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Correlation between work load of nursing and severity of critical general, neurological and cardiac patients

Correlação entre carga de trabalho de enfermagem e gravidade dos pacientes críticos gerais, neurológicos e cardiológicos

Correlación entre carga de trabajo en enfermería y severidad de los pacientes críticos generales, neurológicos y cardiológicos

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Abstract

Objective: To correlate severity of the patient and the nursing staff workload, using Simplified Acute Physiology Score (SAPS3) and Nursing Activities Score (NAS) indexes and comparing them between three subgroups: cardiac, neurological and general. **Methods:** Prospective cohort study, in an Intensive Care Unit of a private hospital in São Paulo, from August to October 2011. **Results:** There were 195 patients, 57.9% male, median age 69 years old. Moderate correlation between NAS and SAPS3 neurological subgroup (p = 0.02, r = 0.430). SAPS3 the general subgroup was higher compared to neurological subgroup (p = 0.002). The NAS is generally greater when compared to cardiac subgroup (p = 0.001). **Conclusion:** There was a moderate correlation between the severity of neurological patients and the nursing workload. The severity and nursing workload in the subgroup of general patients were higher in relation to neurological and cardiac patients, respectively.

Keywords: Severity of illness index; Workload; Nursing; Intensive care units.

Resumo

Objetivo: Correlacionar gravidade do paciente e carga de trabalho da equipe de enfermagem, utilizando os índices *Simplified Acute Psysiology Score* (SAPS3) e *Nursing Activities Score* (NAS) e compará-los entre três subgrupos: cardiológicos, neurológicos e gerais. **Métodos:** Coorte prospectivo, em uma Unidade de Terapia Intensiva de hospital privado de São Paulo, entre agosto a outubro de 2011. **Resultados:** Foram acompanhados 195 pacientes, 57,9% do sexo masculino, mediana de idade 69 anos. Correlação moderada entre NAS e SAPS3 no subgrupo neurológico (p = 0,02; r = 0,430). SAPS3 do subgrupo geral foi maior comparado ao subgrupo neurológico (p = 0,002). O NAS foi maior no subgrupo geral quando comparado ao subgrupo cardiológico (p = 0,001). **Conclusão:** Houve correlação moderada entre a gravidade de pacientes neurológicos e a carga de trabalho de enfermagem. A gravidade e a carga de trabalho de enfermagem no subgrupo de pacientes gerais foram maiores em relação aos pacientes neurológicos e cardiológicos, respectivamente.

Palavras-chave: Índice de gravidade de doença; Carga de trabalho; Enfermagem; Unidades de terapia intensiva.

Resumen

Objetivo: Correlacionar gravedad del paciente y carga de trabajo del equipo de enfermería, utilizando los índices *Simplified Acute Psysiology Score* (SAPS3) y *Nursing Activities Score* (NAS) en tres subgrupos: cardíacos, neurológicos y generales. **Métodos:** Cohorte prospectivo realizado en una Unidad de Cuidados Intensivos de un hospital privado de São Paulo, agosto a octubre de 2011. **Resultados:** Participaron 195 pacientes, 57,9% hombres, edad media 69 años. Correlación moderada entre NAS y SAPS3 subgrupo neurológico (p = 0,02, r = 0,430). SAPS3 el subconjunto general fue mayor en comparación con neurológico (p = 0,002). El NAS es generalmente mayor cuando se compara con el subgrupo cardíaco (p = 0,001). **Conclusión:** Correlación moderada entre la gravedad de pacientes neurológicos y la carga de trabajo de los enfermeros. La gravedad y la carga de trabajo en el subgrupo de pacientes generales eran más altas en relación con pacientes neurológicos y cardíacos, respectivamente.

Palabras-clave: Índice de severidad de la enfermedad; Carga de trabajo; Enfermería; Unidades de cuidados intensivos.

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INTRODUCTION

The nursing workload has been discussed worldwide in hospitals due to its implications for quality of care for patients. In intensive care units (ICU), there is a growing concern due to the impact of new technologies in care, the profile changing of critically ill patients and the need for skilled labor[1].

The use of prognostic indexes and indicators can help in the allocation of equipment and personnel and describe the severity of the population assisted in ICU[2].

The prognosis system SAPS3 (Simplified Acute Physiology Score 3) was recently developed in cohort worldwide[3]. The variables are divided into demographic variables, reasons for ICU hospitalization and physiological variables. For each one of the analyzed variables there is a different weight, depending on the severity of the physiological disorder. In theory, the lowest value assigned by the score is 16 and the highest is 217 points. In addition, it is useful to quantify the acute and chronic physiological disorders during hospitalization, estimating mortality to correct errors and improve the performance of ICU[2].

The nursing work is the time spent by the nursing team to perform the activities of their responsibility, directly or indirectly related to patient care. These activities suffer the interference of the degree of patient dependency, the complexity of the disease, the characteristics of the institution, work processes, physical structure and the profile of team members[4].

The nursing workload also covers other factors that include nursing education (monitoring of students, staff training) and organizational and administrative work[5]. In this way, the nursing workload results of the needs and the nursing staff available to satisfy these needs, that is the care service time[6].

The instruments used to measure the nursing workload were developed in different countries, with the intention to facilitate the clinical practice of nurses according to the demand of patients, relative to the size of the necessary nursing staff and cost analysis of the unit[7]. Among them, there is the Nursing Activities Score (NAS), endorsed in 99 ICUs located in 15 different countries[8]. The final score obtained by NAS, from 23 nursing interventions analysis, shows the percentage of time spent by nurses per shift in direct patient care and thus contributes to the adequacy of the nursing staff in the ICU to patient´s demand for intensive care[8]. The results of the investigations showed that the demographic and clinical variables, such as length of stay at ICU, mortality, disease severity, patient age, type of hospitalization and surgical interventions, analyzed by the Therapeutic Intervention Scoring System (TISS-28), are factors associated with the high workload of the nursing staff in other clinical situations[5].

When evaluating the nursing work related to the severity of the patient, some authors report that the NAS of hospitalization was associated with increased length of stay in ICU[8,9]. In addition, there was an association between mortality and NAS, showing that no patient´s deaths were in higher nursing workload[10].

To properly allocate human resources in ICU, prioritizing the quality and safety of care, there is a need to relate the nursing workload and severity of critically ill patients. The objective of this study was to correlate the severity of the patient with the workload of the nursing team, using the SAPS3 and NAS indexes, respectively, and comparing them in three subgroups of patients: cardiac, neurological and general surgical clinical.

METHOD

This is a prospective cohort study, with data collected in the ICU of a private general hospital located in the central region of São Paulo, Brazil. The unit has forty beds divided into four areas for service general surgical clinical patients, cardiac and neurological, with the nursing team of 63 nurses and 107 nursing technicians. Data collection was from August to October 2011, it was initiated after approval from the Ethics in Research Committee of the hospital (2011-09) and the signing of informed consent and informed term by the legal responsibility of the patient.

The convenience sample consisted of patients hospitalized during the study period, aged equal or more than eighteen years old, with first hospitalization in the unit between data collection and hospitalization exceeding 24 hours. As follow-loss criteria, there were the transferred patients from the ICU to another institution.

To characterize the patients, data for identification and ICU stay were collected. The variables considered were the demographics (age, gender) and clinical (hospital stay in the ICU, hospitalization time, origin, type of treatment, early diagnosis and outcome). Four nurses linked to the research carried out the filling of SAPS3 and NAS instruments at the time of ICU hospitalization. The data source to obtain information was the patient´s medical record and a previously instrument elaborated was used with the study variables. The data were stored in spreadsheet developed in Microsoft Office Excel 2010 software.

For quantitative variables (age, length of stay in the ICU, hospitalization time, SAPS3 and NAS) measures of central tendency and dispersion were calculated, while categorical variables (gender, origin, type of treatment, early diagnosis and outcome) were described as absolute and relative frequencies.

Data analysis was performed using the Pearson correlation coefficient using the Statistical Package for the Social Sciences program, version 17.0. To evaluate the correlation between the NAS scores of hospitalization and SAPS3, Pearson correlation coefficient was used, since there was adherence of these variables to the normal distribution curve (Kolmogorov-Smirnov). To evaluate the difference and compare SAPS3 between groups, ANOVA and the Bonferroni test were used, respectively. To evaluate the difference and compare NAS between the groups the Kruskal-Wallis and Mann-Whitney test were used, respectively. For all statistical tests an error alpha = 5% was set, that is, the test results were considered statistically significant at $p < 0.005$.

RESULTS

During the study period, 195 patients were included. Demographic and clinical characteristics of the 195 patients evaluated by NAS and SAPS3 during the study period are shown in Table 1.

Table 1. Clinical and demographic characteristics of patients hospitalized in ICU. São Paulo, 2011

Characteristics	Total n = 195 n (%)
Age (years) - Median (Min. - max.)	69 (25-101)
Gender	
Male	113 (57.9)
Diagnostic group	
Neurological	29 (14.9)
Cardiac	46 (23.6)
General	120 (61.5)
Type of treatment	
Clinical	115 (59.0)
Surgical	80 (41.0)
Origin	
Surgical Center	69 (35.4)
ER	56 (28.7)
Inter-hospital transference	25 (12.8)
Hospitalization unit	28 (14.3)
Semi-intensive	12 (6.2)
Interventional radiology	4 (2.1)
Others	1 (0.5)
SAPS3 - Average (± DP)	51.5 ± 16.2
NAS - Average (± DP)	65.9 ± 16.6
Hospitalization time in ICU (days) - Median (Min. - max.)	3 (1-51)
Time of hospitalization (days) - Median (Min. - max.)	13 (1-873)
Outcome in ICU	
Discharge	180 (92.3)
Death	15 (7.7)
Hospitalar outcome	
Discharge	162 (83.1)
Death	29 (14.9)
Inter-hospital transference	2 (2.0)

SAPS3: Simplified Acute Physiology 3; NAS: Nursing Activities Score; ICU: Intensive Care Unit.

The median age of patients in the Neurological group was 60 years old (from 26 to 87 years old). In Cardiac groups (from 42 to 101 years old) and General (from 25 to 99 years old), the median was 70 years old. Regarding to gender, 15 patients were male (51.7%) in the Neurological group, 30 (65.2%) of the Cardiac group and 68 (56.7%) of the General group.

Figures 1, 2 and 3 show the analysis of the correlation between SAPS3 and NAS in the different subgroups. There was a moderate correlation between these variables in the subgroup of neurological patients (r = 0.430).

Figure 1. Correlation between Nursing Activities Score (NAS) and Simplified Acute Physiology 3 (SAPS3) of neurological patients. São Paulo, 2011.
* Pearson Correlation Coefficient.

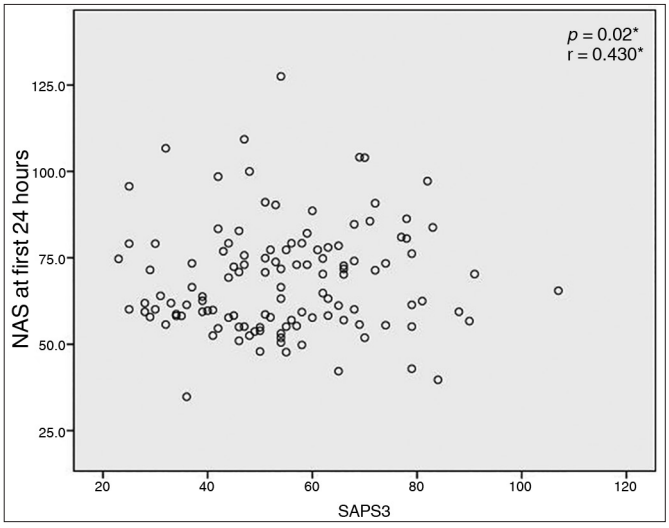


Figure 2. Correlation between Nursing Activities Score (NAS) and Simplified Acute Physiology 3 (SAPS3) of neurological patients. São Paulo, 2011.
* Pearson Correlation Coefficient.

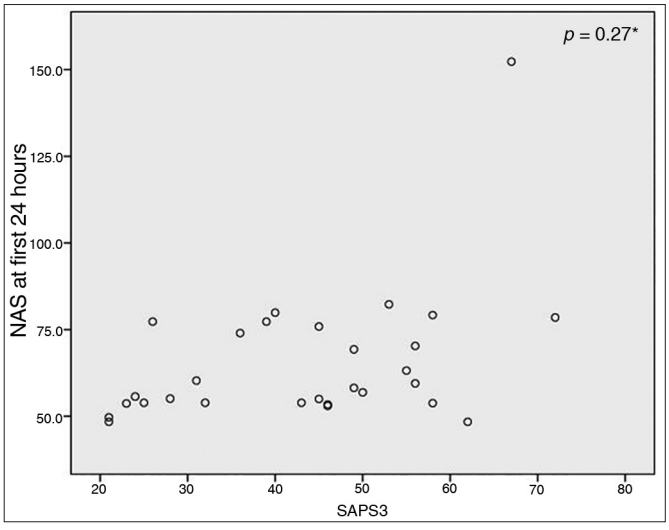
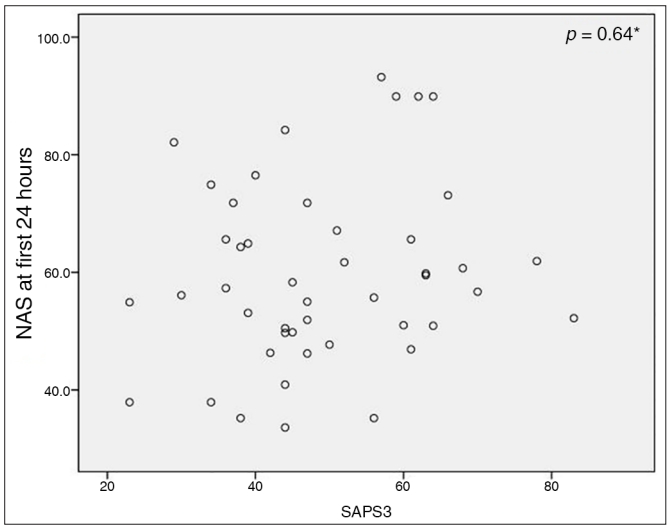


Figure 3. Correlation between Nursing Activities Score (NAS) and Simplified Acute Physiology 3 (SAPS3) of general clinical-surgical patients. São Paulo, 2011.
* Pearson Correlation Coefficient.



The average value of SAPS3 and NAS was compared between the Neurological, Cardiac and General groups of patients, with a significant difference in the two scores (Table 2).

In the two scores evaluated, SAPS3 and NAS, the General group of patients had higher average values when compared to the other two groups. Comparisons between the average values of SAPS3 between groups using the Bonferroni test were: Neurological and Cardiac (p = 0.364), Neurological and general (p = 0.002) and Cardiac and General (p = 0.158). The NAS of ICU hospitalization was also compared between the groups using the Mann-Whitney test: Neurological and Cardiac (p = 0.223), Neurological and General (p = 0.081) and Cardiac and General (p = 0.001).

DISCUSSION

Offering a high-quality, safety and directed care to the real needs for patients hospitalized in ICU, should be the goal of all health care and administrative processes of that professionals involved in health care. This can be achieved by the use and correct use of prognostic indexes and indicators for the rational use of technology, the environment, methods and professionals.

This issue is of fundamental interest, since an oversized team has a high cost[5]. On the other hand, it is known that a small team tends to determine impairment in quality of care, interfering in patient safety[11] prolonging hospitalization and generating greater cost[12].

Therefore, seeking evidence to strengthen this premise is an important contribution to the health system. Thus, this study correlated the nursing workload with the severity of the patients.

The score obtained by NAS directly express the percentage of time spent by the nursing team in the care of critically ill patients whose scores can range from zero to 176.8%[8], that is, how much of a professional working time the patient required in the last 24 hours. Therefore, a score of 100 points means that the patient required 100% of the time of a nursing worker in his care, in the last 24 hours[12]. Each NAS point is similar to 14.4 minutes of nursing care[1].

Our results showed that there was a moderate correlation between severity and nursing workload in the subgroup of neurological patients. The severity and the nursing workload was greater in the subgroup of general surgical clinical patients when compared with the group of neurological and cardiac patients, respectively.

Regarding the study sample, the demographic and clinical characteristics were comparable results to recent studies in critically ill patients[5,9], where our average age was slightly higher than the age of a study at a teaching hospital, a consequence of the quality of life change that lead to the aging of the world population[13]. Some studies[9,13] also showed a predominance of males; mostly clinical patients, and mostly from the operating room, as demonstrated in our findings. Explanations that may explain these data is the profile of chronic diseases of the Brazilian population, population aging and an increased incidence of cancer.

Another relevant data in our sample is the low mortality (7.7%), which was less than other studies[13] and can be influenced by some factors such as comorbidities in the population and their management. Proper management of these conditions may be responsible for low mortality and the reduced length of stay (3 days) in ICU, median common to private institutions[9]. This may be also related to the study place, which is in reference to highly complex treatments, having adequate human resources and a focused institutional culture for patient safety, resulting in a lower incidence of adverse events and, consequently, in a shorter hospital stay. In a study conducted in ICU of a Brazilian public hospital, whose results are similar to ours, this was attributed to good therapeutic perspectives of patients, despite the presence of chronic diseases and old age. It is important to highlight that patients in public hospitals are more serious for their social and economic circumstances, and also the difficulty of access to ICU beds, which aggravates their clinical condition and influences these indicators[14].

Table 2. Comparison of severity (SAPS3) and nursing workload (NAS) in the subgroups of patients. São Paulo, 2011

Scores	Neurological n = 29	Cardiac n = 46	General n = 120	*p*-value
SAPS3 - Average (± SD)	43.31 ± 14.47	49.13 ± 13.80	54.47 ± 16.75	0.002*
NAS - Average (± SD)	62.97 ± 11.79	58.88 ± 14.87	67.94 ± 15.52	0.002†

* ANOVA; † Kruskall-Wallis Test. SAPS3: Simplified Acute Physiology 3; NAS: Nursing Activities Score.

In a recent study, differences have been described in the NAS measurement among patients of public and private institutions, where patients at public hospitals had higher average hospitalization in NAS (68.1) compared to patients in private institutions (56.0)[15]. However, our findings are closer to public institutions, since it is a reference institution in highly complex treatments.

Our results for average hospitalization of NAS indicate a high demand for nursing care. Resolution 26 of the National Health Surveillance Agency (ANVISA)[16], of 11 May 2012, about the minimum requirements for ICU operation and other measures, ask for a nursing technician for each two beds, as well as the ratio of a care nurse for every ten beds or fraction, in each work shift. This proportion of bed by professionals may be considered inadequate for the care of patients in this study, since this high workload of nursing staff can interfere with the safety and quality of care provided to patients.

Our findings showed that only in the subgroup of patients with neurological diagnosis there is a moderate correlation between the severity index and the workload. This correlation is probably because the profile of neurological patients of the study unit is characterized mostly by postoperative elective surgeries, which has repercussions in short stay, but demand more attention in the first 24 hours due to devices and care procedures monitoring.

In another study of patients hospitalized to general and neurological ICUs there is no correlation between NAS and SAPS II, only observing a weak correlation between NAS and length of stay in ICU[17]. Perhaps, this correlation is not described in the literature because NAS is being associated only to the severity of the patient and the presence of organ dysfunction. Besides these factors, a wide range of activities involving clinical, administrative, educational and organizational dimensions should be considered. This hypothesis confirmed a moderate correlation between NAS, APACHE II and the Sequential Organ Failure Assessment (SOFA) in a study in Brazil[6].

The institutional culture based in the quality management, patient safety, continuing education and proper distribution of the nursing team, are aspects that probably influenced our data on the outcomes of patients. More than 80% of the sample had discharge from ICU and hospital, with an average hospital stay of 13 days, even with high scores on NAS.

The literature has shown a lack of studies to confirm the perception that more severe patients require greater workload[13], but it was observed that among patients with higher NAS, the mortality rate was also higher[6]. This condition may reflect service management, which did not consider NAS score for the distribution of human resources. The evidence does not emphasize this need, affecting hospital stay, costs and patient safety. Another interesting aspect is that patients who required high workload and did not survive their stay in the unit was not more than two days[6].

Measuring in which NAS domain the demand is greater is a suggestion to understand this situation. In a research conducted in 2011, the authors attributed the high demand of work (96.2) to the family spent time and intra-hospital transportation[18].

The values of SAPS3 (51.5) among the participants of this study are similar to a study in two surgical ICUs[2] where the average score was 48.5 and the results showed that patients with lower or equal scores to 57 had higher survival rate. Despite the high NAS, these values justify the low mortality in our sample, that is, patients had not a very severe clinical condition. These facts, associated with aspects discussed above, also impact the lack of correlation of severity and workload in the subgroups of general and cardiac patients.

The results showing no correlation between NAS and SAPS3 in subgroups of general and cardiac patients, reinforce the concept that the nursing workload is not only associated with the severity of the patient and intensity of interventions. Therefore, there are also larger acting context, involving the clinical, administrative, educational and organizational aspects of ICU.

CONCLUSION

There was a moderate correlation between the severity of the neurological patient with the nursing workload, using NAS and SAPS3 indexes, respectively. In the subgroup of general patients, gravity and workload was higher when compared to neurological and cardiac subgroups.

Our findings have opened some possibilities for more studies that measure NAS areas in general, neurological and cardiac subgroups to identify which domain has greater interference in the workload. The strength of this study was to show that in specific subgroup of neurological patients is correlated with the severity of nursing workload in order to ensure improvement in the quality of intensive care.

Some limitations should be considered. The main limitation of this study was due to be performed in an ICU of a private hospital of reference in high complexity treatments, with appropriate number of ICU beds to the number of hospital beds, located in São Paulo, with highest number of establishments with ICU in Brazil. Therefore, our results should be extrapolated with care institutions with similar characteristics. In addition, we do not analyze the relationship of NAS with the length of stay and clinical outcome.

REFERENCES

1. Conishi RM, Gaidzinski RR. Nursing activities score (NAS) como instrumento para medir carga de trabalho de enfermagem em UTI adulto. Rev. Esc. Enferm. USP. 2007;41(3):346-54.
2. Silva Junior JM et al. Aplicabilidade do Escore Fisiológico Agudo Simplificados (SAPS3) em hospitais brasileiros. Rev. Bras. Anestesiol. 2010;60(1):20-31.
3. Moreno RP, Metnitz PG, Almeida E et al. SAPS3 - From evaluation of the patient to evaluation of the intensive care unit. Part 2: Development of a prognostic model for hospital mortality at ICU admission. Intensive Care Med. 2005;31:1345-55.

4. Panunto MR, Guirardello EB. Carga de trabalho de enfermagem em Unidade de Terapia Intensiva de um hospital de ensino. Acta Paul. Enferm. 2012;25(1):96-101.
5. Gonçalves LA, Padilha KG. Fatores associados à carga de trabalho de enfermagem em Unidade de Terapia Intensiva. Rev. Esc. Enferm. USP. 2007;41(4):645-52.
6. Altafin JAM, Grion CMC, Tanita MT, et al. Nursing Activities Score and workload in the intensive care unit of a university hospital. Revista bras. ter. intensive. 2014;26(3):292-8.
7. Vincent JL, Moreno R. Clinical review: Scoring systems in the critically ill. Crit Care. 2010;14:207.
8. Miranda DR, Nap R, de Rijk A, Schaufeli W, Iapichino G. Nursing activities score. Crit Care Med. 2003;3:374-82.
9. Nogueira LS, Sousa RM, Padilha KG, Koike KM. Clinical characteristics and severity of patients admitted to public and private ICUS. Texto & Contexto Enferm. 2012;21(1):59-67.
10. Kiekkas P, Brokalaki H, Manolis E, Samios A, Skartsani C, Baltopoulos G. Patient severity as an indicator of nursing workload in the intensive care unit. Nurs Crit Care. 2007;12(1):34-41.
11. Gonçalves LA. Segurança do paciente em Unidade de Terapia Intensiva: carga de trabalho de enfermagem e sua relação com a ocorrência de eventos adversos e incidentes [tese]. São Paulo: Escola de Enfermagem da Universidade de São Paulo; 2011.
12. Queijo AF, Padilha KG. Instrumento de medida da carga de trabalho de enfermagem em Unidade de Terapia Intensiva: Nursing Activities Score (N.A.S). Rev Paul Enferm. 2004;23:114-22.
13. Feitosa MC, Leite IRL, Silva GRF. Demanda de intervenções de enfermagem a pacientes sob cuidados intensivos: NAS - nursing activities score. Esc Anna Nery. 2012;16(4):682-8.
14. Padilha KG, de Sousa RM, Garcia PC, Bento ST, Finardi EM, Hatarashi RH. Nursing workload and staff allocation in an intensive care unit: A pilot study according to Nursing Activities Score (NAS). Intensive Crit Care Nurs. 2010;26(2):108-13.
15. Nogueira LS, Koike KM, Sardinha DS, Padilha KG, Sousa RM. Carga de trabalho de enfermagem em unidades de terapia intensiva públicas e privadas. Revista bras. ter. intensive. 2013;25(3):225-32.
16. Agência Nacional de Vigilância Sanitária (BR). Resolução - RDC nº 26, de 11 de maio de 2012. Altera a Resolução RDC nº 07, de 24 de fevereiro de 2010, que dispõe sobre os requisitos mínimos para funcionamento de Unidades de Terapia Intensiva e dá outras providências. Edição 92. Diário Oficial da União; Brasília (DF): 14 maio 2012. Seção 1, p. 170.
17. Daud-Gallotti RM, et al. Nursing workload as a risk factor for healthcare associated infections in ICU: a prospective study. PLoSone. 2012;7(12):523-42.
18. Stafseth SK, Solms D, Bredal IS. The caracterisation of workloads and nursing staff allocation in intensive care units: a descriptive study using the Nursing Activities Score for the first time in Norway. Intensive Crit Care Nurs. 2011; 27:290-94.