REVISTA DA ESCOLA DE ENFERMAGEM DA USP
JOURNAL OF SCHOOL OF NURSING · UNIVERSITY OF SÃO PAULO

ORIGINAL ARTICLE

doi: https://doi.org/10.1590/S1980-220X2019004203621

Identification of nursing workload in the Sterile Processing Department*

Identificação da carga de trabalho da enfermagem em Centro de Material e Esterilização

Identificación de la carga de trabajo de enfermería en el Centro de Material y Esterilización

How to cite this article:
Costa JA, Fugulin FMT. Identification of nursing workload in the Sterile Processing Department. Rev Esc Enferm USP. 2020;54:e03621. doi: https://doi.org/10.1590/S1980-220X2019004203621

Janaína Anchieta Costa[1]
Fernanda Maria Togeiro Fugulin[2]

* Extracted from the thesis: "Método para dimensionamento de pessoal de enfermagem em Centro de Material e Esterilização (CME)", Programa de Pós-Graduação em Gerenciamento em Enfermagem, Escola de Enfermagem da Universidade de São Paulo, 2015.

[1] Universidade de São Paulo, Escola de Enfermagem, Programa de Pós-Graduação em Gerenciamento em Enfermagem, São Paulo, SP, Brazil.

[2] Universidade de São Paulo, Escola de Enfermagem, Departamento de Orientação Profissional, São Paulo, SP, Brazil.

ABSTRACT

Objective: To determine the workload in the Sterile Processing Department as a parameter for the method of nursing staff sizing. **Method:** Quantitative, observational study conducted in four hospitals in the city of São Paulo, in three steps: mapping of activities in work positions; determination of the standard processing time of materials; and establishment of the average daily workload. **Results:** In the 15 mapped work positions, 1315 samples of time were obtained. As the time values did not show significant differences, it was possible to determine the standard processing time of materials. The average daily workloads corresponded to 217.4; 294.0; 123.1; and 189.1 hours. **Conclusion:** In addition to proposing a method to determine the workload, the present study indicates parameters for the processing of materials and serves as an important reference to develop consistent proposals for the planning, allocation and distribution of nursing staff in these departments.

DESCRIPTORS

Nursing Staff; Workload; Sterilization; Materials Management; Hospital.

Corresponding author:
Janaína Anchieta Costa
Universidade Federal de São Paulo
Rua Sena Madureira, 1500, Vila Clementino
CEP 04021- 001 – São Paulo, SP, Brazil
janaenfe@gmail.com

Received: 02/20/2019
Approved: 09/30/2019

INTRODUCTION

One of the most important resources that have a fundamental role and direct impact on the quality of health services offered to the population are human resources. When properly managed, human resources produce results that greatly contribute to the development of work and achievement of objectives of the sector.

In order to keep up with the evolution of modern companies in constant and profound changes around the world, the performance of health services will generally depend on investments in people, the provision of satisfactory working conditions and the establishment of a democratic and encouraging organizational culture that promotes and sustains continuous improvements in work processes[1].

In this perspective, health institutions should seek management strategies that can reconcile users' health needs with satisfactory economic results so they can remain in the market, balance the operating costs and optimize available and necessary resources in order to maintain the offer of quality and safe services to the population.

The lack of knowledge of tools to control and reduce expenses has impacted the human resources policy of health institutions directly, affecting mainly the nursing staff, who represent the largest number of personnel and consequently, the largest component of the operating budgets of these organizations[2-3].

Despite the relevant role they play in the quality of the care process, the Sterile Processing Department (Portuguese acronym: CME), particularly those in hospital institutions, are the most affected. Perhaps because of the lack of contact with care activities with patients and their families, their staff is still insufficient or lacks qualification for developing activities of processing health products[2].

The insufficiency of staff sizing methods that considered the specificity of the work process developed in the sterile department contributed to maintain this scenario in CMEs. This hindered the performance of estimates and assessments of staff, while provided elements for nurses' argumentation and justification of proposals related to the hiring of additional personnel with hospital institutions administrators[2].

The main variable of the method of nursing staff sizing consolidated for the care units concerns the determination of workload, that is, the average daily work time needed to meet the patients' care demands. In this perspective, the workload in the CME can be obtained by determining the average time spent in the performance of each activity involved in the different stages of material processing. This will favor the operationalization of the planning and assessment of the nursing staff number.

After explaining the activities performed in CMEs, this framework can be used to identify the time spent in developing these actions and support the determination of the nursing workload by proposing a specific sizing method for these departments.

In 2017, the Federal Nursing Council (Portuguese acronym: COFEN), through Resolution number 543, updated and established the minimum parameters to measure the number of professionals from different nursing categories for the services and places where nursing activities are performed[4].

In order to define the workload of nursing professionals in CMEs, this Resolution considers the department's production multiplied by the standard time of activities performed in the different work areas, according to the framework adopted in this study[4].

The aim of this study is to determine the workload in the CME as a minimum parameter for the method of nursing staff sizing. This will contribute to overcome the difficulties involving quantitative and qualitative aspects of professionals in CMEs and to knowledge advancements in human resources management in nursing.

METHOD

Type of study

This is a quantitative, observational, methodological development study[5].

Scenario

The study was conducted in four CMEs of large public and private general hospital institutions in the city of São Paulo.

Selection criteria

Sterile Processing Departments that met the minimum criteria of good practices for processing health products, formulated based on the following regulations and technical manuals in the area were selected to participate in this study[6-13]: centralization of activities related to health products processing; use of equipment in the different stages of health products processing; performance of production controls in the different areas of the department; and presence of nurses (in addition to the one responsible for the unit).

The number of departments was established considering the likelihood of obtaining similar or diverging time values between institutions. Initially, data would be collected in three CMEs, and if significant difference (level of 95%) was found, a fourth institution would be included.

The CMEs that agreed to participate in the study were called CME I, CME II, CME III and CME IV.

The CME I and CME II belonged to private hospitals with 318 and 313 hospital beds and 14 and 10 operating rooms, respectively, at the time of data collection.

The CME III and CME IV were located at public health institutions with 236 and 499 hospital beds and 14 and 22 operating rooms, respectively, at the time of data collection.

Data collection

This study was conducted in three methodological steps:

Step 1: Mapping the activities performed in production operations or work positions in Sterile Processing Departments

In the literature, activities performed by nursing in CMEs were identified in a study that prepared a table of activities validated by nurses, which represented the actions developed in the CME. This table contains six work areas that are defined and presented as specific work processes, 25 sub-processes and 110 activities, in addition to 25 specific activities of nurses[2].

The activities identified in that study[2] were reorganized and grouped into production operations, which were designated as work positions in this study, according to the flow of actions developed by professionals within their workday.

The development flows of health products in the different working areas of the CME were observed and described in order to determine the work positions.

Initially, the flow of activities was observed at the first institution that agreed to participate in the study. The product was an instrument made up of 15 work positions that fully represented the processes and workflows performed in the departments studied.

Each work area of the CME represented a specific work process composed of different production operations visualized in work positions.

To check the feasibility of applying the instrument in the other departments participating in the study, it was presented and discussed with nurses from other institutions before data collection, with the purpose to avoid difficulties that could compromise its application. The nurses consulted considered that the instrument was relevant and represented the work positions of their departments.

Step 2: Determination of the standard processing time of materials in each work position

In order to establish the standard time for processing the materials in each work position, the average time spent by workers in the development of activities that make up the work position was timed.

In this process, the activity is timed continuously and directly with a stopwatch, from the beginning until it is finished. The method for using the stopwatch was defined from Repetitive Reading, which consists of activating the device at the start of each measurement, recording the reading and resetting the device by starting a new measurement[14].

The time spent by professionals was timed by field observers with training in the area and mastery of the work process developed in sterile departments. They were instructed on the study objective, on the instrument containing the identified work positions and the respective activities performed in each of them, in addition to the entire procedure involving data collection.

In order to check the applicability of the instrument built, identify possible difficulties with its use in CMEs, and the degree of reliability for the measurement of the time of work positions, an agreement test was done between the researcher (considered a reference) and the observers.

On the first day of data collection, the time measurement of the first sample in all work positions was performed by each observer and monitored by the researcher. On the other collection days, the researcher was available for clarifying questions and monitored the closure of the collection based on the verification of the number of samples found.

It was difficult to measure the processing time of products in the different work positions because of their heterogeneity. Therefore, in the investigation of time, the items involved in each work cycle *(N)* in the different work positions were considered.

Each work cycle *(N)* was timed and the result of its execution time (T_{Sl}) was registered by the field observer in the data collection worksheet. As the spreadsheet was computerized, when the work cycle time (T_{Sl}) was recorded, the average time $\overline{(TE)}_{S_i}$, the standard deviation *(s)*, the coefficient of variation *(cv)* and the sample size (*N'*) were calculated automatically.

For example, the average time $\overline{(TE)}_{S_i}$ of activities that make up the work process *(S)* of Work position 1 was calculated from the following equation:

$$\overline{(TE)}_{S_i} = \frac{1}{N_{Sl}} \sum_{l=1}^{N} T_{Sl}$$

In the proposed equation, N_{Sl} is the total number of sampled work cycles (sample size) and T_{Sl} is the execution time of the sampled work cycles that were timed by field observers in CME of the institutions participating in the study.

In addition to the investigation of the average time of activities, the daily production of each work position was analyzed in order to determine the average time for processing health products in the different work positions of the CME.

As the work processes developed in each area of the CME are specific, the production was established in a different way. Chart 1 presents the production indicators considered in each work area of the CME.

Chart 1 – Production indicators for each work position of the Sterile Processing Departments – São Paulo, SP, Brazil, 2014.

Area	Work position	Production indicator
A – Dirty or contaminated (purge)	1) Reception of materials from consumer units	Number of kits received by the Sterile Processing Department
	2) Cleaning of materials	Number of kits processed by the Sterile Processing Department

continue...

…continuation

Area	Work position	Production indicator
B – Control of consignment materials	3) Reception of consignment materials	Number of kits received
	4) Consignment materials check after surgery	Number of kits checked
	5) Return of consignment materials to supplier companies	Number of kits returned
C – Preparation of materials	6) Drying of materials and distribution on the preparation benches	Number of kits processed by the Sterile Processing Department
	7) Inspection, testing and separation of clean materials or instruments	Number of instrumental kits processed
	8) Assembly and packaging of materials and instruments	Number of instrumental kits processed
	9) Assembly and packaging of mechanical ventilation kits or circuits	Number of mechanical ventilation kits processed
D – Sterilization of materials	10) Load assembly and monitoring of sterilization cycle	Number of loads/cycles performed
E - Storage and distribution of sterile materials	11) Removal of the sterile load from equipment and checking of the effectiveness of the sterilization process	Number of loads/cycles performed
	12) Storage of sterile materials and clothes	Number of loads/cycles performed
	13) Assembly of transport trolleys to consumer units	Number of trolleys assembled
	14) Organization and control of the environment and sterile materials	Number of kits processed by the Sterile Processing Department
	15) Distribution of materials and sterile clothing to consumer units	Number of kits processed by the Sterile Processing Department

In the present study, the kits were considered as a set of elements, parts or materials assembled for a specific purpose.

In order to transform the items involved in the development of each work cycle measured by produced kits, the average processing time of all cycles obtained in a certain work position was compared with the time of each cycle individually. Thus, the probable number of kits produced in each timed interval was determined by equivalence.

The following equation represents the calculations performed to obtain the average execution times for the kits:

$$(\overline{TK})_{S_i} = \frac{\overline{(TE)}_{S_i}}{\bar{K}}$$

The average time for execution of the kit $\overline{(TE)}_{S_i}$ in a certain work position was calculated by the ratio between the average value of the time obtained for the processing of items $\overline{(TE)}_{S_i}$ involved in the measured work cycles, and the value corresponding to the average number of kits ($\overline{K}$) determined by equivalence.

To determine the average execution time of kits produced in each work position, the average execution times of kits obtained in the four CMEs were calculated. The confidence level 1-α = 0.95 was considered in the data collected, as well as a relative error ε% = 5% between the population average and the sample average.

The standard processing time of the kit $(TP)_i$ was determined by adding the factor corresponding to the worker's rhythm (FR = 1.0) in carrying out the activities of his/her work position and the tolerances corresponding to the personal and fatigue needs of the worker (FT = 1.09), to the average time of the execution of kits $(TK)_{S_i}$[14].

$$(TP)_i = (\overline{TK})_{S_i} \times FR \times FT$$

The sample size *(N')* necessary to statistically define the average time spent in each work cycle was obtained from the *(N')* = first five samples. The number of observations *(N')* for each work cycle was calculated with the following equation adapted for small samples[14]:

$$N' = \left[\left(\frac{t_{95\%}}{\epsilon}\right)\left(\frac{s}{\bar{X}}\right)\right]^2$$

Where:

$\left(\frac{s}{\bar{X}}\right)$ is the coefficient of variation of the collected data;

$t_{95\%}$ is the value of Student's t distribution for (N-1) degrees of freedom (DF);

ε is the value of the relative error admitted between the mean of the population and the sample (ε = 0.05);

By considering similar average execution times for kits obtained in the different work positions, initially, the performance of data collection was scheduled at the CME of three different hospital institutions. However, as the average times for several samples showed a significant difference between institutions at the 95% level, the sample was expanded to four institutions.

Step 3: Establishing the average daily workload in each work position of the department

The average daily workload $\overline{T}_i$ of work position 1 was calculated by the product between the average daily production quantity $\overline{\mathfrak{R}}_i$ of this work position and the standard processing time for each kit $(TP)_i$.

$$(\overline{T_i}) = (TP)_i \times \overline{\mathfrak{R}}_i$$

The average daily production $\overline{\mathfrak{R}}_i$ (number of kits/day) in each work position was obtained from nurses of institutions participating in the study, based on the production records of the departments.

The total average daily workload of the CME $\overline{T_{cme}}$ was obtained by adding the average workloads of all work positions according to the following equation:

$$\overline{T_{cme}} = \sum_{i=1}^{15} \overline{T}_i$$

From the determination of the workload, the number of workers (nursing technicians and assistants) qtec needed to perform the workload of the CME during a workday was obtained by the equation:

$$q_{tec} = \frac{\overline{T_{cme}}}{t}$$

Where:

t is the work shift, that is, the duration of professionals' working hours, which is of six hours in the four institutions.

$\overline{T_{cme}}$ is the total average workload of the CME.

The number of workers required to operate the CME can be determined by the daily number of professionals, plus the technical safety index (Portuguese acronym: IST = 15%) for covering vacations and unplanned absences, according to COFEN Resolution number 543 of 2017[4].

$$Q_{cme} = q_{tec} \times (1 + IST)$$

Data analysis and processing

The collected data were entered into electronic spreadsheets that made up a specific database for each CME, thereby facilitating the organization, consultation, analysis and performance of the proposed calculations.

For the quantitative variables, measures of central tendency and dispersion were calculated.

The professional staff expected in each CME, obtained by applying the proposed method, was compared with the existing staff in the different departments by using the chi square test. The level of significance established was set at 5%.

Ethical aspects

The study was approved by the Research Ethics Committee of the Universidade de São Paulo School of Nursing under Opinion number 623.136 on 04/22/2014 and later, by the institutions that agreed to participate in the study. The guidelines established by Resolution 466/12 of the National Health Council were followed throughout the data collection period.

Nursing professionals were instructed on the objectives of the study, the voluntary participation, guarantee of anonymity and the right to withdraw from the study at any time without causing harm of any kind. The Informed Consent form was signed by professionals before the beginning of data collection.

RESULTS

To achieve the number of samples necessary to establish the standard time in the work positions, 55 (100%) nursing professionals who worked in the four CMEs (four/7% nurses; and 51/93% nursing technicians/assistants/attendants) were observed during the periods of 2-18 June 2014 and 4-12 September 2014, Monday to Friday, from 7:00 am to 4:00 pm.

During the data collection period, 1315 samples of the working time of nursing professionals were collected in the 15 work positions of CMEs participating in the study.

The standard execution time of materials $(TP)_i$ in each work position was the average of the execution times of kits at the four CMEs, plus the factor corresponding to the worker's rhythm (FR) in the execution of activities of the work position , and the value attributed to the percentage of time allocated to the tolerances corresponding to the worker's personal and fatigue needs (FT).

By determining the standard processing time of kits $(TP)_i$ and identifying the daily average of kits produced $(\overline{\mathcal{R}_i})$ in each work position, it was possible to calculate the average daily workload of each work position and the total average daily workload $\overline{T_{cme}}$ of each CME studied.

The synthesis of calculations performed is shown in Table 1.

Table 1 – Average daily workloads for each work position in the Sterile Processing Department – São Paulo, SP, Brazil, 2014.

Area	Work positions	Description of the activity	CME	Daily average of kits	Standard time (min)	Average daily workload (hours/day)
A	1	Reception and collection of materials	I	765	1.94	24.7
			II	1083	1.94	35.0
			III	359	1.94	11.6
			IV	686	1.94	22.2
	2	Cleaning of materials	I	785	2.41	31.5
			II	1127	2.41	45.3
			III	359	2.41	14.4
			IV	695	2.41	27.9
B	3	Receipt of consignment materials	I	20	5.67	1.9
			II	44	5.67	4.2
			III	10	5.67	0.9
			IV	8	5.67	0.8

continue...

…continuation

Area	Work positions	Description of the activity	CME	Daily average of kits	Standard time (min)	Average daily workload (hours/day)
B	4	Consignment materials check after surgery	I	20	8.99	3.0
			II	44	8.99	6.6
			III	10	8.99	1.5
			IV	8	8.99	1.2
	5	Return of consignment materials	I	20	2.67	0.9
			II	44	2.67	2.0
			III	10	2.67	0.4
			IV	8	2.67	0.4
C	6	Drying and distribution of materials after cleaning	I	785	2.94	38.5
			II	1127	2.94	55.2
			III	359	2.94	17.6
			IV	695	2.94	34.1
	7	Inspection, testing, separation and drying of materials	I	675	2.73	30.7
			II	663	2.73	30.2
			III	359	2.73	16.3
			IV	543	2.73	24.7
	8	Assembly and packaging of materials	I	675	2.84	32.0
			II	663	2.84	31.4
			III	463	2.84	21.9
			IV	543	2.84	25.7
	9	Assembly of mechanical ventilation materials	I	106	1.55	2.7
			II	464	1.55	12.0
			III	0	1.55	0.0
			IV	148	1.55	3.8
D	10	Assembly of the sterilization load	I	25	8.01	3.3
			II	32	8.01	4.3
			III	20	8.01	2.7
			IV	35	8.01	4.7
E	11	Removal of sterile load from and checking of sterilization	I	25	2.72	1.1
			II	32	2.72	1.5
			III	20	2.72	0.9
			IV	35	2.72	1.6
	12	Storage of materials	I	25	3.55	1.5
			II	32	3.55	1.9
			III	20	3.55	1.2
			IV	35	3.55	2.1
	13	Assembly of the unit transport trolleys	I	39	5.49	3.6
			II	47	5.49	4.3
			III	23	5.49	2.1
			IV	32	5.49	2.9
	14	Organization and control of the environment and sterile materials	I	785	1.08	14.1
			II	1127	1.08	20.3
			III	588	1.08	10.6
			IV	695	1.08	12.5

continue…

…continuation

Area	Work positions	Description of the activity	CME	Daily average of kits	Standard time (min)	Average daily workload (hours/day)
E	15	Distribution of materials and sterile clothing	I	785	2.13	27.9
			II	1127	2.13	40.0
			III	588	2.13	20.9
			IV	695	2.13	24.7

The average daily workloads of the CMEs were calculated by the sum of the average workloads of all work positions, as shown in Table 2.

Table 3 shows the number of professionals (nursing technicians and assistants) expected for each CME, calculated from the average daily workload of the department, the working hours determined by institutions (six hours) and the technical safety index of at least 15% of the total, of which 8.3% refer to vacation and 6.7% to unexpected absences (IST = 15%, as recommended by COFEN Resolution number 543 of 2017[4]).

In CME III, an IST of 20% was considered when determining the staff to cover recesses related to long weekends because of holidays. As CME III belongs to an institution directly linked to a public university, they adopt the academic calendar, so they have a higher number of days off for holidays that do not coincide with Sundays.

Table 2 – Total average workloads of each CME – São Paulo, SP, Brazil, 2014.

Area	Work position	Description of activity	Average daily workload (hours/day)			
			CME I	CME II	CME III	CME IV
A	1	Reception and collection of materials	24.7	35.0	11.6	22.2
	2	Cleaning of materials	31.5	45.3	14.4	27.9
B	3	Receipt of consignment materials	1.9	4.2	0.9	0.8
	4	Consignment materials check after surgery	3.0	6.6	1.5	1.2
	5	Return of consignment materials	0.9	2.0	0.4	0.4
C	6	Drying and distribution of materials after cleaning	38.5	55.2	17.6	34.1
	7	Inspection, testing, separation and drying of materials	30.7	30.2	16.3	24.7
	8	Assembly and packaging of materials	32.0	31.4	21.9	25.7
	9	Assembly of mechanical ventilation materials	2.7	12.0	0.0	3.8
D	10	Assembly of the sterilization load	3.3	4.3	2.7	4.7
E	11	Removal of sterile load from and checking of sterilization	1.1	1.5	0.9	1.6
	12	Storage of materials	1.5	1.9	1.2	2.1
	13	Assembly of the unit transport trolleys	3.6	4.3	2.1	2.9
	14	Organization and control of the environment and sterile materials	14.1	20.3	10.6	12.5
	15	Distribution of materials and sterile clothing	27.9	40.0	20.9	24.7
Total average daily workload			**217.4**	**294.0**	**123.1**	**189.1**

Table 3 – Demonstration of the number of nursing staff calculated for the Sterile Processing Department – São Paulo, SP, Brazil, 2014.

VARIABLES	CME			
	I	II	III	IV
Total average daily workload - $\overline{T_{tec}}$	217.4	294.0	123.1	189.1
Working hours (hours) - t	6	6	6	6

continue…

...continuation

VARIABLES	CME			
	I	II	III	IV
Number of nursing professionals - q_{tec}	36	49	21	32
Technical safety index (IST)	1.15	1.15	1.20	1.15
Expected nursing staff – Q_{cme}	**42**	**56**	**25**	**36**
Observed nursing staff	**35**	**52**	**28**	**48**
Chi square test	1.07	0.33	0.47	3.81
Calculated chi square	5.68			
Critical value a=0.05 3 DF	7.82			

DISCUSSION

As the methodology proposed in this study is unprecedented in the area of CMEs, the results presented can be compared with few other studies.

Several studies have been developed in many areas of health care on the theme of the nursing staff workload. However, during the literature review, only one study was found[15] with the objective of identifying the nursing staff workload in CMEs. As the method used was quite different from that of the current investigation, it was difficult to compare the data obtained.

This study was developed based on the list of activities described and validated in the literature[2], which favored the determination of the nursing staff workload in CMEs.

The following criteria were developed to select the CMEs: the centralization of activities relevant to the processing of health products; use of equipment in the different stages of material processing; carrying out production controls in the different areas of the department; and the presence of nurses. Such criteria allowed choosing places with good work processes, where activities performed by the nursing staff were in accordance with regulations and technical manuals of the area and, thus, included in the framework of activities used in the study[2].

The objective of the study was not knowing the standard time nor establishing the workload related to nurses' specific activities in CMEs. However, during data collection at the CME IV, nurses were observed while performing the activities described in the work positions in Area B - Control of consignment materials. These samples were considered in the determination of the standard time because they interfered with the workload and were not specific activities of nurses in these departments.

The activities performed by nurses from CMEs in hospitals were analyzed based on the specific activities of nurses validated in a study used in the study[2,16]. The result of this work showed that 15 activities are performed daily and nine are performed monthly. Activities associated with the supervision and control of receipts, use of consignment materials, and charge of consignment materials were a daily task of nurses, with frequencies of 67.75%, 48.39% and 54.84%, respectively. However, in some institutions, these activities are not part of the nurses' duties[16].

To obtain the average time value of each of the 15 work positions, 1315 work cycle samples were measured.

In the analysis of the selected average time or average processing time of kits in the work positions, as there were no significant differences between the values found in the CMEs, the standard time in the different work positions was obtained. In practice, there were variations in the time related to the action of professionals occupying the same work position in the samples, and diversification in the number of items comprising the sets of materials, because the samples were collected randomly.

In this sense, the work processes pertinent to the processing of medical-hospital items in the departments participating in the study are similar.

Regarding the standard material processing time, the first and third higher values obtained were of Work position 4 and Work position 3. In these work positions, complex materials used in orthopedics, neurosurgery and video-assisted surgery are received and subsequently checked by nursing professionals of the CME after their use in surgical procedures.

This finding corroborates the results of another study[15], which also pointed out a longer processing time for packages classified as complex, since the activities involved in their handling require a longer working time of nursing professionals.

The second highest standard time was found in Work position 10. This result was attributed to the procedure of placing the packages for sterilization in the equipment, the identification and description of the load, and the use of traceability control tools.

The largest workload of the nursing staff was found in CME II (294.0 hours). The production of kits observed in this department directly interfered in this result. When analyzing the workload in the work positions, in practically all positions, the workload was higher in CME II, which demonstrates the production, i.e. the quantity of health products processed by the CMEs, directly interferes in their workload.

Considering the workload of the nursing staff of CME II, there is a need for more people, which is already established in practice. The staff of the department includes 52

nursing technicians, a number very close to the expected, which is of 56 workers.

The second highest workload was found in CME I (217.4 hours). The department has a team of 35 nursing technicians, which is less than expected (42) and suggestive of work overload.

When analyzing the nursing staff obtained by applying the method proposed in this study, the existing staff in CME I and CME II, the results may be associated with extra hours established for workers by the institutions in order to meet the need for staff. This fact deserves a separate investigation, as it would justify the material production with a smaller staff than that expected.

In CME IV, the workload was of 189.1 hours, revealing the need for 36 nursing professionals, although the department has 44 nursing technicians. In order to obtain the standard processing time for kits, in the work positions of the area of Control of consignment material, the execution times of activities performed by nurses were considered for determining the department workload. Thus, these professionals were accounted in the observed staff (48). According to this reasoning, the technical staff observed in this CME is much higher than expected.

The analysis of this result suggests the institution may not be functioning at its full capacity or the work processes developed in the different areas of CME IV need to be reviewed in order to clarify the real need for the observed staff. It is also worth investigating if there are other variables or activities performed by professionals outside the department that were not included in the study.

Analyzing the workload in Work positions 10, 11 and 12, slightly higher values were found in CME IV. This result is associated with the greater number of sterilization equipment in this department and the use of formaldehyde autoclave for the sterilization of mechanical ventilation kits. These aspects increase the production in these work positions, compared with CME I and II, where these materials are only thermally disinfected.

The lowest workload was found in CME III (123.1 hours). During data collection, there was a period of workers' strike in the institution, which may have influenced the result obtained, since the workload is directly related to the production in CMEs. The reduction in the number of surgical procedures caused by the lack of personnel may have compromised the daily production of the CME and affected the determination of the workload. Furthermore, the activities related to Work position 9 are not performed in the department, which directly influences the value obtained, mainly when compared to the workload of this position in the other CMEs.

An IST of 1.20 was considered when determining the staff number of CME III because of the additional staff coverage for long weekend holidays foreseen in the calendar of the university to which this department belongs. The staff number was very close to that expected, raising questions about its adequacy in terms of a higher workload under normal operating conditions in the institution.

In order to compare the expected staff number obtained by applying the staff sizing method and the parameters proposed in this study with the staff observed in the CMEs participating in the study, the chi square test was performed (C2) at the significance level a = 0.05. The result of this test showed a value (5.68) less than the critical value (7.82), showing that the calculated value does not differ from the value observed, considering at 5% the significance level in all CMEs.

CONCLUSION

The need to overcome the issue involving quantitative and qualitative aspects of human resources in nursing within CMEs of Brazilian hospitals motivated this study.

The present investigation proposed time parameters to determine the workload. It is also an important reference to assist nurses in the development and justification of consistent proposals for the planning, allocation and distribution of nursing professionals in these departments by taking into consideration the specificity of work processes performed. Based on the workload obtained in each CME studied, the number of staff needed in these departments was determined, the number of existing professionals was evaluated, and how the working time of the nursing staff is distributed in the different work positions proposed in this study was possible to understand.

The use of parameters proposed in this study is recommended in other work scenarios. Then, the results can be compared with those presented in this study in order to validate this methodology in different Sterile Processing Departments in the country.

RESUMO

Objetivo: Determinar a carga de trabalho em Centro de Material e Esterilização como parâmetro para o método de dimensionamento dos profissionais de enfermagem. **Método:** Estudo de natureza quantitativa, observacional, realizado em quatro instituições hospitalares da cidade de São Paulo, em três etapas: mapeamento das atividades em posições de trabalho; determinação do tempo padrão de processamento dos materiais e estabelecimento da carga média diária de trabalho. **Resultados:** Foram obtidas 1315 amostras de tempo nas 15 posições de trabalho mapeadas. Os valores de tempo não apresentaram diferenças significativas, possibilitando determinar o tempo padrão de processamento dos materiais. As cargas médias diárias de trabalho corresponderam à: 217,4; 294,0; 123,1 e 189,1 horas. **Conclusão:** Além de propor um método para determinar a carga de trabalho, a presente investigação indica parâmetros para o processamento de materiais e constitui importante referencial para elaborar propostas consistentes para o planejamento, alocação e distribuição de profissionais de enfermagem nessas unidades.

DESCRITORES

Recursos Humanos de Enfermagem; Carga de Trabalho; Esterilização; Administração de Materiais no Hospital.

RESUMEN

Objetivo: Determinar la carga de trabajo en el Centro de Material y Esterilización como parámetro para el método de dimensionamiento del personal de enfermería. **Método:** Estudio cuantitativo, observacional realizado en cuatro hospitales de la ciudad de São Paulo en tres pasos: mapeo de actividades en puestos de trabajo; determinación del tiempo estándar de procesamiento de materiales; y establecimiento de la carga de trabajo diaria promedio. **Resultados:** En los 15 puestos de trabajo mapeados, se obtuvieron 1315 muestras de tiempo. Como los valores de tiempo no mostraron diferencias significativas, fue posible determinar el tiempo de procesamiento estándar de los materiales. Las cargas de trabajo diarias promedio correspondieron a 217.4; 294,0; 123,1; y 189,1 horas. **Conclusión:** Además de proponer un método para determinar la carga de trabajo, el presente estudio indica parámetros para el procesamiento de materiales y constituye una referencia importante para desarrollar propuestas consistentes para la planificación, asignación y distribución de profesionales de enfermería en estas unidades.

DESCRIPTORES

Personal de Enfermería; Carga de Trabajo; Esterilización; Administración de Materiales de Hospital.

REFERENCES

1. Chiavenato I. Gerenciando com as pessoas: transformando o executivo em um excelente gestor de pessoas: um guia para executivo aprender a lidar com sua equipe de trabalho. 9ª ed. Rio de Janeiro: Elsevier; 2005.
2. Costa JA, Fugulin FMT. Nursing activities in central supply and sterilization: a contribution to personnel design. Acta Paul Enferm 2011;24(2):249-56.
3. Aiken LH, Sloane DM, Bruyneel L, Heede KV, Griffiths P, Busse R, et al. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. Lancet. 2014;383(9931):1824-30.
4. Conselho Federal de Enfermagem (COFEN). Resolução n. 543/2017. Atualiza e estabelece parâmetros para o Dimensionamento do Quadro de Profissionais de Enfermagem nos serviços/locais em que são realizadas atividades de enfermagem [Internet]. Brasília; 2017 [citado 2019 maio 02]. Disponível em: http://www.portalcofen.gov.br.
5. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem. 7ª ed. Porto Alegre: Artes Médicas; 2011.
6. Graziano KU, Silva A, Psaltikidis EM, organizadoras. Enfermagem em Centro de Material e Esterilização. São Paulo: Manole; 2011.
7. Brasil. Ministério da Saúde; Agência Nacional de Vigilância Sanitária. Resolução RDC n. 15, de 15 de março de 2012. Dispõe sobre requisitos de boas práticas para o processamento de produtos para saúde e dá outras providências [Internet]. Brasília; 2012. [citado 2012 mar. 19] Disponível em: http://www.brasilsus.com.br/legislacoes/gm/112548-15.html
8. São Paulo (Estado). Secretaria de Estado da Saúde; Divisão de Infecção Hospitalar, Centro de Vigilância Epidemiológica. Manual de avaliação da qualidade de práticas de controle de infecção hospitalar [Internet]. São Paulo; 2006. [citado 2007 out. 13]. Disponível em: http://www.cve.com.br.
9. Associação Paulista de Estudos e Controle de Infecção Hospitalar (APECHI). Reprocessamento de artigos de uso único. São Paulo; 2008.
10. Sociedade Brasileira de Enfermagem em Centro Cirúrgico, Recuperação Anestésica e Centro de Material e Esterilização (SOBECC). Práticas recomendadas - SOBECC. 7ª ed. São Paulo; 2017.
11. Organização Nacional de Acreditação (ONA). Manual de Acreditação das Organizações Prestadoras de Serviços Hospitalares. Brasília; 2006.
12. Association for the Advancement of Medical Instrumentation. ANSI/AAMI ST79: 2017 Comprehensive guide to steam sterilization assurance in health care facilities. Arlington; 2017.
13. Association of Peri Operative Registered Nurses. Standards, Recommended Practices, and Guidelines. Recommended practices for sterilization. Denver: AORN; 2013.
14. Barners MR. Estudo de tempos e movimentos: projeto e medida de trabalho. São Paulo: Edgard Blücher; 1977.
15. Neis MEB, Gelbcke FL. Carga de trabalho em centro de material e esterilização. Rev SOBECC. 2014;19(1):11-7.
16. Gil RF, Camelo SH, Laus AM. Atividades do enfermeiro de centro de material em instituições hospitalares. Texto Contexto Enferm [Internet]. 2013 [citado 2015 Jul 09];22(4):927-34. Disponível em: http://www.scielo.br/pdf/tce/v22n4/08.pdf