Nursing time in a diagnostic imaging center: development of an instrument

Tempo de enfermagem em centro de diagnóstico por imagem: desenvolvimento de instrumento

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Abstract

Objective: Developing an instrument to measure the time spent by nursing staff in interventions performed in diagnostic imaging centers.
Methods: Cross-sectional study conducted at a private general hospital with the following steps: A) Identification of nursing activities through literature review and field observation. B) Cross-mapping of the activities identified in nursing interventions according to the Nursing Intervention Classification (NIC). C) Validation of interventions. D) Pilot test of the instrument using the work sampling technique.
Results: The judges validated 92 nursing activities corresponding to 32 interventions of the Nursing Interventions Classification (NIC). The most common interventions were: examination assistance, documentation, case management, telephone follow up, admission care and health care information exchange.
Conclusion: The instrument proposed to measure working time in nursing based on nursing interventions in Diagnostic Imaging Centers, has been validated and is available for use.

Resumo

Objetivo: Desenvolver um instrumento para medir o tempo despendido pela equipe de enfermagem, nas intervenções realizadas em centros de diagnóstico por imagem.
Métodos: Estudo transversal desenvolvido em hospital geral particular, conforme estas etapas: A) Identificação das atividades de enfermagem por meio de revisão bibliográfica e observação em campo. B) Mapeamento cruzado das atividades identificadas em intervenções de enfermagem, conforme a Classificação de Intervenções de Enfermagem (NIC). C) Validação das intervenções. D) Teste-piloto do instrumento com utilização da técnica de amostragem do trabalho.
Resultados: Foram validadas pelos juízes 92 atividades de enfermagem correspondentes a 32 intervenções da Classificação de Intervenções de Enfermagem NIC. As intervenções mais frequentes foram: Assistência em Exames, Documentação, Gerenciamento de Caso, Acompanhamento por telefone, Cuidados na admissão e Troca de Informações sobre cuidados de Saúde.
Conclusão: O instrumento proposto para medição do tempo de trabalho da enfermagem, fundamentado nas intervenções de enfermagem em Centro de Diagnóstico por Imagem, foi validado e encontra-se disponível para utilização.

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Introduction

The trends towards costs reduction and productivity increase are a global phenomenon and demand that professionals involved in the provision of health services use measures of cost analysis appropriate to the current reality.

Hence actions are necessary for continuous quantitative and qualitative evaluations of nursing staff in each sector of health organizations where those resources are allocated and where the assistance process is developed.[1]

A proper sizing of professionals in nursing is closely related with safety of patients and workers. In the absence of the quantitative and qualitative necessary to provide safety for patients, their protection will not be possible.[2]

Organizations that do not make efforts to provide good working conditions for nursing professionals can put their patients in situations of greater vulnerability to the occurrence of adverse effects.[3-5]

In its statement on patient safety the *International Council of Nurses*[6] reiterates that professionals and national nursing associations, have the responsibility to: show an active position in search of quality in nursing care, claim a better sizing of the nursing team and develop mechanisms that promote excellence in professional practice, aiming the promotion of patient safety.[6]

In recent years, the sizing of nursing staff has been studied in several areas of health care services.

However, with respect to services in which patients do not remain hospitalized, there is still a shortage of indicators to gauge nursing professionals, like in the cases of Diagnostic Imaging Centers (DIC), often called Radiology.

Among the major diagnostic and therapeutic modalities used in a DIC may be cited: Ultrasound, MRI (Nuclear Magnetic Resonance Imaging), CT (Computerized Tomography), Mammography, Conventional Radiology, Vascular and Interventional Radiology, Densitometry, Radiotherapy, Nuclear Medicine, among others.

Each of these modalities constitutes a universe with its own peculiar characteristics.

The radiological nursing is a specialty related to assistance for users submitted to diagnostic and therapeutic procedures in the DIC.[7]

The technological development, with more agile and resolute appliances favors the performance of invasive procedures, which in a prior moment would be performed in surgeries with greater risk of complications.

In this scenario the DIC have received more and more users in complex situations and depending on nursing care, which justifies the need for a number of staff qualified to meet this needs.

So the question that motivated the development of this study was:

What are the activities that affect the workload of nurses in assisting patients seen in the areas of CT, MRI, Ultrasound, Mammography and Conventional Radiology?

This question allows formulating the following hypothesis:

The Nursing Interventions Classification (NIC)[8] presents itself as an important theoretical and methodological framework for the classification of nursing activities in interventions to build an instrument to measure the time spent by nursing professionals during care with users in the DIC.

The taxonomy proposed by the *Center for Nursing Classification and Clinical Effectiveness*, called Nursing Interventions Classification (NIC), has been used by Brazilian researchers in building tools that allow measuring the time of nursing work.[9-12]

The NIC is a standardized language, proper for nursing, which is intended to communicate a common meaning to several sites of care, as well as helping the improvement of assistance and management practices through development of research that allows the comparison and evaluation of care in nursing provided in different settings.[8]

The aim of this study was to develop an instrument to measure the time spent by nursing staff in interventions/activities in Diagnostic Imaging Centers.

Methods

Cross sectional study conducted in a DIC at a private general hospital located in the city of São Paulo,

São Paulo Province, Brazil, considered to have good nursing practices by the accreditation received (*Joint Comission International:* Gold Certification), and because of the tradition in providing nursing services of high quality in the sectors of Computerized Tomography, Nuclear Magnetic Resonance Imaging, Ultrasound, Mammography and Conventional Radiology.

The DIC of this hospital has an expressive technological park, with equipments in constant modernization. It has four sets of computerized tomography equipment, five of nuclear magnetic resonance, 13 of conventional radiology x-ray, one stereotactic table, two digital mammography and 12 ultrasound machines.

The nursing staff of the studied sectors was composed of 62 professionals, including nurses and technicians/assistants in nursing. The study included 17 professionals, three nurses and 14 technicians/assistants in nursing that were present in the sectors during the data collection period and who consented to take part in the research.

The survey data were collected and organized according to the steps: identification of nursing activities; cross-mapping of the identified activities in accordance to the Nursing Interventions Classification NIC;[8] validation of the interventions/activities in nursing and pilot testing of the instrument.

The activities were raised through literature review and direct field observation. The literature review considered scientific papers, thesis, dissertations and books during the period between the years 2000 e 2011, written in English, Portuguese and Spanish along with the summaries.

The following database were used: *EMBASE, US National Library of Medicine (PubMed), Cumulative Index to Nursing and Allied Health Literature (CINAHL),* Literature of Latin America and the Caribbean in Health Sciences *(*Lilacs*), Medical Literature Analysis and Retrieval System Online (Medline).*

The descriptors were: nursing staff, workload and hospital radiology service.

After the survey and the analysis of the publications found, the ones that did not have nursing care in DIC as their main focus were excluded.

To identify the presence of other activities not mentioned in the literature on DIC, it was held a direct and non-participant observation of nursing professionals during the development of their activities in each sector for three days on average, in the period between 8am and 5pm, during the month of October 2011. The researchers recorded the activity using an electronic device (tablet) and at the end of the day, identified if there was duplication of activities.

Using the technique of cross-mapping, the activities were classified in nursing interventions according with the NIC[8].

To classify the activities in nursing interventions it was used the cross-mapping technique[13] which consists of allocating the identified activities in interventions, maintaining the consistency between the activity and the intervention definition in taxonomy.

The activities that are related to nursing work and that can be performed by other professionals were classified as associated and those not related to the work such as feeding, resting, etc were classified as personal.

The interventions/activities in nursing of the five sectors of the DIC were authenticated in a workshop through content validation[14] by seven judges chosen according to the criteria: nurse with four years of experience and knowledge in the nursing field in DIC and/or in use of NIC and who consented to participate of the Workshop.

Each nursing intervention was assessed regarding: clarity, objectivity in conceptualization, in description and classification of the indicated activities as well as whether the pointed activities represented nursing work in DIC and if there was necessity of inclusion or exclusion.

To construct the instrument to measure the distribution of working time in the DIC, the nursing interventions were listed alphabetically and identified by code. The workday was divided into columns and at intervals of 10 minutes.

The instrument was applied for each professional during six hours on a typical workday, in every sector of the study. The measurement observation always noticed the same sequence or, in other words, the same order of professionals observed when performing work, present in the sectors, to-

talizing three nurses and 14 technicians/assistants in nursing. The pilot testing had as main objective to identify if the designed instrument was able to capture the interventions/activities in practice and consequently, the distribution of time spent in these interventions/activities during a work shift.

For this it was used the work sampling technique, which consists in recording the activities of workers in predetermined categories by instant, intermittent and spaced observations.[15]

In pilot testing, interventions/activities were recorded periodically at intervals of ten minutes.

The collected data were stored in a database specially built for the research. For the quantitative variables, measures of central tendency (mean) were calculated.

The study complied with national and international ethical standards in research involving humans.

Results

126 activities have been identified: 107 in the literature review(16) and 19 activities were added during the field observation; mapped in 54 nursing interventions, according to the NIC. The activity "Attending administrative meetings" presented no NIC intervention that corresponded to this managerial activity inherent to nursing staff. It was decided to create the intervention "Administrative Meeting" to contemplate the activity.

The nursing interventions were analyzed and validated in a workshop composed of seven nurses/judges.

The panel of judges chose to group some interventions and activities, excluding others and as a result, the number of interventions and activities in nursing was reduced from 54 to 32 and from 126 to 92, respectively.

The list with the 32 interventions resulted in a measuring time instrument. The data in chart 1 represent the instrument proposed by the study. The nursing interventions were listed alphabetically and identified by code. The workday was divided into columns and at intervals of ten minutes.

After content validation, the instrument was tested by work sampling technique in 17 nursing professionals present in the five sectors and who consented to participate in the study, totalizing 720 observations. Figure 1 shows the percentage of time distribution in nursing interventions across the five sectors of the DIC. The nursing interventions considered had frequency ≥ 1%.

The percentage of time of the nursing staff of the five sectors of the DIC spent in nursing interventions was of 80%; in associated activities were employed 2% of the time and to personal activities were dedicated 18% of working time.

Discussion

The scarcity of studies on nursing care and the lack of research on sizing in DIC constitute limitations of discussion in this study. The fact that it was performed only in one DIC is a methodological limitation.

This study contributes to nursing offering a list of NIC activities and interventions that are performed in the five sectors of the DIC addressed by this study, and providing a tool for measuring the workload which is validated and ready for practical application.

The standardization through the use of NIC was essential to operationalize the use of this instrument, optimizing the whole process, from collection and analysis until the comparison of distribution of nursing professionals' time.

The content validation methodology through a workshop allowed the association of nurses with practical experience in DIC and nurses specialized in using NIC, which provided a critical view for improvement of the proposed instrument.

During the application of the instrument during a six-hour shift in each of the five sectors studied, all the interventions/activities in nursing performed during the practice of observed professionals were contained in the instrument, validating it in practice.

The work sampling has been considered an appropriate methodology to define the patterns of time distribution in nursing practice.[15] Some as-

**Chart 1.** Instrument to measure the distribution of working time of nursing professionals in DIC

INSTRUMENT: TIME MEASURING OF NURSING PROFESSIONALS IN DIC														

Name of the Collector: _____ Date: __/__/____

Name	7 hours	0	10	20	30	40	50	Name	10 hours	0	10	20	30	40	50
Person 1								Person 1							
Person 2								Person 2							
	8 hours	0	10	20	30	40	50		11 hours	0	10	20	30	40	50
Person 1								Person 1							
Person 2								Person 2							
	9 hours	0	10	20	30	40	50		12 hours	0	10	20	30	40	50
Person 1								Person 1							
Person 2								Person 2							

Number of assistances in the period observed:

Nursing Interventions

1 – Telephone follow up
2 - Medication administration
3 – Emotional support
4A – Examination assistance pre
4B - Examination assistance intra
4C – Examination assistance post
5 – Assistance in self-care: feeding
6 – Assistance in self-care: dressing/grooming
7 – Health screening
8 – Product evaluation
9 – Pain management
10 – Technology management
11 – Infection control
12 – Quality monitoring
13 – Supply management
14 –Environmental management: worker safety
15 – Emergency care

16 – Admission care
17- Postanesthesia care
18 - Delegation
19 – Staff development
20 – Critical path development
21 – Documentation
22 – Case management
23 –Preparatory sensory Information
24 – Shift report
25 - Family involvement promotion
26 – Exercise promotion
27 – Administration meeting
28 – Staff supervision
29 – Transport: interfacility
30 – Health care information exchange
31 - Emergency cart checking
32 - Controlled substance checking

Associated Activities

33 - Print labels
34 - Clean and organize cabinets and countertops
35 - Request repair/maintenance
36 - Answering nonspecific phone calls
37 – Locating companions
38 - Leave the unit to make referrals of several kinds
39 - Locating doctors

Personal Activities

40 - Food/ hydration
41 - Elimination
42 - Socialization
43 - Rest
44 – Answering personal phone calls
45 – Solving personal issues outside the unit
46 - Smoking
47 – Accessing internet for self-interest
48 - Delays
49 - Studying during working hours

pects related with time distribution observed in pilot testing are interesting.

In the five sectors the most significant intervention was the "Examination assistance" at the moment of pre-examination/procedure (36% to 57% of the time distribution).

In contrast, similar studies[9,11,12] in other areas pointed to the intervention "Documentation" as the most prevalent. In this study, the predominance of the intervention "Examination assistance" in relation to "Documentation" (3% to 11% of time) may be justified by the specificity of work dynamics in the DIC.
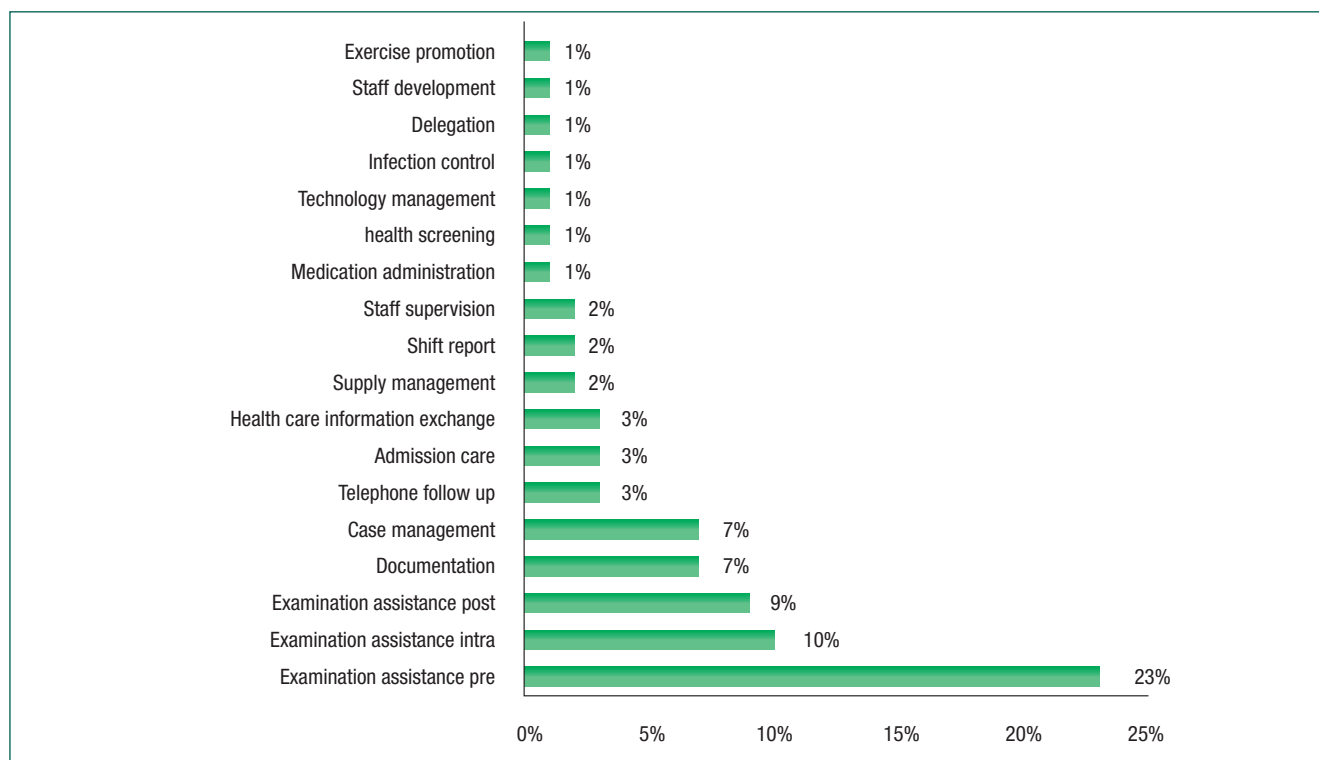
Figure 1. Percentage distribution of interventions by the nursing team at the DIC

The associated activities had little representation in the distribution of time (2%) but the personal accounted for 18%. This indicates a productive time (82%) inside the DIC that is adequate because levels higher than 90% can represent elevation of costs, decreased quality of care and nursing results.[17]

The identification of the distribution of time spent by nursing professionals in interventions/activities and presented in this study is still incipient due to the small number of observations.

Further studies applying the proposed instrument in different diagnostic centers and with a representative sample of professionals will enable the proposal of indicators of time spent on interventions/activities in nursing and therefore in the calculation of the workload in accordance to the care needs of users.

Conclusion

The instrument developed to measure working time in nursing is grounded in nursing interventions in

Diagnostic Imaging Centers in the sectors of Tomography, Magnetic Resonance Imaging, Ultrasound, Mammography and Conventional Radiology, has been validated and is available for use.

Collaborations
Cruz CWM and Gaidzinski RR declare to have contributed with the conception and the project, data analysis and interpretation; article drafting, critical review of intellectual content and final approval of the version to be published.

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