Original Article

Nursing workload in an intensive care unit of a teaching hospital*

Carga de trabalho de enfermagem em Unidade de Terapia Intensiva de um hospital de ensino

Carga de trabajo de enfermería en una Unidad de Cuidados Intensivos de un hospital de enseñanza

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ABSTRACT

Objective: To evaluate nursing workload in an adult intensive care unit (ICU), and to describe the profile of patients admitted to that unit. **Methods:** A descriptive study using the Nursing Activities Score (NAS) for 33 days in an ICU with a capacity of 18 beds. **Results:** 574 observations were obtained from the registry of 107 patients, and the mean NAS score was 62.2%. **Conclusion:** The NAS is in an important tool for measuring nursing workload in ICUs, as it considers various nursing activities performed in daily care. We stress the importance of its application on the everyday life of the nurse.

Keywords: Workload; Intensive care units; Nursing staff; Hospitals, teaching; Nursing assessment

RESUMO

Objetivo: Avaliar a carga de trabalho de enfermagem em uma Unidade de Terapia Intensiva (UTI) - adulto e descrever o perfil dos pacientes, nela, internados. **Métodos:** estudo descritivo com o uso do *Nursing Activities Score* – NAS durante 33 dias em uma UTI com capacidade para 18 leitos. **Resultados:** Foram 574 observações, obtidas do registro de 107 pacientes e a média da pontuação do NAS foi de 62,2%. **Conclusão:** O NAS constitui-se em um importante instrumento para mensurar a carga de trabalho de enfermagem em UTI, uma vez que contempla diversas atividades de enfermagem realizadas no dia a dia da assistência. Ressalta-se a importância de tornar sua aplicação parte do cotidiano do enfermeiro.

Descritores: Carga de trabalho; Unidades de Terapia Intensiva; Recursos humanos de enfermagem; Hospitais de ensino; Avaliação em enfermagem

RESUMEN

Objetivo: Evaluar la carga de trabajo de enfermería en una Unidad de Cuidados Intensivos (UCI) – adulto y describir el perfil de los pacientes, internados en ella. **Métodos:** estudio descriptivo realizado con el uso del *Nursing Activities Score* – NAS durante 33 días en una UCI con capacidad para 18 camas. **Resultados:** Se efectuaron 574 observaciones, obtenidas del registro de 107 pacientes y el promedio de la puntuación del NAS fue de 62,2%. **Conclusión:** El NAS se constituye en un importante instrumento para mensurar la carga de trabajo de enfermería en la UCI, ya que contempla diversas actividades de enfermería realizadas en el dia a dia de la asistencia. Se resalta la importancia de que su aplicación sea parte del cotidiano del enfermero.

Descriptores: Carga de trabajo; Unidades de terapia intensiva; Personal de enfermería; Hospitales escuela; Evaluación en enfermería

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INTRODUCTION

The costs in the hospital area are increased by the development of advanced therapeutic resources and the need for specialized personnel for patient care [1]. The high cost of the intensive care unit (ICU) is justified because it is a site that centralizes care for critically ill patients and those at high risk, requiring human resources and a complex infrastructure with sophisticated technology for diagnosis and treatment [2].

With regard to the nursing staff, in order to guarantee adequate assistance for the demands of the patient, there is a minimum number of professionals required. The professional staffing requirements are calculated using a systematic process that underlies the planning and evaluation, using quantitative and qualitative measures, to determine the staff nurses needed to provide safe patient care [3].

In the hospital, this is a divisive issue, since it must also comply with the regulatory requirements of responsible agencies and the workload experienced by the team of nursing staff. When it comes to a specialized unit, such as the ICU, the study of this theme is even more important, since an imbalance in the nurse-to-patient ratio can lead to higher cost and jeopardize patient safety. Studies show that more severe patients demand a higher nursing workload [4] and an adequate number of nurses can reduce the risk of mortality as well as *burnout* and job dissatisfaction [5].

Thus, it is necessary to evaluate workload in order to have a just and effective utilization of human resources. For this, instruments to measure workload have been the focus of interest in nursing, since the use of these tools allows professionals to argue the need for professionals to meet the workload demand.

The *Nursing Activities Score* (NAS) is an instrument with the purpose of measuring nursing workload, based on time spent on nursing activities, independent of the severity of the patient's disease [6]. It contains 23 items that cover basic activities, ventilatory support, cardiovascular, renal, neurological, metabolic and specific interventions. The score ranges from zero to 100% or more, which may signify, for example, that more than one professional nurse was necessary to provide patient care on a given day [6-7].

The NAS was validated for the Brazilian culture [7] and has been used to measure workload in the ICU, where mean scores ranged from 51.5% to 66.5% in general adult ICU [8-11], 66.7% to 73.7% in cardiac ICU [11-12] and 65.2% in neurologic ICU [11]. Other initiatives to implement the NAS have occurred in units with patients who require high dependency care [13] and in a gastroenterology unit [14]. Although the results were satisfactory, there is a need for clinical validation studies of the instrument with this patient profile.

Studies that used the NAS in the ICU, aimed at downsizing of personnel, made it possible to reassess the adequacy of staff, with consequent reduction of costs in a private hospital [15] and found a *deficit* of professional nurses in a public teaching hospital [16]. Although these studies have demonstrated viability of its application with reliability and sensitivity, its use as an everyday tool in the ICU has not been reported in the literature.

Thus, we proposed the implementation of the NAS in an adult ICU of a tertiary level teaching hospital, in order to assess the nursing workload and describe the profile of patients admitted to the unit. It is understood that the implementation of the NAS assists in the adjustment of the number of human resources as well as the assessment of the demand for nursing care and activities that require more daily nursing attention.

METHODS

This was a descriptive study, conducted in an adult ICU of a teaching hospital in the state of São Paulo, with specialized care at the tertiary and quaternary levels. The ICU is part of the set of units of the hospital and serves adult patients who require medical or surgical care, from the emergency room (ER), surgical center (SC), post-anesthesia care unit (PACU), post-anesthesia ICU (PICU) and infirmary. Its physical structure is composed of five nursing stations divided into two floors. The focus of the study took place in three of these, located on the second floor of the hospital, with an 18 bed capacity, of which 12 were allocated to patients in the postoperative period and six to patients with coronary heart disease.

For the population, we considered all patients located in the unit during the period of May to June, 2008. The data were collected for 33 consecutive days, similar to other studies on the application of the NAS [15,17]. The sample consisted of subjects who met the age criteria of equal to or greater than 18 years of age. For data collection, we used the NAS and a patient demographic and clinical data sheet that included: age, sex, admission date, type of treatment for which the patient was hospitalized (medical or surgical), origin (ER, CC, PICU, PACU, infirmary) and working diagnosis.

The research project was approved by the Institutional Ethics Committee (Process n° 118/2008) with an exemption from signing the Terms of Free and Informed Consent. Data were collected from the records of nursing and medical teams in the patient chart, the researchers' observations during collection of data and the verbal information of the nursing team, that were not registered in the records.

The NAS was implemented in three units, named in this study as: POU 1 (post-operative unit 1), POU 2

(post-operative unit 2) and CCU (coronary care unit). For the measurement of workload in each unit, we chose to consider the bed, independent of the patient that was occupying it.

The data collected were transferred to a spreadsheet program in Microsoft® Excel, and were analyzed with the aid of SPSS® 15.0 for Windows. We used frequency tables for categorical variables (sex, age, length of stay, treatment type, origin and principal problems) and descriptive statistics (mean, standard deviation, median, minimum and maximum) for the continuous variables (total score).

Statistical analysis of association was completed, in order to identify the mean value of the NAS among the nursing units, using analysis of variance (ANOVA). The *Mann-Whitney* test was used to compare values of the NAS between certain ICU beds, and the chi-square or Fisher exact test was used for comparison between the characteristics of patients admitted to the units. For all tests, we adopted a significance level of 5% ($p < 0.05$).

RESULTS

Patient profile characteristics

Of the 107 patients, 40% were located in POU 1, 39% in POU 2, and 21% in the CCU. The average age was 56.4 years (SD = 16.8, Mean = 58), with a predominance of patients aged over 60 years, and the majority were male (64.5%). The average hospital stay was 6.5 days (SD = 8.9, Mean = 4) with the majority of patients hospitalized in the ICU for up to 5 days (Table 1). The principal motive for ICU admission was related to cardiac problems (43%), and the type of treatment for most was surgical (81.3%), with those patients coming directly from the operating room (35.5%) or PACU (36.4%) (Table 1). By relating the demographic and clinical variables of patients, significant differences were verified between the units for: length of stay ($p = 0.003$), type of treatment ($p < 0.001$), origin ($p < 0.001$) and principal health problems ($p < 0.001$) (Table 1).

Nursing workload

The average workload resulting from the NAS was 62.2% (SD = 20.8) with a median of 61.3% (Table 2). In assessing whether the NAS score differed between the three intensive care units, it was found that, although the CCU obtained the highest score in relation to other units, these statistical differences were not significant ($p = 0.617$).

In assessing the workload per bed, it was observed that those located outside of nursing units, in other words those with any kind of isolation, obtained the highest score. When we compared the NAS values of these beds in relation to others on the respective units, there was a statistical difference only for the beds located in the CCU ($p = 0.05$).

Considering that the NAS makes it possible to identify nursing activities within 24 hours of patient care, we could obtain the frequency with which the items and sub-items of the instrument were recorded. It is noteworthy that all activities contained on the instrument were scored. The items that appeared with most frequency were: laboratory tests (97%); medication (97%); performance of hygienic procedures (81.5%); mobilization and positioning more than three times in 24 hours (70.7%); support and care for the families for about an hour in any shift (93.2%); administrative and managerial routine tasks (71.1%); respiratory support (83.6%); and, quantitative measurement of urinary output (96.7%).

The items that appeared with lower frequencies, although still high, were: vital signs, calculation and regular notation of water balance (57.5%); presence at the bedside and observation or continuous activity for two hours or more (35.9%); care for artificial airway (53.7%); treatment for improving lung function (64.8%); vasoactive medication (49.1%); and, enteral feeding (37.5%).

Some items were often low, appearing less than 1% of the time. Among these were: hygiene procedures lasting more than four hours, in any shift (0.2%); intravenous administration for large volume fluid loss (0.2%); cardiopulmonary resuscitation in the last 24 hours (0.7%); measurement of intracranial pressure (0.3%); and, treatment of complicated acidosis/alkalosis (0.2%).

DISCUSSION

There were 574 observations that resulted from the evaluation of daily records of 107 patients treated in these intensive care units. Of these, 65% were male and 35% female, which is similar to other ICU studies, in which the majority were male [7- 9,11, 17-18]. The mean age of patients was 56.4 years (SD = 16.8), however, the prevalent age was over 60 years, with emphasis on the coronary care unit (68%), corroborating studies in intensive care, which showed a predominance of the elderly population [9, 11, 17-18].

The length of stay of patients in the POU 1 and 2 was predominantly less than five days, which explains the high turnover of patients. On the other hand, the CCU had a well-distributed length of stay, with primarily clinical patients admitted from the ER, according to severity and non-elective status. In the POU 1 and 2 units, the majority of the patients originated from the SC and PACU, which is due to the fact that some surgeries, such as cardiac surgery, have as the protocol that the patient

Table 1. Distribution of patients by nursing stations, according to demographic and clinical data. Campinas, 2008.

Characteristics	POU 1		POU 2		CCU		Total		p-value
	n	(%)	n	(%)	n	(%)	n	(%)	
Gender									0.801*
Feminine	14	(32.6)	15	(35.7)	9	(35.5)	38	(35.5)	
Masculine	29	(67.4)	27	(64.3)	13	(59.1)	69	(64.5)	
Age									0.278**
<30	8	(18.6)	4	(9.5)	0	0	12	(11.2)	
31-40	4	(9.3)	4	(9.5)	1	(4.5)	9	(8.4)	
41-50	5	(11.6)	4	(9.5)	2	(9.1)	11	(10.3)	
51-60	12	(27.9)	10	(23.8)	4	(18.2)	26	(24.3)	
> 60	14	(32.6)	20	(47.6)	15	(68.2)	49	(45.8)	
Time of hospitalization (days)									0.003**
<5	33	(76.7)	26	(61.9)	8	(36.4)	67	(62.6)	
5-10	9	(20.9)	9	(21.4)	6	(27.3)	24	(22.4)	
11-20	1	(2.3)	5	(11.9)	3	(13.6)	9	(8.4)	
21-30	0	0	1	(2.4)	0	0	1	(0.9)	
>30	0	0	1	(2.4)	5	(22.7)	6	(5.6)	
Treatment type									<0.001*
Surgical	41	(95.3)	41	(97.6)	5	(22.7)	87	(81.3)	
Clinical	2	(4.7)	1	(2.4)	17	(77.3)	20	(18.7)	
Origin									<0.001**
ER	2	(4.7)	4	(9.5)	18	(81.8)	24	(22.4)	
CC	18	(41.9)	19	(45.2)	1	(4.5)	38	(35.5)	
PACU	21	(48.8)	18	(42.9)	0	0	39	(36.4)	
PICU	0	0	1	(2.4)	0	0	1	(0.9)	
Infirmary	2	(4.6)	0	0	3	(13.6)	5	(4.6)	
Principal problems									
Cardiac	13	(30.2)	11	(26.2)	22	(100)	46	(43)	<0.001**
Neurologic	12	(27.9)	6	(14.3)	0	0	18	(16.8)	
Renal & Urological	4	(9.4)	4	(9.5)	0	0	8	(7.5)	
Gastrointestinal	9	(20.9)	7	(16.7)	0	0	16	(15)	
Vascular	2	(4.7)	7	(16.7)	0	0	9	(8.4)	
Others	3	(6.9)	7	(16.7)	0	0	10	(9.3)	

* Chi-Square Test ** Fisher's exact test

Table 2. Median (%), standard deviation (SD), median, minimum & maximum of the Adult ICU. Campinas, 2008.

Station	n	Mean	SD	Median	Minimum	Maximum	P-value
POU 1	145	61.7	20.0	60.5	0	150.4	0.617
POU 2	231	61.5	23.5	61.3	0	153.3	
CCU	198	63.4	17.9	61.3	0	135.0	
Total	574	62.2	20.8	61.3	0	153.3	

* Analysis of Variance (ANOVA)

goes directly from the operating room to a unit, because of the rigorous attention required in the evolution of these patients.

In the ICU, in general, the reason for treatment was due to cardiac and neurological problems, differing from other ICU studies by the particular characteristics reflecting the reality of the hospital in question. On the units where the population was predominantly surgical, the principal reasons for hospitalization were distributed, resembling the population of a study conducted in medium and large hospitals [17], but with different proportions. In the CCU, all admissions were for cardiac problems, characterizing a specialized unit.

With regard to the workload of the NAS for the ICU, we obtained a mean of 62.2%, similar to those found in national studies, which showed scores close to or greater than 60% [9-11,15,18], which were higher than in a Spanish study [19] that had an mean score of approximately 41%. Despite the CCU having a higher workload than the other intensive care units, these values were lower when compared to other CCU studies[11-12]. This is justified because in the current study, most patients were admitted for clinical treatment, which differs from other studies [11-12], in which there were a predominance of patients who were post-operative for cardiac surgery.

The beds that had higher scores were outside the physical structure of the nursing unit, because it used beds for patients that required some type of precaution or for those who were already hospitalized for a long time and needed privacy. However, only the bed outside of the CCU showed statistical significance ($p = 0.05$) in relation to the other beds in the station itself. This means that in this unit, patients admitted in rooms distant from the station were those which required a higher number of nursing hours and therefore required more complex care. For the nursing manager, this fact must be taken into consideration when determining the number of daily personnel, in order to meet the care needs of patients with safety and quality.

In assessing the workload obtained by the NAS in hours, considering that each point of the instrument is equivalent to 0.24 h [9], we obtained 14.9 nursing hours in patient care: time that is less than that recommended by COFEN Resolution 293/2004 for the patient who requires intensive care. It is noteworthy that the hours recommended by this resolution do not take into account the peculiarities of each ICU, since the institution under study there is a unit for semi-intensive care.

In the analysis by item and subitem of the NAS, the activities that appeared with a frequency exceeding 90% were: laboratory investigations, use of medications, and quantitative measurement of urinary output, which corroborates other studies [9,17]. The "support and care for family members and patients," was also evaluated as a frequent activity, because the hosting of the family, especially during visiting hours, has been valued by professionals in the intensive care environment. The results of a review study showed that, along with talking to the doctor every day to know about the condition and prognosis of the patient, the family would like nurses to talk about the care on the unit, equipment, and what they could do during visiting hours [20].

Those activities related to monitoring of the patient, performing hygienic procedures, administrative and managerial tasks, and respiratory support also contributed to the increase in workload for nursing: data that resemble those of a study conducted in a general adult ICU [9]. Similarly, the items "artificial airway care," "treatment for the improvement of lung function" and "vasoactive medications," appeared at a frequency exceeding 49%, demonstrating that a great number of the patients had cardiac and respiratory instability.

Based on the fact that the study was in intensive care settings, where one can predict times of greater patient instability with the use of high technology, CPR was performed at a very small frequency. Likewise, other activities that required more time for completion included: support and care for family members and patients for more than three hours, and administrative and managerial tasks for about four hours, were assessed to be uncommon. The item "administrative and managerial tasks for about four hours" was considered only when patients died or required more time due to the complexity of activities and the health care offered.

CONCLUSION

The majority of patients were male, aged 60 years or older, with a length of stay less than five days. The site of origin was predominantly the ER for the CCU and surgical center, and PACU in the POU 1 and 2. The reason for treatment of the patients was for cardiac, neurological and gastrointestinal problems, differing from the majority of the studies in terms of the particular characteristics that reflected the reality of the hospital in question. Only in the coronary care unit was the principal problem cardiac in nature.

The study made it possible to measure the nursing workload in the intensive care environments studied, which was, on average, 62.2%. Although the workload identified by the NAS was very close to what was experienced in other Brazilian ICUs, the results are important for application in units with the same characteristics encountered within this study, especially the fact that this study took place in a tertiary and quaternary teaching hospital.

However, the importance of improving the nursing records in order to document the activities performed

with the patient within 24 hours is evident, both to contribute to studies such as this one and to be a legal document. For this, the NAS must be presented to the nursing staff, so everyone is aware of the importance of this tool. The application does not need not to be made primarily by a single nurse; she can involve everyone, provided that they understand and that they standardize the reading and procedures and processes specific to the unit.

It is understood that the implementation of the NAS must be considered in the daily ICU, to make the process of nursing work directed more to the demands of patients and to assist in personnel management, along with the management of hospital services.

REFERENCES

1. Tranquitelli AM, Padilha KG. Sistemas de classificação de pacientes como instrumentos de gestão em unidades de terapia intensiva. Rev Esc Enferm USP. 2007; 41(1): 141-6.
2. Telles SC, Castilho V. Staff cost in direct nursing care at an intensive care unit. Rev Latinoam Enfermagem. 2007; 15(5): 1005-9.
3. Gaidzinski RR, Fugulin FM, Castilho V. Dimensionamento de pessoal de enfermagem em instituições de saúde. In: Kurcgant P, coordenadora. Gerenciamento em enfermagem. Rio de Janeiro: Guanabara Koogan; 2005. p.127-37.
4. Balsanelli AP, Zanei SS, Whitaker IY. Carga de trabalho de enfermagem e sua relação com a gravidade dos pacientes cirúrgicos em UTI. Acta Paul Enferm. 2006; 19(1): 16-20.
5. Aiken LH, Clarke SP, Sloane DM, Sochalsky J, Silber JH. Hospital nursing staff and patient mortality, nurse burnout, and job dissatisfaction. JAMA. 2002; 288(16): 1987–93.
6. Miranda DR, Nap R, Rijk A, Schaufeli W, Iapichino G, TISS Working Group. Therapeutic Intervention Scoring System. Nursing activities score. Crit Care Med. 2003; 31(2): 374-82.
7. Queijo AF, Padilha KG. Nursing activities score (NAS): cross-cultural adaptation and validation to portuguese language. Rev Esc Enferm USP. 2009; 43(N Spec):1018-25.
8. Nogueira LS, Santos MR, Mataloun SE, Moock M. Nursing Activities Score: comparação com o índice APACHE II e a mortalidade em pacientes admitidos em unidade de terapia intensiva. Rev Bras Ter Intensiva. 2007; 19(3): 327-30.
9. Conishi RM, Gaidzinski RR. Nursing Activities Score (NAS) como instrumento para medir carga de trabalho de enfermagem em UTI adulto. Rev Esc Enferm USP. 2007; 41(3): 346-54.
10. Gonçalves LA, Garcia PC, Toffoleto MC, Telles SC, Padilha KG. Necessidades de cuidados de enfermagem em terapia intensiva: evolução diária dos pacientes segundo o Nursing Activities Score (NAS). Rev Bras Enferm. 2006; 59(1): 56-60.
11. Queijo AF. Estudo comparativo da carga de trabalho em unidades de terapia intensiva geral e especializadas, segundo o Nursing Activities Score (NAS) [tese]. São Paulo: Universidade de São Paulo, Escola de Enfermagem; 2008.
12. Ducci AJ, Zanei SS, Whitaker IY. Nursing workload to verify nurse/patient ratio in a cardiology ICU. Rev Esc Enferm USP. 2008; 42(4): 673-8.
13. Lima MK, Tsukamoto R, Fugulin FM. Aplicação do Nursing Activities Score em pacientes de alta dependência de enfermagem. Texto & Contexto Enferm. 2008; 17(4): 638-46.
14. Panunto MR, Guirardello EB. Nursing workload at a gastroenterology unit. Rev Latinoam Enferm. 2009; 17(6): 1009-14.
15. Padilha KG, Sousa RM, Garcia PC, Bento ST, Finardi EM, Hatarashi RH. Nursing workload and staff allocation in an intensive care unit: a pilot study according Nursing Activities Score (NAS). Intensive Crit Care Nurs. 2010; 26(2): 108-13.
16. Inoue KC, Matsuda LM. Sizing the nursing staff in an intensive care unit for adults. Acta Paul Enferm. 2010; 23(3): 379-84.
17. Gonçalves LA, Padilha KG. Fatores associados à carga de trabalho de enfermagem em Unidade de Terapia Intensiva. Rev Esc Enferm USP. 2007; 41(4): 645-52.
18. Ducci AJ, Padilha KG. Nursing activities score: a comparative study about retrospective and prospective applications in intensive care units Acta Paul Enferm. 2008; 21(4): 581-7.
19. Bernat Adell A, Abizanda Campos R, Cubedo Rey M, Quintana Bellmunt J, Sanahuja Rochera E, Sanchís Munõz J, et al. Nursing Activities Score (NAS). Nuestra experiencia con un sistema de cómputo de cargas de enfermería basado em tiempos. Enferm Intensiva. 2005; 16(4): 164-73.
20. Verhaeghe S, Defloor T, Van Zuuren F, Duijnstee M, Grypdonck M. The needs and experiences of family members of adult patients in an intensive care unit: a review of the literature. J Clin Nurs. 2005;14(4):501-9.