ORIGINALES

Nursing workload in a hematology/oncology inpatient unit
Carga de trabalho de enfermagem em unidade de internação de onco-hematologia
Carga de trabajo de enfermería en unidad de ingreso de onco-hematología

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ABSTRACT:
Objective: To identify workload-related factors of nursing generated by hematology/oncology inpatients.
Methods: Prospective cohort study conducted with 151 inpatients at a hematology/oncology unit of a university hospital in São Paulo, Brazil. Data were collected using a form with demographic-clinical information and the Nursing Activities Score (NAS). The collected data were analyzed using descriptive and inferential statistics and linear regression models.
Results: Mean NAS in the unit was 47.8% (11.5 hours). Patients with malignant oncological and hematological diseases generated a higher nursing workload than patients with non-malignant diseases ($p = 0.0034$). Patients who died had higher NAS scores than survivors ($p < 0.0001$). In the linear regression, the variables diagnosis and condition at discharge determined an R^2 of 0.26.
Conclusion: Hematology and oncology patients require high dependency care. This finding can support nurses when planning human resources in this specialty.

Keywords: Workload; nursing; Medical Oncology; Hematology; Nursing, Team; Nursing Staff.

RESUMO:
Objetivo: Identificar os fatores relacionados à carga de trabalho de enfermagem gerada por pacientes onco-hematológicos hospitalizados.
Método: Coorte prospectiva realizada com 151 pacientes internados em unidade de Onco-Hematologia de um hospital universitário, no Estado de São Paulo, Brasil. Utilizou-se para a coleta de dados uma ficha com informações demográfico-clínicas e o *Nursing Activities Score* (NAS). Na análise dos dados utilizou-se estatística descritiva, inferencial e modelos de regressão linear.
Resultados: A média do NAS na unidade foi de 47,8% (11,5 horas). Pacientes com doenças oncológicas e hematológicas malignas demandaram maior carga de trabalho de enfermagem, comparados àqueles com doenças não malignas (p=0,0034); os pacientes que morreram apresentaram maior pontuação de NAS, comparada a dos sobreviventes (p<0,0001); na regressão linear, as variáveis, diagnóstico e condição de saída, determinaram um R^2 de 0,26.
Conclusão: Pacientes onco-hematológicos demandam assistência semi-intensiva, informação que oferece subsídios ao enfermeiro para planejar recursos humanos nesta especialidade.

Palavras chave: Carga de trabalho; Enfermagem; Oncologia; Hematologia; Equipe de Enfermagem; Recursos Humanos de Enfermagem

RESUMEN:
Objetivo: Identificar los factores relacionados con la carga de trabajo de enfermería generada por pacientes onco-hematológicos hospitalizados.
Método: Cohorte prospectivo realizado con 151 pacientes ingresados en unidad de Onco-Hematología de un hospital universitario, en el Estado de São Paulo, Brasil. Se utilizó para la colecta de datos una ficha con informaciones demográfico-clínicas y el *Nursing Activities Score* (NAS). En el análisis de los datos se utilizo estadística descriptiva, inferencial y modelos de regresión linear.
Resultados: La media del NAS en la unidad fue del 47,8% (11,5 horas). Pacientes con enfermedades oncológicas y hematológicas malignas demandaron mayor carga de trabajo de enfermería, comparados a aquellos con enfermedades no malignas (p=0,0034); los pacientes que murieron presentaron mayor puntuación de NAS, comparada con la de los supervivientes (p<0,0001); en la regresión linear, las variables, diagnóstico y condición de salida, determinaron un R^2 de 0,26.
Conclusión: Pacientes onco-hematológicos demandan asistencia semi-intensiva, información que ofrece subsidios al enfermero para planear recursos humanos en esta especialidad.

Palabras clave: Carga de Trabajo; Enfermería; Oncología Médica; Hematología; Grupo de Enfermería; Personal de Enfermería

INTRODUCTION

In the hospital context, the nursing workload, which is the number of hours nurses spend on care depending on patient needs[1], has become a matter of interest in Brazil and worldwide[2-7]. Studies on the subject have proved relevant, especially for managing hospital services, given the serious implications of not providing the adequate number of nursing staff for patients, professionals and the healthcare institution[2-7]. The nursing team with too many members can incur unnecessary costs[2]; however, authors have shown the negative consequences of increased workloads and staff shortage in the provision of patient care[2-6].

Research conducted in intensive care units (ICU) indicates an association between high workload and increased mortality[3,4]. The inverse relationship between length of stay, nursing staff, and the adequate number of nurses reduces the time of hospitalization[5]. Moreover, the occurrence of infection at the inpatient units drops with the adequacy of the nursing team[2, 6].

In Brazil, a study conducted in ICUs found a higher average of adverse events and incidents with understaffing than with the adequate size of the team at two units (p = 0.004 and p = 0.000)[7].

Instruments exist to measure the nursing workload, assess the clinical condition of patients, and calculate the required care[1,8]. Nowadays, one of the most widely used instruments for this purpose is the "Nursing Activities Score - NAS", designed to measure workload in hours of nursing care in the ICU[1]. This instrument was validated for use in Brazil and provides approximately 81% sensitivity for measuring nursing activity, exceeding the range of other instruments with the same purpose. Consequently, it is considered one of the most comprehensive tools for nursing activities in the ICU of adult patients[1,8].

Although the NAS was originally designed for use in the ICU, its capacity to assess the nursing workload in different care contexts permits its use in other clinical specialties[9,10]. In the specialty of hematology and oncology, studies on the nursing workload are still in the early stages, regardless of the instrument or method used. A study conducted with hematology and oncology patients resulted in a mean NAS of 37.9%, ranging from 37.2% to 44.0%, as well as a strong positive correlation with the degree of dependency (r = 0.79) and a strong negative correlation with the patient performance status (r = -0.75)[11].

In hematopoietic stem cell transplantation (HSCT) with patients who also had malignant oncological and hematological diseases, the average workload according to the NAS was 69.7% (16.7 hours), which is similar to the hourly care demand of intensive care[12].

In relation to the hematology/oncology unit, the use of instruments to assess nursing workload is fundamental. Hematology/oncology patients are often admitted to inpatient units with serious and life-threatening clinical conditions. The acute conditions inherent to cancer, reactions to the toxicity of cancer treatment, the occurrence of febrile neutropenia, the multiple blood transfusions, and the greater susceptibility to infection demand qualified nursing care and the adequate number of nursing professionals.

The reasons for conducting this investigation are the risks to patient safety in the case of nursing staff shortages or excessive workloads, the limited number of studies on this specialty, and the importance of tools, such as the NAS, to assess the nursing workload for the management of care. The aim of this study was to identify workload-related factors of nursing care in a hematology/oncology inpatient unit.

METHOD

This is a prospective cohort study conducted in a hematology/oncology nursing ward of a teaching hospital in the interior of São Paulo, Brazil, for tertiary and quaternary care.

This hospital is a reference for cancer patients of the Regional Health Boards (DRS) in the cities of Campinas, Piracicaba, and São João da Boa Vista, state of São Paulo, and other Brazilian states.

The inpatient unit has 18 beds for four specialties; nine in hematology, five in oncology, three in rheumatology, and one in immunology. The nursing staff has 11 nurses and 26 nursing technicians working in different shifts. The morning and afternoon shifts have the same number of workers - 3 nurses and 7 nursing technicians - and the night shift has 5 nurses and 12 technicians.

The sample was composed of all the inpatients for a minimum of 24 hours, totaling 151 patients, from August to November 2014 (93 days). Readmissions were considered in the study.

Data were collected using two instruments: the NAS to measure the nursing workload (dependent variable) and a form to establish the demographic-clinical profile of patients with the following independent variables: sex, age, length of stay, medical diagnosis, type of treatment (clinical, surgical, chemotherapy and/or radiotherapy, and palliative), and condition at time of discharge. The clinical treatment modality included patients who had not undergone any surgical procedure and who had been admitted for other causes other than chemotherapy and/or radiation treatment.

The NAS was applied daily during the day. The people involved in data collection, a nursing student and some of the unit nurses, were previously trained. As specified by the authors of the instrument, we considered the last 24 hours of care provided to each patient[1].

The NAS is divided into the following seven major categories: Basic Activities, Ventilatory Support, Cardiovascular Support, Renal Support, Neurological Support, Metabolic Support, and Specific Interventions. It has 23 items and the maximum final score is 176.8%[1]. Each point of the NAS can be converted into 0.24 hours, which can be used to calculate the number of hours the team dedicated to each patient[13].

The study was approved by the research ethics committee of the Faculdade de Ciências Médicas, Universidade Estadual de Campinas, Brazil, with protocol No. 143.695/2012, and did not require the provision of signed informed consent statements. This study observed the ethical aspects of Resolution 466/12 on the guidelines and standards that govern research involving human beings in Brazil[14].

Data analysis

The number of patients (n = 151) was considered in the analysis of demographic-clinical characteristics, and the sampling unit for the remaining characteristics was total hospital admissions (n = 214).

Concerning the NAS, comparisons involving two or more categorical variables were performed using the Mann-Whitney test or the Kruskal-Wallis test (followed by the Dunn's post test), as considered appropriate. The correlations between length of stay and NAS and between age and NAS were obtained using Spearman's rank correlation coefficient.

To study the relationship between the NAS variable (dependent) and the set of independent variables (demographic-clinical) we constructed linear regression models, with application of the Stepwise variable selection criteria and Box-Cox transformation in the dependent variable. The software used was SAS statistical version 9.4, and a significance level equal to 5% was considered for all the analyses.

RESULTS

Most patients were men (54.3%). The mean age of the patients was 52 years (SD 15.0) and the mean length of stay was 7.9 days (SD 8.8), with a variation from 1 to 50 days. As for medical diagnoses, most of the patients were admitted for gastrointestinal neoplasms (n = 90; 42.4%). The other morbidities were divided into the following groups: several neoplastic diseases (n = 33; 15.6%), non-neoplastic diseases Group (n = 24; 11.3%), lymphomas (n = 22; 10.4%), rheumatologic diseases (n = 22; 10.4%), and leukemia (n = 21; 9.9%).

The predominant treatment was chemotherapy/radiotherapy (n = 115; 54.2%), followed by clinical (n = 69; 32.5%), surgical (n = 16; 7.5%), and palliative (n = 12; 5.6%). During the study, 15 patients died (9.9%). Table 1 shows the results of the nursing workload.

Table 1 - Descriptive statistics of nursing workload for patients in the hematology/oncology unit. Campinas, state of São Paulo, Brazil, 2014.

Nursing workload	n admissions	Mean	SD	n patients	Mean	SD
NAS (%)	214	47.8	12.4	151	48.4	13.7
Hours	214	11.5	3.0	151	11.6	3.3

In August, September, October, and November, the mean NAS were respectively: 49.3% (SD 12.5); 49.8% (SD 12.2); 47.0% (SD 12.5); and 44.9% (SD 11.7), which represents a variation of 10.8 to 12.0 of nursing hours (p = 0.1186).

According to Table 2, patients with malignant hematological and oncological diseases demanded a greater nursing workload than patients with non-neoplastic disease (p = 0.0034). The mean NAS of patients who died during hospitalization was higher than that of the survivors (p<0.0001).

Table 2 – Mean Nursing Activities Score according to the demographic-clinical variables of patients admitted at the hematology/oncology unit Campinas, state of São Paulo, Brazil, 2014.

Demographic-clinical data	n	Mean NAS (%)	SD	p-value
Sex				
Male	82	48.6	12.0	0.2375 **
Female	69	48.2	15.4	
Diagnosis*				
Malignant hematological and oncological diseases	166	48.7	12.3	**0.0034****
Other non-neoplastic diseases	46	44.6	12.4	
Treatment*				
Clinical	69	46.6	13.3	
Surgical	16	47.9	14.7	0.0460***
Chemotherapy and/or radiation therapy	115	47.2	9.5	
Palliative	12	60.5	21.3	
Condition at time of discharge*				**<0.0001****
Survivor	192	46.0	9.7	

			15	73.3	14.4
No survivor					

*variable with missing
** p-value obtained using the Mann-Whitney test
***p-value obtained using the Kruskal-Wallis test

Mean NAS had a statistical significant difference (p = 0.0460) when compared to the other types of treatment. This difference did not persist after Dunn's post test, where all the types of treatment were compared two by two.

There was no correlation between the NAS and the time of stay (p = 0.2145) or between the NAS and the age of patients (p = 0.8359).

The independent variables, medical diagnosis, and condition at discharge, remained in the final regression model and, together, resulted in a R^2 of 0.26, as shown in Table 3.

Table 3 - Factors associated with the nursing workload resulting from the linear regression models. Campinas, state of São Paulo, Brazil, 2014.

Workload	Independent variables*	Coefficient	Confidence interval (95%)	p-value	R^2
NAS	Diagnosis** (ref. non-neoplastic)	0.0054	(0.0019 - 0.0089)	**0.0030**	0.26
	Condition at time of discharge (ref. survivor)	0.0226	(0.0170 - 0.0282)	**<0.0001**	

* Independent variables: categorized diagnosis, proposed treatment, condition at time of discharge, length of stay; ** Classified in malignant hematological and oncological diseases versus other non-neoplastic diseases

In relation to the group of patients who died, 53.3% were women, with an average age of 52.7 years (SD 16.6), 80.0% had malignant oncological or hematological diseases, 26.7% were in palliative treatment, and 26.7% were undergoing chemo and/or radiotherapy.

Of the patients who died, 26.7% used oxygen therapy (catheter or endotracheal intubation) and/or vasoactive drugs (VAD).

DISCUSSION

Patients with malignant oncological/hematological diseases and patients with other non-neoplastic diseases of the investigated inpatient unit demanded an average of 11.7 hours and 10.7 nursing work hours, respectively. According to resolution 293/2004 of the Brazilian Federal Council of Nursing (COFEN), after 9.4 nursing hours, the required nursing care is equivalent to a high dependency unit[15]. Consequently, the complexity of the hematology/oncology unit was above the expected level for an inpatient unit, where patients generally require minimal care (3.8 hours) or intermediate care (5.6 hours)[15].

The monthly means of the NAS ranged from 44.9% (10.8 hours) to 49.8% (12.0 hours) (p = 0.1186). These data support the claim that the workload in the studied inpatient unit was not an isolated event. In all the months the NAS was applied, the patients of this hematology/oncology unit demanded high dependency care.

The mean NAS for patients with malignant hematological and oncological diseases was 48.7% (11.7 hours), less than the value recorded in another Brazilian study conducted at the same hospital in the HSCT units. In this study, the group of autologous transplants had a NAS of 67.3% and the allogeneic group had a NAS of 72.4%. In spite of the similarity of the studies in relation to the sample profile (sex and age), the HSCT patients have specific complications, such as medullary aplasia or complications from the graft, that make their condition complex and dynamic, demanding frequent intensive assistance[12].

Considering the mean NAS for medical diagnosis, the demand for care was greater (p = 0.0034) among patients with malignant oncological and hematological diseases than among those with non-malignant diseases. The use of chemotherapy drugs in the group of patients with neoplasms can increase the nursing workload. Parenteral or oral chemotherapy drugs are included in the list of potentially hazardous drugs. The risk of using these drugs increases and may cause serious harm when the medication process fails[16].

Potentially hazardous drugs or high-alert drugs demand specific care and caution to ensure patient safety. The administration of chemotherapy drugs requires double checking and frequent monitoring of the venipuncture site and the signs and symptoms of toxicity, among other precautions, depending on the drug, all of which can increase the workload. This finding was corroborated in a study[17] conducted at an oncology outpatient clinic, in which the nursing staff needed 3.3 hours to administer chemotherapy drugs. Of these hours, more than half or 51.5% (1.7 hours) were needed for direct drug administration and patient assessment.

Patients with neoplastic diseases are submitted to hemotherapy, which requires more nursing staff time. The frequent monitoring of vital signs and signs and symptoms due to the risk of adverse events directly affects the workload, as primarily observed in item 1 of the NAS, "Monitoring and Titration"[12].
The physical and psychological symptoms in patients with cancer arising from the illness and its treatment, such as decreased sensitivity and/or tingling in hands and feet, lack of energy, nervousness, and difficulty sleeping[18], may contribute to the increased demand for nursing care.

No statistically significant difference was found for the type of treatment (clinical, surgical, chemo and/or radiotherapy, and palliative), which corroborates the data that all patients, despite their specific needs regarding treatment, demanded high dependency nursing care.

Despite the lack of a statistically significant difference, patients receiving palliative care needed more nursing hours (14.5 h), which, in clinical practice, may be considered relevant. In this study, patients receiving palliative care had extensive and complex dressings that often needed to be changed more than once a day. Moreover, patients in advanced stages of the disease often feel pain, which must be constantly assessed, and require medication and comfort measures that can increase the following NAS: "Monitoring and Titration", "Hygiene Procedures", and "Mobilization and Positioning".
Another study corroborates this information by indicating pain management as one of the main nursing interventions in the oncology outpatient unit, preceded only by the nursing consultation and chemotherapy management[19].

In addition to the work demand measured in hours, which generally reflects patient dependency, there is a subjective factor in the care of palliative patients. Nursing professionals believe that taking care of palliative patients causes emotional burnout because of the frequent suffering and death[20].

The patients that did not survive had the highest NAS. This finding agrees with the findings of other studies[12, 21] and can be explained by the fact that more than 1/4 of patients required ventilatory and/or cardiovascular support, which are specialized procedures with an increased demand for nursing care. Another fact that increases the workload in the event of death can be the need to support the families and complete institutional protocols.

Regression analysis revealed that patients with neoplastic diseases and those who died during hospitalization influenced the increasing workload at the hematology/oncology unit. These variables accounted for 26% of the NAS variability, that is, just over a quarter of the variation in nursing workload.

From the standpoint of management, information on time of care can be confronted with human resources and care quality indicators, such as pressure ulcers and falls, to achieve an adequate number of nurses and, consequently guarantee the safety of patients and nursing workers[22].

The limitations of this study are the absence of data on comorbidities and the lack of a severity index that could support the discussion on the care demanded by patients. However, this work contributes to hematology and oncology nursing because of the scarcity of studies that associate specific nursing activities with nursing care demands, and because the studied hospital is a reference in the treatment of patients of this specialty.

CONCLUSION

The patients with malignant oncological/hematological diseases demanded a greater workload than patients with other non-neoplastic diseases (mean NAS of 48.7% versus 44.6%; $p = 0.0034$).

Patients with neoplastic disease ($p = 0.0030$) and patients who died during hospitalization ($p<0.0001$) had an effect on the increase in nursing workload ($R^2=0.26$). This hematology/oncology unit is similar to a high dependency unit because it supports the human resources planning of nurses in this specialty.

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