Classification of patients and nursing workload in intensive care: comparison between instruments

Classificação de pacientes e carga de trabalho de enfermagem em terapia intensiva: comparação entre instrumentos

Clasificación de los pacientes y carga de trabajo de enfermería en cuidados intensivos: comparación entre instrumentos

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ABSTRACT

Objectives: To evaluate the mean nursing workload obtained through the Nursing Activities Score (NAS) and extract the degree of dependency of patients using Perroca's Patient Classification System (PCS).

Methods: Prospective study conducted at the intensive care unit of a private hospital that is a center of reference in oncology. The instruments were applied daily in a sample of 40 patients with a minimum stay of 24 hours.

Results: Two hundred and seventy-seven measurements were performed with the instruments. The NAS mean was 69.8% (± 24.1%) and Perroca's Patient Classification System score was 22.7% (± 4.2%). The hours of care found by averaging NAS were almost twice those estimated by Perroca's, showing a difference of 7.3 hours.

Conclusion: The direct instrument NAS was more appropriate to measure nursing workload when compared to Perroca's indirect instrument in the studied intensive care unit.

Keywords: Nursing. Intensive care units. Nursing staff.

RESUMO

Objetivos: Avaliar as médias da carga de trabalho de enfermagem obtidas por meio do *Nursing Activities Score (NAS)*, bem como os extratos do grau de dependência de pacientes obtidos pelo Sistema de Classificação de Pacientes de Perroca.

Método: Estudo prospectivo realizado na Unidade de Terapia Intensiva de um hospital privado o qual é referência em oncologia. Os instrumentos foram aplicados diariamente em uma amostra de 40 pacientes, com permanência mínima de 24 horas.

Resultados: Foram realizadas 277 medidas dos instrumentos, sendo a média do *NAS* de 69,8% (±24,1) e de Perroca de 22,7% (±4,2). As horas de cuidados encontradas por meio da média do *NAS* foi quase o dobro daquelas estimadas pelo de Perroca, demonstrando uma diferença de 7,3 horas.

Conclusão: *NAS* como instrumento de medida direta da carga de trabalho de enfermagem apresentou-se mais adequado quando comparado ao instrumento de medida indireta de Perroca, na Unidade do estudo.

Palavras-chave: Enfermagem. Unidade de terapia intensiva. Recursos humanos de enfermagem.

RESUMEN

Objetivos: Evaluar la carga de trabajo de enfermería, promedio obtenido a través de la Nursing Activities Score (NAS), así como los extractos del grado de dependencia de pacientes, por el Sistema de Clasificación de Pacientes de Perroca.

Método: Este trabajo es un estudio prospectivo realizado en la Unidad de Cuidados Intensivos (UCI) de un hospital privado, que es referencia en oncología. Los instrumentos se administraron diariamente en una muestra de 40 pacientes, con una estancia mínima de 24 horas.

Resultados: Se realizaron 277 mediciones de los instrumentos, y el promedio de la NAS del 69,8% (± 24,1) y Perroca 22,7% (± 4,2). Las horas de atención encontradas por medio del promedio del NAS fue casi el doble de los estimados por Perroca, mostrando una diferencia de 7,3 horas.

Conclusión: NAS como un instrumento directo para medir la carga de trabajo de enfermería, se presentó el más apropiado, si se lo compara al instrumento de medición indirecta de Perroca en la UCI del estudio.

Palabras clave: Enfermería. Unidad de cuidados intensivos. Personal de enfermería.

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■ INTRODUCTION

An intensive care unit (ICU) is characterized as being an area reserved to assist critical patients with severe clinical conditions that require artificial substitution of functions and continuous clinical care. It demands a specific physical space, with advanced technology and specialized human resources, which makes it a highly costly unit for the health institution[1].

Taking into account the heavy workload of healthcare professionals in this type of unit, one of the challenges faced by managers is to properly apportion the team to offer the patient safe and evidence-based assistance. Nevertheless, it is well known that health institutions plan their staff costs with limited financial resources, specific legislation, and pre-established quality parameters[2].

Staff apportioning is a systematic process to calculate the number of professionals that comprise a nursing team to meet the needs of users according to the profile of care need. To carry out the apportioning it is indispensable to identify the crucial variables, especially the ones related to the determination of working hours for nurses[3].

Direct and indirect tools that measure the care hours demanded by a patient can be used to estimate the nursing workload. These instruments are necessary to support staff apportioning. Patient classification systems (PCSs) are currently used in Brazil to determine the care hours according to the complexity of the assistance that the patient requires.

The measurement provided by PCSs is considered an indirect estimate of the care hours, which does not intend to assess the time spent in each activity by the nursing professionals. Other methods have been emerging as a direct estimate of workload, especially in the context of intensive therapy, considering the time spent in each activity regardless of the obtained care score. The Nursing Activities Score (NAS) has often been applied in this category for allowing a direct measurement of the nursing workload.

One of the classification systems, recently updated and validated in Brazil, stands out among the established systems in the literature, even in comparison with the one currently in force. It is the Perroca's PCS, whose first version was published in 1996 and which was updated in 2009 to encompass some aspects that had not been proven in other patient classification instruments. It also incorporated the new tendencies in assistance and management in nursing practice to match the technological advances in the last decade. The new version has nine care areas: planning and co-ordination of the care process; investigation and monitoring; body care and eliminations; skin and mucosa care; nutrition and hydration; locomotion and activity; therapeutics; health education; and emotional support. Each area is graded from 1 to 4 to describe the increasing complexity of assistance[4].

Taking into account the instruments to assess the workload directly, NAS stands out for its wide application, which is not restricted to intensive care[5-6], because it times activities and care needs to set parameters to apportion nursing human resources. The version translated into Portuguese comprises seven categories or domains: basic activity; ventilatory support; cardiovascular support; kidney support; neurological support; metabolic support; and specific interventions which, with their subcategories or subdomains and their items, total 23 fields that make up to the nursing workload in 24 hours[7].

The literature reveals that both NAS[7-8] and Perroca's PCS[9-10] have been applied more often in healthcare institutions, showing positive results as tools for nursing management practice, especially in ICUs. However, it is important to stress the need to evaluate the applicability of such instruments in different branches of clinical practice, highlighting the best answers obtained in each one to accurately and effectively determine the elements necessary to apportion the nursing staff.

The literature demonstrates that NAS has proven efficient in estimating the nursing workload in Brazilian ICUs[11-15], thus helping the nursing staff work, allowing the planning and setting an accurate availability of assistance.

It is worth mentioning that the literature gives examples of studies describing nursing workloads in ICUs but, unlike the present study, with little emphasis on specific facilities.

Given this context, important issues arise regarding the applicability of these tools and the behavioral aspects related to them in the adult oncological ICU environment. What is the nursing workload assessed through NAS? How dependent are these patients on care? How are these tools aligned or opposed when compared?

With this issue as a starting point, the present study aimed to assess the mean nursing workload through NAS and Perroca's PCS, with the latter providing the patients'

dependency grade levels and used as an indirect workload evaluation method.

■ METHODS

This was a prospective quantitative study[16] carried out in an adult ICU with eight hospital beds in a private hospital in Natal, RN, Brazil that, along with three other facilities, is part of an oncologic attention network recognized by the Brazilian Ministry of Health as a High Complexity Oncology Center.

The research took place from June to August 2014. For sample calculation purposes, a previous study on the use of NAS in intensive therapy[12] was used. Its objectives were to characterize ICU patients regarding their biosocial and hospital stay aspects and evaluate the daily nursing care needs according to NAS. Considering a mean NAS of 66.5% (± 9.1%), found in the referred study, a maximum error of three NAS points, and a significance level of 5%, the designed sample would require a minimum of 35 patients. Therefore, with the study extending to 90 consecutive days, the present experiment reached a sample with 40 patients, including the 5% of the pilot test.

Three tools were used for data acquisition: a patient profile form to register the sociodemographic and hospital stay information; the NAS score with a list of its items; and the patient classification system based on the patient's nursing care dependency level as suggested by Perroca. The last two questionnaires were filled according to a pre-established tutorial.

The data were collected with the patient's or a legal representative's explicit consent and the Free and Clarified Consent Term was signed, according to Resolution nº 466/12 regarding ethical issues in research involving human subjects. Prior to that, the institution's ethics committee approved the project (report nº 558.799 and CAAE 24966013.7.0000.5293). The patients were followed from hospital admission until discharge. The study sample comprised patients of both genders, 18 years old or older, whose length of stay was longer than 24 hours.

The forms of the instruments were filled out with data from the patients' medical records, and complementary information was provided by the nursing staff when necessary. For standardization purposes, the recorded information referred to the previous 24 hours, with the start of the study day at 11 a.m. As for the first day of stay, the interventions realized from the time of admission until 11 a.m. of the next day were computed, regardless of the completion of 24 hours. A similar procedure was applied for the discharge day: the events were recorded from 11 a.m. until the discharge time.

The results were presented as absolute and relative frequencies for categorical variables, and mean and standard deviation for numerical ones. The evaluation of normality of the variables was done through the application of the Shapiro-Wilk test. To determine the association between the NAS and Perroca's PCS nursing care dependency level means, Pearson correlation analysis was used. The data were processed with SPSS software, version 20.0, IBM® Inc.

■ RESULTS

This study gathered a sample of 40 patients. The majority were female (57.5%). The mean age was 62.1 (± 23.4) years, ranging from 20 to 103 years. Most of the patients were older than 60 years (67.5%).

Regarding the clinical aspects, the length of stay varied from one to 23 days, with a mean of 6.9 (± 6.5) days. As for the origin, most of the patients (35%) came from the surgical center, followed by those from the inpatient unit in the same hospital (30%), from other institutions (30%), and from the emergency room (5%). The stay was mainly clinical (60%). The reasons for hospital admission were oncological (27.5%), lung issues (20%), sepsis/infection (15%), cardiac (12.5%), kidney and urological issues (10%), gastrointestinal (10%), and neurological (5%). As for the clinical outcome, 72.5% of the patients were discharged from the ICU and 27.5% died.

Two hundred and seventy-seven NAS and Perroca's PCS measurements were taken to assess the nursing workload and the patients' healthcare dependency level. The mean, standard deviation, and maximum and minimum workloads are shown in Table 1.

Table 1 also exhibits the care hours found with the application of the instruments for a 24-hour nursing care shift. The hours obtained through the NAS tool were almost twice the value calculated with Perroca's PCS, with a time difference of 7.3 hours.

The patients' healthcare dependency level measurement developed by Perroca categorizes the care into four grades: minimum; intermediate; semi-intensive; and intensive. Table 2 reveals that most of the patients (47.3%) required intensive care.

Table 1 – Mean, standard deviation and maximum and minimum workloads as obtained from NAS and Perroca's PCS.

Score	Mean (Standard deviation)/Hours	Minimum/Hours	Maximum/Hours
NAS	69.8 (± 24.1)/16.7*	36.5 (8.7*)	151.2 (36.2*)
Perroca's PCS	22.7 (± 4.2)/9.4**	13 (5.6**)	32 (17.9**)

Source: Research data, 2014.

*Care hours calculation taking into account that each NAS score corresponds to 14.4 minutes.

**Care hours according to COFEN care hours classification from the points obtained through PCS.

Table 2 – Distribution of the patients' evaluation according to the care levels designed in Perroca's PCS and the respective care hours established by COFEN in adult ICU.

Care level/COFEN hours	n	%
Minimum care (9 to 12 points) – 3.8	0	0
Intermediate care (13 to 18 points) – 5.6	59	21.3
Semi-intensive care (19 to 24 points) – 9.4	87	31.4
Intensive care (25 to 36 points) – 17.9	131	47.3
Total	**277**	**100**

Source: Research data, 2014.

As for the mean of NAS domains, it was found that the points were concentrated in the "basic activities" domain. The areas that achieved the highest scores in Perroca's PCS were "body care and eliminations", "skin and mucosa care," and "locomotion and activity." These results can be seen in Figure 1.

The NAS "basic activities" domain has the following subdivisions: monitoring and control; laboratory investigations; medication (except vasoactive drugs); hygiene procedures; drain-related care (except gastric tube); mobilization and positioning; care and support to patients and families; and administrative and management tasks. Figure 1 shows that, apart from the items nutrition and hydration, all of the care areas of Perroca's PCS are encompassed in the correspondent NAS domain.

Finally, a positive correlation was observed between the 24-hour mean NAS and Perroca's PCS care dependency mean levels ($r_p = 0.653$, p <0.001).

■ DISCUSSION

The analysis of demographic and clinical characteristics revealed that age[14,15], origin[11,17], type of hospital stay[18], length of stay[11,14], and mortality[11,15] in the present study

corroborate national and international literature. Divergent results were found regarding gender[11,17], which reinforces the idea that women seek healthcare services more often, including in the oncological area.

The most common reasons for hospital admissions were related to oncological problems. It must be emphasized that the facility where the project was developed is a center of reference in oncology and, despite the fact that the ICU is not exclusively for oncological patients, it is expected that most admissions were of patients with this health problem. This aspect must be emphasized as an interpretation bias but does not present a limitation to the measurement of the necessary nursing activities in a 24-hour period.

The result of NAS evaluation for a 24-hour shift was a mean of 69.8% (± 24.1%), a number similar to the one reported in another paper[12], which implies a high nursing workload. It is necessary to consider that nurses spend 100% of their working time assisting patients. Taking into account that NAS expresses the time spent by a nursing professional in direct assistance to patients in a 24-hour period and the mean NAS obtained in the present study, it follows that a professional can have full dedication to one single patient. This finding differs from the legislation in force[19], which determines the proportion of one nursing technician to two ICU patients. According to the results, the care to two patients in the institution in question would require 139.6% of the nurses' time, which would require more than one professional to execute the task, at the risk of compromising the professional's health and the quality of assistance.

The nursing healthcare dependency level classification determined by Perroca's PCS showed that most patients required intensive care, a result compatible with other national investigations carried out in ICUs[11-12].

Comparison of the means calculated using both instruments provided a positive correlation ($r_p = 0.653$, p <0.001). Thus, the patients that required a higher workload from the nursing staff were the ones that presented
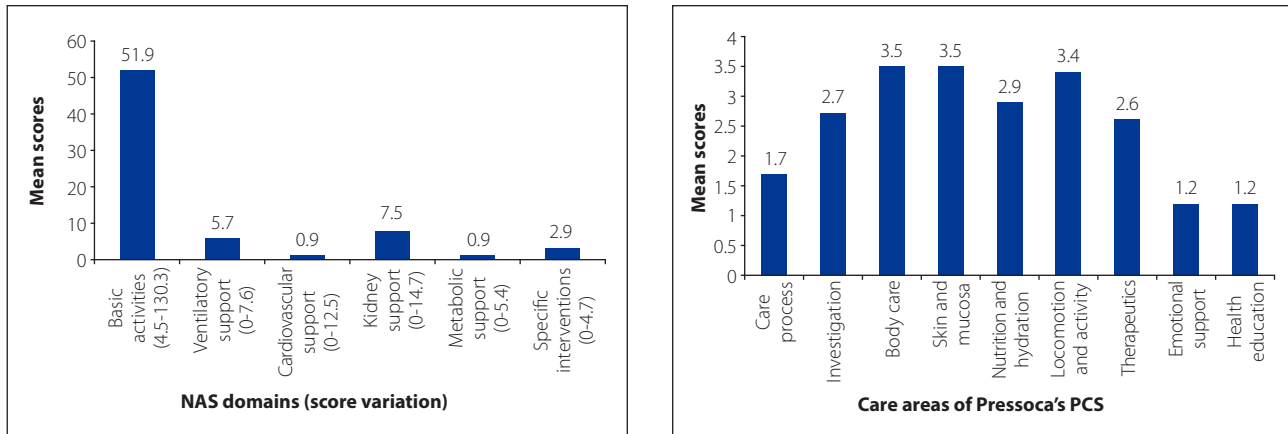
Figure 1 – Comparison of mean scores for NAS (left) and Perroca's PCS (right) methods.

Source: Research data, 2014.

a higher dependency on care and vice versa. However, the observation of the calculated working hours with each instrument reveals a time difference of 7.3 hours, with NAS providing the highest workload. In this way, NAS has proven more suitable to determine the nursing care hours in ICUs. Another study that analyzed the apportion of the nursing staff in adult ICUs through NAS also found satisfactory results[12].

COFEN determines that a patient classified as requiring intensive care must have 17.9 hours of nursing assistance in a 24-hour shift. Comparison between this legal parameter and the hours calculated from the mean NAS (16.7 hours) and mean Perroca's PCS (9.4 hours) shows that the indirect care tool fell short of expectations in terms of assessing the nursing workload.

It is worth emphasizing that the care hours as defined by the mean NAS meet COFEN requirements. Nevertheless, when the maximum value obtained through NAS is considered, the estimated workload is 36.2 hours, that is, more than twice the time stipulated by legislation. This result emphasizes the need to implement increasingly specific nursing workload assessment tools to avoid underrating the real need of nursing care in ICUs.

Above all, the workload found is an essential element in personnel sizing and can be used as supporting information to determine changes in management in order to achieve qualified care and an environment favorable to the professionals' health.

As for the comparison between NAS domains and care areas in Perroca's PCS, a few aspects can be analyzed. NAS has seven domains: basic activities, which presents the subdivisions monitoring and control; lab-

oratory investigations; medication (except vasoactive drugs); hygiene procedures; drain-related care (except gastric tube); mobilization and positioning; care and support to patients and families; and administrative and management tasks. In turn, Perroca's instrument comprises nine areas of care: planning and coordination of the care process; investigation and monitoring; body care and elimination; skin and mucosa care; nutrition and hydration; locomotion and activity; therapeutics; health education; and emotional support. It can be seen that nearly all of the items in Perroca's PCS can be found in the NAS basic activities domain.

It is necessary to stress the specificity of an oncological ICU which, in addition to covering basic and more complex activities, serves a specific clientele that, together with lack of training and continued education of healthcare professionals, influence the physical and psychological aspects of the nursing staff[19].

In this context, NAS seems to be more specific than Perroca's PCS to determine the nursing workload, once it also registers the working hours spent performing additional activities that are more common with patients in an intensive care environment. These tasks are encompassed in other NAS domains. An example of this specificity is clearing/sanitation of artificial airways. In Perroca's tool, this activity is analyzed with others in the area of investigation and monitoring, while in NAS there is the ventilatory support domain, with a sub-item dedicated to the care of artificial airways.

Other actions that have a specific score in NAS and are gathered in areas with other items in Perroca's PCS are administration of vasoactive drugs, intravenous re-

position of a significant volume of fluids, monitoring of the left atrium, measurement of intracranial pressure, cardiorespiratory reanimation, hemofiltration techniques, quantitative measurement of urine output, treatment of complex metabolic acidosis/alkalosis, intravenous hyper-alimentation, enteral feeding, and specific interventions inside and outside the ICU.

However, regarding healthcare education, Perroca's PCS has the advantage of presenting a specific care area addressing this topic, while in NAS this item belongs to the support to family domain.

Perroca's PCS cites systematization of nursing assistance (SNA), whereas in NAS[20] the planning of activities related to nursing assistance is part of the administrative and management tasks domain. SNA organizes the nursing work regarding method, staff, and instruments, making it possible to operationalize the nursing process. This allows nurses to provide individualized care once their actions are systematic and interrelated[12].

■ CONCLUSION

The calculated nursing workload expressed as a NAS score was high, requiring a high care demand from healthcare professionals. The classification of patients through Perroca's PCS revealed that the analyzed patients had an intensive care grade level. However, NAS was more suitable when compared to Perroca's indirect measurement tool.

The importance of using these instruments to manage human and material resources in ICUs must be emphasized. These instruments provide reduction in costs and improvements in the safety and quality of assistance to patients.

The present study contributes to teaching and research in healthcare and nursing, once it reveals the close relationship between workload and patient classification systems, which supports the proposal of staff apportioning. This aspect is often discussed in healthcare institutions, mainly regarding the expenses required for professionals to develop qualified assistance.

The study has the limitation of having been developed in a specific ICU, which may not be compatible with other facilities.

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