



## Staff sizing in the material and sterilization center of a university hospital

Dimensionamento de pessoal no centro de material e esterilização de um hospital universitário  
Dimensionamiento de personal en el centro de material y esterilización de un hospital universitario

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### ABSTRACT

**Objective:** To apply the standard time parameters of nursing activities proposed by *COFEN* Resolution No. 543/2017 to determine the number of nursing technicians in the material and sterilization center of a university hospital and compare the projected framework with the existing one in the sector. **Method:** An exploratory and descriptive study with data collection performed on the sterilization control sheets and direct observation of the work process stages in the different sector areas. **Results:** Only one of the 15 described activities was not conducted in the sector; those most performed which presented more workload and required more personnel were the receiving of contaminated materials and the organization and distribution of sterilized materials; the areas that required the highest number of employees were for materials preparation and cleaning/disinfection. No difference was observed between the number of staff required in the different work shifts, and the calculated staff quantity was similar to that existing in the result of the staff sizing performed using the functional sites. **Conclusion:** The proposals analyzed in this study can be used to calculate staff size in the studied sector and in other institutions.

### DESCRIPTORS

Sterilization; Personnel Downsizing; Nursing Staff, Hospital; Workload.

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## INTRODUCTION

The Material and Sterilization Center (MSC) is a unit of health services whose work processes depend on specific knowledge and practices, with different objectives and purposes from the other units of the hospital, characterized as an indirect care sector with service provided by the nursing team of other units of the hospital and also by other professionals in the health area<sup>(1-2)</sup>.

The work process in the MSC in some ways resembles the industrial production process regarding the division of the work process and its following method of carrying out the activities<sup>(1)</sup>. This process along with the introduction of equipment that automates and modifies the activities developed in this sector has become increasingly sophisticated, thereby requiring adequate staff in quantity and quality<sup>(3-4)</sup>.

We understand that nursing staff sizing should use methodology and criteria which enable adequate human resources for care needs<sup>(5)</sup>. There is a recommendation in the literature that the method to be used should consider variables such as average workload, distribution percentage of nursing professionals, effective working time and technical safety index<sup>(6)</sup>. In analyzing the work process developed in the Material and Sterilization Centers (MSC), it is understood that the staff size calculation must consider the specificity of the various developed actions.

Therefore, in order to know the workload and to decide on a staff sizing that reflects the real need of this work unit, it is necessary to know the variables of the developed work in addition to the workload of the employees, such as the specific activities performed, the number of the times they are performed and the time needed to perform each of them. However, this was (until very recently) one of the major difficulties encountered by those willing to do size scaling in the MSCs.

In order to improve this scenario and enable creating a staffing plan based on the reality of each of the different MSCs, the work activities developed in centers of different institutions were recently mapped, validated and published<sup>(7)</sup>, and in another study in a doctoral thesis which has not yet been published<sup>(8)</sup>, the same authors have raised the standard time for each of these activities, thus providing conditions for such work units to scale size based on more reliable data. The results of this study were so important that they were included in *COFEN (Conselho Federal de Enfermagem – Brazilian Federal Nursing Council) Resolution no. 5433/2017*<sup>(9)</sup>. However, as this last study is very recent, it is necessary that its results be tested in practicing the sizing for different MSCs.

The purpose of this study was to apply the standard time parameters of nursing activities proposed in *COFEN Resolution no. 543/2017* to determine the number of nursing technicians in the MSC of a university hospital and compare the projected framework with the existing one in the sector. To do so, we sought to identify the nursing activities and the frequency with which they were conducted in order to calculate the workload and to quantify the number of nursing technicians.

## METHOD

### STUDY TYPE

This is an exploratory, descriptive and quantitative study.

### SCENARIO

The study was developed at the MSC of the Hospital de Clínicas of the Universidade Federal de Uberlândia, responsible for sterilizing all material used in its different sectors. The processing of health products is centralized in this MSC, and there is no need to use outsourced sterilization services, even for thermosensitive articles which are sterilized in the low temperature equipment in the unit itself.

### STUDY POPULATION

The sample was composed of the entire population, since all 113 autoclave cycle control record sheets filled out in the sector were included from a typical work week.

### DATA COLLECTION

Data were collected from June to August of 2017. The first step in the data collection was a survey of the activities that were performed in the MSC to verify if all the standardized activities<sup>(7,9)</sup> were performed. This was done by one of the researchers who followed the work process steps in the different sector areas in the studied MSC.

As the sector does not count the performance of each one of the activities, the data to arrive at the average number of times each of them were performed were extracted from the sterilization control sheet used in the sector. Various kinds of information are recorded on this sheet which is filled out for each sterilization cycle, such as: autoclave number, lot, cycle number, date, time, description of items placed in the load, biological test result, temperature and pressure indexes, and the signature of the responsible technician. Thus, the data were collected from the sheets filled out in the three work shifts during the course of a week, considering the activities for each of the items placed in the sterilization load.

Data to account for the developed activities in preparing the inhalable materials which were not sterilized were collected using a form which recorded the date, time and quantity of the material during a standard week for three shifts.

### DATA ANALYSIS AND PROCESSING

The collected data enabled calculating the Workload of the MSC, which is the result of multiplying the average number of times the activities are performed by the standard time of each activity. The standard time points for each activity in the doctoral thesis cited above and presented in *COFEN no. 5433/2017*<sup>(8-9)</sup> are as follows: Reception and collection of contaminated materials = 0.033; Cleaning materials = 0.033; Reception of materials on consignment = 0.1; Conference of consignment

materials after surgery = 0.15; Return of materials under consignment = 0.05; Drying and distribution of the materials after cleaning = 0.05; Inspection, testing, separation and drying of materials = 0.05; Assembly and packaging of materials = 0.05; Assembling ventilation assistance supplies = 0.033; Assembly of the sterilization load = 0.133; Sterile load withdrawal and sterilization verification = 0.05; Material storage = 0.066; Loading of transport vehicles of the units = 0.083; Organization and control of the environment and sterile materials = 0.016; Distribution of materials and sterile clothing = 0.033.

Staff sizing was performed using the following formulas:

$$NE = \frac{MSCW \cdot ND}{W} \times \frac{\{1 + TSI\}}{100}$$

$$MSCW = \sum \mu A_1 \cdot STA_1 \dots \mu A_n \cdot STA_n$$

In which:

NE = Number of employees;

MSCW = Material and Sterilization Center Workload;

ND = Number of days in the MSC work week;

W = Weekly workload (in hours) of MSC staff;

TSI = Technical Security Index;

$\mu A_1$  = Average occurrence number of Activity 1

$\mu A_n$  = Average occurrence number of Activity n

$STA_1$  = Standard Time for Activity 1

$STA_n$  = Standard Time for Activity n

The collected data were entered into an Excel worksheet and presented in tables, and the chi-square test was used to analyze the data to verify if the result of this sizing met the staffing needs compared to the existing staff and with the sizing previously carried out in the sector where the functional sites were used.

## ETHICAL ASPECTS

There was no participation of human beings in this study, therefore it was not submitted to the Research Ethics Committee for approval, nor was a Free and Informed Consent Form signed, but its performance was previously authorized by the institution, and ethical aspects related the study were observed.

## RESULTS

The data collection showed that 14 of the 15 standardized activities<sup>(7,9)</sup> are performed in the hospital's MSC; only the loading of the material on the transport cars to the consumer units is not performed, in addition to not performing any activities beyond those described by referenced author.

During the data collection period (a standard week), 113 autoclave cycles were counted, and it was possible to calculate the frequency for which each of the 15 activities were performed through the material sterilization control sheet of these cycles and the form filled out by the researcher to survey the inhalation activities (Table 1).

**Table 1** – Frequency at which each activity was performed at the MSC during a typical work week – Uberlândia, MG, Brazil, 2017.

| ACTIVITY   | DAYS OF THE WEEK |       |       |        |       |      |      | DAILY MEAN |
|--|------------------|-------|-------|--------|-------|------|------|------------|
|  | Mon.             | Tues. | Wed.  | Thurs. | Fri.  | Sat. | Sun. |            |
| Materials received from consumer units   | 1,513            | 1,212 | 1,463 | 1,196  | 1,232 | 686  | 641  | 1,134.71   |
| Cleaning materials   | 922              | 758   | 1,041 | 745    | 702   | 349  | 275  | 684.57     |
| Reception of materials on consignment  | 24               | 13    | 25    | 15     | 17    | 21   | 9    | 17.71      |
| Conference of consignment materials after surgery  | 24               | 13    | 25    | 15     | 17    | 21   | 9    | 17.71      |
| Return of consignment materials to supplier companies  | 24               | 13    | 25    | 15     | 17    | 21   | 9    | 17.71      |
| Drying of materials and distribution on the preparation benches                                | 921              | 783   | 1,084 | 735    | 702   | 333  | 275  | 690.43     |
| Inspection, testing and separation of clean materials or instruments                           | 1,101            | 798   | 1,233 | 751    | 775   | 333  | 323  | 759.14     |
| Assembly and packaging of materials and instruments  | 840              | 585   | 1,041 | 538    | 855   | 229  | 248  | 619.43     |
| Assembly and packaging of ventilator assistance kits or circuits                               | 41               | 85    | 126   | 53     | 70    | 84   | 23   | 68.86      |
| Load assembly and follow-up of the sterilization cycle   | 19               | 20    | 22    | 19     | 16    | 8    | 10   | 16.29      |
| Removal of the sterile load and verification of the effectiveness of the sterilization process | 19               | 20    | 22    | 19     | 16    | 8    | 10   | 16.29      |
| Storage of sterile materials and clothing  | 48               | 32    | 29    | 28     | 23    | 10   | 13   | 26.14      |
| Loading of transport vehicles for consumer units   | 0                | 0     | 0     | 0      | 0     | 0    | 0    | 0          |
| Organization and control of the environment and sterile materials                              | 1,154            | 1,004 | 1,155 | 966    | 946   | 584  | 594  | 914.71     |
| Distribution of sterile materials and clothing to consumer units                               | 1,208            | 1,004 | 1,155 | 957    | 916   | 566  | 595  | 914.43     |

The workload in hours in the MSC was identified by multiplying the average daily performance of the activities

by the standard time proposed for each of them<sup>(8-9)</sup>, as shown in Table 2.

**Table 2** – Hourly workload in MSC according to activities and days of the week – Uberlândia, MG, Brazil, 2017.

| ACTIVITIES   | WORKLOAD      |               |               |               |               |               |               | DAILY MEAN    |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|  | Mon.          | Tues.         | Wed.          | Thurs.        | Fri.          | Sat.          | Sun.          |               |
| Materials received from consumer units   | 49.93         | 40.00         | 48.28         | 39.47         | 40.66         | 22.64         | 21.15         | 37.45         |
| Cleaning materials   | 30.43         | 25.01         | 34.35         | 24.59         | 23.17         | 11.52         | 9.08          | 22.59         |
| Reception of materials on consignment  | 2.40          | 1.30          | 2.50          | 1.50          | 1.70          | 2.10          | 0.90          | 1.77          |
| Conference of consignment materials after surgery  | 3.60          | 1.95          | 3.75          | 2.25          | 2.55          | 3.15          | 1.35          | 2.66          |
| Return of consignment materials to supplier companies  | 1.20          | 0.65          | 1.25          | 0.75          | 0.85          | 1.05          | 0.45          | 0.89          |
| Drying of materials and distribution on the preparation benches                                | 46.05         | 39.15         | 54.20         | 36.75         | 35.10         | 16.65         | 13.75         | 34.52         |
| Inspection, testing and separation of clean materials or instruments                           | 55.05         | 39.90         | 61.65         | 37.55         | 38.75         | 16.65         | 16.15         | 37.96         |
| Assembly and packaging of materials and instruments  | 42.00         | 29.25         | 52.05         | 26.90         | 42.75         | 11.45         | 12.40         | 30.97         |
| Assembly and packaging of ventilator assistance kits or circuits                               | 1.35          | 2.81          | 4.16          | 1.75          | 2.31          | 2.77          | 0.76          | 2.27          |
| Load assembly and follow-up of the sterilization cycle   | 2.53          | 2.66          | 2.93          | 2.53          | 2.13          | 1.06          | 1.33          | 2.17          |
| Removal of the sterile load and verification of the effectiveness of the sterilization process | 0.95          | 1.00          | 1.10          | 0.95          | 0.80          | 0.40          | 0.50          | 0.81          |
| Storage of sterile materials and clothing  | 3.17          | 2.11          | 1.91          | 1.85          | 1.52          | 0.66          | 0.86          | 1.73          |
| Loading of transport vehicles for consumer units   | 18.46         | 16.06         | 18.48         | 15.46         | 15.14         | 9.34          | 9.50          | 14.64         |
| Organization and control of the environment and sterile materials                              | 39.86         | 33.13         | 38.12         | 31.58         | 30.23         | 18.68         | 19.64         | 30.18         |
| <b>Total*</b>  | <b>296.98</b> | <b>234.98</b> | <b>324.73</b> | <b>223.86</b> | <b>237.64</b> | <b>118.12</b> | <b>107.81</b> | <b>220.59</b> |

\* $\chi^2$   $p < 0.005$  (Monday and Wednesday with other days of the week).

It was found that weekend workloads decreased considerably, and statistical analysis showed that the workload was significantly higher on Monday and Wednesday when compared to the other days of the week.

By knowing the average daily workload, it was possible to do the staff sizing for the sector. Thus, using the formula presented in the methodology and considering the average

daily workload (220.59 hours), the working day determined by the institution, which is 36 hours, and the technical safety index recommended by COFEN Resolution no. 527<sup>(9)</sup>, which is 15%, the number of nursing technicians/assistants required for the MSC was 49.32.

The need for employees on different days of the week for the different activities carried out in the MSC is presented in Table 3.

**Table 3** – Number of nursing technicians/assistants needed for the MSC according to activities performed and days of the week – Uberlândia, MG, Brazil, 2017.

| ACTIVITIES  | NUMBER OF EMPLOYEES |       |       |        |      |      |      | MEAN |
|---|---------------------|-------|-------|--------|------|------|------|------|
|   | Mon.                | Tues. | Wed.  | Thurs. | Fri. | Sat. | Sun. |      |
| Materials received from consumer units                          | 11.16               | 8.94  | 10.80 | 8.83   | 9.09 | 5.06 | 4.73 | 8.37 |
| Cleaning materials  | 6.80                | 5.59  | 7.68  | 5.50   | 5.18 | 2.58 | 2.03 | 5.05 |
| Reception of materials on consignment                           | 0.54                | 0.29  | 0.56  | 0.34   | 0.38 | 0.47 | 0.20 | 0.40 |
| Conference of consignment materials after surgery               | 0.81                | 0.44  | 0.84  | 0.50   | 0.57 | 0.70 | 0.30 | 0.59 |
| Return of consignment materials to supplier companies           | 0.27                | 0.15  | 0.28  | 0.17   | 0.19 | 0.23 | 0.10 | 0.20 |
| Drying of materials and distribution on the preparation benches | 10.30               | 8.75  | 12.12 | 8.22   | 7.85 | 3.72 | 3.07 | 7.72 |

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| ACTIVITIES   | NUMBER OF EMPLOYEES |              |              |              |              |              |              | MEAN         |
|--|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|  | Mon.                | Tues.        | Wed.         | Thurs.       | Fri.         | Sat.         | Sun.         |              |
| Inspection, testing and separation of clean materials or instruments                           | 12.31               | 8.92         | 13.79        | 8.40         | 8.66         | 3.72         | 3.61         | 8.49         |
| Assembly and packaging of materials and instruments  | 9.39                | 6.54         | 11.64        | 6.02         | 9.56         | 2.56         | 2.77         | 6.93         |
| Assembly and packaging of ventilator assistance kits or circuits                               | 0.30                | 0.63         | 0.93         | 0.39         | 0.52         | 0.62         | 0.17         | 0.51         |
| Load assembly and follow-up of the sterilization cycle   | 0.57                | 0.59         | 0.65         | 0.57         | 0.48         | 0.24         | 0.30         | 0.48         |
| Removal of the sterile load and verification of the effectiveness of the sterilization process | 0.21                | 0.22         | 0.25         | 0.21         | 0.18         | 0.09         | 0.11         | 0.18         |
| Storage of sterile materials and clothing  | 0.71                | 0.47         | 0.43         | 0.41         | 0.34         | 0.15         | 0.19         | 0.39         |
| Loading of transport vehicles for consumer units   | 0.00                | 0.00         | 0.00         | 0.00         | 0.00         | 0.00         | 0.00         | 0.00         |
| Organization and control of the environment and sterile materials                              | 4.13                | 3.59         | 4.13         | 3.46         | 3.38         | 2.09         | 2.13         | 3.27         |
| Materials received from consumer units   | 8.91                | 7.41         | 8.52         | 7.06         | 6.76         | 4.18         | 4.39         | 6.75         |
| <b>Total*</b>  | <b>66.41</b>        | <b>52.54</b> | <b>72.61</b> | <b>50.06</b> | <b>53.14</b> | <b>26.41</b> | <b>24.11</b> | <b>49.32</b> |

\*X<sup>2</sup> p< 0.005 (Monday and Wednesday with other days of the week).

It was found that the average number of required staff is significantly higher on Mondays and Wednesdays, and that staffing requirements are considerably reduced on weekends.

The data also enabled us to identify the number of nursing technicians/assistants needed for each of the work areas in the MSC (Table 4).

**Table 4** – Number of nursing technicians/assistants per MSC area according to the days of the week – Uberlândia, MG, Brazil, 2017.

| AREAS  | NUMBER OF EMPLOYEES |              |              |              |              |              |              | MEAN*        |
|--|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|  | Mon.                | Tues.        | Wed.         | Thurs.       | Fri.         | Sat.         | Sun.         |              |
| Cleaning/disinfection                                      | 19.08               | 15.45        | 19.78        | 15.22        | 15.1         | 8.03         | 7.05         | 14.24        |
| Control of consigned materials                             | 1.55                | 0.84         | 1.62         | 0.97         | 1.1          | 1.35         | 0.58         | 1.14         |
| Materials preparation                                      | 30.24               | 23.25        | 35.96        | 21.57        | 24.89        | 9.9          | 9            | 22.12        |
| Sterilization  | 0.55                | 0.58         | 0.64         | 0.55         | 0.47         | 0.23         | 0.29         | 0.47         |
| Storage and distribution of sterile materials and clothing | 14.91               | 12.52        | 14.29        | 11.94        | 11.44        | 6.99         | 7.32         | 11.34        |
| <b>Total</b>   | <b>66.33</b>        | <b>52.64</b> | <b>72.28</b> | <b>50.25</b> | <b>52.98</b> | <b>26.50</b> | <b>24.24</b> | <b>49.32</b> |

\*X<sup>2</sup> p<0.005 (Cleaning/disinfection and Materials preparation with the other sectors).

It could be verified that the areas which require less employees are the Control of consigned materials and the Sterilization area. Statistical analysis showed that the

number of staff required for the Materials preparation and Cleaning/disinfection areas is significantly higher than for the others.

Table 5 was elaborated to verify if there is a difference between the number of nursing technicians/assistants in the different work shifts in the MSC.

**Table 5** – Average number of nursing technicians/assistants required by the MSC according to area and work shift – Uberlândia, MG, Brazil, 2017.

| MSC AREA   | MORNING     | AFTERNOON   | NIGHT        | MEAN         |
|--|-------------|-------------|--------------|--------------|
| Cleaning   | 4.4         | 4.7         | 4.43         | 4.51         |
| Control of consigned materials                             | 0           | 0.2         | 0.3          | 0.17         |
| Materials preparation                                      | 8.1         | 7.1         | 8.49         | 7.90         |
| Sterilization  | 0.1         | 0.1         | 0.1          | 0.10         |
| Storage and distribution of sterile materials and clothing | 2           | 5           | 3            | 3.33         |
| <b>Total*</b>  | <b>14.6</b> | <b>17.1</b> | <b>16.32</b> | <b>16.01</b> |

\*X<sup>2</sup> between shifts p > 0.005.

It was verified that there is no statistically significant difference between the numbers of employees needed for the different work shifts.

## DISCUSSION

In the course of this study, it was observed that the literature on MSC is focused on the technical knowledge and the most efficient practice, with few works which address the activities and the work processes developed in this area with the purpose of promoting subsidies for the nursing staff sizing in the MSC<sup>(7-9)</sup>. Thus, when the results achieved in this study are analyzed in conjunction with the existing knowledge about staffing in MSC could contribute to fill this gap in the literature on the subject<sup>(7)</sup>.

With the data collection, it was observed that almost all the standardized activities<sup>(7-9)</sup> are performed in the MSC; the only one that is not performed on location is loading the transport cars to the consumer units. This can be observed due to the work method determined by the institution, which does not allow employees to take the sterilized material to the hospital sectors. All materials are stored in the sterile room and distributed by the counter according to the needs of each sector. The sector worker goes to the MSC and exchanges contaminated material (delivered to the cleaning area) with sterile material (removed from the distribution counter). If the loading of the transport cars existed in the MSC of the analyzed Hospital, the number of staff needed would certainly be greater than in the one under study. Within the hospital institutions around the country there are MSCs in which such activity exists and others in which it does not exist; a fact which will always interfere in the staff sizing result.

The data regarding the number of times the activities are performed show that the most frequent are the reception, organization and distribution of materials, followed by cleaning, drying, inspection of the materials and assembly

of the packages. These were also the most performed activities in the four studied MSCs in the research in which the standard times for each activity were determined<sup>(8)</sup>, which can be explained by the fact that all material, irrespective of whether or not it is sterilized, needs to be approved, and all materials that are sterilized need to be organized in the sterile room and distributed to the consumer units. In addition, most of the material processed in the MSC comes from the operating room and needs to be washed, dried, inspected and packaged in boxes or packages.

On the other hand, the less frequently performed activities are the load assembly and follow-up of the sterilization cycle, withdrawing the sterile load and verifying the effectiveness of the sterilization process, the conference and return of the consignment materials together to the suppliers and storing the sterile materials and clothing. These were also the activities with less performance frequency in the aforementioned study<sup>(8)</sup>. Assembly, monitoring and withdrawal of the sterile load are the least performed activities due to waiting for the materials needed to assemble a load, and only two or three loads per shift are performed depending on the service flow. The receiving and return of consigned materials are less performed activities because these materials are used in specific surgeries, and the hospital also has consigned material kits, which are in the hospital itself, and there is no need to make requests to the companies, as the request is restricted to replacing the materials consumed in surgeries such as plates, pins, wires and screws.

In addition, the results of the study demonstrated all activities performed in the MSC presented in the literature as subsidies for defining the unit workload<sup>(7)</sup>.

The highest daily averages of workload are found in reception, inspection and separation, drying, distribution, cleaning of materials and assembly of the packages. This result was also similar to that found in the four MSCs evaluated in that same study<sup>(8)</sup>.

The joint analysis of the three variables showed that the most frequent activities in the MSC are also those that represent a greater workload, and consequently demand the largest number of staff, constituting 87.4% of the total staff.

The study also allowed to identify in detail what is presented in the literature as the main measure for the staff sizing, namely the existing workload<sup>(6)</sup>.

Statistical analysis of the existing workload in the MSC and the amount of staff required per day of the week showed that Mondays and Wednesdays have a significantly higher workload than the other days of the week, and therefore require a statistically higher quantity than the other days, especially when compared to the weekend.

A study which analyzed the workload in the MSC through the production of material packages<sup>(10)</sup> did not find a significant difference between the weekend (when an increase occurred in the production of simple packages) and the working days. This result, unlike the result of the present study, may have occurred due to the different methodology used which did not consider all the activities carried out in the MSC.

No other studies addressing the distribution of activities, workload or quantity of MSC staff over the days of the week were found in the literature, which therefore did not allow a comparison of these data. However, although it was not the object of this study, such results can be explained by the number of elective surgeries performed at the surgical center and obstetric center, which is larger on these days of the week. Thus, the days of the week with the highest concentration of workload and need for employees may vary from one institution to another.

MSC activities can often be grouped into four or five clearly defined areas of work, commonly referred to as cleaning, consignment, preparation, sterilization, and storage and distribution.

The results on the staffing amount needed for each of these areas showed that the material preparation area and the cleaning/disinfection require a statistically larger number of staff than the others, as these two areas together demand 73.72% of the total staff needed for the MSC, and this is because the activities with the highest workload are carried out in these two areas. On the other hand, the sterilization and control of consigned material areas demand only 3.26% of the total staffing due to the fact that there are few surgeries in which consigned materials are used, in addition to the small number of sterilization cycles. No data were found in the literature to compare these findings.

It was found that even though the shift in the afternoon required more personnel to carry out the activities, there was no significant difference between the number of employees needed for the morning, afternoon and evening shifts. No study was found which analyzed the need for shift work, but although it was not the result of the study performed to determine the standard times of activities<sup>(8)</sup>, the number of employees in two of the four MSCs varied little over the three shifts, and was slightly higher in the night shift.

The result of the sizing performed using the workload found and the proposed formula described above demonstrated that the MSC under study needs 49.32 nursing technicians/assistants.

Today the sector has 41 employees, which is not enough according to the nurse responsible for the sector; however, there are four additional employees who do 144 hours of shift work, which corresponds to four employees in addition to the total. Thus, in reality the sector has been working with 45 employees. When comparing the result found in the sizing performed (49.32 employees) with the total number of employees in the industry (45), it was verified that the sizing meets the needs of the sector under the current conditions and demonstrates the need for four more technicians/assistants. In addition, the statistical analysis shows that there

is no significant difference between the total found in the sizing and the total in the sector ( $p > 0.005$ ).

The result was then compared with the last sizing in the sector, in which the Functional Sites methodology was used where nurses of the sector randomly stipulated the ideal number of Functional Sites. In this sizing, we considered the existence of 289 functional sites, and the same data used in the sizing of this study, meaning the work period of 6 hours, the weekly workload of 36 hours and the technical safety index of 15%. Such size scaling demonstrated the need for 55 professionals, which is also not statistically different from the result found in the sizing resulting from this study ( $p > 0.005$ ).

Thus, it was verified that the activities and their respective performance times established as the standard<sup>(7-9)</sup> met the needs of staff sizing, and can be used as a methodology for calculating personnel in this and other MSCs.

A limitation of this study was the impossibility of performing a better discussion by making comparisons with literature data, which is scarce. Some integrative reviews of the literature show that only one of the 48 published studies on workload relates to the MSC<sup>(11)</sup>, and those seeking studies on staff sizing show that none of the 27 articles refer to MSC<sup>(12)</sup>, only one of 29 articles was related to MSC<sup>(13)</sup>, and only one from 37 was about MSC<sup>(14)</sup>. This article found in the reviews is the same one used in this study.

## CONCLUSION

This study allowed to: verify that only one of the fifteen activities established as standard in the studies which supported this was not performed in the studied MSC; find the number of times each activity was performed in a standard week; calculate the workload corresponding to each activity and every day of the week; calculate the amount of staff needed to carry out the different activities on different days of the week; and determine the number of employees needed for the MSC for each of its areas and for each of the work shifts.

The study showed that the staffing amount resulting from the performed sizing is not different from the amount of staff in the sector, nor from the amount of staff resulting from the last calculation in the sector, thereby allowing to conclude that the standardized activities and their respective standard times evaluated in this study can be used as a methodology for calculating staffing in this and other MSCs.

In order to facilitate staffing, we suggest that nurses responsible for MSCs find ways to permanently account for standardized activities so that they will always have the numbers needed to perform staffing calculations at hand.

## RESUMO

**Objetivo:** Aplicar os parâmetros de tempo padrão das atividades de enfermagem propostos pela Resolução COFEN n.º 543/2017 para dimensionar o quantitativo de técnicos de enfermagem no centro de material e esterilização de um hospital universitário e comparar o quadro projetado com o existente no setor. **Método:** Pesquisa exploratória e descritiva, com a coleta de dados realizada nas folhas de controle de esterilização e observação direta das etapas do processo de trabalho nas diferentes áreas do setor. **Resultados:** Apenas uma das 15 atividades descritas não era realizada no setor; as mais realizadas, que apresentaram maior carga de trabalho e requeriam maior

número de pessoal foram a recepção de materiais contaminados e a organização e distribuição do material esterilizado; as áreas que requeriam maior quantitativo de funcionários foram o preparo de materiais e o expurgo. Não foi observada diferença entre o número de pessoal requerido nos diferentes turnos de trabalho, e o quantitativo de pessoal calculado foi semelhante ao existente ao resultado do dimensionamento realizado utilizando os chamados sítios funcionais. **Conclusão:** As propostas analisadas neste estudo podem ser utilizadas para o cálculo de pessoal no setor estudado e em outras instituições.

## DESCRITORES

Esterilização; Dimensionamento de Pessoal; Recursos Humanos de Enfermagem no Hospital; Carga de Trabalho.

## RESUMEN

**Objetivo:** Aplicar los parámetros de tiempo estándar de las actividades de enfermería propuestos por la Resolución COFEN nº 543/2017 para dimensionar la cantidad de técnicos de enfermería en el centro de material y esterilización de un hospital universitario y comparar el cuadro diseñado con el existente en el sector. **Método:** Investigación exploratoria y descriptiva, con la recolección de datos llevada a cabo en las hojas de control de esterilización y observación directa de las etapas del proceso laboral en las distintas áreas del sector. **Resultados:** Solo una de las 15 actividades descritas no era realizada en el sector; las más realizadas, las que presentaron mayor carga laboral y requirieron mayor número de personal, fueron el recibimiento de materiales contaminados y la organización y distribución del material esterilizado; las áreas que requirieron mayor cantidad de funcionarios fueron la preparación de materiales, su limpieza y desinfección. No se observó diferencia entre el número de personal requerido en los distintos turnos laborales y la cantidad de personal calculada fue semejante a la existente en el resultado del dimensionamiento realizado utilizando los llamados sítios funcionales. **Conclusión:** Las propuestas analizadas en este estudio pueden utilizarse para el cómputo de personal en el sector estudiado y en otros centros.

## DESCRIPTORES

Esterilización; Reducción de Personal; Personal de Enfermería en Hospital; Carga de Trabajo.

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