



## ORIGINALES

### Nursing workload required by patients during ICU admission: a cohort study

Carga de trabalho da enfermagem requerida por pacientes durante internação numa UTI: estudo de coorte

Carga de trabajo de enfermería requerida por los pacientes durante la hospitalización en una UCI: estudio de cohorte

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#### ABSTRACT:

**Objective:** To identify the nursing workload required by adult patients during hospitalization in an Intensive Care Unit (ICU) and in relation to the clinical outcome.

**Methods:** Prospective cohort with 53 patients admitted to an adult ICU between July and September 2018. The Nursing Activities Score (NAS) was used for data collection. Descriptive and inferential statistics were used to compare means. The value of  $p < 0.05$  was considered significant. This study was approved by the Research Ethics Committee (Opinion 2,014,344).

**Results:** There was a predominance of female patients (28 - 52.83%), aged between 17 and 96 years, from the urgency/emergency service (34 - 65.38%), and admitted due to diseases of the circulatory system (18 - 33.96%). The severity of patients according to the SAPS 3 score was 52.32 points and the estimated mortality was of 25.34%. The length of hospital stay ranged from 2 to 38 days and discharge prevailed among the outcomes (39 - 73.58%). The average NAS was 57.41%, equivalent to 13.78 hours of nursing care in a 24-hour period. The average nursing workload at admission was higher than the average measured at the time of clinical outcome ( $p < 0.001$ ). Patients who died during hospitalization had an average NAS higher than that of patients who survived ( $p = 0.022$ ).

**Conclusions:** The nursing workload varied over the hospitalization period, being greater on the first day of hospitalization and in the care of patients with a poor prognosis (death).

**Keywords:** Nursing; Workload; Patient Severity; Intensive Care Units.

## RESUMO:

**Objetivo:** Identificar a carga de trabalho da enfermagem requerida por pacientes adultos durante a internação em uma UTI e em relação ao desfecho clínico.

**Métodos:** Coorte prospectiva realizada com 53 pacientes internados em uma UTI de adultos entre julho e setembro de 2018. Utilizou-se o *Nursing Activities Score* (NAS) para a coleta de dados. Realizou-se a estatística descritiva e inferencial para comparação de médias. Considerou-se como significativo o valor de  $p < 0,05$ . Este estudo obteve aprovação pelo Comitê de Ética em Pesquisa (Parecer 2.014.344).

**Resultados:** Houve predomínio de pacientes do sexo feminino (28 – 52,83%), com idade entre 17 e 96 anos, proveniente do serviço de urgência/emergência (34 – 65,38%), devido a doenças do aparelho circulatório (18 – 33,96%). A gravidade pelo SAPS 3 média foi de 52,32 pontos e estimativa de mortalidade de 25,34%. O tempo de internação variou de 2 a 38 dias e a alta dos pacientes prevaleceu (39 - 73,58%). A média do NAS foi de 57,41%, equivalendo-se a 13,78 horas de assistência de enfermagem, no período de 24 horas. A média da carga de trabalho da enfermagem no momento da admissão foi maior que a média mensurada no momento do desfecho clínico ( $p < 0,001$ ). Os pacientes que evoluíram para o óbito durante a internação apresentaram uma pontuação média no score NAS superior à dos pacientes que sobreviveram ( $p = 0,022$ ).

**Conclusões:** A carga de trabalho da enfermagem variou ao longo do período de internação sendo maior no primeiro dia de internação e no cuidado dos pacientes com prognóstico reservado (óbito).

**Palavras Chave:** Enfermagem; Carga de Trabalho; Gravidade do Paciente; Unidades de Terapia Intensiva.

## RESUMEN:

**Objetivo:** Identificar la carga de trabajo de enfermería requerida por pacientes adultos durante su estadía en una UCI y en relación con el desenlace clínico.

**Métodos:** Estudio de cohorte prospectivo realizado con 53 pacientes hospitalizados en una UCI de adultos entre julio y septiembre de 2018. Se utilizó el *Nursing Activities Score* (NAS) para la recopilación de datos. Se emplearon estadísticas descriptivas e inferenciales para comparar los promedios. Se consideró el valor de  $p < 0,05$  como significativo. Este estudio fue aprobado por el Comité de Ética en Investigación (Opinión 2.014.344).

**Resultados:** Hubo un predominio de pacientes del género femenino (28-52,83%), con edades comprendidas entre 17 y 96 años, procedentes del servicio de urgencia/emergencia (34-65,38%), debido a enfermedades del sistema circulatorio (18-33,96%). La severidad promedio por el SAPS 3 fue de 52,32 puntos y la estimación de mortalidad fue de 25,34%. La duración de la estancia hospitalaria osciló entre 2 y 38 días y prevaleció el alta de los pacientes (39-73,58%). El promedio de NAS fue de 57,41%, equivalente a 13,78 horas de atención de enfermería, durante un período de 24 horas. La carga de trabajo de enfermería promedio al momento de la entrada fue mayor que el promedio medido al momento del desenlace clínico ( $p < 0,001$ ). Los pacientes que progresaron a la muerte durante la hospitalización tuvieron un puntaje NAS promedio más alto que el de los pacientes que sobrevivieron ( $p = 0,022$ ).

**Conclusiones:** La carga de trabajo de enfermería osciló durante el período de estancia hospitalaria, siendo mayor el primer día de hospitalización y en la atención de pacientes con un pronóstico reservado (muerte).

**Palabras Clave:** Enfermería; Carga de Trabajo; Gravedad del Paciente; Unidades de Cuidados Intensivos.

## INTRODUCTION

The evaluation of nursing workload has been discussed worldwide in hospital institutions due to its implications for the quality of patient care<sup>(1)</sup>. Such evaluations stand out in scenarios of greater complexity such as Intensive Care Units (ICUs), and they are related to the impact of the application of new technologies in care, the change in the profile of critically ill or at-risk patients, and the need for specialized human resources<sup>(1,2)</sup>.

In view of the need for qualitative and quantitative assessments of nursing human resources, instruments have been developed with the objective of classifying patients in relation to their needs and quantifying the time spent in providing nursing care<sup>(2)</sup>.

The Nursing Activities Score (NAS) is one of the abovementioned instruments and aims to assess the workload and help in the sizing of nursing personnel. It has a total of 23 items that portray the need for care of seriously ill patients over the last 24 hours of hospitalization, based on the quantification of interventions performed by the nursing team during this period<sup>(2,3)</sup>.

Each item scored on the NAS is equivalent to 14.4 minutes of nursing care, the final value being obtained by adding the points of each patient and expressed in terms of percentage of time spent by nurses with provision of care. The 23 items are distributed into seven categories related to: basic activities, ventilatory support, cardiovascular support, kidney support, neurologic support, metabolic support, and specific interventions, totaling 32 activities. Each activity has a score ranging from 1.2 to 32 points, reaching a maximum of 176.8% of the time spent with the patient in the 24 hours of work<sup>(3)</sup>. This instrument has demonstrated satisfactory levels of reliability, allowing its use as a reliable and valid instrument to measure nursing workload in the ICU and justify the need for additional personnel when the workload increases<sup>(4)</sup>.

Excessive workload is one of the contributing factors to the occurrence of negative outcomes, especially in critically ill patients<sup>(5)</sup>. Findings indicate that sociodemographic and clinical characteristics, length of stay in the ICU, mortality and severity of patients are factors associated with high workload of the nursing team<sup>(3,6)</sup>. Thus, care demand indicators are increasingly necessary in nursing, ensuring safety in health care for both patients and professionals<sup>(7)</sup>.

Based on the findings of other studies and the importance of systematic assessment of the nursing workload, the question raised here is: what is the nursing workload required by adult patients throughout ICU stay?

Considering that the workload of the nursing team can compromise the quality of care offered to critical patients and that the use of instruments to assess the nursing workload, such as the NAS, can contribute to the management of care, this research aims to identify the nursing workload required by adult patients during admission to an ICU and in relation to their clinical outcome.

## METHODS

This is a prospective cohort study developed in an Adult ICU of a medium-sized philanthropic hospital located in a municipality in Atlantic rainforest zone of Minas Gerais. This ICU is composed of six beds and is directed to care in the various clinical and surgical specialties. The team of professionals who provide assistance to patients consists of nurses, physical therapists, psychologists, nutritionists, physicians and nursing technicians.

The study population consisted of all adult patients who were admitted to the ICU between the months of July and September 2018, totaling 67 patients. Of the total number of patients hospitalized in this period, 14 were excluded from the sample of

this study, as they remained hospitalized for less than 24 hours. At the end, the sample consisted of 53 patients.

The instrument used for data collection contained in its header the identification information of patients such as sex, age, date of hospitalization, medical diagnosis, origin, clinical outcome of the patient at admission, and score in the SAPS 3 prognostic index. As another evaluation item in this instrument, there was a box containing the 23 items evaluated by the NAS, with their respective sub-items and spaces for filling the daily score of each patient during the ICU stay, so that at the end the sum of the scores and the mean score were. No changes were made in the semantic aspect, description, content, sequence, form, use or application in the length of the scores.

The instrument was applied daily by the researcher, based on the clinical evaluation of the patient and the data put in the medical record.

The data were entered twice in the Microsoft Excel software and analyzed using the Stata version 15.0. Descriptive statistics were performed with distribution of simple and percentage frequencies and analytical statistics with the Student's t-test for comparison of means. The value of  $p < 0.05$  was considered significant.

This study was approved by the Research Ethics Committee of the Federal University of Viçosa (Opinion 2,014,344). The patients included in the study were instructed on the objectives of the research and invited to participate in its realization by signing the Informed Consent Form (ICF). In cases where patients were not able to sign the informed consent form, the signature of their guardians was requested. The confidentiality and anonymity of patients and professionals involved was maintained.

## RESULTS

There was a predominance of female patients (28 - 52.83%), aged between 17 and 96 years (mean of 67.34 years), and coming from the urgency/emergency service (34 - 65.38%), and admitted due to diseases of the circulatory system (18 - 33.96%). The SAPS 3 score varied from 24 to 83 points (average of 52.32 points), with an estimated minimum mortality of 0.7% and maximum of 77.5% (average of 25.34%). The length of hospital stay ranged from 2 to 38 days (mean 07 and total 371 days) and discharge (39 - 73.58%) prevailed over death (14 - 26.42%) among outcomes.

Regarding the nursing workload, measured from the application of the NAS, the average found was 57.41%, with a minimum value of 34.8%, maximum of 96%. Knowing that each point in the NAS corresponds to 14.4 minutes, it was found that the patients needed, on average, 13.78 hours of nursing care in the period of 24 hours (minimum = 8.35 hours and maximum = 23.04 hours).

Among the nursing interventions described in the NAS, laboratory investigations and medication administration were carried out with all hospitalized patients throughout the period of data collection. Other nursing practices also obtained a frequency greater than 80% during hospitalization, namely, monitoring and control of vital signs and water balance (89.22%), hygiene procedures (88.41%), mobilization and positioning more than three times in 24 hours or with two nurses at any frequency (93.53%), and specific interventions (intubation, surgery, endoscopy) (95.42%). The NAS items that

were most frequently identified during the 371 observations corresponding to the total days of patients' hospitalization are shown in Table 1.

**Table 1:** Distribution of frequency of nursing activities included in the NAS performed with patients admitted to the ICU. Viçosa, Minas Gerais, Brazil. 2018.

<b>Variables assessed by the NAS</b>	<b>n</b>	<b>%</b>
1. Monitoring and control		
1. a. Vital signs and water balance*	331	89.22
1. b. Bedside for two hours or more*	39	10.51
1. c. Bedside for four hours or more*	01	0.27
2. Laboratory investigations	371	100
3. Medication, except vasoactive drugs	371	100
4. Hygiene procedures		
4. a. Hygiene procedures*	328	88.41
4. b. Hygiene procedures for more than two hours*	43	11.59
4. c. Hygiene procedures for more than four hours*	-	-
5. Care with drains (except nasogastric tube)	176	47.44
6. Mobilization and positioning		
6. a. Up to three times in 24 hours*	07	1.89
6. b. More than three times in 24 hours or with two nurses*	347	93.53
6. c. Three or more nurses*	17	4.58
7. Family and patient support and care	17	4.58
7. a. Support and care for family and patient for one hour*	17	4.58
7. b. Support and care for family and patient for three hours or more*	-	-
8. Administrative and managerial tasks		
8. a. Routine tasks	225	60.65
8. b. Administrative and managerial tasks for two hours*	146	39.35
8. c. Administrative and managerial tasks for four hours or more*	-	-
9. Respiratory support	228	61.46
10. Care for artificial airways. Orotracheal tube or tracheostomy.	108	29.11
Tracheostomy		
11. Treatment to improve lung function	290	78.17
12. Vasoactive medication	67	18.06
13. Volume replacement with more than 3L/m <sup>2</sup> /day	49	13.21
14. Monitoring left atrium - pulmonary artery catheter	08	2.16
15. Cardiorespiratory resuscitation, except precordial punch	11	2.96
16. Hemofiltration. Dialytic techniques	06	1.61
17. Quantitative measurement of urine output (e.g., bladder catheter)	183	49.33
18. Measurement of intracranial pressure	-	-
19. Treatment of complicated metabolic acidosis/alkalosis	58	15.63
20. Intravenous hyperalimentation	-	-
21. Enteral feeding (nasogastric tube, jejunostomy)	143	38.54
22. Specific interventions within the ICU	354	95.42
23. Specific interventions outside the ICU	35	9.44

\*The sub-items of items 1, 4, 6, 7 and 8 are mutually exclusive

Regarding the data on nursing workload at the time of admission and the clinical outcome of the patients (discharge or death), it was found that there was a variation in the demand for nursing work during the hospital stay. The average nursing workload at admission was higher (71.69%) than the average measured at the time of clinical outcome (52.35%), being this difference statistically significant ( $p < 0.001$ ) (Table 2).

**Table 2.** Comparison of the nursing workload measured by the NAS at the time of admission and clinical outcome of patients admitted to the ICU. Viçosa, Minas Gerais, Brazil. 2018.

	<b>Admission (n = 53)</b>	<b>Clinical outcome (n = 53)</b>	<b>p-value*</b>
NAS Average (SD)	71.69 (± 1.58)	52.35 (± 2.08)	P < 0.001

\*Student's t-test

There was also a statistically significant difference in the average nursing workload in the clinical outcomes of patients admitted to the ICU ( $p = 0.022$ ). Patients who died during hospitalization had an average NAS (63.66%) higher than that of patients who survived (55.18%), corresponding to a workload of 15.28 hours and 13.24 hours, respectively (Table 3).

**Table 3.** Comparison of the average nursing workload measured by the NAS in the different clinical outcomes presented by patients admitted to the ICU. Viçosa, Minas Gerais, Brazil. 2018.

	<b>Death (n = 14)</b>	<b>Discharge (n = 39)</b>	<b>p-value*</b>
NAS Average (SD)	63.66 (± 2.90)	55.18 (± 1.88)	P = 0.022

\*Student's t-test

## DISCUSSION

Among the epidemiological characteristics of critically ill patients found in the present study, the average age (67.34 years) and the female sex stood out, which reinforces the worldwide trend towards the feminization of old age. The age of the patients, even though it is not an item included in the assessment of the nursing workload, plays an important role with regard to the demand for care. Elderly patients present changes that are typical of the aging process, including nutritional problems that can trigger complications in skin integrity and require a longer period of care from the nursing team<sup>(8)</sup>.

The majority of patients admitted to the ICU (65.38%) were referred from urgency/emergency services, corroborating the findings of a study conducted in Piau , where 60.8% of the patients came from the emergency unit (60.8%)<sup>(9)</sup>. Compatibility of the data presented in this study with the scientific literature regarding the main reasons for hospitalization of critically ill patients was also observed, with admissions mainly caused by the presence of diseases of the circulatory system (33.96%), following the tendency of illness due to chronic non-transmissible conditions among the elderly population<sup>(10)</sup>.

In this study, the nursing workload measured by the NAS averaged 57.41%, equivalent to 13.78 hours of assistance, considered close to the value found by other studies conducted in the countryside of Minas Gerais and in the capital of Piau , where the NAS average was 58.85% and 59.90%, respectively<sup>(9,11)</sup>. However, in relation to the international reality, it was observed that the workload found (57.41%) was less

than the average value obtained in three ICUs in Portuguese hospitals (63.04%)<sup>(12)</sup>. Such variations found may be justified by peculiarities of each hospital.

Of the total actions described in the NAS, laboratory investigations and medication administration appeared as the most frequent care measures, being performed with all hospitalized patients during the 371 observation days (100%). Another study carried out in two different ICUs in Piauí corroborates these findings, which can be directly related to the units' routine<sup>(9)</sup>.

Throughout the ICU stay, patients require different actions offered by the nursing team, gradually less as the clinical picture progresses towards a positive outcome. A comparison of the average NAS of the first and last day of hospitalization of patients showed a decrease of 19.34% in the nursing workload. A similar result was found in a study with critical pediatric patients, where the mean NAS on the first day of hospitalization was 69.4% while on the last day it was 59.8%. Such results reflect the clinical situation of patients at different moments<sup>(13)</sup>.

The severity of the clinical condition can influence the patients' degree of dependence, as well as their clinical outcome. In this study, it was found that hospital discharge was the most prevalent outcome (73.58%). However, although death was less prevalent, patients who had such an outcome required an average nursing workload 8.48% higher than that required by patients who survived and were discharged from the ICU. This result is similar to that found in the study<sup>(9)</sup> conducted in two ICUs in Piauí, where patients who were admitted to the ICU and who did not survive demanded a greater workload (63.5%) during hospitalization ( $p = 0.001$ ).

Nursing workload is associated with human resources, quality of care, patient safety and costs. The assessment of the nursing workload is a very important care and administrative tool. Instruments for measuring patient care complexity aid in calculating the demand for hours of nursing care per patient per day, ultimately helping in the sizing of the nursing staff on each shift, in order to improve the quality and safety of care<sup>(13,14)</sup>.

Regarding the sizing of nursing personnel based on the NAS, it was found that the employee/patient ratio 1:2 in force in the researched unit would not be possible to be equated, since in this study the average NAS was above 50%. This finding, also reported in other national studies, corroborates the existence of overload among professionals in the intensive care nursing team<sup>(9,15)</sup>.

The relationship between the workload of the nursing team and patient safety deserves special note. When there is a high workload, there is a deficit in patient surveillance, and this in turn increases the risk of adverse events such as falls, urinary tract infections, central catheter infections and medication administration errors<sup>(8,14,-15)</sup>.

In this sense, the routine and systematic use of the NAS should be considered an initial alternative for improving the distribution of work in the nursing team and patient safety. However, the NAS should not be considered self-sufficient, because only calculating the work time spent by the nursing team without considering the number of professionals needed to provide such care leads to precarious care. The information generated after application of the NAS must be analyzed by the management team in order to check the numerical and qualitative adequacy of professionals in the ICU, in order to effectively contribute to the safety of care<sup>(16)</sup>.

Thus, based on the results of this study, there was a high demand for nursing care and a clear need to reflect on the impact of this workload on professionals, as well as on the quality of care for critical patients.

As a limitation of the study, the fact that the data refer to the reality of a single ICU stands out. This aspect hinders the generalization of the results. However, the diversity of the clinical picture of the patients analyzed is similar to the diversity found in other studies conducted in other ICUs on the subject. Furthermore, the data were collected in a single moment, not separated by shifts, but rather taking into account the patient's evolution within 24 hours.

## CONCLUSIONS

The nursing workload showed an average NAS of 57.41%, equivalent to 13.78 hours of care. The patients were predominantly female, aged between 17 and 96 years, coming from the emergency unit, admitted for cardiovascular diseases, and remained in the ICU for an average of 07 days. The nursing workload varied over the hospitalization period, but there was a greater workload on the first day. In addition, patients who died required a significantly higher nursing workload.

Based on the results obtained, it is clear that the NAS is a useful tool for managing the care of critically ill patients, and should be systematically evaluated throughout hospitalization. It is noteworthy that this was the first study that evaluated the workload required by patients in this ICU, thus, further work will be needed to assess associations between workload and specific severity indices for this clientele profile.

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