



Nursing staff in the internal medicine and surgical units of teaching hospitals: composition and cost

Quadro de profissionais de enfermagem em unidades médico-cirúrgicas de hospitais de ensino: composição e custos

Cuadro de los profesionales de enfermería en las unidades médico-quirúrgicas de los hospitales de enseñanza: composición y costos

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ABSTRACT

Objective: Evaluate the mean quantitative and qualitative nursing staff working in the internal medicine and surgical units of three public general teaching hospitals in the city of São Paulo, compared to projected mean staff according to the parameters of Cofen Resolution No. 293/04, as well as measure the mean cost of current and projected nursing staff. **Method:** Quantitative, descriptive, exploratory study using prospective data collection. **Results:** In most of the units studied, the number of nursing professionals was adequate. In two of the institutions, the percentage of nurses was lower than that recommended by Cofen. Qualitative and quantitative adjustment of the staff would represent a monthly cost increase of R\$141,326 for Hospital A, R\$138,989 for Hospital B, and a reduction of R\$99,028 for Hospital C. **Conclusion:** The main contribution of this study was the proposed method for qualitative and quantitative evaluation of nursing staff, in addition to determining the average cost for adjustments.

DESCRIPTORS

Nursing; Hospital nursing staff; Workload; Cost and Cost Analysis.

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INTRODUCTION

In recent decades, the social, political and economic landscape has prompted the pursuit of management strategies capable of reconciling budget constraints with improvement of products and services offered to populations. Health institutions also face the challenge of efficient use of resources while also improving the service provided to their users.

In Brazil, these institutions are experiencing major hardships due to lack of investment in infrastructure and the workforce, combined with the increasing health needs of the population. Problems related to management and training of human resources are considered one of the main factors in deterioration of health care services⁽¹⁾.

The primary measures adopted by managers in this sector in their efforts to tackle rising costs often result in quantitative and qualitative limitations in nursing staff, creating work overloads that hinder the organization and execution of care processes and stand in the way of promoting measures to enhance quality of care and the safety of users and care providers⁽²⁾. The institutions often fail to meet the minimum nursing staff parameters recommended in Resolution No. 293/04 of the Federal Council of Nursing (COFEN)⁽³⁾.

Knowledge needs to be generated to assist in the decision-making process involving nursing staff adjustments and the costs they would entail, thereby helping to guide human resources policies and transform management processes in health institutions.

From this perspective, this study sought to evaluate the mean quantitative and qualitative nursing staff working in the internal medicine and surgical units of three public general teaching hospitals in the city of São Paulo, compared to the projected mean staff parameters recommended in COFEN Resolution No. 293/04, as well as measure the average cost of the nursing staff, both current and projected, as per this Resolution.

METHOD

A quantitative, descriptive, exploratory study, utilizing prospective data collection, conducted in the internal medicine and surgical units of three public general teaching hospitals, referred to as Hospital A, Hospital B and Hospital C, in the city of São Paulo. This study was approved by the Research Ethics Committees of the School of Nursing of University of São Paulo (Process No. 1110/2011). Two units were analyzed in Hospital A, three in Hospital B and five in Hospital C.

Data were collected between August 2012 and July 2013.

The study population consisted of nursing professionals (nurses and nursing technicians/aides) and patients hospitalized in the selected internal medicine and surgical units.

CALCULATION OF THE QUANTITATIVE AND QUALITATIVE DAILY MEANS FOR PROFESSIONALS IN THE UNITS

The daily mean of nurses and nursing technicians and aides working in the units during each month of the period

from August 2012 to July 2013 was calculated through the following equation:

Where:

$$\bar{Q}_k = \frac{\sum_{d=1}^n Q_{k(d)}}{d}$$

\bar{Q}_k = daily mean number of professionals from category k working in the unit;

$\sum_{d=1}^n Q_{k(d)}$ = sum of the daily number of professionals from category k working in the units on $d = 1, 2, 3, \dots, n$ days of the sample, obtained through the monthly work shift records;

k = professional category being analyzed (nurse, nursing technician or aide).

PROJECTION OF THE QUANTITATIVE AND QUALITATIVE DAILY MEAN OF PROFESSIONALS NEEDED FOR THE UNITS

The following calculations were employed:

Identification of the daily mean number of patients according to the degree of nursing dependency: The researchers, in partnership with the nursing team providing the care, classified the patients according to the degree of nursing dependency, using the patient classification system (PCS) designed by Fugulin⁽⁴⁾.

The mean number of patients according to type of care was calculated using the equation:

Where:

$$\bar{n}_j = \frac{\overline{TO}}{100} \times L_j$$

\bar{n}_j = daily mean number of patients according to type of care j (minimum, intermediate, high dependency, semi-intensive and intensive);

\overline{TO} = mean monthly occupancy rate in the units, from August 2012 to May 2013;

L_j = number of beds, according to type of care j (minimum, intermediate, high dependency, semi-intensive and intensive).

The calculation of the mean recommended daily workload of nursing professionals, according to COFEN Resolution No. 293/04⁽¹⁾, was obtained through the equation:

Where:

$$\bar{C}_j = \bar{n}_j \times \bar{h}_j$$

\bar{C}_j = mean daily workload according to type of care j (minimum, intermediate, high dependency, semi-intensive and intensive);

\bar{n}_j = mean daily number of patients according to type of care j (minimum, intermediate, high dependency, semi-intensive and intensive);

\bar{h}_j = mean recommended daily hours of care according to COFEN Resolution No. 293/04⁽³⁾ (minimum, 3.8 hours; intermediate, 5.6 hours; high dependency and semi-intensive, 9.4 hours; intensive, 17.9 hours).

The calculation of the mean number of professionals according to category was obtained by applying the following equations:

Where:

$$\bar{Q} = \frac{\sum_{j=1}^n \bar{C}_j}{t}$$

\bar{Q} = mean daily number of nursing professionals required;
 $\sum_{j=1}^n \bar{C}_j$ = sum of the daily mean workloads according to n types of care (minimum, intermediate, high-dependency, semi-intensive and intensive);
 t = daily working hours.

The number of nurses was calculated using the proportion recommended in COFEN Resolution No. 293/04⁽³⁾ for this professional category.

Where:

$$\bar{Q}_{enf} = \bar{Q} \times \bar{P}_{enf}$$

$$\bar{Q}_{téc/aux} = \bar{Q} \times (1 - \bar{P}_{enf})$$

\bar{Q}_{enf} = mean daily number of nurses;
 \bar{Q} = mean daily number of nursing technicians/aides;
 \bar{P}_{enf} = mean proportion of nurses (minimum and intermediate care, 33%, high-dependency and semi-intensive care, 42%, and intensive care 52%);
 $\bar{Q}_{téc/aux}$ = mean proportion of nursing technicians and aides (minimum and intermediate care, 66%, high-dependency and semi-intensive care, 58%, and intensive care 48%).

These calculations enabled comparison of mean number of current nurses and nursing technicians/ aides with the projected number for the internal medicine and surgical units according to official parameters.

Data on nursing staff costs came from the personnel departments of the hospitals, which sent spreadsheets with the mean payroll costs for nurses and nursing technicians/aides during the study period.

The spreadsheets contained records on the number of professionals, base wages, social security payments, bonuses and benefits, by functional category.

Annual wages were calculated by totaling wages, charges, benefits and bonuses; that was total was divided by the number of professionals, by category, to obtain monthly wages.

To determine the monthly mean hourly costs per category, the monthly mean wage was divided by the number of hours worked, according to the contracts for each hospital.

The variance in the number of projected professionals (NPP), according to the categories, in relation to the number of current professionals (NCP), as well as the variance in the monthly wage costs for the projected team (MWC-PT) in relation to the monthly wage costs for the current team (MWC-CT) was calculated as follows⁽⁵⁾:

$$\text{Variance} = (\text{NPP}/\text{NCP} - 1) \times 100 = \%$$

$$\text{Variance} = (\text{MWC-PT}/\text{MWC-CT} - 1) \times 100 = \%$$

DATA ANALYSIS

The data was entered in electronic spreadsheets and presented in figures and charts, using measures of central tendency.

The test of significance between means and the Chi-square test were used, at a significance level of 5% to compare current staff with projected staff.

Personnel costs were analyzed by descriptive statistics, using the monthly wage mean by professional category in Hospitals A, B and C. The amounts are shown in Brazilian reals.

RESULTS

During the period studied, patients in the internal medicine and surgical units of the three teaching hospitals were classified by the researchers according to the PCS of Fugulin, Gaidzinski e Kurcgart⁽⁴⁾. The mean daily number of patients was: 76 in Hospital A, 118 in B, and 117 in Hospital C. The mean daily distribution of patients according to the classification is shown in Figure 1.

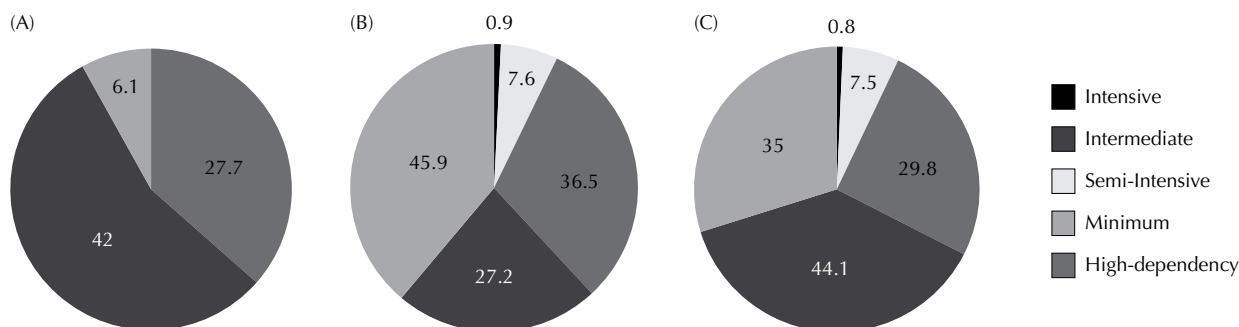


Figure 1 - Mean daily number of patients according to the patient classification system from August 2012 to July 2013 - São Paulo, 2014.

Figure 1 shows that in Hospital A there was a predominance of patients classified as needing intermediate and high-dependency care, with no semi-intensive or intensive care patients. In Hospital B, the largest number of patients was in the minimum care category, followed by high-dependency and intermediate care. In Hospital C, the intermediate care category had the largest number of patients, followed by minimum and high-dependency care. Hospitals B and C allocated, on average, one intensive care

patient and seven semi-intensive care patients per day in the units studied.

Figure 2 shows mean current daily nursing staff and projected staff for the same units, in accordance with Cofen Resolution n. 294/04⁽³⁾.

In the two units from Hospital A, there was no significant difference between projected teams and current teams, using the Cofen method, demonstrating adequate numbers for the current nursing staff.

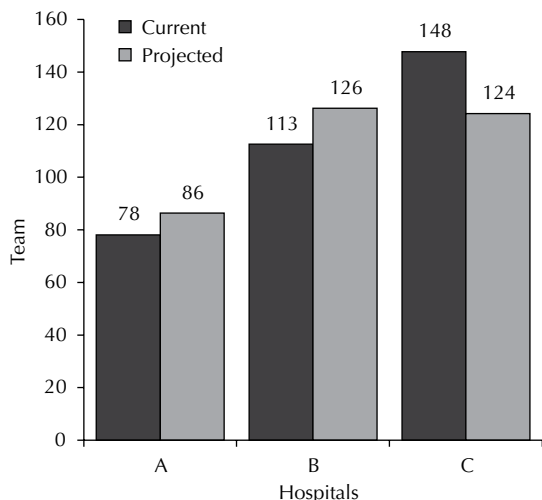


Figure 2 - Mean daily current and projected nursing staff, in the internal medicine and surgical units of the three teaching hospitals, from August 2012 to July 2013 - São Paulo, 2014.

In Hospital B, there was a significant difference in only one unit between projected teams and current teams using the Cofen method, demonstrating a shortage in the current nursing staff. In the other two units this difference was not significant, indicating an adequate number of professionals.

In Hospital C, there was a significant difference in only two of the five units studied between projected teams and current teams using the Cofen method, demonstrating that in these units the current numbers of professionals exceeded the projected numbers. In the other units, where the difference between projected and current staff was not significant, the number of professionals was adequate.

Figure 3 presents the mean daily distribution of professionals, according to category, currently working in the units of the hospitals studied and the projected percentages established by Cofen, taking into account workload and predominant type of care.

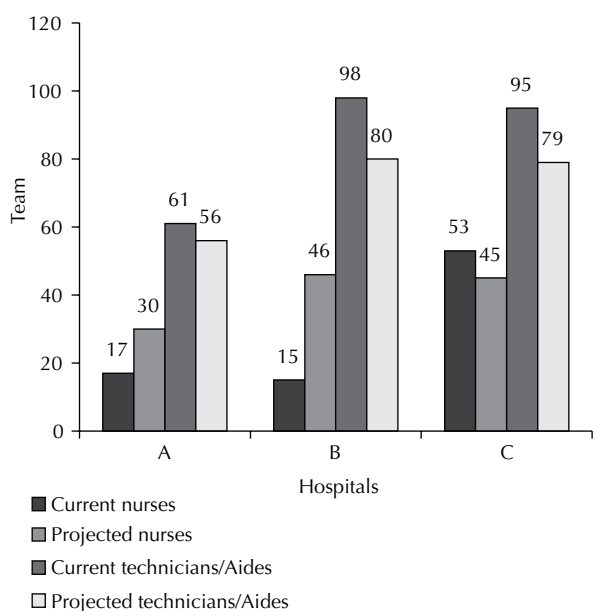


Figure 3 - Mean daily current and projected nursing staff by professional category from August 2012 to July 2013 - São Paulo, 2014.

In the two units studied in Hospital A, there was a significant difference between the projected number of nurses and the current number of nursing, using the Cofen method, indicating that the number of nurses was lower than the proportion recommended by Cofen.

In all the units from Hospital B, there was a significant difference between the number of projected number of nurses and the current number of nurses, using the Cofen method,, indicating that the number of nurses was lower than the proportion recommended by Cofen.

In Hospital C, there was a significant difference in two units between the projected number nurses and the current number of nurses, using the Cofen method, indicating the number of nurses exceeded the proportion recommended by Cofen. The other units had an adequate number of nursing professionals.

NURSING STAFF COSTS IN HOSPITALS A, B AND C

As shown in Chart 1, the mean total monthly wage costs for current nursing staff was R\$755,408 in Hospital A, R\$476,506 in Hospital B and R\$ 621,791 in Hospital C.

It can be seen that the mean annual hourly cost of the nurse category in Hospital A was 3.24 times that of Hospital C and 1.75 times that of Hospital B. The mean annual hourly cost of the nurse category in Hospital B was 1.85 times that of Hospital C. In relation to the nursing technician/aide category, the mean annual hourly cost in Hospital A was 3.83 times that of Hospital C and 1.83 times that of Hospital B. The mean annual hourly cost of this category in Hospital B was 2.09 times that of Hospital C.

Monthly working hours (203.36 hours) were higher in Hospital C, followed by Hospitals A and B. Monthly working hours in Hospital C were 1.41 times that of Hospital A and 1.7 times that of Hospital B. The working hours of Hospital A were 1.2 times that of Hospital B.

The mean hourly and monthly cost for the minimum projected number of nursing professionals according to Cofen Resolution No. 293/04⁽³⁾ by professional category and daily working hours are presented in Chart 2, where it can be noted that the mean monthly cost of the projected team would be R\$896,734.08 in Hospital A, R\$615,494.40 in Hospital B and R\$522,762.78 in Hospital C.

In charts 1 and 2, it can be seen that the qualitative and quantitative adjustment of nursing staff, according to the minimum parameters in Cofen Resolution No. 293/04, would represent a monthly increase of R\$141,325.92 for Hospital A, by adding 13 nurses and eliminating 5 nursing technicians/aides; an increase of R\$138,988.80 for Hospital B by adding 31 nurses and eliminating 18 nursing technicians/aides; and a R\$99,028 reduction for Hospital C by eliminating 8 nurses and 16 nursing technicians/aides.

DISCUSSION

In most of the units studied, the nursing staff was quantitatively sufficient, according to Cofen parameters. Only one unit in Hospital B had a lower number of professionals than the projected number according to Cofen parameters.

Chart 1 - Distribution of the mean of current number nursing professionals and the mean of annual hourly costs and monthly wage costs, according to professional category and daily working hours - São Paulo, 2014.

Current professional category - Hospital A	Quantity	Mean annual hourly cost	Mean total monthly wage cost (144 hours)	Total
Nurse	17	R\$98.06	R\$14,120.64	R\$240,050.88
Nursing Technician/Aide	61	R\$58.67	R\$8,448.48	R\$15,357.28
Total current team	78	-	-	R\$755,408.16
Current professional category - Hospital B	Quantity	Mean annual hourly cost	Mean total monthly wage cost (120 hours)	Total
Nurse	15	R\$55.92	R\$6,710.40	R\$100,656.00
Nursing Technician/Aide	98	R\$31.96	R\$3,835.20	R\$375,849.60
Total current team	113	-	-	R\$ 476,505.60
Current professional category - Hospital C	Quantity	Mean annual hourly cost	Mean total monthly wage cost (203.36 hours)	Total
Nurse	53	R\$30.23	R\$6,147.57	R\$325,821.21
Nursing Technician/Aide	95	R\$15.32	R\$3,115.47	R\$295,969.65
Total current team	148	-	-	R\$621,790.86

Chart 2 - Distribution of the minimum projected number of nursing professionals and mean hourly and monthly cost, according to professional category and daily working hours - São Paulo, 2014.

Projected professional category - Hospital A	Quantity	Variance in number of professionals	Mean annual hourly cost	Mean total monthly wage cost (144 hours)	Total	Wage variance
Nurse	30	+ 76.4%	R\$98.06	R\$14,120.64	R\$423,619.20	-
Nursing Technician/Aide	56	- 8.2	R\$58.67	R\$8,448.48	R\$473,114.88	-
Projected total team	86	+ 68.2%	-	-	R\$896,734.08	+18.7%
Projected professional category - Hospital B	Quantity	Variance in number of professionals	Mean annual hourly cost	Mean total monthly wage cost (120 hours)	Total	Wage variance
Nurse	46	+ 206.6%	R\$55.92	R\$6,710.40	R\$308,678.40	-
Nursing Technician/Aide	80	+/- 18.3%	R\$31.96	R\$,835.20	R\$306,816.00	-
Projected total team	126	+ 188.3%	-	-	R\$615,494.40	+ 29.1%
Projected professional category - Hospital C	Quantity	Variance in number of professionals	Mean annual hourly cost	Mean total monthly wage cost (203.36 hours)	Total	Wage variance
Nurse	45	+/- 15.1%	R\$30.23	R\$6,147.57	R\$276,640.65	-
Nursing Technician/Aide	79	+/- 16.8%	R\$15.32	R\$3,115.47	R\$246,122.13	-
Projected total team	124:	+/- 31.9%	-	-	R\$522,762.78	+/- 15.9%

In two units of Hospital C, the number of professionals exceeded the projected number according to Cofen, which represents the **minimum** parameter for determining the size of nursing teams.

However, with respect to the percentage distribution of nursing professionals, it was noted that, except for the units from Hospital C, the number of nurses in the units of Hospitals A and B were lower than that recommended by Cofen. The variance in the number of nurses indicated the need for 76.4% more nurses in Hospital A and 206.6% more in Hospital B. In Hospital C, this variance corresponded to a reduction of 15.1% in nurses.

This finding corroborates the results of another study⁽⁶⁾ that showed that the proportion of nurses in most Brazilian health institutions was lower than the distribution recommended by Cofen, which represents a standard to be achieved by hospital institutions in Brazil.

Nursing staff adjustments, mainly in terms of adjusting the proportion of nurses in relation to nursing technicians/aides, represented an 18.7% increase in per-

sonnel costs in Hospital A and 29.1% in Hospital B, and a 15.9% reduction in Hospital C.

The composition of the nursing staff, contractual working hours, and wages were variables examined in order to reconcile costs and human resources in the internal medicine and surgical units of Hospitals A, B and C. However, other variables could have an influence on cost estimates, such as number of beds, care complexity and available technological resources. Knowledge of these variables, combined with costs, could assist in the decision-making process regarding adjustments in current staff in light of care needs and legal requirements.

From this perspective, nurses need to determine quantitatively and qualitatively determine the number of professionals needed to achieve the desired standards of care, and analyze the financial impact of these resources on the outcome of care activities carried out by nursing teams, considering that although economic aspects are important, they should not override technical, human, ethical and social aspects when making decisions⁽⁷⁾.

A recent study⁽⁸⁾ conducted in nine European countries to provide information about nursing professionals in hospitals found that measures to curb spending that focus quantitatively and qualitatively on nursing professionals can expose users to risk and adversely affect patient care outcomes, suggesting that a greater number of nurses providing care could reduce preventable hospital deaths.

Therefore, nurses also need to seek knowledge, skills and competencies that support negotiations in reference to the nursing staff, demonstrating that while adjusting the number of professionals may result in higher operating costs, it can help reduce expenses arising from negative care outcomes that are due to quantitative and/or qualitative insufficiency in professionals⁽⁷⁾.

CONCLUSION

The contribution of this study is its proposed method for qualitatively and quantitatively evaluating nursing staffs, as well as determining the mean cost for staff adjustments.

The results merit careful analysis and interpretation so that decisions can be made that will promote efficient supply and distribution of nursing professionals, in quantitative and qualitative terms, to meet desired quality and safety standards.

The use of this method in other situations and correlation of the results with care and management quality indicators could help to scientifically demonstrate the impact of nursing staffs on patient outcomes and health institutions.

RESUMO

Objetivo: Avaliar o quadro quanti-qualitativo médio de profissionais de enfermagem em serviço nas unidades médico-cirúrgicas de três hospitais gerais, públicos e de ensino, do município de São Paulo frente ao quadro médio projetado, segundo parâmetros da Resolução Cofen nº 293/04 e mensurar o custo médio dos quadros em serviço e projetado. **Método:** Estudo quantitativo, exploratório descritivo, com coleta prospectiva de dados. **Resultados:** Na maioria das unidades estudadas o quadro de profissionais de enfermagem está quantitativamente adequado. Em duas Instituições a proporção de enfermeiras é inferior ao preconizado pelo Cofen. O ajuste quali-quantitativo do quadro representaria acréscimo mensal de R\$ 141.325,92 para o Hospital A; R\$ 138.988,80 para o Hospital B e redução de R\$ 99.028,00 para o Hospital C. **Conclusão:** A principal contribuição deste estudo reside na proposição de um método para avaliação quali-quantitativa do quadro de profissionais de enfermagem, bem como para determinação do custo médio de sua adequação.

DESCRITORES

Enfermagem; Recursos Humanos de Enfermagem no Hospital; Carga de Trabalho; Custos e Análise de Custo.

RESUMEN

Objetivo: Evaluar el promedio del cuadro cuantitativo y cualitativo de los profesionales de enfermería que prestan servicio en las unidades médico-quirúrgicas de tres hospitales generales, públicos y de enseñanza, del municipio de São Paulo, frente al cuadro medio proyectado según los parámetros de la Resolución Cofen nº 293/04 y mensurar el promedio de costo de los cuadros en servicio y proyectado. **Método:** estudio cuantitativo, descriptivo, exploratorio, con recolección prospectiva de datos. **Resultados:** en la mayoría de las unidades estudiadas el cuadro de los profesionales de enfermería está cuantitativamente adecuado. En dos instituciones, la proporción de enfermeras es inferior a la recomendada por el Cofen. El ajuste cualitativo y cuantitativo del cuadro representa un incremento mensual de R\$ 141,325.92 para el Hospital A; R\$ 138,988.80 al hospital B y la reducción de R\$ 99,028.00 al hospital C. **Conclusión:** la principal contribución de este estudio está en proponer un método de evaluación cualitativa y cuantitativa de los profesionales de enfermería, así como para determinar el promedio de costo de su adecuación.

DESCRIPTORES

Enfermería; Personal de Enfermería en Hospital; Carga de Trabajo; Costos y Análisis de Costos.

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