



## Nursing staff sizing in the emergency room of a university hospital

Dimensionamento de enfermagem em sala de emergência de um hospital-escola

Dimensionamiento de enfermería en servicio de urgencias de un hospital escuela

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### ABSTRACT

**Objective:** To verify the adequacy of the professional nursing staff in the emergency room of a university hospital and to evaluate the association between categories of risk classification triage with the Fugulin Patient Classification System. **Method:** The classification of patients admitted into the emergency room was performed for 30 consecutive days through the methodology proposed by Gaidzinski for calculating nursing requirements. **Results:** The calculation determines the need for three registered nurses and four non-registered nursing for each six hour shift. However, only one registered nurse and four non-registered nurse were available per shift. There was no correlation between triage risk classification and classification of care by the Fugulin Patient Classification System. **Conclusion:** A deficit in professional staff was identified in the emergency room. The specificity of this unit made it difficult to measure. To find the best strategy to do so, further studies should be performed.

### DESCRIPTORS

Nursing Staff; Personnel Downsizing; Emergency Nursing; Nursing Administration Research.

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## INTRODUCTION

The emergency area is an important component of health care. In recent years, there has been an increased demand for these services, due to the growth in the number of accidents, urban violence and lack of structure of primary care<sup>(1)</sup>. This situation results in overcrowding of emergency services<sup>(2)</sup>, thereby lowering the quality of care provided and as there are a lack of inpatient beds, critically ill patients end up staying in emergency rooms, thus increasing the nursing workload and essentially moving the intensive care units into emergency rooms<sup>(1)</sup>.

In this context, the nursing work process is an essential part of the treatment system to the population and when it suffers interference in its structural problems, it directly reflects on the quality of care delivered to the user<sup>(3)</sup>. Quality care is possible when institutions promote working conditions, physical and human resources and coherent institutional processes for safe practice<sup>(4)</sup>.

The nursing team is the largest segment of professionals within a hospital. The lack of financial resources in health care institutions is reflected by reduced spending on these professionals, reflecting on the quality of care provided to the population<sup>(5)</sup>. Studies have shown better results where the ratio between nurses and patients is adequate<sup>(5-7)</sup>, including reduced mortality and customer satisfaction. The situation of emergency services is worrisome because its features, such as fluctuating demand and occupancy rate, complicate the choice of an instrument for the measuring of nursing human resources in this area<sup>(8)</sup>.

The use of tools for measuring nursing assists in ensuring quantitative and qualitative professionals to meet the health needs of users, thus contributing to safe and quality care<sup>(8)</sup>.

The ordinance number 2048/GM of 2002, approving the technical regulation of the state of emergency and emergency systems in Brazil, describes the need for sufficient staff to meet emergency services 24 hours a day, however, not making it clear as to what should be the calculation for measuring the optimal number of nurses, nursing technicians and nursing assistants in these locations<sup>(1)</sup>.

The measuring of the nursing staff is regulated by Resolution 293/2004 of the Brazilian Federal Nursing Council, but as the emergency room cannot be associated with beds per day, the functional unit site should be used, having a three-dimensional meaning for the nursing work when considering the activities developed, the operational area or location of the activity and the work period. According to this resolution, the nursing staff calculation uses a patient classification system and considers the hours of nursing care distributed in percentage, according to the professional category in the different types of care<sup>(9)</sup>.

For the best prediction of quantitative nursing, the calculation of the technical safety index should also be performed, which takes into account planned and unplanned absences, in addition to obtaining the employee productivity index<sup>(8)</sup>.

It is important to note that a classification method for the level of care of emergency patients was validated for the

Portuguese language<sup>(10)</sup>, but the time spent in the care of patients and the professionals' workload during initial care<sup>(1)</sup> is still not yet clearly known.

Today, emergency services have a patient classification (triage) system that stratifies the risk of deterioration of health status and the level of patient's suffering, conformed into the waiting time for medical care. The policy of the Humanization of the Health System brought a classified triage risk rating to the reception of patients in public health services, which are the observed signs and symptoms presented by the patient, as well as the priority level for service<sup>(11)</sup>.

This study aimed to measure staff nursing for the care of patients who remained into the emergency room of a University hospital, and also to evaluate the association among categories of triage risk classification with the Fugulin Patient Classification System<sup>(12)</sup>.

## METHOD

This is a descriptive, quantitative, cross-sectional study, undertaken in adult emergency room of São Paulo Hospital. The São Paulo Hospital is the university teaching hospital of the Federal University of São Paulo, located in the south of São Paulo city (SP) and is responsible for the care of an area of more than five million inhabitants. The adult emergency department has a room for clinical emergencies, a room for surgical emergencies, one male and one female room of observation, a medication sector and triage risk classification area, serving about a thousand patients per day<sup>(13)</sup>.

Data collection was performed after approval from the Ethics Committee of the Federal University of São Paulo. We included all patients who remained into the clinical emergency room during the month of August 2012 and who agreed to participate in the study after reading and signing the Informed Consent Statement. The development of the study met the national and international standards of ethics in research involving human subjects.

Sociodemographic, economic and personal data, medical diagnosis at admission, triage risk classification and outcome were collected through structured interviews and reading the patient's charts.

The sizing calculation was performed by following the steps of the proposed model by Gaidzinski<sup>(8)</sup>, using the following criteria: the classification level of care required by patients according to a validated patient classification system; obtaining time of assistance and ratio of registered nurses and non-registered nurses assistants according to the level of care by Resolution of the Federal Nursing Council number 293/2004<sup>(9)</sup>; calculation of the technical security index that covers planned and unplanned absences; and finally, determining the staff productivity index<sup>(8)</sup>.

The level of care required by each patient was estimated by the Fugulin Patient Classification System<sup>(12)</sup>, which classifies the level of nursing care into five levels: intensive care, semi-intensive care, high dependency care, intermediate care and minimal care. The following health variables are used for this classification system: mental status, oxy-

genation, vital signs, mobility, walking, feeding, body care, disposal, treatment, skin integrity/tissue impairment, dressing and time taken in dressing the patient. Each variable is scored 1-4, with the addition of the points leading to the corresponding classification<sup>(12)</sup>.

The assessment of nursing care time and determining the percentage of each professional category were also performed according to the Federal Nursing Council Resolution number 293/2004<sup>(9)</sup>. However, as we adopted the Fugulin Patient Classification System<sup>(12)</sup> in which care is divided into five levels, it was necessary to perform the calculation of hours and nursing percentage for the high dependency care category, as this is not covered by the resolution. Thus, we used the value of the average of the hours and the percentage between the semi-intensive and intermediate levels, resulting in a value of 7.5 hours of nursing, with 37% being nurses and 63% technicians/nursing assistants. It is noteworthy that there was a smaller proportion of registered nurses in relation to the non-registered nurses assistants because this category incurs a higher cost to the institution that was chosen.

To identify the percentage of planned and unplanned absences of the nursing staff, we applied the personnel calculation equation<sup>(8)</sup> adapted to the peculiarities of the institution, and a retrospective collection was made for unplanned absences from management records of the unit from 2012.

The productivity index was regarded as excellent with 85% of actual working hours in a 6-hour shift<sup>(13)</sup>. Finally, after obtaining all necessary variables, we performed the nursing requirements calculation proposed by Gaidzinski<sup>(8)</sup> and the results were compared with the existing nursing requirements chart in the clinical emergency room of the São Paulo Hospital.

The adult emergency room of São Paulo Hospital uses its own triage risk classification protocol for emergency admission triage, in which there are five priority levels: red with immediate care, orange within 15 minutes, yellow within 60 minutes, green within 120 minutes and blue within 240 minutes. Information regarding to triage risk classification was collected from medical records.

For statistical analysis, the average, the standard deviation and the median for continuous variables was calculated (age, age group, individual income, per capita income); for categorical variables (gender, marital status, race, education, religion, employment status, personal history, diagnosis at admission, triage risk classification and outcome), we calculated the frequency and percentage. We used analysis of variance to compare continuous variables with the Fugulin Patient Classification System<sup>(12)</sup>, and we used the chi-square test to compare categorical variables with the Fugulin Patient Classification System<sup>(12)</sup>. When it was not possible, we used the Fisher's exact test or likelihood ratio. The significance level was 95%.

## RESULTS

The study included 149 patients and we carried out 239 assessments on the level of care, as some patients were evaluated more than once due to their stay in the emergency room.

Most patients were male (58.4%) and with olive skin (*pardo*) (36.2%). Regarding education, 40.4% had incomplete elementary school, and 53.4% were retired or pensioners. The average family income was three (one to 19.2) minimum wages and the average individual income 1.5 (0 to 12.8) minimum wage.

Of the 149 patients, 49% had hypertension, 24.2% were smokers and 16.8% had diabetes mellitus. The most prevalent medical diagnoses on admission were related to cardiovascular disease (22.8%), followed by infectious diseases (22.1%), and neurological (18.8%). Regarding the risk classification, the majority of patients were classified as red (76.4%), followed by orange (11.5%), yellow (8.8%), green (2.7%) and blue (0.7%). Of all patients (n = 139), 71.1% were discharged, 9.2% were hospitalized and 19.7% died.

Of the 149 patients, 25.5% were classified as patients in need of intensive care, 36.9% semi-intensive care, 30.9% of high dependency care and 25.5% intermediate care at admission, and no patient had the need for minimal care.

Older age, unemployment, retirement and lower individual income were significantly associated with more complex care classification levels upon admission in the clinical emergency room (Table 1).

**Table 1** – Association between sociodemographic and economic characteristics and the level of care required by patients upon admission in the emergency room of São Paulo Hospital - São Paulo, SP, Brazil, 2012.

Variables	InC N(%)	HDC N(%)	SIC N(%)	IC N(%)	Total N(%)	p-value
Age Groups (years)*						
Up to 40	2(20)	10(21.7)	7(12.7)	11(28.9)	30(20.1)	0.0057
41 to 60	6(60)	18(39.1)	17(30.9)	3(7.9)	44(29.5)	
61 to 80	1(10)	15(32.6)	21(38.2)	15(39.5)	52(34.9)	
81 or older	1(10)	3(6.5)	10(18.2)	9(23.7)	23(15.4)	
Job situation*/+						
Employed	4(40)	22(47.8)	11(20)	8(21.6)	45(30.4)	0.0487
Unemployed	2(20)	5(10.9)	12(21.8)	5(13.5)	24(16.2)	
Retired	4(40)	19(41.3)	32(58.2)	24(64.9)	79(53.4)	
Individual Income**						
Medium	1.7(0.0 – 6.4)	2(0.3 – 12.8)	1.4(0.0-9.6)	1(0.4-2.8)	1.5(0.0-12.8)	0.0142

Note: \* Chi-square test; + Total of 148 patients; ++ Variance Analysis. Individual Income in minimum wages (R\$622.00).

Legend: InC - Intermediate Care; HDC - High Dependency Care; SIC - Semi-Intensive care; IC - Intensive Care

Patients with neurological diseases, medical diagnosis of cancer admissions, infectious diseases and hemorrhage had more complex levels of care at the time of clinical emergency room admission. The lower severity of the patient, the higher the percentage of discharge, and the higher the dependency, the greater the percentage of death.

Medically diagnosed Cardiovascular disease upon admission was related to less complex care classification levels (Table 2).

There was no statistical correlation between the rating and the rating of care for the Fugulin Patient Classification System<sup>(12)</sup> (Table 3).

**Table 2** – Association between clinical features and the level of care required by patients upon admission in the emergency room of São Paulo Hospital – São Paulo, SP, Brasil, 2012.

Variables	InC N(%)	HDC N(%)	SIC N(%)	IC N(%)	Total N(%)	<i>p-value</i>
Background						
Neurological Disease*/+						
No	9(90)	42(97.7)	44(83)	28(80)	123(87.2)	0.0388
Yes	1(10)	1(2.3)	9(17)	7(20)	18(12.8)	
Diagnosis upon admission						
Cardiovascular Disease*						
No	3(30)	31(67.4)	48(87.3)	33(86.8)	115(77.2)	0.001
Yes	7(70)	15(32.6)	7(12.7)	5(13.2)	34(22.8)	
Neoplasia*						
No	10(100)	46(100)	51(92.7)	38(100)	145(97.3)	0.0428
Yes	0(0)	0(0)	4(7.3)	0(0)	4(2.7)	
Infectious Disease*						
No	9(90)	42(91.3)	42(76.4)	23(60.5)	116(77.9)	0.0062
Yes	1(10)	4(8.7)	13(23.6)	15(39.5)	33(22.1)	
Hemorrhage*						
No	10(100)	35(76.1)	50(90.9)	35(92.1)	130(87.2)	0.0348
Yes	0(0)	11(23.9)	5(9.1)	3(7.9)	19(12.8)	
Outcome*/++						
Discharge	9(90)	36(83.7)	40(72.7)	16(47.1)	101(71.1)	0.0076
Inpatient	1(10)	3(7)	4(7.3)	5(14.7)	13(9.2)	
Death	0(0)	4(9.3)	11(20)	13(38.2)	28(19.7)	
<b>Total</b>	10(100)	46(100)	55(100)	38(100)	149(100)	

Note: \* Chi-square test; + Total of 141 patients; ++ Total 142 patients.

Legend: InC - Intermediate Care; HDC - High Dependency Care; SIC - Semi-Intensive care; IC - Intensive Care.

**Table 3** – Association between risk classification with the Fugulin Patient Classification System<sup>(12)</sup> of the patients admitted to the emergency room of São Paulo Hospital - São Paulo, SP, Brazil, in 2012.

Risk Classification	InC N(%)	HDC N(%)	SIC N(%)	IC N(%)	Total N(%)	<i>p-value</i>
Red	6(60)	36(80)	41(74.5)	30(78.9)	113(76.4)	0.1414
Orange	2(20)	5(11.1)	6(10.9)	4(10.5)	17(11.5)	
Yellow	0(0)	2(4.4)	8(14.5)	3(7.9)	13(8.8)	
Blue/Green	2(20)	2(4.4)	0(0)	1(2.6)	5(3.4)	
<b>Total*</b>	10(100)	45(100)	55(100)	38(100)	148(100)	

Note: \* Total of 148 patients.

Legend: InC - Intermediate Care; HDC - High Dependency Care; SIC - Semi-Intensive care; IC - Intensive Care.

Regarding absences, it was found that both nurses and technicians/assistants have two days off a week, and including the holidays in 2012 that did not coincide with Sundays, resulting in a value of 10 days. All professionals have 30 days of vacation and after a survey of the unit records during the data collection period of days registered nursing professionals and non-registered nursing assistants were absent, we found an average of 5.3 days of unplanned absences

for registered nurses and 1.8 days for non-registered nurses assistants (Table 4).

After the nurse quantification calculation, it was found that the number of registered nurses in the clinical emergency room should be 13, which is approximately three per each 6 hour shift, and non-registered nursing assistants should be 14, or approximately four per 6-hour shift. We observed that, on average, eight patients are remained to

the emergency room every day, leading to an average of 2.6 patients per registered nurse and two patients for non-registered nursing assistants.

**Table 4** – Care level classification for patients admitted into the emergency room of the São Paulo Hospital - São Paulo, SP, Brazil, 2012.

Level of Care	N(%)	Daily Average
Intermediate Care	13(5.4)	0.5
High Dependency Care	59(24.7)	2
Semi-Intensive Care	90(37.6)	3
Intensive Care	77(32.3)	2.6
<b>Total</b>	<b>239(100)</b>	<b>8</b>

## DISCUSSION

This study estimates the nursing measurements for patients who remain hospitalized in the clinical emergency room of a university hospital, however, it was not possible to assess the quantitative and the qualitative nursing professionals for the initial treatment of patients. This is because the existing methodology is to address only closed sectors, and the resolution of the Federal Nursing Council number 293/04<sup>(9)</sup> does not clarify the methodology used to carry out measurements for emergency sectors during the first consultation.

However, the proposed nursing measurements used for the hospitalization sectors was effective for obtaining the number of professionals needed to care for patients in emergencies sectors, contributing to better provision of human resources for these sectors.

In this study, we observed older patients with less education, lower individual income, previous neurological disease, medical diagnosis of cancer, and infectious or hemorrhagic disease which presented classification levels of more complex care at the time of admission to the emergency room. Furthermore, the lower the level of patient care, the greater the discharge percentage, and the higher the level of care, the greater the percentage of death. Cardiovascular disease diagnosis upon admission was related to classification levels of less complex care, however, an article that aimed to calculate the *Nursing Activities Score* in a post-cardiac surgery unit found 73.7% the time of care needed by nursing staff. This can be explained by the difference between the care profiles of cardiac patients in the emergency and post-operative rooms<sup>(14)</sup>.

The elderly population is characterized as vulnerable, as the aging process is related to the loss of functionality and increased comorbidities. The less education and lower income may also compromise the responses of individuals in terms of health, because education is closely linked to better health indicators<sup>(15)</sup>.

Previous neurological disease was associated with the need for more complex care, which may occur from the association of neurological damage to disability and functional limitations, which makes patients dependent on care for months, years, or the rest of their lives<sup>(16)</sup>. Infectious diseases are usually diagnosed with associated increasing

severity and mortality, which may partly justify the presence of more complex levels of care and its adverse outcomes, such as death and prolonged hospitalization, as found in this study<sup>(17)</sup>.

Most patients in this study were classified as red followed by orange, which shows a high degree of urgency in this population and justifies their admission to the emergency room, but there was no significant correlation between the color of risk classification and the required level of nursing care. This can be explained by the fact that patients who entered the adult emergency room as lesser risk (yellow, green, blue), showed a deterioration in their health after initial treatment, thereby requiring care in the emergency room due to a lack of beds in the intensive care unit. A study that evaluated the predictive validity of the Manchester risk rating compared to the TISS-28 (*Therapeutic Intervention Scoring System*), an instrument that measures the severity of patients, found that patients evolve in different ways between the different risk ratings so that more emergency risk ratings were related to the higher TISS-28 scores<sup>(18)</sup>.

It was found that most patients were in intensive and semi-intensive care, and that no patients classified as minimal care, which corroborates the findings of another study in intensive care units<sup>(19)</sup>, therefore showing the characterization of the emergency room as an intensive care unit. Also, we observed a correlation between death and more complex level of care upon admission, showing that the number of deaths increases as the classification of care progresses. This is because patients who need more care are patients with greater organ system impairment, requiring more assistance to maintain their vital functions.

The average unplanned absences found was 5.3 for registered nurses and 1.8 for non-registered nurses assistants, with a final increase of 60% for registered nurses and to 50% for non-registered nurses assistants. The difference between the actual quantity of nurses in the emergency room and the ideal calculated quantity may explain this difference found in the average of unplanned absences among these professionals; since a far-from-ideal measurement is associated with increased workload, stress and burnout<sup>(20)</sup>. An article that identified absenteeism of the nursing staff of a teaching hospital emergency room found an average increase rate of 51%<sup>(21)</sup>.

Regarding the level of nursing care required by patients, a study that characterized the care profile of adult patients remained into the emergency department of a public hospital in São Paulo found that most of the patients presented as minimal care, followed by intermediary, high dependency, intensive and semi-intensive<sup>(22)</sup>. The divergent data found in this study may be explained by the fact that the present study was to characterize only the emergency room patients and not all patients admitted to the emergency department, which certainly shows that patients are found at different care levels when evaluating the unit as a whole.

In this study, the calculation for the quantifying of the nursing team showed that there should be 13 registered nurses, or roughly three for each 6 hour shift and 14 non-

registered nurse assistants, or roughly four for each 6 hour shift, so that there is assistance quality to patients in the clinical emergency room of the São Paulo Hospital. The findings of this study show that the number of nurses is lacking, because the emergency room of the São Paulo Hospital has only one registered nurse per shift, however, the non-registered nursing assistants staff for each 6 hour shift is appropriate (having four non-registered nursing assistants).

A study found a mathematical calculation to obtain the workload present in the emergency room units using the average number of patients or procedures performed as variables and the score obtained by the application of the *Nursing Activities Score*, and another calculation for the shock room using the average number of patients or procedures used and the average length of service in the area<sup>(23)</sup>. This study proposes a methodology for obtaining nursing measurements, but uses an unvalidated instrument for the emergency area.

Research that quantified the nursing staff in the adult ICU of a University Hospital indicated a projected quantity of 15 registered nurses and 13 non-registered nurses assistants to every eight beds, approximately four registered nurses and non-registered nurses assistants on duty every 6 hours, with a ratio of approximately one registered nurse and one non-registered nurse assistant for every two beds<sup>(19)</sup>. The similarity between the emergency room and intensive

care unit should be noted, because the quantity of nursing staff and the relationship between the estimated nursing staff and beds are similar.

However, the actual number of employees obtained through the sizing/measuring calculations is not ideal for quality assistance to be provided, since in addition to the care of hospitalized patients, there is also all the initial care to patients who arrive in serious condition and with real and imminent possibility of death.

## CONCLUSION

The clinical emergency room has nursing care classification levels very similar to that found in intensive care units, showing that the assistance profile is more complex care. The projected nursing measurements and the one in the clinical emergency room of the University Hospital analyzed here are very different, showing a deficit in staffing. In addition, the projected measurements do not include the initial treatment of spontaneous or referred demand, so the construction of a better model adapted to the emergency room is necessary.

There was no correlation between the triage risk classification and the classification of care according to the Fugulin Patients Classification System. Further studies should be conducted to better understand the possible correlations between these patient classification systems.

## RESUMO

**Objetivo:** Verificar a adequação dos recursos humanos de enfermagem no serviço de emergência de um hospital universitário e avaliar a associação entre as categorias da classificação de risco com o Sistema de Classificação dos Pacientes de Fugulin. **Método:** Foi realizada a classificação dos pacientes internados na sala de emergência durante 30 dias consecutivos, aplicando-se a metodologia proposta por Gaidzinski para o cálculo de dimensionamento de enfermagem. **Resultados:** O cálculo determinou a necessidade de três enfermeiras e quatro técnicos/auxiliares de enfermagem a cada turno de 6 horas. No entanto, estavam disponíveis apenas uma enfermeira e quatro técnicos/auxiliares por plantão. Não houve correlação entre classificação do risco e classificação de cuidado pelo Sistema de Classificação dos Pacientes. **Conclusão:** Foi identificado déficit no quadro de profissionais na sala de emergência. A especificidade dessa unidade dificultou o dimensionamento. Para se encontrar a melhor estratégia para fazê-lo, novos estudos devem ser realizados.

## DESCRITORES

Recursos Humanos de Enfermagem; Downsizing Organizacional; Enfermagem em Emergência; Pesquisa em Administração em Enfermagem.

## RESUMEN

**Objetivo:** Verificar la adecuación de los recursos humanos de enfermería en el servicio de urgencias de un hospital universitario y evaluar la asociación entre las categorías de la clasificación de riesgo con el Sistema de Clasificación de los Pacientes de Fugulin. **Método:** Se llevó a cabo la clasificación de los pacientes ingresados en servicio de urgencias durante 30 días consecutivos, aplicándose la metodología propuesta por Gaidzinski para el cálculo de dimensionamiento de enfermería. **Resultados:** El cálculo determinó la necesidad de tres enfermeras y cuatro técnicos/auxiliares de enfermería cada turno de 6 horas. Sin embargo, estaban disponibles solo una enfermera y cuatro técnicos/auxiliares por turno. No hubo correlación entre clasificación del riesgo y clasificación de cuidado por el Sistema de Clasificación de los Pacientes. **Conclusión:** Se identificó un déficit en el cuadro de profesionales en el servicio de urgencias. La especificidad de esa unidad dificultó el dimensionamiento. Se deben llevar a cabo nuevos estudios a fin de hallarse la mejor estrategia para hacerlo.

## DESCRIPTORES

Personal de Enfermería; Reducción de Personal; Enfermería de Urgencia; Investigación en Administración en Enfermería.

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