

## Nursing workload in the emergency department: a methodological proposal

Ana Cristina Rossetti<sup>1</sup>  
Raquel Rapone Gaidzinski<sup>2</sup>  
Fernanda Maria Togeiro Fugulin<sup>3</sup>

**Objective:** This study aimed to propose a methodology for identifying the nursing workload in the Emergency Department (ED). **Methods:** this is methodological research, undertaken in a public general hospital in the municipality of São Paulo, Brazil, in the areas: triage, shock room, emergency room, suturing room, and medication/procedures for adult and pediatric patients rooms, using different strategies and instruments. Due to the characteristics of the data collection, distinct samples were obtained in each of the areas. **Results:** The average daily workload, in hours, corresponded to: triage 48; shock room 30.9; emergency 170.6; observation of adult patients 293.6; observation of pediatric patients 108.7; medication/procedures in adult patients 175.5; medication/procedures in pediatric patients 60.4; and suturing 7.9. **Conclusion:** The instruments used for data collection were shown to be appropriate and made it possible to construct a methodological proposal for identification of workload of nursing professionals in E.D. in a general public hospital.

**Descriptors:** Workload; Nursing Staff, Hospital; Personnel Management.

<sup>1</sup> MSc, Care Manager, Hospital Moysés Deutsch – M'Boi Mirim, Instituto de Responsabilidade Social, Hospital Albert Einstein, Brazil.

<sup>2</sup> PhD, Full Professor, Escola de Enfermagem, Universidade de São Paulo, Brazil.

<sup>3</sup> PhD, Associate Professor, Escola de Enfermagem, Universidade de São Paulo, Brazil.

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Corresponding Author:

Raquel Rapone Gaidzinski  
Universidade de São Paulo. Escola de Enfermagem  
Av. Dr. Enéas de Carvalho Aguiar, 419  
Bairro Cerqueira César  
CEP: 05403-000, São Paulo, SP, Brasil  
E-mail: raqui@usp.br

## **Carga de trabalho de enfermagem em pronto-socorro geral: proposta metodológica**

Objetivo: neste estudo o objetivo foi propor metodologia para identificar a carga de trabalho de enfermagem em pronto-socorro (PS). Métodos: trata-se de pesquisa metodológica, realizada em PS de hospital geral público, no município de São Paulo, nas áreas: triagem de risco, salas de choque, emergência, sutura, medicação/procedimentos de pacientes adultos e pediátricos e observação de pacientes adultos e pediátricos, utilizando-se diferentes estratégias e instrumentos. Pela característica da coleta de dados, obtiveram-se amostras distintas em cada uma das áreas. Resultados: a carga média diária de trabalho, em horas, correspondeu à triagem de classificação de risco 48, choque 30,9, emergência 170,6, observação de pacientes adultos 293,6, observação de pacientes pediátricos 108,7, medicação/procedimentos de pacientes adultos 175,5, medicação/procedimentos de pacientes pediátricos 60,4 e sutura 7,9. Conclusão: os instrumentos utilizados para coleta de dados mostraram-se adequados, possibilitando a construção de proposta metodológica para identificação de carga de trabalho dos profissionais de enfermagem em PS de hospital geral público.

Descritores: Carga de Trabalho; Recursos Humanos de Enfermagem no Hospital; Administração de Recursos Humanos em Hospitais.

## **Carga de trabajo de enfermería en sala de emergencias general: enfoque metodológico**

Objetivo: Este estudio propone una metodología para identificación de la carga de trabajo de enfermería en sala de emergencias (SE). Métodos: Se trata de un estudio metodológico, realizado en SE del hospital general público en Sao Paulo, en las áreas: salas de detección de riesgo, choque, emergencia, sutura, medicamentos/procedimientos para pacientes adultos y pediátricos y observación pacientes adultos y pediátricos, utilizando diversas estrategias e instrumentos. Como resultado de la característica de la recolecta de datos, diferentes muestras se obtuvieron en cada una de las áreas. Resultados: La carga promedia de trabajo diario en horas corresponden: detección de riesgo 48; descarga 30,9; emergencia 170,6; observación de pacientes adultos 293,6; observación de pacientes pediátricos 108,7; medicamentos/procedimientos pacientes adultos 175,5; medicamentos/procedimientos pacientes pediátricos 60,4; sutura 7,9. Conclusión: Los instrumentos utilizados para la recolección de datos fueron adecuados y permiten construir una metodología para la identificación de la carga de trabajo del personal de enfermería en el SE del hospital general público.

Descriptores: Carga de Trabajo; Personal de Enfermería en Hospital; Administración de Personal en Hospitales.

## **Introduction**

In recent years, the growing demand for attendance in emergency departments has contributed decisively to overloading these services, turning them into some of the most problematic areas in the health system<sup>(1)</sup>.

Organized to provide immediate attendance, the Emergency Departments (ED) are often the "gateway" to the health system, receiving definite emergency patients, patients with clinical pictures seen as emergency, patients diverted from primary and specialized care, and social emergencies.

Such demands blend in the ED services, overloading them and, because of the high workload, compromising the quality of the care given to the population<sup>(1)</sup>. This

context is worsened, moreover, by organizational problems and by the lack of financial resources for adapting to local needs, whether these are to do with physical structure or human resources.

In this context, the health care professionals who work in these services, in addition to performing their activities in an atmosphere of unpredictability and uncertainty, which requires knowledge, speed of reasoning and promptness in carrying out the process of decision-making, frequently find themselves without sufficient staff to meet the patients' needs<sup>(2)</sup>.

Thus, the characteristics of ED, allied with the insufficient numbers of nursing professionals, create an

overload of work and are reported by the nurses as the principal source of stress<sup>(3-5)</sup>.

In addition to compromising the workers' health and quality of life, the lack of nursing personnel directly influences the results of the care given, prolonging the hospitalization time and increasing the costs of the patients' treatment<sup>(6)</sup>.

Various factors contribute to the shortage of nursing professionals for attending the patient in the ED services. Among these, one finds the small amount of information which nursing managers have about systematized criteria for planning and evaluating the quantity and quality of professionals, and the scarcity of parameters which could facilitate the operationalization of the conventional methods of dimensioning of nursing personnel. The adoption of a system for identifying the workload has been indicated as key to planning for the numbers of nursing professionals<sup>(7)</sup>. Therefore, it becomes necessary to investigate the indicators for nursing workload which allow nursing managers to apply methods for dimensioning the nursing professionals in a general ED unit, both to ensure the quality and safety of the care and the professionals, and for the sustainability of the health institution.

In this perspective, this study's objective is to propose a methodology for identifying workload

and contributing to the calculation of the nursing professionals' needs in a general ED.

## Method

This is methodological research, undertaken in the ED of a municipal secondary care hospital, managed by social organization, located in the municipality of São Paulo.

The study was developed in all the areas of ED: triage (two clinic rooms), shock room (entrance area of emergency for adults and children first attendance, with three beds), emergency room (five beds), observation of adult patients (33 beds), observation of pediatric patients (22 beds), rooms for medication/procedures on adult patients (22 seats) and pediatric patients (16 seats) and the suture room.

The average daily workload was calculated through the product of the average daily demand of patients ( $\bar{n}$ ) by the average time of the care spent per patient or per procedure  $\bar{h}$  except for triage, where the references used were: quantity of work posts, in this case the clinics, and these clinics' uptime in 24 hours.

For calculating the workload in each area of the ED, the equations shown in Figure 1 were applied.

Area of ED	Equation used	Definitions
Triage	$C = n \cdot h$	C = area's daily workload n = quantity of clinics in the area h = number of hours the area spends functioning
Emergency room	$\bar{C} = \bar{n} \cdot \left( \frac{NAS \cdot 14,4}{60} \right)$	$\bar{C}$ = area's average daily workload $\bar{n}$ = average daily quantity of patients or procedures in the area
Observation of adult and pediatric patients	$C = \sum_j [\bar{n}_j \cdot \bar{h}_j]$	NAS = average NAS of the patient $\sum_j$ = sum of average daily workload referent to each category of care of the PCS
Shock room	$\bar{C} = \bar{n} \cdot \bar{h}$	$\bar{n}_j$ = average daily quantity of patients in the Observation area, referent to each category of care of the PCS $\bar{h}_j$ = average time of attendance in the Observation area, referent to each category of care of the PCS $\bar{h}$ = average time of attendance in the area
Rooms for medication/procedures with adult and pediatric patients		
Suture room		

Figure 1 – Equations used for calculating average daily workload according to ED area. São Paulo, Brazil, 2010

The sample was comprised of patients registered in the ED, in the period of 8<sup>th</sup> June to 15<sup>th</sup> August 2010.

Due to the dynamics of the ED, and to ensure the reliability of the results, the collection was undertaken by nurses who worked in the hospital and by students from the 4<sup>th</sup> year of the undergraduate nursing course, trained, who took turns in the collection. The students were accompanied by a nurse from the ED.

In the areas in which the data collection took place in the 24 hours (shock room, suturing room, medication/procedures with adult and pediatric patients rooms). These professionals dedicated themselves exclusively to this activity. In those areas where the collection took place at specified times of day (observations of adult and pediatric patients and emergency room) the collection took place on those days when these professionals

were present, being characterized, therefore, as a convenience sample. In this way, the quantity of days observed was different in each of the areas of the ED.

In the shock room, suturing room and medication/procedures with adult and pediatric patients rooms, the starting and finishing times of all the activities/procedures carried out were recorded. In these areas, for calculating the average daily workload, the median in the equation proposed for determining value of  $\bar{h}$  was applied, given that the average was affected by the extreme results and did not represent this variable adequately.

To measure the average time of assistance in the emergency room, the Nursing Activities Score (NAS)<sup>(8)</sup> was used. This instrument was considered appropriate in the face of the seriousness of the profile of this area's patients, who remain there awaiting transfer to the hospital's ICU or that of another service.

The NAS<sup>(8)</sup> contains 23 items which cover the nursing activities undertaken with the patients, with weights which represent the percentage of the nursing time dedicated to undertaking the activities, during the 24 hours. The sum of all the weights represents the percentage of the time taken up with the nursing activities for one patient in the day. To transform these weights in minutes, it is considered that 100% refers to 24 hours, or 1440 minutes, thus 1 point (or 1%) represents 14.4 minutes.

The NAS<sup>(8)</sup> was administered in a prospective way, that is, the patients were evaluated in the 23 items of the instrument, according to the care required for quality assistance. When the patient remained in the area for more than 24 hours, the NAS<sup>(8)</sup> score collected the night before was validated, by consulting the doctors' or nurses' notes in the patient file, referring to the presence of unforeseen events which occurred, such as: death, transference, resuscitation, and volemic reposition, among others. When necessary, the NAS<sup>(8)</sup> score was corrected to express the patients' care needs with greater reliability.

The areas of observation for adult and pediatric patients were considered similar to an inpatient unit, considering that the patients remain there for observation of their clinical picture or awaiting transfer to inpatient units. In this way, in the area for observation of adult patients, the average assistance time ( $\bar{h}$ ) was obtained through administering the Fugulin Patient Classification System (PCS)<sup>(9)</sup>, used by Resolution COFEN n<sup>o</sup> 293/04<sup>(10)</sup>. In the area where pediatric patients were observed, it was decided to use the Dini PCS<sup>(11)</sup>.

Both the instruments considered the patients' degree of dependency for the following categories of care: intensive care, semi-intensive care, high dependency care, intermediate care and minimal care.

The average time of care needed by the patients, in each category of care, followed that called for in Resolution COFEN n<sup>o</sup> 293/04<sup>(10)</sup>: intensive care, 17.9 hr; semi-intensive care, 9.4 hr; intermediate care, 5.6 hr; and minimal care, 3.8 hr. For the patients classified as high dependency, for which time was not established by Resolution COFEN n<sup>o</sup> 293/04<sup>(10)</sup>, it was decided to use the same hours of nursing care indicated for semi-intensive patients.

All the beds occupied by patients in these areas were evaluated, by administering the above-mentioned instruments, at 8 am.

In addition, in these areas, the quantity of patients ( $n$ ) was recorded for four times of day: 8 am, 2 pm, 8 pm and 2 am, which correspond to the work shifts: morning (7 am to 1 pm), afternoon (1 pm to 7 pm), night 1 (7 pm to midnight) and night 2 (midnight to 7 am).

Triage was considered a work place which must have one nurse available to gather, evaluate and classify the risk of the patients who arrive in ED. Thus, in this area, the two clinics were taken into account, with uninterrupted functioning (24 hours).

The different areas' workloads, expressed in hours, were converted to average time of assistance per patient and, when possible, transformed into the ratio of quantity of health professionals per patient, by means of the ratio between average time of assistance spent per patient and the effective time of work in 24 hours.

To calculate the productive work time, that is, the time that professionals dedicated during the work day to direct and indirect care, the percentage of 85% of productivity was considered<sup>(12)</sup>. The 15% of the day remaining is necessary for the pauses in which professionals attend to their personal needs.

For this, the following equation was administered:

$$r = \frac{\bar{h}}{\rho \cdot 24}$$

In which:

$r$  = nurse-patient ratio;

$\bar{h}$  = average time of assistance spent per patient;

$\rho$  = productive time (85%).

To obtain the nurse-patient ratio it is necessary to transform the number obtained ( $r$ ) into the fraction  $1/r$ .

The result of this ratio represents the number of patients to whom each nursing professional provides

care, expressed by  $1:n$ , where 1 represents the nursing professional and  $n$  the quantity of patients for this professional.

The data collected was described in absolute and relative frequencies, in the case of the qualitative variables. For the quantitative variables, the description was undertaken by averages and standard deviations and medians, as well as minimum and maximum values.

The research obtained approval from the Research Ethics Committee of the Sociedade Beneficente Israelita Brasileira Albert Einstein (Process CEP/Einstein N° 10/1287 CAAE: 0021.0.028.196-10).

## Results

In triage considering two clinics which stayed functioning uninterruptedly, the daily workload was of 48 hours, the result of the product of daily time of functioning (24 hr) multiplied by the daily quantity of clinics (2). Only nurses worked in this area.

In the emergency room, the NAS<sup>(8)</sup> instrument was administered 426 times, to evaluate the workload generated by the patients attended in this area. The patients' average age was 56.3 years ( $\pm 18.4$ ), with 14 the minimum age and 94 the maximum. The average daily quantity of patients was 10.4 ( $\pm 3.1$ ), which represented 207.8% occupation of the area's capacity (five beds).

$$\bar{C} = [(1 \times 17.9) + (2.9 \times 9.4) + (8 \times 9.4) + (13.7 \times 5.6) + (25.4 \times 3.8)] = 293.6 \text{ h}$$

The average daily workload was 293.6 hr. The average of patients corresponded to 51 and the average time of nursing assistance was 5.7 hr per patient.

In the observation of pediatric patients the average age was 3.1 ( $\pm 3.7$ ) years, with a minimum of zero (less than one month) and the maximum was 13 years.

The average of patients was 13.7 ( $\pm 4.2$ ) which represented 62.3% occupation of the area's capacity (22 beds). The most frequent category of care in this area was high dependency, with 299 (66.7%) patients, followed by the categories of care: intermediate 67

$$\bar{C}_{AO} = [(0 \times 17.9) + (1.9 \times 9.4) + (7.5 \times 9.4) + (2.2 \times 5.6) + (2.1 \times 3.8)] = 108.7 \text{ h}$$

The average daily workload was 108.7 hr. The average nursing assistance time per patient was 7.9 hr, considering the average of 13.7 patients.

In the shock room, 410 records were collected from patients. The daily average of patients was

The emergency room patients had an average total NAS<sup>(8)</sup> score of 984.7 ( $\pm 221.9$ ). The average daily score per patient was 68.4 ( $\pm 15.4$ ). Considering that each point on the NAS<sup>(8)</sup> is equivalent to 14.4 minutes, the average assistance time, in hours, per patient, was 16.4 ( $\pm 3.7$ ). This area's average daily workload corresponded to 170.6 hr.

In the observation of adult patients, 2000 classifications were made, according to the Fugulin PCS<sup>(9)</sup>. The patients' average age was 56.1 ( $\pm 20.1$ ), with a minimum of 14 and a maximum of 103. The average quantity of patients was 51 ( $\pm 5.3$ ), which is 151% occupation of the area (33 beds).

Regarding the care categories, this area's patients were classified as: minimal care - 1014 (50.7%); intermediate care - 547 (27.4%); high dependency care - 320 (16%); semi-intensive care - 116 (5.8%) and intensive care - 3 (0.2%).

The distribution of the average daily quantity of patients, by care type, in the observation of adult patients, was of 1 patient with intensive care needs; 2.9 patients with semi-intensive care; 8 patients with high dependency care; 13.7 patients with intermediate care and 25.4 patients with minimal care.

The average daily workload was calculated substituting the values of  $\bar{h}_j$  and  $\bar{n}_j$  in the equation proposed for this area, shown below.

(15%), minimal 63 (14.1%) and semi-intensive 19 (4.2%) patients. Patients with intensive care were not recorded in the area during the period studied.

The distribution of the average daily quantity of patients by care type was 1.9 patients with semi-intensive care; 7.5 patients with high dependency care; 2.2 patients with intermediate care; and 2.1 patients with minimal care.

The average daily workload was calculated substituting the values of  $\bar{h}_j$  and  $\bar{n}_j$  in the equation proposed for this area, shown below.

61.7 ( $\pm 6.8$ ). The analysis of the 410 records showed a median time of attendance by the nursing team of 0.5 hr. The average daily workload corresponded to 30.9 hr.

In the room for medication/procedures with adult

patients, 1364 records were analyzed. The average age was 39.2 ( $\pm 17.2$ ) years.

The average of patients attended by nursing team was 195 ( $\pm 23.3$ ). The median nursing assistance time per patient corresponded to 0.9 hr. The average daily workload for the nursing team was 175.5 hr. In the room for medication/procedures with pediatric patients, 767 records were analyzed. The average age was 3.9 ( $\pm 4.1$ ) years. The daily average of patients was 100.7 ( $\pm 7.4$ ) patients and the median nursing assistance time to the patients was 0.6 hr. The average daily workload for the nursing team was 60.4 hr.

For verifying the average daily workload generated

by the patients in the area of the Suture room, 187 records were collected. These patients' average age was 29.2 ( $\pm 22.3$ ) years. Due to its being an area which attends patients of all ages, the variation was from one year up to 82 years.

The average of patients who entered for nursing procedures corresponded to 26.2 ( $\pm 3.7$ ) patients. The nursing assistance time had a median of 0.3 hr. Thus, the average daily workload generated by the patients for the nursing team, in this area during the period studied, was 7.9 hr.

Table 1 summarizes the workload results, for the area of the ED.

Table 1 – Average daily workload per area, average time of care per patient, in hours, and nurse-patient ratio in the areas of triage, emergency rooms, and observation of adult and pediatric patients, general ED. São Paulo, Brazil, 2010

Area	Average daily workload (hours)	Average time of care, per patient (hours)	Nurse-patient ratio
Triage	48		1:1 clinic
Shock room	30.9	0.5	---
Emergency room	170.6	16.4	1:1.2
Observation of adult patients	293.6	5.7	1:3.3
Observation of pediatric patients	108.7	7.9	1:2.5
Room for medication/procedures with adult patients	175.5	0.9	
Room for medication/procedures with pediatric patients	60.4	0.6	
Suture room	7.9	0.3	

## Discussion

In this study, the workload in ED was analyzed, taking into account the areas of triage; shock room; emergency room; observation of adult patients; observation of pediatric patients; rooms for medication/procedures with adult and pediatric patients and the Suture room.

In the area for triage, the time work took corresponded to 24 hours, in line with the working hours and the quantity of clinics. This ratio was also referred to in research carried out in the United States<sup>(13)</sup>, which considered a workload of 24 hours for this area, per day, and a nurse-patient ratio of 1 nurse per shift per clinic in the 24 hours.

The analysis of average daily time of work found in the shock room was considered low in relation to the context of the area. This information raised questions about the method used in data collection, which measured the time of nursing attendance without taking into account the quantity of professionals involved, simultaneously, in this attendance.

The majority of the emergency attendances are

accomplished by more than one nursing professional; consequently, the workload must be doubled or tripled in the cases where the attendance is provided by two or three professionals. Therefore, one may consider that the average work time in this area is, at least, two times bigger, that is, 1 hr instead of 0.5 hr per patient.

The same occurred in the room for medication/procedures with pediatric patients, where nursing procedures are frequently undertaken by two nursing professionals. However, it is estimated that, in this area, an increase of 1.5 times the average daily workload compared to that found in this study would correspond to 1 hr instead of 0.6 hr per patient.

The average daily work time found in the areas of the room for medication/procedures with adult patients and the Suture room was considered appropriate for the context of those areas.

In the emergency room, the average assistance time, in hours, per patient, per day was 16.4 hr, and the nurse-patient ratio was 1:1.2, a value close to that found in a study undertaken in the United States<sup>(13)</sup>

which obtained 15.8 hr or 1:1.5 nurse-patient. This area's patients have the profile of critically-ill patients, therefore the average assistance time corresponded to the studies which administered the NAS<sup>(8)</sup> in different intensive care units<sup>(14-15)</sup>, as well as with the time value for intensive care, recommended by the Ministry of Health<sup>(16)</sup> (15hr) and below the time for intensive care called for in Resolution COFEN n° 293/04<sup>(10)</sup>, considered appropriate for the Brazilian context by a study<sup>(17)</sup> which evaluated the parameters proposed in this Resolution<sup>(10)</sup>.

In the area of observation of adult patients, the majority of patients (50.7%) were classified as minimal care; 27.4% as intermediate care and 16% as high dependency. Similar results were found in a Medical Clinic inpatient unit: minimal care, 45.9%; intermediate care 24.9% and high dependency, 29%<sup>(9)</sup>.

The average time of care per patient found in the observation of adult patients was 5.7 hr (1 nursing professional for 3.5 patients), which corresponds to the time of intermediate care recommended in the Resolution COFEN n° 293/04<sup>(10)</sup>. Research carried out in the American context<sup>(13)</sup> obtained, in the ED studied, an average of 3.1 hr of nursing care per patient (that is, 1:8), a value below that called for in Resolution n°293/04<sup>(11)</sup> for minimal care patients.

It should be emphasized that in the present research, the work time was identified by means of an instrument for classification of patients which shows the care time required by the patient, different from the study cited<sup>(13)</sup> which ascertained the work time given by the nursing professionals present on the shift.

The average work time per patient in the observation of pediatric patients was 7.9 hr (1:2.5). This average value is between the times for intermediate care and semi-intensive care established by Resolution COFEN n° 293/04<sup>(10)</sup>.

With the exception of the area of triage, the present research had, as a limitation, the lack of indication of the proportion of the quantity of professionals, per category, necessary in each area of the ED.

## Conclusion

The development of this research made it possible to analyze the differences between the areas of an ED and the relevancy of a methodology for identifying the nursing work load for each of these areas.

In the shock room, where the emergency attendances are, usually, carried out by more than one nursing professional, it was observed that the

instrument used for data collection was limited to the time of assistance to the patient and did not take into account the quantity of nursing professionals who, simultaneously, provided care to the patient – which doubles or triples the care time.

The same occurred in the room for medication/procedures for pediatric patients, where the nursing procedures are usually carried out by two professionals. It is therefore understood that in these areas the workload identified may be affected by the limitation of the method used in collecting data.

It is recommended that research related to this issue should consider the need for more than one professional in patient care.

The use of the nurse-patient ratio to establish the workload may be considered a more comprehensible strategy in communication with management of hospital institutions. It is recommended that the quantity of these ratios be rounded to the nearest whole number, in line with each institution's characteristic.

The choice of differing instruments for identifying nursing workloads in the different areas of ED was necessary due to the peculiarities of each area.

The instruments used were shown to be appropriate for identifying the workload in the emergency room and in the observation of adult and pediatric patients, respectively.

The proposal of a methodology for measuring workload in ED allowed the identification of time indicators for different areas of a general ED and thus contributes to the calculation of the dimensioning of nursing professionals in this type of service.

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