# Nursing workload related to the body mass index of critical patients

## Carga de trabalho de enfermagem relacionada ao índice de massa corporal de pacientes críticos

Luana Loppi Goulart[1]
Fernanda Souza Angotti Carrara[2]
Suely Sueko Viski Zanei[1]
Iveth Yamaguchi Whitaker[1]

**Keywords**
Intensive care units; Workload; Body mass index; Obesity; Nursing care

**Descritores**
Unidades de terapia intensiva; Carga de trabalho; Índice de massa corporal; Obesidade; Cuidados de enfermagem

**Submitted**
September 22, 2016

**Accepted**
January 30, 2017

## Abstract

**Objective:** To measure and compare the nursing workload and the frequency of the items scored in the Nursing Activities Score (NAS) considering the different groups of BMI of patients hospitalized in Intensive Care Units (ICU).

**Methods:** Longitudinal study conducted in the ICU of a university hospital in São Paulo in which the BMI of patients was calculated by dividing the weight by the square of the height and the nursing workload was measured through the NAS.

**Results:** Analysis of 529 patients showed that the NAS did not differ between the groups according to the BMI. Obese patients demanded more time for hygiene procedures and more people to support the mobilization/positioning process. Underweight patients received treatment for improving lung function with a higher frequency.

**Conclusion:** The results showed no difference in the nursing workload when the BMI of the patient was considered.

## Resumo

**Objetivo:** Mensurar e comparar a carga de trabalho de enfermagem e a frequência dos itens pontuados no *Nursing Activities Score* (NAS), considerando os diferentes grupos de IMC de pacientes internados em Unidade de Terapia Intensiva (UTI).

**Métodos:** Estudo longitudinal realizado na UTI de hospital universitário em São Paulo, na qual o IMC do paciente foi calculado dividindo-se o peso pelo quadrado da altura e a carga de trabalho de enfermagem foi mensurada pelo NAS.

**Resultados:** A análise de 529 pacientes mostrou que o NAS não diferiu entre os grupos conforme o IMC. Os pacientes obesos demandaram mais tempo para o procedimento de higienização e maior número de pessoas para mobilização/posicionamento. Pacientes de baixo peso receberam mais frequentemente tratamento para melhora da função pulmonar.

**Conclusão:** Os resultados não apontaram diferença na carga de trabalho de enfermagem quando se considerou o IMC do paciente.

**Corresponding author**
Iveth Yamaguchi Whitaker
Napoleão de Barros street, 754, 04024-002, São Paulo, SP, Brazil.
iveth.whitaker@unifesp.br

DOI: http://dx.doi.org/10.1590/1982-0194201700006

[1]Escola Paulista de Enfermagem, Universidade Federal de São Paulo, São Paulo, SP, Brazil.
[2]Associação Paulista para o Desenvolvimento da Medicina, São Paulo, SP, Brazil.

**Conflicts of interest:** there are no conflicts of interest to declare.

## Introduction

It is necessary to consider the various aspects related to the available therapeutic resources, competency, and dimensioning of the multidisciplinary team in order to meet the needs of patients hospitalized in the Intensive Care Unit (ICU) with safety and quality.

In the nursing team the inappropriate proportion of nurses/technicians per patient may result in a high rate of absenteeism due to work overload and health impairment, possibly affecting hospital costs.[1] Dimensioning the nursing team according to the needs of patients is not an easy task, and the use of an instrument to measure the workload may support nurses in this process. Studies on nursing workload and demand of care in ICU have pointed out the Nursing Activities Score (NAS) as a reliable tool.[2-4]

The NAS was developed in order to define the nursing activities that best describe the workload of nurses in an ICU. It consists of seven major categories: basic activities; ventilatory; cardiovascular; renal; neurological; and metabolic supports, as well as specific interventions, totaling 23 items. The application of the NAS aims to measure the time required to perform the nursing activities during patient care within a 24-hour period, totaling a maximum score of 176.8%, representing the time spent by the nursing team in patient care per shift.[2]

The NAS was translated and validated in Brazilian Portuguese[3] and since then a number of Brazilian publications have emerged regarding its performance, considering the clinical and demographic profiles, the severity of illness and organ dysfunction scores, mortality, and length of stay of patients hospitalized in the ICU[5-8] The results of the integrative review that analyzed the application of the NAS in the ICU, considering the organization of health care, evidenced its dissemination throughout the world. It also pointed out the variables with which the NAS was confronted in analyzing the nursing workload in intensive care environments. The studies selected for this review included, with a higher frequency, the variables related to the characteristics of patients (age and gender), the clinical conditions (severity of illness, organ dysfunction, risk of mortality, and risk of pressure injury), conditions of the unit (including type of ICU, proportion of nurses/technicians per patient, and occupation rate), and the outcome (mortality and length of stay). In addition, the importance of exploring the use of the NAS with a view to the analysis of the care process, costs management, and care quality[9] was emphasized.

The nursing team has pointed to patient obesity among the factors related to the increased workload. Obese patients may be hospitalized in the ICU due to their comorbidities or other health problems. Regardless of the factors related to the impairment of the clinical condition of obese patients in the ICU, complaints by the nursing team pointed out that this type of patient demands more time and a higher number of professionals for mobilization, whether during bathing or mobilization/positioning.

Thus, considering that the nursing team points out the high demand for care of an obese patient and the scarcity of studies assessing the relationship between Body Mass Index (BMI) and the nursing workload in the ICU, this study intends to analyze to what extent the BMI of the patient may result in nursing team work demand. Therefore, this study aims to measure and compare the nursing workload and the frequency of the items scored in the NAS considering the different groups of BMI of ICU patients.

The results are expected to support nurses in the dimensioning of nursing staff according to the demand for care of patients when considering their BMI in the daily routine of the clinical practice.

## Methods

Descriptive, longitudinal study with a quantitative approach to analyze the relationship between nursing workload and BMI.

This study is supplementary to the research: "Obesity in intensive care unit patients: character-

ization and analysis of morbidity," conducted in the Intensive Care Center (ICC) of the University Hospital at the Federal University of São Paulo (HU/UNIFESP). The ICC consists of two general ICUs and one neurological ICU, totaling 35 beds for adult patients. The present study was approved by the Research Ethics Committee of UNIFESP (CEP-CAAE: 37296914.4.0000.5505) in compliance with national and international ethics standards for research involving human beings.

The sample consisted of 529 patients included in the previously mentioned primary study on obesity in the ICU within the period between May and November 2012. These patients were selected according to the following inclusion criteria: length of stay >24 hours; both genders; and age equal or superior to 18 years, as it was an ICC for adults. Minimum length of stay of 24 hours in the ICU was adopted due to the need to collect data on the scores of organ dysfunction and nursing workload measured applying the Sequential Organ Failure Assessment (SOFA)[10] and the Nursing Activities Score (NAS), respectively. Pregnant patients, patients with ascites, patients diagnosed with brain death at admission, and patients who were ICU readmission were not included in the study. The criterion of excluding patients readmitted to the ICU was considered in order to avoid selection bias. Measurements of anthropometric data, severity of illness, and organ dysfunction are not conducted in patients with brain death admitted to the ICU. The specific goal is maintenance until the retrieval of organs; therefore, they were not included in the sample of this study.

The nursing workload was measured applying the NAS; the scores were calculated per patient and per day of hospitalization, resulting in a final score of the length of stay of the patient in the ICU. In this study the analysis of the workload was conducted considering the frequency with which each item of the NAS was scored. The first 24 hours and the discharge of the patient from the ICU were considered, as in these two different moments the demand of care required by the patient is different, possibly allowing the observation of the impact of the BMI, particularly in the execution of nursing interventions.

The BMI of each patient calculated in the primary study was considered for analysis. The classification of individuals according to body weight is based on the BMI, one of the measures widely used to estimate the body fat percentage for anthropometric-nutritional assessment of the population. It is obtained through calculation of the weight in kilograms (kg) divided by the square of the height in meters ($m^2$). The patients' weight was collected in their medical records, preferably the weight measured at the moment of their admission at the hospital. Preoperative weight was considered for surgical patients without these data. For the others, the study considered the weight recorded in the ICU during the first 24 hours of hospitalization through the use of the Jack 150 device, a lift system with a digital dynamometer, model IWB 500, with a capacity of 150 kg. The height was obtained from the patient's medical record, routinely measured at the moment of admission of the patient to the ICU and performed through the use of an anthropometric rule.

The BMI was classified for analysis according to the tables provided by the World Health Organization (WHO).[11] Therefore, patients presenting a BMI <18.5 kg/$m^2$ were considered as underweight, while patients presenting a BMI between 18.5 and 29.9 kg/$m^2$ were considered normal and pre-obese, and BMI ≥30 kg/$m^2$ were considered obese.

The variables age, gender, origin, admission category, length of ICU stay, ICU discharge, the indexes Simplified Acute Physiology Score 3 (SAPS 3),[12] calculated with data from the first hour of hospitalization of the patient in the ICU, and SOFA[10] admission and discharge were obtained for characterization of the sample.

Data for analysis were entered in an electronic spreadsheet using Microsoft Office Excel. Mean, standard deviation, median, minimum, and maximum values were calculated for the continuous variables (age, length of ICU stay, SAPS 3, SOFA admission and discharge, and NAS). Relative frequency was calculated for the categorical variables (gender, origin, type of patient, ICU outcome, and BMI).

Variance analysis (ANOVA) was used to compare the groups of BMI with the continuous variables. Chi-squared test or Likelihood Ratio test were used for

comparison with the categorical variables. The ANOVA for repeated measures with segmented factors was used for comparison of the groups of BMI considering the NAS scores and the length of stay. A level of significance of 5% ($p<0.05$) was adopted in all of the tests.

## Results

The sample consisted of 529 patients: 50.7% were male, with a mean age of 59.5 years (SD=18.3), from the Operating Room (64.1%) and the Emergency Department (24%). The mean length of ICU stay was 7.3 days (SD=9.2). Most patients presented with a surgical diagnosis 48.6% for elective and 15.9% for emergency surgery, the other 35.5% were medical. The mortality rate in the sample was 12.5%. The mean value of the SAPS 3 was 44.2 (SD=15.4), the SOFA admission was 3.5 (SD=3.1), and the SOFA discharge was 2.2 (SD=3.8). The mean value for the workload measured by the NAS was 64.5% (SD=8.2).

Table 1 presents data of the groups according to the BMI; underweight patients representing 6.4%, normal weight and pre-obese 73.7%, and obese

**Table 1.** Demographic, hospitalization, and clinical variables according to the groups of Body Mass Index (underweight, normal weight/pre-obese, obese)

| Variables | Body Mass Index | | | Total | p-value |
|---|---|---|---|---|---|
| | Underweight (<18.5) | Normal/pre-obese (≥18.5 and <30) | Obese (≥30) | | |
| Age | | | | | |
| Mean (SD*) | 57.2(22.3) | 60.2(18.3) | 57.8(16.9) | 59.5(18.3) | 0.366† |
| Median | 57.5 | 61 | 59 | 60 | |
| Minimum-Maximum | 21-96 | 19-98 | 22-91 | 19-98 | |
| Gender - n(%) | | | | | |
| Female | 18(52.9) | 181(46.4) | 62(59.0) | 261(49.3) | 0.065‡ |
| Male | 16(47.1) | 209(53.6) | 43(41.0) | 268(50.7) | |
| Discharge - n(%) | | | | | |
| Discharged alive | 26(76.5) | 342(87.7) | 95(90.5) | 463(87.5) | 0.098‡ |
| Death | 8(23.5) | 48(12.3) | 10(9.5) | 66(12.5) | |
| Length of ICU stay | | | | | |
| Mean (SD*) | 7.0(7.7) | 7.5(9.5) | 6.8(8.2) | 7.3(9.2) | 0.736† |
| Median | 5 | 4 | 4 | 4 | |
| Minimum-Maximum | 1-39 | 1-114 | 1-47 | 1-114 | |
| Admission category - n(%) | | | | | |
| Elective surgery | 15(44.1) | 190(48.7) | 52(49.5) | 257(48.6) | 0.882‡ |
| Emergency surgery | 7(20.6) | 63(16.2) | 14(13.3) | 84(15.9) | |
| Medical | 12(35.3) | 137(35.1) | 39(37.2) | 188(35.5) | |
| SAPS 3§ | | | | | |
| Mean (SD*) | 48.4(16.5) | 44.2(15.0) | 42.5(16.5) | 44.2(15.4) | 0.147† |
| Median | 50 | 43 | 40 | 43 | |
| Minimum-Maximum | 19-90 | 16-93 | 16-84 | 16-93 | |
| SOFA‖ admission | | | | | |
| Mean (SD*) | 3.7(3.1) | 3.5(3.1) | 3.5(3.4) | 3.5(3.1) | 0.912† |
| Median | 3 | 3 | 2 | 3 | |
| Minimum-Maximum | 0-11 | 0-18 | 0-13 | 0-18 | |
| SOFA‖ discharge | | | | | |
| Mean (SD*) | 2.5(3.9) | 2.3(3.8) | 2.0(3.7) | 2.2(3.8) | 0.709† |
| Median | 1 | 1 | 1 | 1 | |
| Minimum-Maximum | 0-15 | 0-20 | 0-19 | 0-20 | |
| NAS | | | | | |
| Mean (SD*) | 64.4(8.4) | 64.2(7.9) | 65.3(9.1) | 64.5(8.2) | 0.467† |
| Median | 65.3 | 63.4 | 64.0 | 63.6 | |
| Minimum-Maximum | 47.7-77.5 | 45.4-93.9 | 47.0-103.2 | 45.4-103.2 | |

*SD - Standard deviation; †Analysis of Variance (ANOVA); ‡Chi-squared test; §Simplified Acute Physiology Score 3; ‖Sequential Organ Failure Assessment

19.9%. Considering the previously mentioned demographic, clinical, hospitalization, and workload variables no statistical differences were observed between the three groups of BMI.

The data in table 2 show that the mean NAS values in the three groups of BMI in two different moments, whether in the admission or in the discharge of patients in ICU, were not statistically different. Based on this finding the NAS scores during admission were used to verify which items of this scale were selected to define the nursing workload according to the BMI of the patient considering the variety of nursing interventions performed at this moment.

**Table 2.** Values of the Nursing Activities Score at admission and discharge of patients according to the Body Mass Index (underweight, normal weight/pre-obese, obese)

| Variables | Body Mass Index | | | Total | p- value‡ |
|---|---|---|---|---|---|
| | Underweight (<18.5) | Normal/ pre-obese (≥18.5 and <30) | Obese (≥30) | | |
| NAS* admission | | | | | 0.802 |
| Mean (SD†) | 79.7(5.6) | 78.9(6.4) | 79.1(7.6) | 78.0(6.6) | |
| Median | 77.8 | 77.8 | 77.1 | 77.8 | |
| Minimum-Maximum | 65.8-89.6 | 65.8-100.5 | 67.2-111.9 | 65.8-111.9 | |
| NAS* discharge | | | | | 0.954 |
| Mean (SD†) | 68.7(8.7) | 68.9(8.0) | 68.9(8.2) | 68.9(8.8) | |
| Median | 68.3 | 67.2 | 68.2 | 67.9 | |
| Minimum-Maximum | 58.2-88.3 | 46.1-103.3 | 58.2-97.0 | 46.1-103.3 | |

*NAS - Nursing Activities Score; †SP - Standard deviation; ‡ ANOVA - Analysis of variance

The items scored with higher frequency by the NAS in the first day of hospitalization, with percentages between 95-100%, were: 1b - Presence at bedside and continuous observation or active for two hours or more during a shift, 2 - Laboratory investigations 3 - Medication, 4a - Performing hygiene procedures, 7a - Support and care for patients and their families, 8b - Performing management and administrative tasks requiring full dedication for about two hours, 17 - Quantitative urine output measurement.

Table 3 shows the items scored in the NAS according to the BMI of patients in the first day in the ICU. The items that indicated statistical differences among the groups of patients according to the BMI were: 4b - Performing hygiene procedures for more than two hours in a shift (p=0.037), 6c - Performing procedure(s) with

**Table 3.** Comparison of the frequency of the items scored in the Nursing Activities Score in the first day of hospitalization with the groups of Body Mass Index (low weight, normal weight/pre-obese, obese)

| Variables | | Body Mass Index | | | p-value |
|---|---|---|---|---|---|
| | | Underweight (<18.5) | Normal/pre-obese (≥18.5 and <30) | Obese (≥30) | |
| | | n(%) | n(%) | n(%) | |
| 1-Monitoring and controls | 1a | - | 3(0.8) | - | 0.399* |
| | 1b | 34(100.0) | 382(97.9) | 104(99.0) | 0.396* |
| | 1c | - | 5(1.3) | 1 (1.0) | 0.644* |
| 2-Laboratory investigations | Yes | 34(100.0) | 390(100.0) | 105(100.0) | - |
| | No | - | - | - | |
| 3-Medication | Yes | 34(100.0) | 390(100.0) | 105(100.0) | - |
| | No | - | - | - | |
| 4-Hygiene procedures | 4a | 34(100.0) | 387(99.2) | 101(96.2) | 0.071* |
| | 4b | - | 2(0.5) | 4(3.8) | 0.037* |
| | 4c | - | 1(0.3) | - | 0.737* |
| 5-Care of drain | Yes | 29(85.3) | 328(84.1) | 91(86.7) | 0.807† |
| | No | 5(14.7) | 62(15.9) | 14(13.3) | |
| 6-Mobilization and positioning | 6a | 4(11.8) | 65(16.6) | 15(14.3) | 0.666* |
| | 6b | 30(88.2) | 322(82.6) | 84(80.0) | 0.542* |
| | 6c | - (-) | 3(0.8) | 6(5.7) | 0.007* |
| 7-Support and care for patients and their families | 7a | 34(100.0) | 390(100.0) | 105(100.0) | - |
| | 7b | - | - | - | |
| 8-Management and administrative tasks | 8a | - | - | - | - |
| | 8b | 34(100.0) | 390(100.0) | 105(100.0) | |
| | 8c | - | - | - | |
| 9-Respiratory support | Yes | 29(85.3) | 337(86.4) | 88(83.8) | 0.791† |
| | No | 5(14.7) | 53(13.6) | 17(16.2) | |
| 10- Care of artificial airway | Yes | 12(35.3) | 138(35.4) | 31(29.5) | 0.527† |
| | No | 22(64.7) | 252(64.6) | 74(70.5) | |
| 11-Treatment for improving lung function | Yes | 17(50.0) | 170(43.6) | 33(31.4) | 0.047† |
| | No | 17(50.0) | 220(56.4) | 72(68.6) | |
| 12-Vasoactive medication | Yes | 16(47.1) | 140(35.9) | 43(41.0) | 0.319† |
| | No | 18(52.9) | 250(64.1) | 62(59.0) | |
| 13-Intravenous replacement of large fluid losses | Yes | 4(11.8) | 43(11.0) | 9(8.6) | 0.748† |
| | No | 30(88.2) | 347(89.0) | 96(91.4) | |
| 14- Left atrium monitoring | Yes | 1(2.9) | 10(2.6) | 2(1.9) | 0.907* |
| | No | 33(97.1) | 380(97.4) | 103(98.1) | |
| 15-Cardiopulmonary resuscitation | Yes | - | 1(0.3) | 1 (1.0) | 0.584* |
| | No | 34 (100.0) | 389 (99.7) | 104 (99.0) | |
| 16-Hemofiltration techniques | Yes | - | 1(0.3) | - | 0.737* |
| | No | 34(100.0) | 389(99.7) | 105(100.0) | |
| 17-Quantitative urine output measurement | Yes | 34(100.0) | 390(100.0) | 105(100.0) | - |
| | No | - | - | - | |
| 18-Measurement of intracranial pressure | Yes | 2(5.9) | 23(5.9) | 5(4.8) | 0.904† |
| | No | 32(94.1) | 367(94.1) | 100(95.2) | |
| 19-Complicated metabolic acidosis/ alkalosis treatment | Yes | 1(2.9) | 6(1.5) | 4(3.8) | 0.374† |
| | No | 33(97.1) | 384(98.5) | 101(96.2) | |
| 20-Intravenous hyperalimentation | Yes | 1 (2.9) | - (-) | - (-) | 0.063* |
| | No | 33(97.1) | 390(100.0) | 105(100.0) | |
| 21-Enteral feeding | Yes | 5(14.7) | 60(15.4) | 12(11.4) | 0.594† |
| | No | 29(85.3) | 330(84.6) | 93(88.6) | |
| 22-Specific interventions in the unit | Yes | 7(20.6) | 51(13.1) | 14(13.3) | 0.470† |
| | No | 27(79.4) | 339(86.9) | 91(86.7) | |
| 23-Specific interventions outside the unit | Yes | 8(23.5) | 89(22.8) | 25(23.8) | 0.975† |
| | No | 26(76.5) | 301(77.2) | 80(76.2) | |

*Likelihood ratio; †Chi-Square

three or more nurses in any frequency (p=0.007), and 11 - Treatment for improving lung function (p=0.047).

In items 4b and 6c the percentage of patients in the obese group was higher in relation to the other groups (3.8% and 5.7%, respectively). In item 11 the percentage of patients in the underweight group was higher (50.0%).

## Discussion

The nursing workload in the different groups of BMI was not statistically different in the studied sample. That is, the NAS values observed in the group of underweight patients, normal weight/pre-obese, and obese patients were similar in both general mean and admission or discharge mean.

The characteristics of the studied sample in relation to the variables gender, age, length of stay, origin, and mortality rate were found to be similar to those observed in other studies that applied the NAS in different ICUs for adults. In these, more than half the patients were also males[4-6,13] with a mean age between 53 and 64 years,[4,5,7,13] length of ICU stay between 5 and 9 days, mainly referred from the operating room and emergency department (elective surgeries representing the most frequent ones).[7,13,14] Although the mortality rate was between the values presented in the several studies, from 3%[7] to 26%[8,15,16] in the analysis of variation of the percentages of mortality, it is important to take into account that, in addition to the admission category, other variables also interfere in the outcome, including the clinical condition or severity of illness.

The predominance of normal and pre-obese patients followed by obese and underweight patients was observed in relation to the BMI in the studied sample. Regarding the demographic, clinical, hospitalization, and workload variables, the three groups of patients presented no statistical difference.

The workload measured by the NAS was similar to the value observed in Brazilian adult ICUs, whose variation in the mean value of the scores has been between 62.2% and 70.4%.[5,7,8,14] Similar results were observed in Italian ICUs.[17] However, differences in the NAS mean values were observed in studies conducted in Norway, where a higher mean value was obtained (96.2%),[18] and Belgium, with a lower mean value than those observed in the Brazilian studies (54.7%).[19]

The NAS is an instrument that enables the analysis of the nursing workload in ICUs considering the variety of factors related to patient care. The dissemination of studies about the workload measured with the use of the NAS in different critical adult populations was observed, and their results were compared to the results found in this study.[9] However the scarcity of studies analyzing the impact of the body mass of the patient in the nursing workload hindered the comparison and analysis of the results observed in this study.

In a study that compared the nursing workload generated in Brazilian ICUs during admission and discharge of 600 patients in public and private hospitals, the mean NAS of admission was higher (61.9%) than the value for discharge (52.8%),[13] similarly to the results observed in the sample of this study. Analysis of nursing workload in the admission and discharge of patients was also conducted in a Spanish ICU. Patients were divided into three groups: those with acute coronary syndrome; those with acute respiratory failure; and those with sepsis. The sample consisted of 563 patients, and significant differences were observed in the workload in the first day of hospitalization in relation to discharge in the three groups; the highest workload in both admission and discharge was observed for patients classified as having acute respiratory failure and sepsis.[20]

The cardiac surgery postoperative ICU also presented significant reductions in the mean NAS in the 72 hours after admission (58.1%) in comparison with the mean NAS in the first 24 hours (82.4%).[21]

In order to compare the nursing workload required per each adult, elderly, and very elderly patient, the NAS was applied to 600 patients hospitalized in the general adult ICUs of two public and two private hospitals in the city of São Paulo. The NAS scores for admission and discharge of patients

differed among the three groups between 64.4% and 59.0% at admission and between 55.8% and 50.4% at discharge. The elderly group obtained the highest mean NAS value in both measurements. A statistically significant difference was observed between the NAS scores for discharge in the adult and elderly groups, indicating that advanced aged patients possibly presented a higher demand for care and that, after leaving the ICU, this condition would result in a higher nursing workload in the receiving unit.[15]

In the present study a detailed analysis of the NAS items that scored with higher frequency on the first day of hospitalization, namely 1b, 2, 3, 4a, 7a, and 17, corroborates the results of other studies evaluating the frequency of the items at admission[13,15,16] as well as in the studies that analyzed these items throughout the length of stay of the patient in the ICU.[5,14] These findings result from the fact that the nursing interventions, such as the presence at bedside and continuous observation or active for two hours or more in a shift, laboratory investigations, medication, performing hygiene procedures, support and care for patients and their families, performing management and administrative tasks requiring full dedication for about two hours, and quantitative urine output measurement, are part of the daily routine activities in an ICU.

Focusing on the BMI of the patients, the items scored with higher frequency in the NAS and that presented statistically significant difference were 4b - Performing hygiene procedures for more than two hours in a shift, 6c - Performing procedure(s) with three or more nurses at any frequency, and 11 - Treatment for improving lung function. Item 11 was the most frequent in underweight patients, indicating that the pulmonary function of these patients was worse at admission in relation to the other groups. It is important to observe that this group of patients presented higher levels of severity and worse organ dysfunction both at admission and at discharge, as well as a higher percentage of mortality.

Although obese patients present a higher frequency of the item 6c, as these patients require a higher number of people for mobilization, the frequency at which this item was scored was insufficient to increase the nursing workload and affirm that these patients demand a higher number of these professionals. One explanation for this fact is that several obese patients in this study were hospitalized for elective surgeries, particularly bariatric surgeries. Therefore, it is possible to infer that in the first 24 hours of hospitalization in the ICU the patients, possibly with better clinical conditions, collaborated with the nursing team in relation to their mobilization in the bed. This study points out the fact that the insufficient number of professionals to perform the care involving the mobility of obese patients with total dependence may contribute to a higher risk of occurrence of adverse events as well as to generate physical overload in the professionals due to physical efforts exceeding the recommended levels.

The results obtained in this study do not infer that the BMI of patients hospitalized in the ICU have contributed to increase the nursing workload. This finding may be related to the reduced number of underweight patients and the predominance of normal and pre-obese patients associated with the fact that this is a unicentric study, an aspect considered as a limitation of the study. In relation to future research on the effect of the BMI on the nursing workload in the ICU, in addition to considering different clinical conditions and levels of severity it is important to analyze the observed and indicated number of professionals per patient in the ICU. It is also important to observe the need to expand the data collection through a multicentric study in order to increase the study of underweight and obese patients.

The objective measurement of the nursing workload in the ICU for allocation of professionals considering the complexity and demand of care to critical patients has been a useful tool for nurses in their daily clinical practice, as it enables them to provide more safety and quality of care.

## Conclusion

The results of this study allow the conclusion that the nursing workload in the ICU, according to the NAS, presented no differences between groups with

different BMIs. However, obese patients demanded more time for hygiene procedures and more people to assist in the mobilization/positioning process. Underweight patients received treatment to improve their pulmonary function with a higher frequency.

## Collaborations

Goulart LL, Carrara FSA, Zanei SSV, and Whitaker IY declare that they have contributed to the design of the study, analysis and interpretation of the data, writing of the article, relevant critical review of intellectual content, and final approval of the version to be published.

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