

RESEARCH ARTICLE (ORIGINAL) 

## Workload in a hospital inpatient unit using the Nursing Activities Score

*Carga de trabalho numa unidade de internamento hospitalar de acordo com o Nursing Activities Score*

*Carga de trabajo en una unidad de internamiento hospitalario según el Nursing Activities Score*

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**Abstract**

**Background:** High workload can be associated with patient acuity and long hospital stay, often calling for semi-intensive nursing care.

**Objective:** To assess the workload of a nursing team of a hospital inpatient unit using the Nursing Activities Score (NAS).

**Methodology:** An exploratory, cross-sectional, quantitative study was conducted with patients admitted to a hospital inpatient unit. The sample was characterized using sociodemographic and clinical data, and the NAS was used to collect data from documented nursing records.

**Results:** The mean NAS score was 43.2, ranging from 59.0 to 54.1 for the first day and the last day of hospitalization, respectively, which is the average nursing care time. Patients who died and those who showed a positive culture for multidrug-resistant bacteria had higher mean NAS scores on the last day.

**Conclusion:** The nursing workload is high, evidenced by the high demand for care.

**Keywords:** workload; nursing care; nursing; hospital units

**Resumo**

**Enquadramento:** A elevada carga de trabalho pode estar associada à complexidade clínica dos doentes e à longa permanência na unidade, constituindo um tratamento de enfermagem frequentemente baseado em cuidados semi-intensivos.

**Objetivo:** Avaliar a carga de trabalho de uma equipa de enfermagem de uma unidade de internamento através do *Nursing Activities Score* (NAS).

**Metodologia:** Estudo exploratório, transversal, quantitativo, realizado com doentes internados numa unidade de internamento hospitalar. A forma de caracterização composta por dados sociodemográficos, clínicos e o NAS foi usada para recolher dados de registos documentados de cuidados de enfermagem.

**Resultados:** O NAS médio foi de 43,2, variando de 59,0 e 54,1 ao primeiro dia e no último dia de internamento, respetivamente, e este é o tempo médio que um doente necessita de um enfermeiro. Além disso, os pacientes que acabaram por morrer e aqueles que mostraram cultura positiva para germes multirresistentes tiveram médias de NAS mais altas no último dia.

**Conclusão:** A carga de trabalho da equipa de enfermagem é elevada, evidenciada pela elevada procura de cuidados.

**Palavras-chave:** carga de trabalho; cuidados de enfermagem; enfermagem; unidades hospitalares

**Resumen**

**Marco contextual:** La elevada carga de trabajo puede estar asociada a la complejidad clínica de los pacientes y a la larga estancia en la unidad, lo que supone un tratamiento de enfermería a menudo basado en cuidados semiintensivos.

**Objetivo:** Evaluar la carga de trabajo de un equipo de enfermería en una unidad de internamiento hospitalario a través del *Nursing Activities Score* (NAS).

**Metodología:** Estudio exploratorio, transversal y cuantitativo, realizado con pacientes ingresados en una unidad de internamiento hospitalario. La forma de caracterización compuesta por datos sociodemográficos, clínicos y el NAS se utilizó para recoger datos de registros documentados de cuidados de enfermería.

**Resultados:** El promedio del NAS fue de 43,2, variando entre 59,0 y 54,1 el primer día y el último día de hospitalización respectivamente, y este es el tiempo promedio en que un paciente necesita a un enfermero. Además, los pacientes que terminaron muriendo y aquellos que mostraron un cultivo positivo de gérmenes multirresistentes tuvieron en el NAS medias más altas el último día.

**Palabras clave:** carga de trabajo; atención de enfermería; enfermería; unidades hospitalarias



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## Introduction

Nursing workload combines both care and management requirements, involving direct and indirect care to patients. In this context, it is essential to establish an association between the patient's clinical status and his/her dependency on the nursing team, as well as the time that nurses spend performing their activities to promote adequate management of human resources, thus avoiding excessive workload and ensuring the quality of the services (Reich, Vieira, Lima, & Rabelo-Silva, 2015).

In healthcare units, patient dependency levels and nursing care hours are measured through the Patient Classification System (*Sistema de Classificação de Doentes*, SCD), proposed by the Federal Nursing Council in Resolution No. 543/2017 (*Conselho Federal de Enfermagem* [COFEN], 2017). However, in practice, the indirect measures for assessing nursing care hours per patient do not always reflect the actual care needs or the complexity of their care (Reich et al., 2015).

Calculating the nursing workload is important to determine adequate staffing levels for attending to patients' needs in this context. The unit's characterization will improve the quality of care while ensuring the health and safety of both patients and workers (Goulart, Carrara, Zanei, & Whitaker, 2017).

In this perspective, nursing workload consists of the product between the average daily number of patients cared for, based on dependency level and type of care, and the average nursing care hours per patient, based on dependency level and type of care (Fugulin, Gaidzinski, & Castilho, 2010). Therefore, assessing nursing workload requirements and the factors influencing them is essential for promoting adequate staffing levels (Queijo, 2008).

The Nursing Activities Score (NAS) measures the amount of nursing time (as a percentage) required for each patient in 24 hours. To this end, it assesses seven categories: Basic activities, Ventilatory support, Cardiovascular support, Renal support, Neurological support, Metabolic support, and Specific interventions (Queijo & Padilha, 2009).

The NAS was originally developed for measuring nursing workload in an intensive care unit (ICU), although it can be used in other care contexts (Queijo & Padilha, 2009). It can be used in inpatient units, considering that, sometimes, inpatients have severe clinical conditions and high demand for care compatible with intensive care (Silva et al., 2017). However, few studies use this instrument in inpatient units, especially in medical units, which is a knowledge gap. In this scenario, the NAS will contribute to identifying the profile of inpatients and their specificities, which is not possible using only the SCD. Also, by measuring the time spent in nursing care delivery, the NAS contributes to establishing adequate nurse staffing levels, with benefits for both the team and the patients. Thus, the study aimed to assess the workload of a nursing team of an inpatient unit using the NAS.

## Background

For Queijo and Padilha (2009), care indicators are essen-

tial for ensuring the quality of nursing care delivery and contribute to adequate staffing levels in hospital units. The same authors believe that nursing workload assessment is essential for the health institution, considering that inadequate staffing levels increase the institution's costs. In turn, a small team can reduce the quality of care.

A recent study by Reich et al. (2015) used the NAS to assess the workload in a coronary unit and fill a knowledge gap in this specific population. The study found significant associations between the workload and the reason for hospitalization. It also found that the instrument can help to establish nurse staffing levels and plan activities, taking into account the patients' needs in all shifts.

In practice, specific shifts require a higher number of nurses to care for the patients, possibly because of the unit's routines and the total number of staff. This instrument is used to assess the nurses' workload when performing the necessary interventions.

It is necessary to establish an association between the patient's clinical status, nursing care dependency, and the workload to adequately plan the unit's activities and avoid excessive workloads (Reich et al., 2015).

## Research question

What is the workload of a nursing team in an inpatient unit?

## Methodology

An exploratory and cross-sectional study, with a quantitative approach, was conducted in an inpatient unit of a public university hospital (UH) in southern Brazil.

The UH is a pedagogical hospital focused on developing education, research, and health care, serving 100% of patients through the Unified Health System (*Sistema Único de Saúde*, SUS). It is the largest public hospital with the only emergency department that operates exclusively within the SUS in the interior of the State and covers a population of 1.2 million inhabitants. It is a center of excellence in medium and high complexity care and in emergency care that serves 45 municipalities in the Central-Western region of Rio Grande do Sul.

This scenario was chosen specifically because it is an inpatient unit that cares for adult patients from different specialties, namely a significant number of patients after discharge from the hospital's intensive care unit (ICU). To measure the nursing workload, patient data were collected from August 2017 to January 2018, indirectly, that is, data were obtained exclusively from their medical records, and no direct contact was made with the patients. To this end, the daily visits were carried out at pre-established schedules in the unit under analysis, and the information was collected in the medical records made in the past 24 hours. It should also be noted that patients did not undergo any treatment or further examination for research purposes. The inclusion criteria were: patients aged 18 years or older, both male and female, of any medical specialty, and who

were admitted to the unit during the period established for data collection. The exclusion criteria were: patients who were hospitalized for less than 24 hours. Therefore, the study sample included 133 patient records.

Two instruments were used for data collection. The first instrument was elaborated by the authors and is composed of the patients' sociodemographic and clinical data, based on records referring to the first 24 hours in the inpatient unit and updated during hospitalization. The following variables were investigated: gender, marital status, origin (city), unit of origin, type of hospitalization, medical diagnosis, associated comorbidities (diabetes mellitus [DM], high blood pressure, or both), culture for multi-drug-resistant (MDR) bacteria, and discharge destination. The second instrument was the NAS, which was developed by Miranda and collaborators. This instrument was translated into Brazilian Portuguese and cross-culturally adapted and validated for the Brazilian reality by Queijo and Padilha (2009). This instrument assesses the time spent by nurses in performing 23 procedures, with scores ranging from 1.2 to 32.0 points. The final score results from the sum of the items' scores, ranging from 0 to 176.8%, and indicates the percentage of time spent by the nurse in patient care. This instrument was completed every day by the researchers, based on the record of nursing activities performed in the last 24 hours of hospitalization, in a predetermined schedule and providing retrospective information about the nursing workload. Data were inserted into Microsoft Excel® 2010 and analyzed using IBM SPSS software, version 21. Descriptive statistics were used to describe the patients' profile and the nursing workload: absolute frequency (*N*) and percentage tables (%) for categorical variables, and calculation of position

and dispersion measures (mean, standard deviation, minimum and maximum values) for continuous variables. The Student's *t*-test was used to compare the means between the several clinical variables. Pearson's correlation coefficient was used to assess the correlations between quantitative variables. In all analyses, the results were considered statistically significant if  $p < 0.05$ , with a 95% confidence interval.

This study complied with the provisions set out in Resolution No. 466 of December 12, 2012, of the National Health Council, for research involving human beings (Ministério da Saúde, 2012). It was approved by the Research Ethics Committee of the participating university, under CAAE 70575017.8.0000.5346 and opinion number 2.169.349. The sample data were obtained exclusively from the consultation of the patients' medical records, and it was not necessary to use the Informed Consent Form.

## Results

The study included 133 patients, of whom 62.4% were men, 47.4% were married, and 58.9% came from Santa Maria. Regarding the clinical profile, 60.2% were admitted to the institution's emergency room; 70.7% with a clinical hospitalization; 18% with a medical diagnosis related to neurological diseases and 18% with a diagnosis related to cardiovascular diseases; 62.4% of patients had DM, high blood pressure (HBP), or both as comorbidities associated with the reason for hospitalization. In addition, 21.1% of patients had a positive culture for MDR bacteria, and 8.3% of patients died. Table 1 shows the data described above.

Table 1

*Characterization of the patients hospitalized in the inpatient unit, according to the sociodemographic and clinical variables (N = 133)*

Variables	Frequency	
	Absolute (n)	Relative (%)
<b>Gender</b>		
Male	83	62.4
Female	50	37.6
<b>Marital status</b>		
Partner/married	63	47.4
Single/without a partner	43	32.3
Widowed/divorced	27	20.3
<b>Origin</b>		
Santa Maria	68	51.1
Other	65	48.9
<b>Unit of origin</b>		
Emergency room	80	60.2
Intensive Care Unit <sup>1</sup>	30	22.6
Post-Anesthesia Care Unit	11	8.3
Clinical Surgical	7	5.3
Other units	5	3.8
<b>Type of hospitalization</b>		
Clinical	94	70.7
Surgical	39	29.3
<b>Medical diagnosis</b>		
Neurological diseases	24	18.0
Cardiovascular diseases	24	18.0
Gastrointestinal diseases	23	17.3
Endocrine diseases	18	12.3
Trauma	14	10.5
Infectious diseases	12	9.0
Lung diseases	10	7.5
Cancer and blood diseases	5	3.8
Kidney diseases	1	0.8
Autoimmune diseases	2	1.5
<b>Associated DM and/or HBP</b>		
Yes	83	62.4
No	50	37.6
<b>Positive culture for MDR bacteria</b>		
Yes	28	21.1
No	105	78.9
<b>Destination</b>		
Hospital discharge	122	91.7
Death	11	8.3

*Note.* DM = diabetes mellitus; HBP = high blood pressure; MDR = multidrug-resistant bacteria; NAS = Nursing Activities Score. <sup>1</sup>Patients from the Adult ICU and the Cardiovascular ICU.

Table 2 shows the quantitative variables associated with the inpatients' sociodemographic and clinical data and the workload measured using the NAS.

Table 2  
*Descriptive measures of the sociodemographic and clinical variables and the workload (NAS; N = 133)*

Variables	Minimum	Maximum	Mean	SD
Age (years)	18.0	97.0	55.1	18.7
Length of stay (days)	1.0	91.0	15.9	16.1
Mean NAS score of patients during hospitalization (%)	21.7	89.2	43.2	15.6
Mean NAS score of patients on the 1st day of hospitalization (%)	25.7	126.7	59.0	19.2
Mean NAS score of patients on the last day of hospitalization (%)	1.9	144.2	54.1	23.7

Note. SD = standard deviation; NAS = Nursing Activities Score.

The mean age of inpatients was 55.1 years ( $\pm 18.7$  years). They remained hospitalized, on average, for 15.9 ( $\pm 16.1$ ) days. Concerning the workload, the mean NAS score was 43.2% during hospitalization ( $\pm 15.6$ ), 59.0% ( $\pm 19.2$ ) on the first day of hospitalization, and 54.1% ( $\pm 23.7$ ) on the last day of hospitalization. This percentage indicates the average time that a nurse spends with a patient.

Table 3 shows the descriptive analysis of NAS, according to the clinical variables. Thus, the patients who died corresponded to a significantly higher mean workload on the last day of hospitalization (NAS on the last day), and patients with a positive culture for MDR bacteria had the highest NAS scores of nursing workload during hospitalization (mean NAS scores, first day, and last day).

Table 3  
*Descriptive measures of NAS, according to the clinical variables*

Variables	NAS Mean	<i>p</i>	NAS score 1st day	<i>p</i>	NAS score Last day	<i>p</i>
<b>Destination</b>						
Hospital discharge	42.1	0.07	58.9	0.930	49.4	0.00*
Death	55.3		59.5		106.4	
<b>Positive culture for MDR bacteria</b>						
Yes	56.8	0.000*	73.1	0.000*	66.2	0.02*
No	39.5		55.2		50.9	
<b>DM and/or HBP</b>						
Yes	42.6	0.599	57.8	0.400	54.1	0.971
No	44.1		60.9		54.2	

Note. MDR = multidrug-resistant bacteria; DM = diabetes mellitus; HBP = high blood pressure; NAS = Nursing Activities Score. Student's *t* test \* $p \leq 0.05$ .

Inter-variable correlations were also assessed: mean NAS score, NAS score on the 1st day, NAS score on the last day, age, and length of treatment. Table 4 shows positive correlations between mean NAS scores and the NAS on the first and the last day of hospitalization, as well as between the NAS score on the last day and the NAS score on the first day of hospitalization. Moreover, a positive correlation was found between age and the NAS score

on the last day, as well as between the length of hospital stay and the mean NAS score and the NAS on the first day. Based on these findings, it can be concluded that the highest workload required by the patient occurs on the first day and last day of hospitalization. Table 4 also shows that older patients require a higher workload on the last day of hospitalization and that the longer patients are hospitalized, the higher is the average workload.

Table 4  
Pearson's correlation between the NAS and the sociodemographic and clinical variables (N = 133)

Variables	Mean NAS	NAS score first day	NAS score last day	Age	Length of stay
Mean NAS score	1.000				
NAS score on first day	0.000*	1.000			
NAS score on last day	0.000*	0.000*	1.000		
Age	0.059	0.569	0.031**	1.000	
Length of stay	0.020**	0.004**	0.139	0.632	1.000

Note. NAS = Nursing Activities Score. Pearson's correlation coefficient \* $p \leq 0.01$ ; \*\* $p \leq 0.05$ .

## Discussion

In this study, the majority of patients were men (62.4%), mostly clinical (70.7%), coming from emergency departments (60.2%). These data are in line with recent studies conducted with severely obese patients (Santos, Marques, Monteiro, Carvalhal, & Santos, 2019; Siqueira, Ribeiro, Souza, Machado, & Diccini, 2015). An American study with 1,254 males showed that the male population is more hesitant to seek health services on a preventive basis, resulting in future health problems for these individuals. The study also revealed that most individuals were hypertensive, diabetic, obese, and had heart conditions (Sherman, Patterson, Tomar, & Wigfall, 2020).

Another important finding of this study is the high rate of patients with DM, HBP, or both as comorbidities before hospitalization. Another study showed that stroke patients also had these comorbidities (Costa et al., 2018). Moreover, the nurse is responsible for the hemodynamic and neurological monitoring to identify possible early alterations, such as increased intracranial pressure and cerebral edema, and intervene as soon as possible to reduce the risks of sequelae that are common in these patients (Oliveira et al., 2019). These actions are essential for a successful treatment and generate considerable demand for nursing activities.

Regarding the outcome of hospitalization, discharge prevailed, which corroborates studies conducted in other units (Camuci, Martins, Cardeli, & Robazzi, 2014; Siqueira et al., 2015). Hospital discharge begins and is developed throughout the hospitalization and requires the health team's cooperation and co-responsibility (Silva, Ribeiro, & Azevedo, 2018). In addition, this process involves a higher nursing workload, especially regarding the health education of patients and their families.

Based on the NAS, the average nursing workload in the unit under analysis was 43.2%, which means that nurses spend, on average, 43.2% of their time in patient care. A nursing technician is responsible for six to 13 patients per shift in the current context, explaining the professionals' high workload.

Thus, the high nursing workload may be associated with clinical complexity, patient acuity, and high dependency level of neurological patients, which often corresponds to semi-intensive nursing care. It should be noted that the institution does not have a semi-intensive care unit, which makes this inpatient unit a reference for the allo-

cation of patients discharged from the ICU (Taschetto et al., 2018).

Consequently, in this study, the mean NAS score is lower than the scores found in Brazilian ICUs, where the mean score ranged from 62.14% to 71.43% (Oliveira et al., 2019; Silva & Gaedke, 2019). Moreover, concerning the NAS score on the first day and the last day of hospitalization, this study found a higher workload of 59.0% and 54.1%, respectively. This result may be associated with the patient's status on the first day of hospitalization, whose unstable clinical situation requires more care (Trettene et al., 2015). Regarding the mean NAS score on the last day of hospitalization, it was evident that patients who died corresponded to a significantly higher mean workload due to patient acuity and high demand for postmortem care (Oliveira et al., 2019).

Significant correlations were observed between nursing workload, age, and length of stay in the unit, demonstrating patients' high dependency on nursing care. This result differs from that found in a study that assessed the workload in a coronary unit (Reich et al., 2015).

This study also found the presence of MDR bacteria in 21.1% of patients. A significant association was also identified between patients colonized with MDR bacteria and the mean NAS score, the NAS on the first day of hospitalization, and the NAS on the last day of hospitalization (56.8  $p < 0.000$ ; 73.1  $p < 0.000$ ; and 66.2  $p < 0.02$ , respectively). In a retrospective study conducted in nine cardiology ICUs of a high-complexity public hospital with a sample of 835 patients (Sherman et al., 2020), the authors found that the workload measured using the NAS did not influence the occurrence of healthcare-associated infections in those units.

## Conclusion

This study concluded that the high nursing workload may be associated with clinical complexity and patient acuity, calling for nursing treatment often based on semi-intensive care.

The mean NAS score is lower than the scores found in Brazilian ICUs. As for the NAS score on the first day and on the last day of hospitalization, a higher workload was found. As for the NAS score on the last day of hospitalization, it was evident that patients who died corresponded to a significantly higher mean workload due to patient

acuity and high demand for postmortem care. Therefore, this study can promote discussions about the importance of adequate staffing levels to meet patients' care needs, valuing care quality and safety.

### Author contributions

Conceptualization: Camponogara S., Freitas, E. O., Petry, K. E.

Data curation: Camponogara S., Freitas, E. O., Petry, K. E., Pinno, C.,

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Writing – review & editing: Camponogara, S., Freitas, E. O., Petry, K. E., Pinno, C., Taschetto, C. F., Nunes, L. M., Menezes, J.A.

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