within an acceptable range of 45 hours per week (24). There were a large number of units where the nursing staff worked more than 8 hours per day, despite studies indicating that nurses report a significant increase in the numbers of errors and near errors in ICUs where shifts are longer than 8.5 or 12 hours per day and 40 hours per week (25, 26). While there is a 7.5-hour night shift statutory limit in Turkey (24), hospital directors are authorized to organize rosters any way they see fit according to the needs at hand (27). Extended working hours in ICUs may compromise patient safety, and there is a need for nurse managers to take steps toward shortening shifts.

The data obtained are based on the information provided by the head nurse of each ICU. Our inability to collect data on the spot for this investigation may be a limitation of our study.

Conclusion

The shortage of critical care nurses is a serious problem at a local, national, and global scale, and the competency of nursing staff is equally important to the quality and safety of patient care. The results of our study on the status of the nursing workforce in Turkish ICUs in university and private hospitals found a shortage of nurses, high patient caseloads, inadequate training opportunities, high turnover, and insufficient intensive care experience. While weekly working hours were within acceptable limits, daily working hours were excessive in a portion of the ICUs. These findings represent problems that can significantly compromise the quality and safety of patient care. It is essential for policy-makers, nurse managers, and hospital administrators to develop strategies that will enhance the quantity of quality nurses and increase current retention rates.

Informed Consent: The study was carried out in accordance with the ethical guidelines in the Declaration of Helsinki for experiments involving humans. All study participants provided informed consent about ethical issues.

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References

- Rothschild JM, Hurley AC, Landrigan CP, et al. Recovery from medical errors: the critical care nursing safety net. *Jt Comm J Qual and Patient Saf* 2006;32:63-72.
- ACCCN ICU Staffing Position Statement (2003) on Intensive Care Nursing Staffing. Available at: http://www.accn.com.au/images/stories/downloads/staffing_intensive_care_nursing.pdf. Accessed January 16, 2013.
- Brilli RJ, Spevetz A, Branson RD, et al. Critical care delivery in the intensive care unit: defining clinical roles and the best practice model. *Crit Care Med* 2001;29:2007-2019. [CrossRef]
- Bray K, Wren I, Baldwin A, et al. Standards for nurse staffing in critical care units determined by: The British Association of Critical Care Nurses, The Critical Care Networks National Nurse Leads, Royal College of Nursing Critical Care and In-flight Forum. *Nurs Crit Care* 2010;15:109-11. [CrossRef]
- Critical Care Nurse Training Standards Task Group Final Report. 2005. Available at: http://www.caccn.ca/en/files/mohltc_report_ccn_stds.pdf. Accessed January 16, 2013.
- Williams G, Schmollgruber S, Alberto L. Consensus Forum: worldwide guidelines on the critical care nursing workforce and education standards. *Crit Care Clin* 2006;22:393-406. [CrossRef]
- Yenidoğan birimlerinde bebek ölümleriyle ilgili komisyon raporu. Türk Tabipler Birliği, 2005. Available at: <http://tr.pdfsb.com/readonline/6246524b6577313656334235436e3568-5293203>. Accessed March 15, 2013.
- Çocuk yoğun bakım hizmetleri: mevcut durum ve öneriler. Çocuk Acil Tıp ve Yoğun Bakım Derneği, 2006. Available at: http://web.deu.edu.tr/cocukyogunbakim/yayinlar/cocuk_yogun_bakim_raporu.pdf. Accessed March 15, 2009.
- Cho SH, Hwang JH, Kim J. Nurse staffing and patient mortality in intensive care units. *Nurs Res* 2008;57:322-30. [CrossRef]
- Nurse Staffing and Quality of Patient Care. In: Evidence Report/Technology Assessment. Agency for Healthcare Research and Quality U.S. Department of Health and Human Services, 2007. Available at: <http://archive.ahrq.gov/downloads/pub/evidence/pdf/nursestaff/nursestaff.pdf>. Accessed January 16, 2013.
- Morrison AL, Beckmann U, Durie M, et al. The effects of nursing staff inexperience (NSI) on the occurrence of adverse patient experiences in ICUs. *Austr Crit Care* 2001;14:116-21. [CrossRef]
- Kendall-Gallagher D, Blegen MA. Competence and certification of registered nurses and safety of patients in intensive care units. *AJCC* 2009;18:106-14. [CrossRef]
- 2008 Yoğun Bakım Ünitelerinin Standartları. MoH, Turkey. Available at: <http://www.saglik.gov.tr/TR/belge/1-7063/yogun-bakim-uniterinin-standartlarigenelgesi-200853.html>. Accessed March 15, 2009.
- 2008 Yoğun Bakım Hemşireliği Eğitim Programı Uygulama Yönergesi. MoH, Turkey. Available at: <http://www.saglik.gov.tr/TR/belge/1-6755/yogun-bakim-hem-sireligi-egitim-programi-uygulama-yonerg-.html>. Accessed March 15, 2009.
- 2007 Yoğun Bakım Ünitelerinin Standartları. MoH, Turkey. Available at: <http://www.saglik.gov.tr/TR/dosya/1-27111/h/yogunbakimstandartlari.doc>. Accessed March 15, 2009.
- 2012 Yataklı Sağlık Tesislerinde Yoğun Bakım Hizmetlerinin Uygulama Usul ve Esasları Hakkında Tebliğde Değişiklik Yapılmasına Dair Tebliğ. MoH, Turkey. Available at: <http://www.resmigazete.gov.tr/eskiler/2012/02/20120218-12.htm>. Accessed February 03, 2013. PMID:15778649 PMID:17071704 PMID:12224909 PMID:15857520 PMID:19646118
- Estabrooks CA, Midodzi WK, Cummings GG, et al. The impact of hospital nursing characteristics on 30-day mortality. *Nurs Res* 2005;54:74-84. [CrossRef]
- O'Brien-Pallas L, Griffin P, Shamian J, et al. The impact of nurse turnover on patient, nurse, and system outcomes: a pilot study and focus for a multicenter international study. *Policy Polit Nurs Pract* 2006;7:169-79. [CrossRef]
- HSM Group, Ltd. Acute care hospital survey of RN vacancy and turnover rates in 2000. *J Nurs Adm* 2002;32:437-9. [CrossRef]
- Jones CB. The costs of nurse turnover, part 2: application of the Nursing Turnover Cost Calculation Methodology. *J Nurs Adm* 2005;35:41-9. [CrossRef]
- Coffman JM, Seago JA, Spetz J. Minimum nurse-to-patient ratios in acute care hospitals in California. *Health Affairs* 2002;21:53-64. [CrossRef]
- Marcin JP, Rutan E, Rapetti PM, et al. Nurse staffing and unplanned extubation in the pediatric intensive care unit. *Pediatr Crit Care Med* 2005;6:254-7. [CrossRef]
- Cho SH, June KJ, Kim YM, et al. Nurse staffing, quality of nursing care and nurse job outcomes in intensive care units. *J Clin Nurs* 2009;18:1729-37. [CrossRef]
- 4857 sayılı iş kanunu. Available at: <http://www.iskanunu.com/4857-sayili-is-kanunu/245-4857-sayili-is-kanunu-maddeli-metin#67>. Accessed February 12, 2013.
- Rogers AE, Hwang WT, Scott LD, et al. The working hours of hospital staff nurses and patient safety. *Health Affairs* 2004; 23:202-12. [CrossRef]
- Scott LD, Rogers AE, Hwang WT & Zhang Y. Effects of critical care nurses' work hours on vigilance and patients' safety. *Am J Crit Care* 2006;15:30-7.
- MoH. Yataklı tedavi kurumları işletme yönetmeliği. Turke: MoH; 2005. Available at: <http://www.saglik.gov.tr/TR/belge/1-10615/yatakli-tedavikurumlari-isletme-yonetmeliği-son-degisi-.html>. Accessed February 12, 2013.