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Cost of nursing staffing adequacy in a neonatal unit

CUSTO DA ADEQUAÇÃO QUANTITATIVA DE PROFISSIONAIS DE ENFERMAGEM EM UNIDADE NEONATAL

COSTO DE ADECUACIÓN CUANTITATIVA DE PROFESIONALES DE ENFERMERÍA EN UNIDAD NEONATAL

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ABSTRACT

The objectives of this descriptive, quantitative study were: to identify the mean nursing care time provided and required by newborns (NB) hospitalized at the Neonatal Unit of the University of São Paulo University Hospital; to calculate the cost of the mean nursing care time provided and required, by NB; to assess the cost of the nursing staffing adequacy required to assist the NB. The mean nursing care times, provided by the nursing staff and required by NBs, were calculated using equations available in the literature and by applying the Nursing Activities Score. The costs of the mean nursing care times and to make nursing staffing adequate were calculated based on the hourly cost of nurses and nursing technicians. The financial impact of nursing staffing adequacy accounted for a 30% increase over the cost of the current situation.

RESUMO

Este estudo descritivo, de natureza quantitativa, visou: identificar o tempo médio de assistência de enfermagem despendido e requerido pelos Recém-Nascidos (RN) internados na Unidade Neonatal do Hospital Universitário da Universidade de São Paulo; calcular o custo do tempo médio de assistência de enfermagem despendido e requerido por RN; verificar o montante financeiro da adequação do quadro de profissionais de enfermagem requerido para assistir os RN. O tempo médio de assistência despendido pela equipe de enfermagem e requerido pelos RN foi calculado por meio de equações disponíveis na literatura e aplicação do Nursing Activities Score. O custo do tempo médio de assistência e do montante financeiro da adequação do quadro de profissionais foi calculado com base no custo/hora dos enfermeiros e dos técnicos de enfermagem. O impacto financeiro da adequação quantitativa de profissionais de enfermagem correspondeu a um acréscimo de 30% no custo do quadro existente.

RESUMEN

Este estudio descriptivo cuantitativo objetivó identificar el tiempo promedio de atención de enfermería dispensado y requerido por Recién Nacidos (RN) internados en Unidad Neonatal de Hospital Universitario de Universidad de São Paulo; calcular costo de tiempo promedio de atención de enfermería dispensado y requerido por RN, verificar monto financiero de adecuación del cuadro de profesionales de enfermería requerido para atender a RN. Los tiempos promedio de atención dispensados por el equipo y requeridos por los RN fueron calculados mediante ecuaciones disponibles en literatura y aplicación del Nursing Activities Score. El costo de tiempos promedio de atención y monto financiero de adecuación del cuadro de profesionales se calculó con base en costo/hora de enfermeros y técnicos de enfermería. El impacto financiero de adecuación cuantitativa de profesionales de enfermería correspondió a un incremento de 30% sobre el costo del cuadro existente.

DESCRIPTORS

Intensive Care Units, Neonatal
Nursing
Workload
Economics, nursing
Hospital costs

DESCRIPTORES

Unidades de Terapia Intensiva Neonatal
Enfermagem
Carga de trabalho
Economia da enfermagem
Custos hospitalares

DESCRIPTORES

Unidades de Terapia Intensiva Neonatal
Enfermería
Carga de trabajo
Economía de la enfermería
Costos de hospital

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INTRODUCTION

The technological advances and changes in the modern world impose transformations in the assets and services production systems that go beyond geographical, political, ideological, economic, social and cultural limits, and demand the use of new management strategies that allow for quality achievement, maintenance and improvement to maintain continuous organizational development⁽¹⁾.

Within this context, the health organizations also need to search for new management ways to allow for their survival, facing the great challenge of combining the efficient use of available resources and a better service provision for the population.

However, the lack of investments associated with the poor human resources policies in many health institutions has led to the deterioration of the working conditions with a negative impact on productivity and the services performed, and consequently, in the results of the services provided to the patients⁽²⁾.

In practice, it is observed that many problems encountered are not solved, most of them resulting mainly from the economic measures and management strategies adopted⁽³⁾.

Due to limited budgets, the main measures adopted by the managers fall within the quantitative and / or qualitative limitation of nursing workers, leading to a high workload that makes it difficult to organize and execute health care processes as well as promote any measure that favors safety of the users and care providers⁽⁴⁾.

The identification of the workload is considered key to determine the quantitative and qualitative assessment of nursing staffing. In order to identify it, it is necessary to measure the time spent by the nursing staff when taking direct and indirect care of the patients⁽⁵⁾.

Therefore, the present study, performed⁽⁶⁾ with the objective to assess the workload of a nursing team at a teaching hospital, identified a gap in the staff of the units researched, suggesting work overload which undoubtedly can risk the safety of patients and the nursing staff.

In an international context, the development of researches that show the direct relationship between the conformity of the nursing staff and the care outcomes, mainly related to the safety of patients and nursing staff, have been published by the professional associations in question in order to show the importance of adequacy of the professional staff.

These studies show that the inadequacy, both in numbers and quality of personnel, directly influences the care

provided to patients and the health of the nursing staff, increasing the risk of emotional exhaustion, stress, work dissatisfaction and burnout, subsequently showing in the rates of absence and turnover⁽⁷⁾.

Due to this reality, the production of knowledge is necessary to subsidize the understanding of the implications resulting from a low staff number and the search for new alternatives and possibilities to transform the management processes in use at health institutions, mainly the ones related to cost management.

OBJECTIVES

- To identify the average time spent on nursing care with the Newborns (Recém-Nascidos - RN) in the Neonatal Unit in the University Hospital at the São Paulo University (HU-USP);
- To calculate the cost of the average nursing time spent and required per RN, in this Unit;
- To verify the financial amount to adapt the nursing staff required to assist RNs at the Neonatal Unit.

METHOD

This is a descriptive quantitative research, performed at the Neonatal Unit of the University Hospital of the São Paulo University (HU-USP), after the approval by the Research Ethics Committee of the Institution (register number 681/06).

The Neonatal Unit counts with 24 beds to admit the RNs. In order to assist the children born in the institution, there are 19 beds for children from the Obstetric Center, the Rooming-in Units or from the Neonatal Intensive Care. The other five beds are reserved for external RNs, coming from the Children's Emergency Unit or Ambulatory or Neonatal Intensive Care from other health institutions⁽⁸⁾.

The objectives of this Unit include: to provide nursing care in a personalized way; provide favorable conditions so that the parents can have an adequate bond with their children; to favor and encourage parents to learn how to take care of their children; foster, support and encourage breastfeeding; encourage and allow the mothers to stay during the first 24 hours; introduce the practice of kangaroo care and offer conditions for the development of learning and research in the neonatal unit⁽⁸⁾.

The most frequent causes for hospital admission are: early respiratory discomfort; metabolic disturbances, mainly hypoglycemia and hyperbilirubinemia; congenital infections; problems related to prematurity and fever⁽⁸⁾.

In relation to the level of dependency of nursing care, the RNs are classified according to the proposal⁽⁹⁾, in the semi-intensive care category: RNs subject to the instability of vital functions, with no imminent threat to life but with the risk of a sudden deterioration of their clinical status which require nursing and medical care, in a permanent and specialized way.

The population in this study encompassed the RNs hospitalized in the Unit, regardless of the diagnostic, who had either clinical or surgical treatment, and remained in hospital for a period of at least 24 hours.

The size of the sample was calculated statistically based on the following criteria:

- the population was considered normally distributed;
- the acceptable confidence interval was 95% ($Z_c=1.96$);
- the accepted percentage error (e%), between the average sample and the average population shall be equal to or lower than 5%;
- the occupancy rate percentage of the Unit (To%) was measured according to the historical averages, i.e 50.7%;
- the Neonatal Unit has 24 beds.

The calculation to determine the size of the sample showed the need to assess all the RNs hospitalized over a minimum period of 14 days.

The average care time spent with the patients was calculated with the use of an equation mentioned in the literature⁽¹⁰⁾, from the nursing staff existing in the Unit:

$$h_k = \frac{q_k \cdot t}{\bar{n}}$$

where:

h_k = average care time (in hours), per RN, as per professional category k ;

q_k = average daily amount of workers of the professional category k ;

t = working hours of the professionals;

\bar{n} = average daily amount of RNs.

The average care time required by the RNs was estimated applying the Nursing Activities Score (NAS)⁽¹¹⁾.

NAS is a tool to measure the nursing workload in Intensive care units (UTI), which translates into the amount of time spent to assist the patient. It is considered a reliable, valid and stable indicator⁽¹²⁾, and has proven to be adequate to measure the workload of the nursing team in the neonatal area because it covers the work processes and the nursing activities performed with the RNs.

NAS measures the time spent on the nursing activities to take care of the patient and its total score, obtained

from the scores of each one of the 23 items of the tool, and shows the amount of time used to assist a patient 24 hours and can reach the maximum value of 176.8%. Therefore, a score of 100% shows the need of a nurse (or nursing professional) per duty-shift to assist the patient⁽¹¹⁾.

NAS was applied to all RNs hospitalized in the Neonatal Unit in the period from November 6 to December 6 2006 by the researchers, through the clinical assessment of the needs and when necessary, filled out with the information reported by the nursing team.

In order to calculate the daily number of professionals of the nursing team requested to assist the RNs hospitalized in the unit, the following equation was used:

$$Q = \frac{24}{6} \cdot \frac{\sum_{i=1}^n NAS_i}{100}$$

In which:

$$\sum_{i=1}^n NAS_i = \text{sum of the NAS of each patient.}$$

The average care time required by the RNs, according to the average NAS scoring, was calculated according to the equation⁽¹³⁾:

$$\bar{h} = \frac{NAS}{100} \cdot 24$$

where:

$$\frac{\sum_{i=1}^T NAS(i)}{T} = \text{average value of NAS from a sample of T patients;}$$

$$\sum_{i=1}^T NAS(i) = \text{sum of NAS of each patient } i, \text{ from } i=1 \text{ to } i=T;$$

T = amount of patients shown in the period;

$24/100$ = ratio corresponding to 24 hours per 100 NAS points.

From the identification of the average care time spent and requested by the RNs in the Neonatal Unit, it was possible to calculate the direct labor cost (DLC).

DLC relates to the personnel who work directly on a product or service provided, as long as it is possible to measure the time spent and the identification of who performed the task⁽¹⁴⁾.

The cost of DLC, per professional category, per hour worked, i.e. the cost per hour worked was calculated between the composition of the monthly salary (CMS) of each category (consisting of the average salary amount of the category plus gratifications, five-year bonus, health al-

lowances and social contributions) and the monthly labor contract period.

In order to calculate the average salary of the category (ASC), the average salary corresponding to the initial level of the USP career employees was used (S1 for nurses and T1 for nurse technicians), as per the table made available on the website www.usp.br/drh, related to the month of May 2011.

The monthly number of working hours, for the purpose of costs, was 144 hours for nurses and nurse technicians.

The composition of the monthly salary included (CMS):

- a) Average Salary of the category (ASC);
- b) Part of the 13th salary, i.e. 1/12 ASC;
- c) Health allowance corresponding to 20% of the minimum salary;
- d) Five-year bonus, which corresponds to 5% ASC;
- e) Gratification per on-duty shift corresponding to a monetary increase over salary when the employee works at nights, holidays and weekends which happens, on average, three times a month;
- f) Part of vacation pay, i.e. 1/12 of 1/3 of the CMS (Σ a+b+c+d+e)
- g) Social contributions, 40% of the total CMS (Σ a+b+c+d+e+f), as it is a public hospital.

Table 1- Cost of hour of care provided, per RN in 24 hours, according to the professional category and distribution of the work shifts, São Paulo – 2011

Period	Morning			Afternoon			Night 1			Night 2			TOTAL		
	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$
Nurse	1.0	72.48	72.48	0.8	72.48	57.98	0.6	72.48	43.48	0.6	72.48	43.48	3.0	72.48	217.44
Technician	2.4	40.40	96.96	2.6	40.40	105.04	2.3	40.40	92.92	2.3	40.40	92.92	9.6	40.40	387.84
Total			169.44			163.02			136.40			136.40	12.6		605.28

Table 2- Cost of hour of care required with the application of NAS, per RN, in 24 hours, according to the professional category and distribution of the work shifts, São Paulo – 2011

Period	Morning			Afternoon			Night 1			Night 2			TOTAL		
	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$	Hours	Unit Cost R\$	Total Cost R\$
Nurse	1.3	72.48	94.22	1.0	72.48	72.48	0.8	72.48	57.98	0.8	72.48	57.98	3.9	72.48	282.67
Technician	3.2	40.40	129.28	3.2	40.40	129.28	2.9	40.40	117.16	2.9	40.40	117.16	12.2	40.40	492.88
Total			223.50			201.76			175.14			175.14	16.1		775.55

The DLC unit cost amount corresponded to:

- nurses – 10,437.60/144 hours = **R\$ 72.48/ hour**;

- nurse technicians – 5,817.88/144 hours = **R\$ 40.40/ hour**.

These amounts were used to calculate the hours of care provided by the existing professional staff (Table 1)

RESULTS

Forty-eight (48) RNs hospitalized in the Neonatal Unit were part of this study during the data collection period. NAS was applied 301 times at the Neonatal Unit, over 30 days.

The average nursing staffing during this study period was five nurses and 16 nurse technicians, totaling 21 nursing professionals, 24 hours, to assist on average 10 (95% IC= 8.74 to 11.26) RNs.

The average care time spent with the RNs corresponded to 12.6 hours, of which 76% (9.6 hours) were spent by nurse technicians and 24% (3 hours) by nurses, as shown in Table 1.

The workload required by the RN, projected with the application of NAS during the period studied corresponded to 668.6% (95% IC=587.2% to 750%); the average NAS scoring per RN was 66.9% (95% IC=65.6% to 68.2%) which in health care hours is equivalent to 16.1 hours of care, per RN, in 24 hours. Of these hours, 24% (3.9) shall be executed by nurses and 76% (12.2) by nurse technicians, as seen in Table 2.

Based on the workload (668.6%) the nursing staffing required for the daily care of the RNs was calculated: 27 (95% IC=23.4 to 30.0) professionals.

In order to calculate the cost of these hours, the DLC unit cost for the nurses and assistants was calculated, from the CMS of the categories, and the calculations are shown in Table 1.

and required by the RNs, as per the table projected via the application of NAS (Table 2).

The average cost of the hours of care provided per RN in 24 hours, according to the professional category was R\$ 217.44 for the nurses and R\$ 387.84 for the assistants, totaling R\$ 605.28.

Table 3 – Table showing the calculation of the monthly salary composition of nurses and nurse technicians, São Paulo –2011

Composition of monthly salary	Nurses R\$	Nurse technicians R\$
a- Average salary of the category (ASC)	6.132.31	3.309.99
b- Part of the 13th salary (1/12 of ASC)	511.02	275.83
c- Health allowance (20% of R\$ 620,00)	124.00	124.00
d- Five years bonus (5% ASC)	306.61	165.50
e- Gratification per on-duty shift (3 x R\$ 68,00)	180.00	-----
e- Gratification per on-duty shift (3 x R\$ 56,00)	-----	168.00
f- Part of Vacation pay (1/12 de 1/3 Σ a+b+c+d)	201.49	112.31
g- Social Contributions (40% Σ a+b+c+d+e+f)	2.982.17	1.662.25
Total	10.437.60	5.817.88

The average cost of the hours of care required by the application of NAS, per RN in 24 hours, according to the professional category was R\$ 282.67 for the nurses and R\$ 492.88 for the assistants, with a total of R\$ 775.55.

According to NAS, a RN needs, on average, 3.9 nurse/ hours per day, increasing 0.9 nurse/ hours and 12.2 nurse technician/ hours, increasing 2.6 hours of this professional.

The financial impact on the cost of the nurse/hour required over the existing one is R\$ 65.23, which corresponds to an increase by 30%. In relation to the nurse technicians, the increase is of R\$105.04, corresponding to 27%.

The total increase of the cost of hours of care per patient was R\$ 170.27 (28%).

As previously mentioned, from the workload measured by NAS, the nursing staffing required for the daily care of the RNs was 27 (95% IC= 23.4 to 30.0) professionals. This increase would demand the addition of six professionals, being two nurses in the morning, two in the afternoon and one per each night shift.

In order to calculate the increase in the cost of staff, there was the need to calculate the cost of the average nursing staffing in the neonatal unit in the period studied, which is shown in Table 4.

Table 4- Distribution of the monthly cost of the average existing nursing staff, São Paulo – 2011

Category	Quantity	Unit Cost R\$	Total Cost R\$
Nurse	5	10.437.60	52.188.00
Assistant	16	5.817.88	93.086.08
Total	21		145.274.08

The monthly cost of the increase in the average nursing staffing required, according to the application of NAS is shown in Table 5.

Table 5 – Distribution of the monthly cost of the average nursing staffing required, São Paulo – 2011

Category	Quantity	Unit Cost R\$	Total Cost R\$
Nurse	7	10.437.60	73.063,20
Assistant	20	5.817.88	116.357,60
Total	27		189.420,80

Comparing Tables 4 and 5, it is observed that the increase in the monthly cost of the required staff with the application of NAS would be R\$ 44,146.72, which corresponds to an increase by 30% over the financial amount of the existing staff.

DISCUSSION

The results of the study show the need to have an adequate nursing staffing in the Neonatal Unit. As it represents an increase in operational costs, this adequacy demands specific knowledge, abilities and skills to subsidize the preparation of the justifications to negotiate the professional staff with the institution managers.

However, nurses have found several difficulties to justify the needs of quantitative and qualitative adequacy of nursing staffing, both to improve care quality and to meet the new demands made by the health institution managers, mainly as a result of the growing need to rationalize the costs and increase services offered⁽⁶⁾.

Therefore, the professionals in question need to develop knowledge that will help them make decisions related to the allocation of human resources, indicated as one of the elements that generate higher costs for the health organizations.

However, the production of knowledge on health costs and nursing is an emergency, and studies in this area are scarce, especially related to the Brazilian reality⁽¹⁵⁾, what makes the comparative analysis of the results obtained in the present investigation unfeasible.

The search for knowledge related to cost management and its application in the care and management practice demands a change of the health professionals, mainly in what is related to the value of the financial aspects of health care and the understanding that the objective to manage the economic aspects of health care is based on the optimization of resources, guarantee of access and equity for the users and maintenance of the quality of service⁽¹⁶⁾.

Therefore, apart from determining the quantity and quality of professionals needed to reach the desired care

standard, the nurses also need to analyze the financial impact of these resources in the result of care activities developed by the nursing team, remembering that although the economic aspects are important, they should not be more so than the technical, human, ethical and social aspects in the decision-making process.

In this context, we verify that the issues related to the adequacy of the nursing professional staff become relevant and are being investigated in order to produce technical and scientific evidence that foster awareness of the meaning of a staff that meets, not only the needs of patients and of the health institutions, but the safety of patients and of the nursing team professionals⁽¹⁷⁾.

A research⁽¹⁸⁾ performed via a systematic literature review considered that the size of the nursing staff has a definitive and measurable impact on the care results, such as: adverse events, permanence period, patient mortality, and nurse turnover.

An investigation performed with patients hospitalized in 799 hospitals in the United States related the number of nursing hours with the quality of the services provided, and concluded that the higher number of hours of care provided by the nurses is associated with the reduction of the mortality rate and the adverse event rate, as well as a reduction in the mortality rate as a result of these events⁽¹⁹⁾.

Another study carried out in England showed that in hospitals with a higher number of patients per nurse, the mortality rates were 26% higher than in the ones that had a smaller rate of patients per nurse⁽²⁰⁾.

From the financial point of view, the researchers⁽²¹⁾ concluded that when an increase in the number of nurses in the hospitals occurred, there was also a significant increase in the operational costs, but with no profit reduction. On the other hand, in the hospitals where there was a higher number of assistants than nurses, high operational costs were identified, followed by lower profit.

The study of systematic review of the literature⁽²²⁾ shows that the concern with the safety of the patients

and the quality of the care has prompted researches on the practice and the cost x effectiveness ratio of interventions and health care, including the distribution of human resources.

The evidences that show the relationship between the time of nursing care and the quality of service can contribute to prove the impact of the nursing hours on the results and on the safety of the patients, subsidizing the budgetary negotiation of the professional staff with the managers of the health institutions to add value and quality of services⁽¹⁷⁾.

CONCLUSION

This study has enabled us to identify the average nursing care time spent and required by the RNs hospitalized in the Neonatal Unit at the HU-USP, showing a gap between the care time spent with the RNs and the care time they require. The professional staff required was 29% higher than the existing professional team in the unit, suggesting work overload of the nursing team.

The average cost of the hours provided per RN, in 24 hours was R\$ 141.33 for the nurses and R\$ 254.40 for the nurse technicians, corresponding to a total of R\$395.73.

The average cost of the required hours of care with the application of NAS in 24 hours according to the professional category was R\$ 183.72 for the nurses and R\$ 323.30 for the assistants, with a total of R\$ 507.02, corresponding to an increase of 28%.

The increase in the monthly cost of the required staff by NAS would be R\$ 28,833.58, which corresponds to an increase by 30% over the financial amount of the existing staff.

The analysis of the available literature studies shows that, although the adequacy of the nursing professional staff leads to higher operational costs, it can contribute to reduce the expenses deriving from the negative results of the care provided to the patients as a result of the insufficient quantity and/or quality of the professionals.

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