

Assessment of Nursing Workload Using Nursing Activities Score in Surgical Clinics During the COVID-19 Pandemic

COVID-19 Küresel Salgınında Cerrahi Kliniklerde Hemşire İş Yükünün Hemşirelik Aktivite Aracı ile Değerlendirilmesi

Hümeysra Zengin¹, Derya Özcan¹

¹Hacettepe University Adult Hospital, Director of Nursing Services, Ankara, Türkiye

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Abstract

Background: As the COVID-19 pandemic spread rapidly, healthcare needs of the population increased dramatically throughout the province, and we had limited human resources, using the workforce efficiently became a crucial factor in our hospital. In this study, we evaluated the nurse workforce of surgical clinics in the second year of the pandemic.

Method: A prospective observational study was conducted at the university hospital between 17-23 of September 2021. The data were collected by using the Nurse Observation Form for the descriptive information of the patients, the Nursing Activity Scale (NAS) to measure nursing activities, and the weekly nurse work list for the patient-to-nurse ratio. The forms were filled once a day for seven days during the day shift.

Results: The study included 226 patients in surgical clinics. The mean age of the patients was 48.3 (SD=18.3) years, and most of the patients (65%) were women. The average length of stay in hospital was 11.6 (SD=21.8) days, and 57.5% of patients had comorbidities. More than half of the patients were in the postoperative period. In the inpatient units included in the study, nurse/patient ratio was changing between 1/5-6 to 1/13-14 in the morning and evening shifts. The one-week average NAS score of the patients hospitalized in surgical clinics was 21.8 (Min:9.8, Max:64.3) for brain surgery units and 21.4 (Min:12.9, Max:54.4) for urology units. These NAS scores indicated that more nurses are needed in these clinics than the number of nurses currently in service.

Conclusion: Our findings showed that more nurses are needed in some services to allocate sufficient time to nursing activities. In this study, NAS was used to predict the workload of the next shift at the patient-nurse level and, thus, assess the patient-to-nurse staff ratios.

Keywords: Nursing, COVID-19, nursing workload, nursing activities score, surgery ward.

Öz

Giriş: COVID-19 küresel salgınında, virüsün yayılma hızına göre ve il genelinde nüfusun sağlık gereksinimine bağlı olarak insan kaynağının az ve sınırlı olduğu hastanelerde, iş gücünü verimli kullanmak önem kazanmıştır. Bu çalışmada salgın döneminin ikinci yılında elektif cerrahiye açılan cerrahi kliniklerinde hemşire iş gücünün değerlendirilmesi amaçlanmıştır.

Yöntem: Bu çalışma, bir üniversite hastanesinde 17.09.2021- 23.09.2021 tarihleri arasında yapılan prospektif gözlemsel bir çalışmadır. Hastaların tanıtıcı bilgileri için hemşire gözlem formu, hemşirelik faaliyetlerini ölçmek için Hemşirelik Aktivite Skalası (NAS) ve hasta hemşire oranı için haftalık hemşire çalışma listesi kullanılmıştır. Veriler, gündüz vardiyasında yedi gün boyunca günde bir kez toplanmıştır.

Bulgular: Çalışmaya, cerrahi kliniklerinde yatan 226 hasta alınmış olup hastaların yaş ortalaması 48.3 (SS=18.3) ve çoğunluğu (%65) kadın olarak saptanmıştır. Hastaların ortalama yatış günü 11.6 (SS=21.8) iken %57.5' inde ek hastalık olduğu ve yarısından fazlasının ameliyat sonrası dönemde bulunduğu tespit edilmiştir. Çalışmaya alınan yataklı birimlerde sabah ve akşam vardiyalarında hemşire başına en az 5-6 hasta ve en fazla 13-14 hasta düştüğü görülmüştür. Cerrahi kliniklerinde yatan hastaların bir haftalık NAS skor ortalamaları en yüksek beyin cerrahisi kliniği 21.8 puan (Min:9.8, Max:64.3) ve üroloji kliniğinde 21.4 puan (Min:12.9, Max:54.4) olarak hesaplanmıştır. Bu bölümlerde NAS puanına göre var olan hemşire sayısından daha fazla hemşireye gereksinim duyulduğu belirlenmiştir.

Sonuç: Hemşirelik faaliyetleri puanları, bakım alan hasta sayısının ve hastanede kalış süresinin fazla olduğu kliniklerde artmıştır. Bu çalışma, hemşirelik faaliyetlerine yeterli zaman ayırmak için bazı kliniklerde daha fazla hemşireye gereksinim olduğunu ortaya koymuştur. Bu çalışmada NAS kullanılmış olup bu, hasta-hemşire düzeyinde bir sonraki vardiyanın iş yükünün ve dolayısıyla hasta-hemşire personel oranlarının öngörülmesine katkıda bulunmuştur.

Anahtar Sözcükler: COVID-19, pandemi, hemşirelik aktivite aracı, hemşirelik iş yükü, cerrahi klinikler.

Corresponding author / Sorumlu yazar: Hümeysra Zengin • zenginhumeysra@gmail.com

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Introduction

Many researchers have proposed methods for determining nurse staffing requirements. Although many studies have investigated this issue, better nurse staffing methods need to be developed. Nurse managers must decide in advance the number of nursing staff that need to be recruited and the number of staff to be deployed in each shift, either as a fixed daily staffing plan or in response to immediate demand (Griffiths et al., 2016).

A pandemic refers to a situation where the level of disease is out of control, and countries and international organizations, such as the World Health Organization, emphasize its importance; it is a term used to indicate a globally significant health problem (Borges et al., 2021). During the pandemic, the workload of healthcare workers increased, patients needed more attention, the number of jobs increased, including changes in documentation/new technologies for patient care, employees worked more than normal shifts, and the number of patients per nurse increased (Doleman et al., 2023). Sudden disasters, such as a pandemic, can cause confusion in society and healthcare institutions (Shaffer, 2019). In such cases, many people are admitted to hospitals, which greatly increases the burden on health systems. During the two years of the pandemic, new intensive care units and ward beds were opened in health institutions periodically, taking into account patient care needs across the country and cities (Lopes Piberio et al., 2022). As the number of staff affected by the COVID-19 disease in hospitals increased, additional staff was needed due to labor loss (Haldane et al., 2021). During the pandemic, researchers asked the healthcare organizations to develop and implement policies focusing on supportive conditions and better working environments for employees, and to keep the workload at a reasonable level by ensuring staff adequacy (Hunter et al., 2022). Nurses, who constitute the largest workforce in large-scale healthcare organizations, play a key role in maintaining the quality of patient care and improving the health conditions of patients.

As the COVID-19 pandemic spread rapidly and the healthcare needs of the population across provinces increased dramatically, many departments of hospitals had to make new arrangements. Based on the decisions of the health authorities during the outbreak, non-essential elective surgical operations were postponed to minimize contact between individuals, and control the spread of the coronavirus in institutions providing secondary and tertiary healthcare services (Mehta et al., 2022). Patients were admitted to inpatient surgical clinics only in emergencies. In the second year of the pandemic, elective surgical operations were started again after the outbreak was brought under control in our country. The change in many structural and administrative characteristics in hospitals over two years caused difficulties in predicting and planning the nurse workforce required in the newly opened units. Therefore, the workforce needed to be used efficiently in public hospitals, especially in those where human resources were limited. In disaster situations, such as a pandemic, planning for these units is difficult if the number of nurses required for the proper functioning of certain units of a hospital is not determined by national standards (Sharma and Rani, 2020). When nurses are needed to multitask, and experience resource limitations and increased physical and psychological load, their physical and mental health is affected, and their professional quality of life deteriorates (Vizheh et al., 2020; Niu et al., 2022). Managing human resources effectively in times of crisis is a challenging issue for managers in healthcare institutions. Therefore, a valid assessment tool is needed to accurately assess patient care needs at any given time in the unit and develop recruitment strategies for the dynamic nursing staff (Decock et al., 2012; Youngh et al., 2015). Nursing workload includes the amount of time and the physical and cognitive effort that nurses need to invest to perform direct and indirect activities related to patient care. Objective measurement of the nursing workload per shift can help to plan staffing requirements (Debergh et al., 2012). Information collected during a task analysis usually focuses on the workforce, which is active around the clock. However, within 24 hour, the nursing duty includes a few unequal shifts.

The Nursing Activities Score (NAS) tool is used to measure the nursing workload required for special patient groups or intensive care units and provide appropriate nursing care (Bruyneell et al., 2019). NAS can also be used as a managerial tool to predict the nursing interventions and their durations required for a patient in the next period. It can also be used to predict changes in the workload of nurses (Miranda et al., 2003). Additionally, this tool can be used to measure nursing workload at the patient acuity level over 24 h. In a study that found COVID-19 patients increase the nursing workload in terms of the number of patients per nurse and the Nursing Activity Score per nurse, the researchers critically analyzed the measurement tools based on the NAS and stated that they are inadequate in determining the number of nurses per patient in daily practice, and they decrease the effectiveness of nursing workload scoring systems (Hoogendoorn et al., 2020). However, in other studies where NAS was validated, it reflected 81% of the time spent on nursing activities (Nieri et al., 2018). The obtainable score on the scale ranged between 0 and 177 for 23 items. A score of 177 represented the labor and time of 1.77 full-time nurse workforce. Compared to TISS-28, which only assessed 43.3% of therapeutic interventions, the NAS was more specific in assessing nursing activities. It also included the provision of indirect care in administrative and management terms. Additionally, 81% of the scores obtained from the NAS covered patient care activities, and 19% covered the activities of the nurses (Miranda et al., 2003).

In this study, we evaluated the nursing workload in the surgical clinics in the second year of the pandemic. The time spent by nurses performing activities in the departments opened to elective surgery was calculated, based on which the nursing workload was assessed effectively.

Method

Study Subjects and Design: We conducted a descriptive study at the university hospital from 17 to 23 September 2021. The study was conducted in five surgical clinics in a tertiary university hospital with 801 beds, opened for elective surgery in Hacettepe Adult Hospital. There were 18 surgical clinics in this hospital and 354 surgical beds. The number of beds opened for elective surgery was 150. The study was approved by the hospital management. In this study, no direct personal/patient information was collected. The surgical clinics were coded so that they could not be identified in the reports. As this was an observational study and the data were de-identified, informed consent was not required.

Data Collection Tools:

Patient Information Form: This form consisted of five questions on socio-demographic characteristics (e.g., age, gender, comorbid diseases, hospitalization status pre-op/post-op, and hospitalization duration).

Nursing Activities Score: This tool was developed by Miranda et al. in 2003, based on the TISS-28 developed in 1996, and a measurement tool that listed therapeutic nursing interventions and intervention clusters. The NAS is a reliable tool consisting of 23 items and is used for the real-time assessment of the duration of nursing activities. It has been validated in critical patient groups and translated into various languages. The validity and reliability of NAS in Turkish were assessed by Karadilli in 2016, and the validity of that version of NAS was found to be high. In the reliability analysis of NAS, the total Cronbach's Alpha coefficient of 23 items was found to be 0.30, which is a very low result. The NAS items are independent of each other and evaluate different units of a whole. Therefore, combining or removing any items from this whole is not recommended (Karadilli & Aksoy, 2016).

Weekly Nurse Worklist: In this study, a list of nurses who worked in two shifts according to the number of patients in surgical clinics in weekly periods was created. This list included nurses who were working in the surgical clinics of hospitals. In total, 44 nurses were working in the five clinics opened to elective surgery. In the clinics included in the study, nurses worked in two (morning and evening) shifts.

Data Collection: The data were collected using a patient documentation form and nurse weekly list NAS to measure nursing activities. The NAS form was filled during the day shift once a day for seven days. The data from the professionals were collected prospectively, directly in the inpatient clinics. A spreadsheet was filled in daily by checking the scales and confirming with the nurses the number of professionals working in each shift.

Data Analysis: The data were analyzed using SPSS for Windows 25.0 (Statistical Package for Social Sciences). The values were presented as numbers (percentages) for categorical variables and mean, standard deviation (SD) for continuous variables. In a study, Margadant et al. found that a nurse fulfills nursing activities in 80% of the working time in an eight-hour shift $((8 \text{ h} \times 60 \text{ min}) / 100) \times 0.8 = 3.84$, and 1 NAS point was evaluated as equal to 3.84 min of nursing time (Margadant et al., 2020). Based on that study, the average NAS score calculated for a patient was multiplied by 3.84 and converted into nurse working time to assess the number of nurses needed in the clinics of our hospital, which were opened to patient hospitalization with the start of elective surgical operations.

Ethical Considerations: The study was approved (Date:1.09.2021, Number:01028) by the hospital management. In this study ethics committee approval was not required since no direct personal information was collected. The authors declared that the study was conducted in accordance with the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Results

The mean age of patients (n = 226) was 48.3 (SD=18.3) years. Most patients were female (65%), and 57.5% of them had comorbid diseases. More than half of the patients were in the postoperative period. The mean number of hospitalization days in the clinics was 11.6 (SD=21.8) days (Table 1).

Table 1. Demographic characteristics of the patients

Demographic Characteristics	Surgical Clinics											
	Brain Surgery		General Surgery-1		General Surgery-2		Gynecology		Urology		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Age (mean, SD)	52.4 (18.3)		54.2 (16.6)		53.2 (17.5)		29.1 (5.5)		56.8 (15)		48.3 (18.3)	
Gender												
Female	21	55.3	34	70.8	27	69.2	54	100.0	12	25.5	148	65.0
Male	17	44.7	14	29.2	12	30.8	0	0	35	74.5	78	35.0
Comorbid Diseases												
Yes	25	65.8	33	68.8	26	66.7	14	25.9	32	68	130	57.5
No	13	34.2	15	31.2	13	33.3	40	74.1	15	32.0	96	42.5
Hospitalization Status												
Preop	26	68.4	24	50.0	16	41.0	8	14.8	28	59.6	102	45.1
Postop	12	31.6	24	50.0	23	59.0	46	85.2	19	40.4	124	54.9
Hospitalization Duration, mean, (SD)	20.02 (33.16)		19.5 (30.2)		9.1 (11.3)		5.2 (12.7)		6.4 (4.2)		11.6 (21.8)	

Table 2. Patient to nurse ratio, NAS score averages in the weekly period

Ward	Schedule						
	Mid-week	Weekend			Mid-week		
	17.9.2021	18.9.2021	19.09.2021	20.09.2021	21.09.2021	22.09.2021	23.09.2021
Brain Surgery							
Number of patients	23	22	21	21	27	26	24
Patient/Nurse Ratio							
morning	5.7	7.3	10.5	5.2	6.7	6.5	6
night	11.5	11	10.5	10.5	13.5	13	12
Average NAS Score	20.6	20.1	20.3	24.6	24	21.7	20.8
General Surgery-1							
Number of patients	23	22	21	22	16	25	22
Patient/Nurse Ratio							
morning	7.6	11	11	7.3	5.3	8.3	7,3
night	12.5	11	11	11	8	12.5	11
Average NAS Score	12.9	11,7	11.1	15.1	12.9	19.2	16.8
General Surgery-2							
Number of patients	16	15	20	15	12	21	15
Patient/Nurse Ratio							
morning	5.3	7.5	7.5	5	4	7	5
night	8	7.5	7.5	7.5	6	10.5	7.5
Average NAS Score	13.5	12.7	13.9	22.2	13.2	19.1	19.9
Gynecology							
Number of patients	15	18	12	15	23	20	13
Patient/Nurse Ratio							
morning	5	9	6	5	7.6	6.6	4.3
night	7.5	9	6	7.5	11.5	10	6.5
Average NAS Score	16.9	12	9.8	23.5	15.3	13.8	16.7
Urology							
Number of patients	22	18	20	19	20	22	24
Patient/Nurse Ratio							
morning	5.5	9	10	4.7	5	5.5	6
night	11	9	10	8.5	10	11	12
Average NAS Score	21.2	19.6	19.2	24.1	19.9	21.9	24

The ratio of patients per nurse in 24 h and during all shifts (morning + night) is presented in Table 2. In the clinics included in the study, there were at least five patients per nurse and at most 13 patients per nurse in the morning and evening shifts.

Table 3. Nursing workload according to NAS scores of surgical clinics

	A	B	C	D	E	F	G	H
Clinics	Average Number of Inpatients (Min-Max)	Average NAS Score for a Patient (Min-Max)	Nurse Working Time by NAS Score For One Patient (BX3.84)	Nurse Working Time For All Patients (AXC)	Number of Nurses Working in Morning Shift	Total Nurse Working Time (E X 384 (min)	Increased Nurse Work Time Required (D-F)	Number of Nurses Needed According to NAS Score (G/384)
Brain Surgery	23.4 (21-27)	21.8 (9.8- 64.3)	83.7	1958	4	1536	806	2.09
General Surgery-1	21.5(16-25)	16.7 (9.8-48.9)	64.1	1378	3	1152	226	0.5
General Surgery-2	16.2 (12-21)	16.3 (9.8-37.5)	62.6	1014	3	1152	-138	-0.4
Gynecology	16.5 (12-22)	15.5 (8,7-48.9)	59.6	982	3	1152	-169	-0.4
Urology	20.7 (18-24)	21.4 (12.9-54.4)	82.2	1701	4	1536	165	0.4

The one-week assessment of NAS score averages of the patients hospitalized in surgical clinics showed that the scores were high in the brain surgery and urology units (Table 3). Some clinics needed more nurses, whereas the number of available nurses in other clinics was quite high.

Discussion

In surgical clinics, very special nursing care is provided in the preoperative and postoperative periods in the form of various treatment regimens and the daily use of circulatory and respiratory support technology (Oliveira et al., 2015). A study showed that an increase in the workload of nurses was associated with the length of hospital stay, and the increase in workload affected the quality of care provided to the patients (McHugh et al., 2021). The hospital stay of patients who underwent surgery due to adult spinal deformity during the pandemic was three days shorter (six days versus nine days) than that before the pandemic (Wang et al., 2021). In a retrospective study that investigated hospitalized patients during the pandemic, the average length of stay was found to be 4.72 days, or two days shorter (Huang et al., 2023). Thus, the duration of hospital stay was shorter during the pandemic. However, in this study, the average length of hospital stay was found to be at least 5.2 (SD=12.7) days in the gynecology ward and at most 20.02 (SD=33.16) days in the brain surgery ward. In this study, the length of hospital stay was found to be longer during the pandemic.

A cross-sectional study conducted in 12 European countries found that the ratio of patients per nurse in hospitals (all shifts) was 5.4 in Norway, 13.0 in Germany, 3.3 in Norway, and 10.5 in Germany (Aiken et al., 2012). In the United States, a study analyzed the data from 617 hospitals found a mean number of 5.3 patients per registered nurse and 3.6 patients per total number of nursing professionals. In England, a mean of 7.97 patients per registered nurse was found in clinics, with at least 4.85 patients and at most 11.06 patients; while in surgical units, a mean of 7.33 patients per registered nurse was found, with at least 4.60 patients and at most 11.34 patients (Griffiths et al., 2016). A study evaluated the three-month change in nurse staff grades in 969 hospitals in Korea in 2020 and reported that the score varied between 1 and 7, depending on the nurse-to-patient ratio (Park et al., 2021). In the clinics included in this study, there were at least 5 patients per nurse in the morning shift, and this number was similar to that reported in other studies. In the evening shift, the number of patients per nurse was over 13–14 patients, and this number was higher than that reported in studies from other countries. The results of a randomized controlled study based on 14 medical and 14 surgical clinics of seven hospitals in Belgium showed that a lower number of patients per nurse was associated with lower mortality rates (Haegdorens et al., 2019). Pre-calculating the workload of nurses during a pandemic and pre-determining the workload of nurses (which increased during the pandemic) could have reduced the challenges that were experienced during the pandemic (Lucchini et al., 2020). Some studies have reported that assessing the number of nurses required per patient for each unit and evaluating the workload is important to ensure the safety of patients and employees (Fasoi et al., 2020). We found that one-week NAS score averages were different in each clinic (Table 2). According to the one-week NAS score averages of the patients hospitalized in the surgical units, the number of nurses needed in the different units was different. Studies showed that in the morning shift, more medical treatments were administered, and patients were transferred from the emergency room and other intensive care units, creating a greater workload for nurses (Moghadam et al., 2021).

The increase in the NAS total score indicated that the workload of nurses increased (Miranda et al., 2003). Since the nursing service is provided 24 h a day, seven days a week, conditions may change even in every shift due to the nature of the work. Especially in surgical clinics, morning and evening shifts are quite intense, and the number of patients is lower on weekends. Similarly, in this study, we calculated the workload of nurses in departments opening to elective surgery and involved many nurses in these departments, especially during morning hours. We found that additional nurses were needed in the day shift, especially in neurosurgery and urology services. Studies conducted in the United States and Britain showed that the ratio of nurses per patient in inpatient clinics was at least 5 and at most 11 (Aiken et al., 2012; Magalhães et al., 2017); similarly we just found this ratio during the morning shift in our study. The results of the study indicated that the number of nurses should be flexible depend on the number of patients and changes in case density in surgical clinics. This study was conducted when elective surgeries were started again during the pandemic period; based on the NAS, we aimed to estimate the workload at the patient-nurse level and determine the patient-to-nurse staff ratios in the following shift or day. Nurse working hours was calculated for a patient according to the NAS score, and the total nurse working hours was determined for the total number of patients in the ward. Based on these results, the nursing workload was found to be higher, especially in the patient groups hospitalized in the neurosurgery and urology departments. This finding indicated that surgeries performed in the preoperative and postoperative periods might create workload at various levels.

Limitations of the study: Hygiene procedures and new treatments (e.g., high flow nasal cannula oxygen therapy) applied to patients infected with this disease during the COVID-19 pandemic were some of the difficulties that increased the nursing workload. Since the workload of nurses was evaluated using NAS in this study, the time spent on hygiene procedures and new treatments could not be evaluated. Other methods need to be improved, including predictive analytics, which can continuously evaluate multiple parameters in real-time staffing during emergencies, such as pandemic. We also could not determine the exact number of nurses required for surgical services. Nursing workload was not calculated based on the type of surgeries performed on patients. The reliability of NAS was not evaluated in this study.

Conclusion

Health human resource planning is a dynamic and complex issue. The number of nurses working in inpatient treatment institutions in many countries is determined by the number of inpatients, which varies in many hospitals. NAS can be used to calculate nursing activities, and distributing the workforce based on the NAS scores can be an effective method to ensure patient safety for nurse managers with limited nursing staff during periods of crisis. A standardized approach to measure patient care needs, especially during a pandemic, might make it easier to estimate nursing workload. Using this strategy, the necessary nursing care can be provided to patient groups in greater need.

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