Original Article

Nursing activities in central supply and sterilization: a contribution to personnel design*

Atividades de enfermagem em centro de material e esterilização: contribuição para o dimensionamento de pessoal

Actividades de enfermería en centro de material y esterilización: contribución para el tamaño del personal

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ABSTRACT

Objectives: To identify and validate the activities performed by nursing staff in the Central Supply and Sterilization department, in order to define the workload of nurses on this unit**. Methods:** Nursing activities were identified through a review of literature and statements made by official agencies on the subject. To validate these identified activities, we used the Delphi technique to achieve content validation. **Results:** 11 nurse experts working in Central Supply and Sterilization participated in the study. Comments and suggestions made in the first phase of the Delphi technique led to changes in the content of these activities. These changes were then re-assessed by the experts, resulting in the validation of six areas of work, 25 sub-processes, 110 activities and 25 specific nursing activities. **Conclusion:** This research identified prospects for new investigations that contribute to parameters supporting the process of scaling the nursing staff in these units.
Keywords: Nursing staff, hospital; Nurse's role; Materials management, hospital

RESUMO

Objetivos: Identificar e validar as atividades realizadas pela equipe de enfermagem em Centros de Material e Esterilização, como subsídio para definição da carga de trabalho da unidade. **Métodos**: A identificação das atividades ocorreu, mediante consulta às indicações formuladas pelos órgãos oficiais, bem como levantamento bibliográfico sobre o assunto. Na validação das atividades identificadas, foi utilizado o método da Validade de Conteúdo, aplicando-se a Técnica Delphi. **Resultados**: Participaram como juízas 11 enfermeiras que atuavam em Centros de Material e Esterilização. Os comentários e sugestões realizados na primeira fase da Técnica Delphi, determinaram alterações no conteúdo do quadro de atividades, que foram submetidas à nova avaliação do grupo, resultando na validação de seis áreas de trabalho, 25 subprocessos, 110 atividades e 25 atividades específicas da enfermeira. **Conclusão:** Com esta pesquisa evidenciam-se perspectivas para a realização de novas investigações que contribuam para a determinação de parâmetros que subsidiem o processo de dimensionar pessoal de enfermagem nestas unidades.
Descritores: Recursos humanos de enfermagem no hospital; Papel do profissional de enfermagem; Administração de materiais no hospital

RESUMEN

Objetivos: Identificar y validar las actividades realizadas por el equipo de enfermería en Centros de Material y Esterilización, como subsidio para la definición de la carga de trabajo de la unidad. **Métodos**: La identificación de las actividades se llevó a cabo mediante la consulta a las indicaciones formuladas por los órganos oficiales, así como por el levantamiento bibliográfico sobre el asunto. En la validación de las actividades identificadas, se utilizó el método de Validez de Contenido, aplicándose la Técnica Delphi. **Resultados**: Participaron como jueces 11 enfermeras que trabajaban en Centros de Material y Esterilización. Los comentarios y sugerencias realizadas en la primera fase de la Técnica Delphi, determinaron alteraciones en el contenido del cuadro de actividades, que fueron sometidas a la nueva evaluación del grupo, resultando en la validación de seis áreas de trabajo, 25 sub procesos, 110 actividades y 25 actividades específicas de la enfermera. **Conclusión:** Con esta investigación se evidencian perspectivas para la realización de nuevas investigaciones que contribuyan a la determinación de parámetros que subsidien el proceso de establecer el tamaño del personal de enfermería en estas unidades.
Descriptores: personal de enferméria en hospital; rol de la enfermera; administración de materiales de hospital

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INTRODUCTION

In recent decades, the Brazilian healthcare system has been struggling with improving quality of services offered to the population. To achieve this goal, it is paramount to incorporate new management strategies that can reduce costs, improve services and meet customers' needs and expectations[1].

However, the lack of understanding of effective measures that can enable control of costs and reduction of expenses has had an impact on human resources policies of health care institutions, strongly affecting nursing professionals, who account for the highest number of employees within these institutions.

Faced with limited budgets, managers of healthcare institutions frequently resort to quantitative/qualitative decrease of nursing personnel, which implies on work overload, impairs organization and delivery of patient care, and compromises implementation of strategies to improve quality of care.

Consequently, nurses in charge of managing nursing services have found it hard to allocate their personnel. Faced with the challenge of offering immediate and safe care to patients, nurses try to distribute human resources available prioritizing patient care, rather than areas not directly involved in direct patient care.

Therefore, in spite of the pivotal role that Central Sterile Supply Units (CSSUs) perform in the quality of care, particularly when performed within hospitals, they frequently struggle with insufficient or under-qualified personnel to develop activities regarding processing odontological-medical-hospital items.

This situation is worsened by the lack of standardized approach to estimate personnel needs, taking into account the specificity of the tasks carried out in this area, and provide nurses with the necessary evidence to estimate needs and assess personnel performance in CSSUs, providing solid data to subsidize proposals related to allocating additional personnel when negotiating with higher management.

The main approach to estimate nursing personnel relies on the concept of workload per nurse, which is calculated according to the average number of patients, taking into account the patient's degree of dependence on the nursing team or the type of care provided, the average time necessary per patient, considering the degree of dependence or type of care[2].

From this point of view, the workload is based on patients' needs for direct and indirect care, and the time spent by the nursing team to provide such care[3].

Based on the same principle, a similar calculation could be made at CSSUs, identifying the tasks performed and determining the time spent on each task required to process materials.

Considering the lack of a widely accepted model to subsidize the estimation of personnel for these units, this study aimed at identifying and validating activities developed in each area of hospital CSSUs, in order to subsidize the definition of the time spent to perform them and provide parameters to plan and assess a suitable personnel structure to provide these services adequately.

METHODS

This is a study of methodology development[4], aiming at identifying and validating activities carried out by the nursing team at CSSUs, to generate initial data to subsidize assessment of workload at these units.

In order to identify activities developed by the nursing team at CSSUs, we initially consulted recommendations issued by Brazilian departments of health, as well as the few guidelines available. Secondly, we reviewed the literature on the subject, considering the pertinent activities performed in each area of CSSUs, as well as those which are carried out specifically by nursing professionals.

In order to validate activities identified as being representative of those performed by nurses at CSSUs, we used the content validation approach[5] applying the Delphi technique[6].

The panel of experts consisted of nurses, board-certified and/or with at least 5 years experience at CSSUs in hospitals in São Paulo that were appointed as references for the high quality of their services.

These hospitals were indicated by four university professors with extensive expertise and work experience in this area, who contribute for the definition of minimum criteria for these activities and carry out academic activities in this area of expertise. Out of the fourteen institutions appointed, we excluded the ones that did not qualify as general hospitals (n=3). The panel of experts who participated in our study consisted of 11 nurses, each representing one of the 11 remaining institutions.

This panel evaluated the relevance, clarity and objectivity of the definitions of the work areas and the related sub-processes; clarity and objectivity in describing activities performed in each area; representativeness of the activities described regarding nursing-related work in each area; performance of these activities, need for inclusion or exclusion of activities in each area.

Areas, work sub-processes and activities that reached agreement of at least 70% in any phase of the Delphi Technique were considered valid.

All participants were informed of the aim of the study, the confidentiality regarding individual participations, the voluntary character of participation and signed the Informed Consent. The study was approved by the Ethics Review Board of the School of

Nursing – University of São Paulo (registration number 728/2008).

RESULTS

Review of literature initially identified 200 articles in local and/or international publications, but only 12[7-18] of which allowed for the identification of activities performed by nursing professionals at hospital CSSUs .In addition, we complemented our research with regulations and guidelines related to the topic[19-30].

Activities identified in the literature were analyzed and organized in a specific instrument, which was later be subjected to analysis by the panel of experts.

In the literature we identified 44 activities related to 5 work areas and 18 activities that are attributable to the nurse.

Analysis of literature showed that activities performed at CSSUs are structured according to the work processes developed at the different areas of the unit.

Based on that, in our instrument each area was defined and presented as a specific work process, identified by a letter (A-F). Within each area, each work sub-process was identified, defined and represented by a number. Related activities were represented by letters and numbers.

Although sterilization is a single step in the preparation process, the area was divided according to the type of sterilization performed (autoclaving under pressure and low temperature sterilization), as the use of certain sterilization agents and/or equipment demands specific procedures and separate area for execution[6,17,19-20].

Therefore, the instrument presented to the panel consisted of 6 work areas, 24 sub-processes, 96 activities and 18 activities which are attributable to the nurse.

Throughout our study the panel consisted of 11

Table 1 – Nursing activities validated by the panel in area A – Soiled or contaminated. Sao Paulo, 2009

Area A – Soiled or contaminated: receipt, checking, cleaning and disinfection of supplies
Work sub-process 1 - Receipt
A.1.1 Receipt of containers with contaminated supplies returning from client units, such as wards, outpatient units, emergency room, diagnostic and image units, hemodynamic unit and endoscopy unit. This area is restricted to authorized personnel.
A.1.2 Receipt of containers with contaminated supplies returning from the obstetric and surgery rooms. This area is restricted to authorized personnel
A.1.3 Unloading containers from the goods lift with contaminated supplies returning from the obstetric and surgery rooms
A.1.4 Checking contaminated supplies returning from client units, such as wards, outpatient units, emergency room, diagnostic and image units, hemodynamic unit, endoscopy unit, obstetric and surgery rooms.
A.1.5 Registration of contaminated supplies received client units, such as wards, outpatient units, emergency room, diagnostic and image units, hemodynamic unit, endoscopy unit, obstetric and surgery rooms.
Work sub-process 2 – Sorting and disassembly
A.2.1 Sorting supplies received from client units.
A.2.2 Preparation of cleaning dilution.
A.2.3 Opening hinges and disassembly of other types of supplies received.
A.2.4 Soaking supplies for pre-established length of exposure, before manual cleaning.
A.2.5 Preparation of racks with supplies for washing/decontamination.
A.2.6 Preparation of racks with supplies for respiratory support for washing/decontamination.
A.2.7 Preparation of racks with supplies for ultrasonic cleaning.
Work sub-process 3 - Cleaning
A.3.1 Individual manual cleaning of supplies.
A.3.2 Loading racks into washer/decontaminator and programming cleaning cycle.
A.3.3 Loading racks with respiratory support equipment into washer/ decontaminator and programming cleaning cycle.
A.3.4 Loading racks with supplies for ultrasonic cleaning and programming cleaning cycle.
A.3.5 Rinsing supplies after ultrasonic cleaning.
Work sub-process 4 – Disinfecting supplies for respiratory support
A.4.1 Steam washing/decontamination of heat-tolerant items.
A.4.2 Chemical disinfection of supplies.
Work sub-process 5 - Inspection
A.5.1 Inspection of supplies that were washed manually.
A.5.2 Inspection of supplies that were cleaned in the ultrasonic washer.
Work sub-process 6 – Re-washing supplies
A.6.1 Re-washing all supplies previously subjected to cleaning but still soiled after inspection.
Work sub-process 7 – Drying supplies
A.7.1 Individual manual drying of supplies using absorbent fabric.
A.7.2 Manual drying of supplies under pressurized airflow.

Table 2 – Nursing activities validated by the panel in area B – Control of Loaner Supplies. Sao Paulo, 2009.

Area B – Control of loaner supplies: designated for receiving, checking and returning loaner supplies
Work sub-process 1 - Receipt, checking and registration
B.1.1 Receipt of loaner supplies sent by vendors to be sterilized, according to surgeon's requests and vendors' inventory.
B.1.2 Receipt of pre-sterilized loaner supplies sent by vendors, according to surgeon's requests and vendors' inventory.
B.1.3 Checking supplies to be sterilized, according to the usual procedure.
B.1.4 Checking pre-sterilized supplies, according to the usual procedure.
B.1.5 Registration of supplies to be sterilized, according to the usual procedure.
B.1.6 Registration of pre-sterilized supplies, according to the usual procedure.
B.1.7 Identification of loaner supplies, according to the usual procedure.
B.1.8 Delivery of loaner supplies to Area A – Soiled or contaminated to be sterilized
B.1.9 Delivery of pre-sterilized loaner supplies to Area F- Storage and distribution of sterile supplies.
Work sub-process 2 – Checking supplies returning from operation room
B.2.1 Checking supplies received after surgical procedure.
B.2.2 Registration of supplies used, for further invoicing and registration in patient's chart, according to the usual procedure
Work sub-process 3 – Return of loaner supplies
B.3.1 Checking loaner supplies to be returned.
B.3.2 Re-checking loaner supplies in the presence of vendor's representative, registering return to vendor.

Table 3 – Nursing activities validated by the panel in area C – Preparation of supplies. Sao Paulo, 2009

Area C – Preparation of supplies: designated for inspection and assembly of supplies, including supplies for respiratory support and surgical supplies
Work sub-process 1 – Receipt of supplies from area A - soiled or contaminated supplies
C.1.1 Receipt of manually cleaned supplies.
C.1.2 Receipt of supplies disinfected in the steam washer/decontaminator. Unload the equipment.
C.1.3 Receipt of supplies washed in the ultrasonic washer.
Work sub-process 2 – Drying of supplies
C.2.1 Individual manual drying of supplies using absorbent fabric.
C.2.2 Manual drying of supplies under pressurized airflow.
C.2.3 Automated drying in the drying machine.
Work sub-process 3 – Sorting, inspection, lubrication and testing of clean supplies
C.3.1 Sorting and labeling of supplies.
C.3.2 Inspection of supplies, checking for cleanliness.
C.3.3 Manual lubrication of supplies.
C.3.4 Verification of integrity of supplies.
C.3.5 Testing functioning of supplies.
C.3.6 Separation of non-conforming supplies for further assessment and disposal, according to specific protocol.
C.3.7 Replacement of non-conforming supplies.
Work sub-process 4 – Checking and assembly of supplies
C.4.1 Checking spare supplies.
C.4.2 Checking supplies in surgical boxes and/or kits, according to size and type.
C.4.3 Checking respiratory support kits/circuits.
C.4.4 Checking pieces of endoscopic surgery kits.
C.4.5 Assembly of spare supplies, applying chemical indicator to monitor sterilization process, according to the usual procedure.
C.4.6 Assembly of surgical box or kit, applying chemical indicator to monitor sterilization process, according to the usual procedure.
C.4.7 Assembly of respiratory support kits/circuits.
C.4.8 Assembly endoscopic surgery kits, applying chemical indicator to monitor sterilization process, according to the usual procedure.
Work sub-process 5 – Packaging of supplies
C.5.1 Packaging of supplies and spare supplies using surgical paper, film or tyvek.
C.5.2 Packaging of surgical kits and boxes using surgical paper, film or tyvek.
C.5.3 Manual packaging of spare supplies, surgical boxes and kits using sterile drapes, non-woven textile (spunbonded/meltblown/spunbonded) or crepe paper.
C.5.4 Packaging of surgical supplies, using rigid container systems.
C.5.5 Packaging of respiratory support kits in specific package.
C.5.6 Labeling of packages, according to the usual procedure.
Work sub-process 6 – Receipt, checking and assembly of clothing
C.6.1 Receipt of clothing to be sterilized.
C.6.2 Checking clothing to be sterilized.

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C.6.3 Assembly of packages of surgical kits to be sterilized, placing sterilization indicator, according to the usual procedure.
C.6.4 Manual packaging of clothing, using sterile drapes or non-woven textile (spunbonded/meltblown/spunbonded).
C.6.5 Labeling of assembled clothing packages, according to the usual procedure.
Work sub-process 7 – Delivery of supplies to outsourced sterilization services
C.7.1 Sorting supplies which will be sterilized by outsourced services.
C.7.2 Testing functioning and integrity of supplies to be sterilized by outsourced services.
C.7.3 Checking supplies to be sterilized by outsourced services.
C.7.4 Registration of supplies to be sterilized by outsourced services.

Table 4 – Nursing activities validated by the panel in areas D and E – Sterilization of Supplies. Sao Paulo, 2009

Area D – Sterilization in pressurized autoclave: designated for sterilization of supplies in autoclave
Work sub-process 1 – Loading autoclave and monitoring sterilization cycle
D.1.1 Performing Bowie Dick test to start equipment operation.
D.1.2 Loading autoclave, placing sterilization control tests.
D.1.3 Registering load number/cycle/batch to ensure tracking, according to the usual procedure.
D.1.4 Selection of sterilization cycle.
D.1.5 Monitoring autoclave operation parameters.
D.1.6 Documenting autoclave operation parameters.
Work sub-process 2 – Removal of sterile load from autoclave and verification of efficacy of sterilization process
D.2.1 Removal of sterile load from autoclave.
D.2.2 Verification of color alterations in chemical and biological indicators.
D.2.3 Incubation of biological indicators.
D.2.4 Reading and registration of biological indicators.
D.2.5 Organization and filing of sterilization test forms and controls.
Area E – Low temperature sterilization: designated for sterilization of supplies at low temperature
Work sub-process 1 - Loading and monitoring sterilization cycle
E.1.1 Performing test to start equipment operation
E.1.2 Loading equipment, placing sterilization control tests.
E.1.3 Registering load number/cycle/batch to ensure tracking, according to the usual procedure
E.1.4 Selection of sterilization cycle.
E.1.5 Monitoring operation parameters of the sterilization equipment.
E.1.6 Documenting operation parameters of the sterilization equipment.
Work sub-process 2 - Removal of sterile load and verification of efficacy of sterilization process
E.2.1 Removal of sterile load from sterilization equipment.
E.2.2 Verification of color alterations in chemical and biological indicators.
E.2.3 Incubation of biological indicators.
E.2.4 Reading and registration of biological indicators.
E.2.5 Organization and filing of sterilization test forms and controls.

nurses, all female, ranging in age from 27 to 54 years (64% over 40 years). Participants had significant work experience in this area (55% of participants, 6 – 15 years work experience) and/or were certified in management of Operating Room, Central Sterile Supply and Post-Operative Recovery (73%).This specialization encompasses management of the area of Central Supply.

In the first phase of the Delphi Technique all items described in the data collection instrument- areas, sub-processes and activities - were validated, reaching agreement level of 70% or above. However, comments and suggestions made by the panel required alterations in the content of the table of activities, which was re-evaluated by the panel.

After the second phase of the Delphi Technique, activities carried out by the nursing team at CSSUs, as well as the areas and sub-processes were considered validated, resulting in six work areas (represented by letters), 25 sub-processes (represented by numbers) and 110 activities (represented by letters and numbers), as show in Tables 1,2, 3, 4 and 5.

Activities which are attributable to the nurse in CSSUs and were validated by the panel were:

1. Coordination of the work process in the unit;
2. Supervision of activities carried out in the unit;
3. Definition of work schedule in each area of performance of the nursing team;
4. Monitoring execution of activities, especially when done by recently hired personnel;
5. Supervision of operation of equipment used in each work area;
6. Monitoring testing of products, supplies and equipment;
7. Supervision and control of receipt of loaner supplies to the unit;
8. Supervision and control of use and invoicing of loaner supplies to the vendor;
9. Supervision and control of return of loaner supplies to the unit;

Table 5 – Nursing activities validated by the panel in area F – Storage and distribution of sterile supplies. Sao Paulo, 2009

Area F – Storage and distribution of sterile supplies, designated for the storage and distribution of sterile supplies
Work sub-process 1 – Receipt of sterile supplies
F.1.1 Removal of sterile load from sterilization equipment; await result of sterilization tests before clearing for storage.
F.1.2 Receipt of sterile supplies from outsourced sterilization services.
F.1.3 Checking supplies received from outsourced sterilization services
Work sub-process 2 – Storage of sterile supplies
F.2.1 Inspection of packages with sterile supplies.
F.2.2 Use of "Cover Bag".
F.2.3 Return non-conforming packages for reprocessing
F.2.4 Store sterile supplies.
Work sub-process 3 – Organization and control of sterile environment and supplies
F.3.1 Verification and registration of temperature and humidity in the area.
F.3.2 Verification of expiration date of sterile supplies and sorting of overdue items.
F.3.3 Return overdue items for re-sterilization.
F.3.4 Verification and inventory registration of sterile supplies.
F.3.5 Assembly of surgical kits.
Work sub-process 4 – Distribution of sterile supplies
F.4.1 Distribution and registration of surgical kits, loaner supplies, other supplies and sterile clothing to Operation Rooms and Obstetric Ward, using goods lift.
F.4.2 Distribution and registration of surgical kits, loaner supplies, other supplies and sterile clothing to Operation Rooms and Obstetric Ward. This area is restricted to authorized personnel.
F.4.3 Distribution and registration of surgical kits, loaner supplies, other supplies and sterile clothing to other client units. This area is restricted to authorized personnel.

10. Confirmation of the daily schedule of surgeries, checking the delivery of loaner supplies;
11. Confirmation of the daily schedule of surgeries, checking the availability of sterile supplies;
12. Checking documentation of sterilization;
13. Follow up and control of stock of sterile supplies;
14. Follow up and assessment of maintenance of instruments and equipment;
15. Follow up and assessment of validation and qualification of equipment;
16. Follow up, planning and implementation of training programs;
17. Participation in purchasing supplies and equipment;
18. Participation in assessment of personnel performance;
19. Participation in administrative/management meetings regarding CSSU;
20. Participation in programs, committees, courses and events regarding CSSU;
21. Participation in defining programs to prevent occupational hazards and improve safety of workers;
22. Development of research;
23. Control of unit productivity;
24. Interaction with client units; and
25. Follow up on assessment of indicators of quality in the unit.

DISCUSSION

Review of the literature allowed us to observe that publications in the area of CSSU focus on technical knowledge and efficacy in the processing of odontological-medical-hospital items. Few studies were found regarding the activities performed, as well as the work processes developed by the nursing team in these units.

Comments and suggestions made by the panel of experts who participated in the first phase of the Delphi Technique of our study determined the implementation of alterations in the content of the table of activities initially proposed.

These alterations were subsequently compared to data found in the published literature regarding CSSU and comments/suggestions considered relevant were incorporated and subjected to a new analysis by the panel.

Definitions of three out of the six work areas described were modified: Area A - Soiled or Contaminated, Area B - Control of Loaner Supplies and Area C – Preparation of Materials.

Five out of the 24 work sub-processes proposed were also altered and subjected to assessment by the panel. Three of them were in area A – Soiled or Contaminated: sub-process 1 – receipt, sub-process 4 – disinfecting supplies for respiratory support and sub-process 7 – delivery of supplies/instruments to outsourced sterilization services. One of them was in area B – Control of Loaner Supplies - sub-process 2 - checking supplies returning from Operation Rooms. The last alteration was in area D – Sterilization in Pressurized Autoclave: sub-process 2 –removal of sterile load from autoclave and verification of efficacy of sterilization

process.

The panel suggested inclusion or exclusion of a few interventions in five areas of the table of activities, except for Area C – Preparation of Supplies and inclusion of actions in the list of activities attributable to the nurse.

Alterations were subjected to new evaluation, and were only included in case they reached consensus agreement of 70% or above in this second phase. Otherwise, the original text was maintained.

Minimum agreement level was not reached in six of the alterations proposed to the table of interventions performed by nursed at the CSSUs.

FINAL CONSIDERATIONS

This study allowed us to identify and validate the activities developed by the nursing team at CSSUs.

The use of the Delphi Technique allowed nurses with extensive experience in the area to point out specific aspects which characterize work performed at the CSSUs, thus contributing to the definition of concepts regarding the areas and work sub-processes identified.

This panel of nurses evaluated the areas, work sub-processes and activities as being relevant, stating that they adequately reflect the practice of the nursing team at CSSUs.

The better understanding of activities comprised in processing ondontological-medical-hospital items may subsidize future studies of time spent to perform them and the establishment of parameters to help plan and assess personnel suitable to achieve the goals for CSSUs.

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