

Nursing Activities Score and the cost of nursing care required and available

Nursing Activities Score e custo da assistência de enfermagem requerida e disponível
El Nursing Activities Score y el costo de la asistencia de Enfermería requerida y disponible

Elaine Machado de Oliveira¹

ORCID: 0000-0002-1975-297X

Ligia Maria Dal Secco¹

ORCID: 0000-0002-3730-1275

Walquiria Barcelos de Figueiredo¹

ORCID: 0000-0003-4314-0188

Katia Grillo Padilha¹

ORCID: 0000-0002-6440-4667

Silvia Regina Secoli¹

ORCID: 0000-0003-4135-6241

¹Universidade de São Paulo. São Paulo, São Paulo, Brazil.

How to cite this article:

Oliveira EM, Secco LMD, Figueiredo WB, Padilha KG, Secoli SR. Nursing Activities Score and the cost of nursing care required and available. Rev Bras Enferm [Internet]. 2019;72(Suppl 1):137-42. [Thematic Issue: Work and Management in Nursing]. DOI: <http://dx.doi.org/10.1590/0034-7167-2017-0655>

Corresponding Author:

Elaine Machado de Oliveira
E-mail: elainemachado@usp.br

Submission: 09-26-2017 **Approval:** 12-09-2017

ABSTRACT

Objective: To estimate the cost of nursing care required and available through the use of the Nursing Activities Score. **Method:** Quantitative study, direct costing of nursing care required and available in the Intensive Care Units. Data collection included variables of the patients, nursing professionals and nursing workload measured by the Nursing Activities Score. The cost of nursing care was estimated by multiplying the cost of each hour with the total number of hours of care per category. **Results:** The negative difference of R\$ 94,791.5 between the cost of available and required nursing care indicated an increase of 3.2 nurses and 7.0 nursing technicians. **Conclusion:** The cost of nursing care required identified through the application of the Nursing Activities Score, which is higher than the cost of available care, indicates the need to adjust the number of professionals to meet patients' demands.

Descriptors: Nursing Care; Intensive Care Units; Work Load; Costs and Cost Analysis; Professional Practice Management.

RESUMO

Objetivo: Estimar o custo da assistência de enfermagem requerida e disponível com o uso do *Nursing Activities Score*. **Método:** Estudo quantitativo, análise de custo direto da assistência de enfermagem requerida e disponível nas Unidades de Terapia Intensiva. A coleta dos dados incluiu variáveis dos pacientes, profissionais de enfermagem e carga de trabalho de enfermagem medida pelo *Nursing Activities Score*. O custo da assistência de enfermagem foi estimado pela multiplicação entre o custo de cada hora e o total de horas da assistência por categoria. **Resultados:** A diferença negativa de R\$ 94.791,5 entre o custo da assistência de enfermagem disponível e requerida indicou acréscimo de 3,2 enfermeiros e 7,0 técnicos de enfermagem. **Conclusão:** O custo da assistência de enfermagem requerida identificado por meio da aplicação do *Nursing Activities Score*, mais elevado que o custo da assistência disponível, indica a necessidade de ajustar o número de profissionais para atender às demandas dos pacientes.

Descritores: Cuidados de Enfermagem; Unidades de Terapia Intensiva; Carga de Trabalho; Custos e Análise de Custo; Gerenciamento da Prática Profissional.

RESUMEN

Objetivo: Determinar el costo de la asistencia de Enfermería requerida y disponible con el uso del *Nursing Activities Score*. **Método:** Estudio cuantitativo, con análisis de costo directo de la asistencia de Enfermería requerida y disponible en las Unidades de Terapia Intensiva. La recolección de los datos incluyó variables de los pacientes, profesionales de Enfermería y carga de trabajo de Enfermería medida por el *Nursing Activities Score*. El costo de la asistencia de Enfermería fue determinado por la multiplicación entre el costo de cada hora y el total de horas de la asistencia por categoría. **Resultados:** La diferencia negativa de 94.791,5 reales entre el costo de la asistencia de Enfermería disponible y requerida indicó un aumento de 3,2 enfermeros y 7,0 técnicos de Enfermería. **Conclusión:** El costo de la asistencia de Enfermería requerida identificado por medio de la aplicación del *Nursing Activities Score*, más elevado que el costo de la asistencia disponible, indica la necesidad de ajustar el número de profesionales para atender las demandas de los pacientes.

Descriptor: Cuidados de Enfermería; Unidades de Terapia Intensiva; Carga de Trabajo; Costos y Análisis de Costo; Gestión de la Práctica Profesional.

INTRODUCTION

The economic concern currently experienced in the national context also extends to health services, especially considering the complexity of the Intensive Care Unit (ICU) environment, structured with highly specialized human resources and advanced technology for the care of serious patients⁽¹⁻²⁾. Nursing professionals, who represent the largest proportion of human resources, directly impact on institutional costs, becoming a frequent target of financial constraint measures⁽³⁾.

Thus, the importance of investigating the results of the investment in the number of nursing professionals, integrating management and care actions in the safety and quality of practices⁽⁴⁾, requires nurses to justify the cost of nursing care and to demonstrate the good results achieved patients and institutional economics, in order to reduce the impact of staff cuts on staff⁽³⁾.

In this sense, investigating the cost of nursing care required and available enables us to identify whether the number of professionals available at the Unit is adequate to meet patients' demands and to promote cost management to provide sufficient supervision and good patient outcomes.

The literature presents positive results for the safe and quality care that justifies the investment in the adequate number of nursing professionals^(1-3,5-7).

Studies show that the adequate number of nursing professionals in the unit, including the ICU, impacts on better outcomes relative to patients and professionals⁽⁶⁻⁷⁾, as it promotes the distribution of activities and the adjustment proportion of patients per nurse. The adequate management of nursing activities reduces the workload and increases patient supervision, impacting on the reduction of incidents with and without damage, mortality and length of hospital stay⁽⁷⁾.

The initial cost of investing in the number of nursing professionals, over a longer period of time, has an important influence on reducing institutional costs by reducing incidents and treating damages to patients, as well as favoring the quality of nursing practice environment and permanence reducing the need for new hires to cover the care demands^(3,6,8-9).

Thus, nurses' knowledge in management places them in a privileged position to develop strategies for researching the costs of nursing care, focusing on the results of efficient care, since the very close contact of the patients allows evaluating the care provided and identifying the best investment strategies^(3-4,10-11).

An important strategy to manage the costs of nursing care presents the measure of workload as a means of investigating the adequate number of professionals for patient supervision in order not to burden the institution's financing. The workload may influence the increase in the cost of care as a consequence of the variation in the number of professionals, because in excess, it increases the stress and impacts the permanence or turnover of the professionals in the ICU. Consequently, changes in staff numbers increase the cost of nursing care through the need to hire new professionals and training to meet the demands⁽⁹⁾.

Despite the few results available in the literature, the Nursing Activities Score (NAS) tool, which measures the nursing workload in proportion to the time of care required by the patient, presents a better applicability for the investigation of the cost of care for covering 81.0 % of nursing activities. With these attributes, the tool allows to estimate the cost of the required care and compare

it with the cost of nursing care available for the adequacy of the number of professionals in the unit⁽⁹⁾.

A Brazilian study, which applied the NAS to calculate the mean cost of nursing care required by ICU patients and compare with the available care time, found that the NAS mean of 85.6% impacted the required care cost, higher than the cost of available care. The results also show the need for investment of 42.6% in nursing human resources for the adequacy of care cost, considering the demands required by the patients⁽¹⁾.

Another study that also applied the NAS to analyze the cost of nursing care, although developed in neonatal ICU, found a NAS 66.9% mean and the need to invest 30.0% in the cost of nursing care and 27.0 % of nursing technicians in the Unit to meet the patients' demands. This study reinforces the importance of investigating the cost and the hours of nursing care, considering the number of professionals working in the ICU for the conformity between the demands demanded by the patients and the availability of the unit⁽²⁾.

The literature presents, therefore, relevant results of the investigation of the cost of nursing care, which use the measurement of the actual workload in care time, especially with the NAS application, in order to compare the hours of care required available, and adjust the number of professionals in the units in order to ensure adequate care and not burden the institutional processes.

OBJECTIVE

To estimate the cost of nursing care required and available with use of the Nursing Activities Score.

METHOD

Ethical aspects

The study was approved by the Ethics Committee for the Analysis of Research Projects (CAPPesq), *Hospital das Clínicas*, Medical School of the *Universidade de São Paulo*, and conducted according to the ethical standards required by Resolution 466 of December 12, 2012.

Design, place of study and period

This is a quantitative, descriptive study using the direct costing of nursing care required and available, developed at the Central Institute of the *Hospital das Clínicas* of the Medical School of the *Universidade de São Paulo*, which has a capacity of about 900 beds, of which 100 for Intensive Care Units. The 8 ICU included in the study totaled 71 beds of the specialties: Surgical (9 beds), Burns (4 beds), Nephrology (2 beds), Clinic (9 beds), Neurology (9 beds), Infectious Diseases Clinics (14 beds) and Surgical Emergencies (17 beds). The development period of this study was between June and August 2016.

Study samples; inclusion and exclusion criteria

The sample units were patients and nursing professionals. The non-probabilistic sample for convenience included all eligible patients according to age criteria of 18 years or older, submitted to clinical or surgical treatment and ICU hospitalization time greater than 24 hours for the application of the NAS tool.

Regarding the nursing team, the non-probabilistic sample included all nurses and nursing technicians who worked during the study period, excluding those who were excluded for any reason.

Study protocol

In order to collect data between June and August 2016, different sources of information and tools were used.

Patient profile data were obtained from medical records. The tool included the variables of age, sex, mortality risk measured by the Simplified Acute Physiology Score III (SAPS III)⁽¹²⁾, type of clinical and surgical treatment, length of stay, number of comorbidities, and survivor.

The SAPS III is a tool composed of 20 items with a score between 16 and 217, which includes acute physiological score and assessment of the patient's previous state to measure the predictive mortality rate at ICU admission by means of points or percentage of the risk of death⁽¹²⁾.

The data on the nursing team were collected by consulting the daily scales of the number of nurses and nursing technicians, and number of patients per day in ICU. The nursing workload measured by the Nursing Activities Score (NAS) tool⁽¹³⁾ was extracted from the institutional database.

The NAS tool, translated and validated in Brazil, with precision for the measurement of the nursing workload⁽¹³⁾, consists of 7 categories, namely: *Basic activities (Monitoring and Control, Hygiene Procedures, Mobilization and Positioning, Support and Care for Family and Patients, Administrative and Management Tasks); Ventilatory support; Cardiovascular; Kidney; Neurological; Metabolic; and Specific interventions*. These categories include a total of 23 items, 5 of them with sub-items, with scores varying from 1.2 to 32 points. The final score indicates the proportion of the care time required by the patient in the last 24 hours, and may reach a maximum of 176.8%, indicating, in this case, the need for more than one nursing professional per patient⁽⁹⁾.

The nursing workload was collected daily by the ICU nurses in online system through applications with login and individual password. The data were stored in the database called dbNAS, which integrated with the institutional server, allows the communication between all ICUs of the institution and the extraction of reports via the Internet.

The nurses were trained in theoretical and practical courses in the Units to consolidate the application of the tool. Subsequently, NAS concordance tests were performed, which were collected by the nurses and by the expert researchers, which resulted in low agreement on items with subitems (1,4,6,7,8) and item 9, revealing underestimated scores of the nurses in specialists. In this way, new training was developed with emphasis on these specific items and for the use of the online tool⁽¹⁴⁾.

The information corresponding to the salaries, benefits and charges of the nursing professionals were obtained from the institutional documents of the Human Resources sector.

Analysis of results and statistics

The variables were typed in Excel spreadsheet, checked, imported and processed in the Statistical Package for the Social Sciences (SPSS), version 19.0.

The mean number of patients per nurse and the average number of patients per nursing technician was calculated by dividing the number of patients per day by the number of professionals in each category per day in the Units.

In order to calculate nursing care required hours, each NAS point corresponded to 14.4 minutes of professional time⁽¹⁵⁾. The average daily required hours of care per category were estimated using a rule of three, considering the average number of nurses and nursing technicians per day in the study sample.

The average daily hours of available nursing care was calculated using the equation $H = q.t/n^{(2)}$, in which:

H = average hours of care available per day;

q = average daily number of professionals in each professional category;

t = ICU professionals workday of 6 hours daily;

n = daily mean of patients in the ICU.

The proportion of available care hours corresponding to each category was also calculated using the average number of nurses and staff on the team per day.

In order to estimate the average hours of care required and available during the study period, the mean number of hours per day of each category was multiplied by the mean daily number of patients and by 67, which corresponded to the days of the study.

The average monthly wage was constituted by the base salary and insalubrity, plus 60% to the gross salary related to the benefits and charges (vacations, thirteenth salary, addition by working time). The workload was 220 hours per month distributed in 6-hour days for nurses and nursing technicians. To complete the monthly workday, the professionals performed 12-hour shifts.

The cost of the nursing care hour was identified by dividing the average monthly salary of each category by 220, which corresponded to the monthly hours worked. The estimation of the cost of nursing care required and available in the study period was performed by directly multiplying the cost of each hour of nurses' and technicians' attendance and the total hours of care of each category.

The identification of the number of nurses and technicians needed to match the demands of the patients with the ICU availability was calculated by means of a rule of three. The calculated difference between the cost of available care and required per category divided by the cost of the professional corresponding to each category in the study period, and indicated the number of nurses and nursing technicians to be added in the team for the adequacy of nursing care.

For the analysis of the qualitative variables, absolute and relative frequencies were used, and for the quantitative variables, measures of central tendency (mean, standard deviation, median and interquartile range), minimum and maximum.

RESULTS

The total sample of patients in the study period consisted of 265 individuals hospitalized in the 8 ICU, the majority of which were male (55.5%), submitted to clinical treatment (55.5%) and outpatient ICU survivor status 76.6%). The mean age was 49.2 years (SD=17.5), risk of death according to SAPS III 34.8% (SD=26.3), length of stay 15.4 days (SD=17.5) and number of comorbidities 1.4 diseases (SD=1.2). The mean daily ICU patients were 8.6 (SD=4.2), with a 95% confidence interval ranging from

8.4-8.9, median 9.0, interquartile range 10.0, minimum 1.0 and maximum 20.0.

Regarding nursing professionals, the study found a total of 115 nurses and 256 nursing technicians.

Table 1 presents a mean of 4.2 (SD=1.1) patients for each nurse and 1.6 (SD=0.4) patients for each nursing technician. The mean NAS presented a high nursing workload (93.1%, SD=13.3).

The hours of nursing care required and available by category and the calculation of the difference are shown in Table 2.

For the direct cost of nursing care, the 220 hours per month of nurses and nursing technicians corresponded respectively to R\$ 7,126.40 (32.4 per hour) and R\$ 3,496.40 (15.9 per hour).

The estimate of the cost of nursing care required and available and the difference between these measures in the study period are presented in Table 3.

The negative difference between the direct cost of the available and required care in the study ICU corresponds to R\$ 94,791.50. The results by category also presented negative difference.

In order to calculate the adequacy of the number of nurses and nursing technicians in the Units during the study period, the difference between the available and required care cost of nurses (R\$ 45,855.70) and nursing technicians (R\$ 48,941.80) divided by the cost of the professional of each category in the period (R\$ 14,252.80 and R\$ 6,992.80, respectively) indicated 3.2 nurses and 7.0 nursing technicians to be added in the team.

DISCUSSION

The directly proportional relationship between nursing care and cost hours allows not only to estimate the direct cost of care, but also to compare the cost of care required and available, through the NAS, to adjust the number of nursing professionals needed to quality of care and management of the cost of nursing care in the ICU.

The NAS application for nursing workload measurement shows that the hours of nursing care required by the patients were higher than the hours of care available by the ICU professionals, impacting on the negative difference between the available and required care hours (-4493.4 hours). The high workload measured by the NAS (93.1%, SD=13.3) and the risk of death in patients (34.8%, SD=26.3) reinforced the high demand for ICU care and high average hours of care required in the study period.

An important result shows that, in view of the risk of death measured by SAPS III, 34.8% (SD=26.3), the proportion of deaths with 23.4% of patients may be reflecting on the quality of supervision promoted by the appropriate number of professionals in the Units.

Although the Brazilian resolution indicated a proportion of 10 patients for each nurse in the ICU and two patients for each nursing technician⁽¹⁶⁾, the lowest proportions found in this study, both for nurses (4.2, SD=1.1) and for technicians (1.6, SD=0.4) are necessary to supervise the high demand found and achieve the best results for patients.

Studies show that the adequacy of the number of nursing professionals can lead to a decrease in incidents and risk of death, and reinforce the importance of the adequate proportion of patients per nurse for the distribution of activities and better results of the patients^(13,17).

Other studies investigating the number of nurses in the unit and patient outcomes have concluded that the increase in nurses for supervision is associated with a reduced risk of injury incidents such as surgical site and urinary tract infection, pressure injury, pneumonia, thrombosis deep venous, low digestive hemorrhage, sepsis and metabolic complications⁽¹⁷⁾. In addition, the increase of one nurse per day per thousand surgical patients decreased the chances of 7 new cases of pressure injury and 4 sepsis as a consequence of the adequacy of the number of professionals before the patients' demands⁽³⁾.

The decrease in the occurrence of incidents directly impacts the reduction of institutional costs by reducing treatment with the damages^(8,17). Therefore, research into the cost of nursing care required and available, and the adequate number of professionals to adjust between patient demands and Unit availability, allows developing strategies for managing the cost of nursing care for patient supervision and safety.

Although the proportion of patients per nurse and nursing technician identified in this study

Table 1 - Descriptive measure of nursing professionals, according to professional category, patient / nurse and patient/technician and nursing activities score, São Paulo, Brazil, 2016

Variables	Mean (SD)†	Median	Interquartile Range	Minimum	Maximum	CI* 95%
Nurse	7.9(3.1)	6.0	8.5	2.0	20.0	[7.6-8.3]
Nursing Technician	16.4(4.6)	14.0	13.0	2.0	26.0	[15.9-17.0]
Patient/nurse	4.2(1.1)	4.0	1.9	0.6	11.0	[4.1-4.3]
Patient/technician	1.6(0.4)	1.7	1.2	0.5	3.0	[1.5-1.7]
NAS*	93.1(13.3)	95.3	17.4	54.5	145.3	[91.4-94.8]

Note: *NAS: Nursing Activities Score; †SD: Standard Deviation; #CI95%: 95%Confidence Interval.

Table 2 - Measure of hours of nursing care required and available, according to professional category, São Paulo, Brazil, 2016

Category	Hours of nursing care required	Hours of nursing care available	Difference between hours of care available and required
Nurse	4068.5	2653,2	-1415.3
Nursing technician	8485.0	5406.9	-3078.1
Total	12553.5	8060.1	-4493.4

Tabela 3 - Measure of the cost of nursing care required and available, according to professional category, São Paulo, Brazil, 2016

Category	Cost of the nursing care required (R\$*)	Cost of the nursing care available (R\$*)	Difference between the cost of the care available and required (R\$*)
Nurse	131,819.40	85,963.70	-45,855.70
Nursing technician	134,911.50	85,969.70	-48,941.80
Total	266,730.90	171,939.40	-94,791.50

Note: *R\$: Brazilian currency.

was lower than that indicated by Brazilian legislation⁽¹⁶⁾, the negative difference between the required care cost (R\$ 266,730.90) and available (R\$ 171,939, 40) shows the need to invest R \$ 94,791.50 in nursing professionals to meet patients' demands. This difference corresponds to 35.5% of the required care cost, requiring an increase of 3.2 nurses and 7.0 nursing technicians to be distributed in the study ICU to adjust the number of professionals to meet the demands presented by the nurses. according to the NAS measure.

A Brazilian study that also investigated the cost of nursing care required and available at the ICU through the NAS application identified an average workload of 85.6% and the need to invest about \$ 15,000 in nursing human resources to meet the demands of patients. The cost of required care was 30.0% higher than the cost of care available by professionals⁽¹⁾.

Another national study that also applied the NAS to calculate the cost of nursing care through workload measurement, although developed in neonatal ICU, reinforces the need to invest in the number of professionals to meet patient demands and promote supervision the ICU. The NAS average of 66.9% impacted on the higher required mean hours of care than available at the Unit, implying a 28.0% increase in the cost of care to meet patients' demands⁽²⁾.

Other evidence has also identified an estimated institutional cost increase of between \$ 300-15 billion per year related to the handling of incidents and damage caused by the heavy workload, which makes it difficult to supervise patients⁽¹⁷⁾. In addition, the high workload increases turnover, the need for overtime and the hiring of new professionals to meet the demands, also impacting the increase in costs^(3,8). These results reinforce the importance of the adequacy of the number of nursing professionals in the Unit for patient safety, workload management and care costs⁽¹⁷⁾.

Therefore, the environment with high workload must be carefully managed, because the excess of activities disperses the attention of the professional and exposes the patient to the risks of occurrence of incidents, besides increasing the care costs^(3,8,17).

The addition of professionals to meet the demands of patients initially increases institutional costs, however, in the longer term, it is compensated by the reduction of incidents and treatment of damages⁽³⁾, increase of productivity, economy and profits^(8,18).

An international study evaluating the cost of care and patient outcomes found that an hour's increase in nurse's care generates

savings of approximately US\$452.00 from institutional costs and prevents complications for patients⁽⁸⁾.

Thus, the literature and the results of the study reinforce the importance of workload management and the adjustment of the number of nursing professionals in the Unit for the supervision of patients and adjustment of care costs.

Study limitations

The limitations include the development in a single institution, making it difficult to generalize the data and the non-inclusion of unforeseen absences of nursing professionals, showing the importance of developing future research to aggregate different analyzes and increase the knowledge of this subject in Nursing.

Contributions to the sector of Nursing

The study contributes to the discussions related to the adequate number of nursing professionals in the ICU to meet the demands of patients with quality and safety, as well as to promote the management of the cost of care through the Nursing Activities Score tool and to enable nurses to obtain possible results be applied in clinical practice, as well as in the development of research to strengthen knowledge in Nursing.

CONCLUSION

The application of the Nursing Activities Score tool makes it possible to estimate the cost of nursing care and to identify the need to adjust the number of professionals by measuring the nursing care required hours and compare them with the available hours of care. In this study, the cost of care required by the patients, which was higher than the cost of care available, affected the difference between these measures, with a negative result of R\$ 94,791.5, indicating the need for investment in the number of nursing professionals. This result corresponds to 35.5% of nursing care required costs, and an increase of 3.2 nurses and 7.0 nursing technicians to be distributed among the ICU to promote the adequacy of the number of nursing professionals to meet the demands required by the patients, measured using the NAS.

REFERENCES

1. Araújo TR, Meneguetti MG, Auxiliadora-Martins M, Castilho V, Chaves LDP, Laus AM. Financial impact of nursing professionals staff required in an Intensive Care Unit. *Rev Lat Am Enfermagem* [Internet]. 2016 [cited 2017 Jul 16];24:e2818. Available from: <http://dx.doi.org/10.1590/1518-8345.1274.2818>
2. Fugini FMT, Lima AFC, Castilho V, Bochembuzio L, Costa JA, Castro L, et al. Cost of nursing staffing adequacy in a neonatal unit. *Rev Esc Enferm USP* [Internet]. 2011 [cited 2017 Jul 16];45(spe. number):1582-88. Available from: <http://dx.doi.org/10.1590/S0080-62342011000700007>. English, Portuguese
3. Aiken LH. Economics of nursing. *Policy Polit Nurs Pract* [Internet]. 2008 [cited 2017 Jul 16];9(2):73-9. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2577000/pdf/nihms74980.pdf>
4. Melo TO, Lima AFC. Cost of nursing most frequent procedures performed on severely burned patients. *Rev Bras Enferm* [Internet]. 2017 [cited 2017 Aug 23];70(3):481-88. Available from: <http://dx.doi.org/10.1590/0034-7167-2015-0034>. English, Portuguese.
5. Aiken LH, Sermeus W, Heede KV, Sloane DM, Busse R, McKee M, et al. Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. *BMJ* [Internet]. 2012 [cited 2017 Jul 16];20(344):e1717.

Available: <http://www.bmj.com/content/bmj/344/bmj.e1717.full.pdf>

6. Aiken LH, Sloane D, Griffiths P, Rafferty AM, Bruyneel L, McHugh M, et al. Nursing skill mix in European hospitals: cross-sectional study of the association with mortality, patient ratings, and quality of care. *BMJ Qual Saf* [Internet]. 2016 [cited 2017 Jul 16];26:559–68. Available from: <http://qualitysafety.bmj.com/content/qhc/early/2016/11/03/bmjqs-2016-005567.full.pdf>
7. Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Griffiths P, Busse R, et al. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet* [Internet]. 2014 [cited 2017 Jul 17];383(9931):1824–30. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4035380/pdf/nihms571000.pdf>
8. Lee M, Moorhead S, Clancy T. Determining the cost-effectiveness of hospital nursing interventions for patients undergoing a total hip replacement. *J Nurs Manag* [Internet]. 2014 [cited 2017 Jul 16];22(7):825–36. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/jonm.12022/epdf>
9. Miranda DR, Jegers M. Monitoring costs in the ICU: A search for a pertinent methodology. *Acta Anesthesiol Scand* [Internet]. 2012 [cited 2017 Jul 16];56(9):1104–13. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1399-6576.2012.02735.x/epdf>
10. Mendes RNC, Silva LGC, Haddad MCL, Moreno FN, Gil RG. Cost-effectiveness of needle and catheter over needle with active protection devices in the hospital setting. *Texto Contexto-Enferm* [Internet]. 2015 [cited 2017 Jul 17];24(3):867–74. Available from: <http://dx.doi.org/10.1590/0104-07072015002870014>. English, Portuguese.
11. Eduardo EA, Peres AM, Kalinowski CE, Cunha ICKO, Bernardino E. The negotiator that we have and the negotiator that we want in nursing. *Texto Contexto-Enferm* [Internet]. 2016 [cited 2017 Jul 17];25(3):e1030015. Available from: <http://dx.doi.org/10.1590/0104-07072016001030015>. English, Portuguese.
12. Metnitz PG, Moreno RP, Almeida E, Jordan B, Bauer P, Campos RA, Iapichino G, Edbrooke D, Capuzzo M, Le Gall JR. SAPS 3-from evaluation of the patient to evaluation of the intensive care unit. Part 1: objectives, methods and cohort description. *Intensive Care Med*. [Internet]. 2005 Aug [cited 2017 Aug 05];31:1336–44. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1315314/pdf/134_2005_Article_2762.pdf
13. Queijo AF, Padilha KG. Nursing Activities Score (NAS): Nursing Activities Score (NAS): cross-cultural adaptation and validation to portuguese language. *Rev Esc Enferm USP* [Internet]. 2009[cited 2017 Jul 16];43(spe):1018–25. Available from: <http://dx.doi.org/10.1590/S0080-62342009000500004>. English, Portuguese.
14. Padilha KG, Barbosa RL, Oliveira EM, Andolhe R, Ducci AJ, Secoli SR. Patient safety in Intensive Care Units: development of a research project. *Rev Esc Enferm USP* [Internet]. 2015 [cited 2017 Aug 05];49(spe):157–63. Available from: <http://dx.doi.org/10.1590/S0080-623420150000700022>. English, Portuguese.
15. Conishi RMY, Gaidzinski RR. [Evaluation of the Nursing Activities Score (NAS) as a nursing workload measurement tool in an adult ICU]. *Rev Esc Enferm USP* [Internet]. 2007 [cited 2017 Jul 20];41(3):346–54. Available from: <http://dx.doi.org/10.1590/S0080-62342007000300002>. Portuguese.
16. Ministério da Saúde (BR), Agência Nacional de Vigilância Sanitária. Resolução - RDC n. 26, de 11 de maio de 2011. Dispõe sobre os requisitos mínimos para funcionamento de Unidades de Terapia Intensiva e dá outras providências. *Diário Oficial da União: República Federativa do Brasil*; 2012. May 14, Seção 1: p. 170. (col. 3).
17. Twigg D E, Gelder L, Myers H. The impact of understaffed shifts on nurse-sensitive outcomes. *J Advanced Nurs* [Internet]. 2015 [cited 2017 Jul 16];71(7):1564–72. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/jan.12616/epdf>
18. Kavanagh KT, Cimiotti JP, Abusalem S, Coty MB. Moving healthcare quality forward with nursing-sensitive value-based purchasing. *J Nurs Scholarsh* [Internet]. 2012 [cited 2017 Jul 16];44(4):385–95. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3558794/>