ORIGINAL ARTICLE

The medication process, workload and patient safety in inpatient units

Processos de medicação, carga de trabalho e a segurança do paciente em unidades de internação

Procesos de medicación, carga de trabajo y seguridad del paciente en las unidades de hospitalización

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ABSTRACT

Objective: To conduct a survey of critical points in the medication process, its repercussions on the demands made on the nursing team and risks related to patient safety. **Method:** This was a qualitative descriptive study that adopted an ecological-restorative approach. The data were collected through focus groups and photographs. Participants consisted of nurses and nursing technicians. **Results:** Three categories emerged from the thematic analysis: challenges related to the process of prescribing and dispensing medication; medication administration with relation to work shift organization; and the use of new technologies to reduce medication errors. The results indicated that the medication process plays a central role in organizing nursing care, being that these professionals represent the last barrier for detecting medication prescription and administration errors. **Conclusion:** By identifying vulnerabilities in the medication administration phase, the use of technology can help ensure patient safety.

DESCRIPTORS

Workload; Nursing, Team; Medication Systems, Hospital; Medication Errors; Patient Safety.

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INTRODUCTION

The topic of patient safety has been at the center of discussions by the main health organizations in the world, especially over the last two decades. Studies published by the *Institute of Medicine*[1] and the *World Health Organization*[2] have unleashed a global movement about issues involving the risks of errors or failures that can cause harm to or even the death of patients in existing healthcare systems. The theme of patient safety refers to a broader range of themes intrinsic to and integrally related to it.

There is growing evidence that the workload of hospital nursing teams is associated with patient safety; nonetheless, there are still gaps in knowledge regarding the nature of the relationship between nursing workload and patient safety.

A study involving nursing staff found that high nursing workload led to poorer surveillance of patients and greater risk of adverse events[3]. However, despite these international initiatives to measure workload and establish minimum nursing staff in inpatient care, this is still a distant goal in Brazil[4-5].

A Brazilian study investigated the association between nursing workload and the safety of hospitalized patients. The results showed that the nursing team reported medication administration as one of the factors associated with high workload. They also showed that the higher the number of patients per professional, the greater the risk associated with care, i.e., the more likely the occurrence of errors that affected patients, such as those involving medication preparation and administration[6].

Similar findings have also been emphasized in other Brazilian and international studies, which have demonstrated that activities related to the medication process have the most impact on nursing workload. Furthermore, these studies have also shown that timing errors are among the most common in relation to work shifts with a higher number of patients[7-9].

A Canadian study found that one in every seven hospitalized patients in clinical inpatient units had experienced at least one adverse event related to nursing care, an incidence of 18.5 per 1000 patients per day. These results indicated that the most common adverse events were patient falls (5.9%) and medication administration errors (5.5%)[10].

Hospital medication processes consist of several phases, starting with medical prescription, transferring or verifying prescriptions, and then dispensing and administering medications. The administration of one drug alone can involve 30-40 steps, and with each step, the risk of error increases[11].

Practical experience with nursing, teaching and research has shown that this process is organized differently in different health institutions, both regarding the phases of the medication process and at the level of computerization, automation, and the use of technologies. The different realities in the hospital setting make it difficult for nursing professionals to master the knowledge and skills needed to deal with such complex processes.

In light of these considerations, it can be said that the medication process is a fundamental factor in patient care and recovery, representing a central element of work organization in hospital nursing. The risks associated with patient safety and the high cost of medications to the system point to the need for better understanding of all the phases involved in the process in order to find solutions that reduce medication errors and patient harm.

This study aimed to describe how work was organized at the teaching hospital and identify critical points in the medication process, in addition to its repercussions on the job demands of the nursing team, which can represent risks to the safety of hospitalized adult patients.

METHOD

This was an exploratory, descriptive and qualitative study, conducted within the perspective of ecological and restorative thought. This study design, anchored in previous studies, allowed for an in-depth analysis of the theme in focus, as new variables were explored, leaning towards the discovery of unknown dimensions that could generate hypotheses and theories for explaining the phenomenon studied[6,12-16].

The study was developed in three clinical inpatient units at a university teaching hospital in the south of Brazil. It was approved by the institution's ethics committee under number 12-0332. The data were collected between January and June 2014 in three phases, following the assumptions of the participatory photo-elicitation methodology and adapted to the field of ecological restoration[6, 12-14].

Each of the three units contained 45 beds. The nursing team in each unit consists of 15 nurses and 45 nursing technicians, distributed among five work shifts (morning, afternoon and three different nights). Among other activities, the nursing team was responsible for finding medication in the hospital pharmacy and designating an afternoon nursing technician to update and review all drug prescriptions.

Convenience sampling was used to select participants and consisted of four nurses and 14 nursing technicians who were willing to participate in the study after being invited to do so by the research team.

A focus group was conducted in the first phase to discuss the safety of medication processes and create the itinerary of the photo walkabout. The group was encouraged to discuss how medication processes occur in their work routines, in addition to the implications that these processes bring to the organization of work shifts and the risks related to patient care. Four nurses and seven nursing technicians participated in the first focus group.

In the second phase, digital photographs were taken on two consecutive days, during a photo walkabout with the participation of three of the research team members: the main researcher, who conducted the walkabout; a research scholarship holder, who took notes about the photos; and a nurse who was a member of the hospital team and who took the pictures; and a nursing technician from each inpatient unit. The 63 photos were taken according to the pre-defined itinerary in order to capture images portraying the steps involved in medication preparation and administration, medication prescription and dispensing processes carried out by doctors and pharmacists, the risk of error in the processes, and the use of new technologies to help prevent medication

errors. The narrative of the pictures as told by participants was recorded during the walkabout.

In the third step, a focus group was convened for the process of photo-elicitation, in which 25 pictures were selected for review with the participants in order to bring to light their ideas about and experiences with, the safety of the medication process in the studied units. Four nurses and nine nursing technicians took part in the second focus group. All of the nurses and some of the technicians participated in both focus groups.

All of the participants read and signed an informed consent form before participating in the focus groups and photo walkabout. Other staff members, patients and family members also signed a consent form after being informed about the research, agreeing to have photos taken of their healthcare environment. The procedures used in this study abided by Resolution no. 466 of the Brazilian National Council of Health[17] regarding research with human subjects. Group participants were identified with the letter "P", followed by a sequential number.

The information collected was organized into files using NVivo 10 software. This qualitative data analysis tool led to the organization of the different sources of data, which consisted of both the literal transcription of the focus group discussions and photograph narratives and the audio recordings, digital photos, field notes, forms, and itineraries that guided the image-capturing process.

Following the steps of pre-analysis, exploration of the material, result processing, inference and interpretation, the study first sought to identify and code emerging themes and then group them by similarity of content and construct.

These categories helped describe and comprehend the investigated phenomenon[18].

The researchers aimed to immerse themselves in the data in order to codify them, using an inductive form of content analysis, and avoided using pre-conceived categories, allowing the themes and their grouping into categories to flow directly from the raw data. Categorization was conducted independently by three researchers, followed by meetings with the research team to validate the relevance of the themes and the categories found.

RESULTS

The empirical material that resulted from the focus group discussions, the photographs taken during the photo walkabouts, and field observations and notes were grouped into three categories, as described below.

The first category – **challenges related to the process of prescribing and dispensing medication** – contained themes relative to the phases that precede medication administration. In the focus group and photo-elicitation process, participants discussed aspects about the partially computerized processes of medication prescription, scheduling, and verification. They also discussed how medications were dispensed by the pharmacy.

Medical prescription were written out electronically, however, nurses were responsible for reviewing and adjusting the electronic scheduling. They also were responsible for verifying the prescriptions, re-scheduling them manually, and locating medications in the pharmacy. Some of these issues are illustrated in the following excerpts and in Figure 1, which portrays the transportation of medication from the hospital pharmacy to two of the researched units:

(...) The greatest load from my point of view is the pharmacy. It stresses us out, we have to administer an injection but we have go to the pharmacy sometimes five or six times before getting that medication (P2).

One staff member is responsible for medication, she goes to the pharmacy several times, for there are many inclusions[medications] in our unit (...) she carries several super heavy bags (...) but for now that's what we're able to do, as the hospital has a transparent bag for carrying medications (P7).

(Source: Focus Group 1, January 28, 2014)

Figure 1 - Transporting medication from the pharmacy to the units– Porto Alegre, Rio Grande do Sul, Brazil, 2014.
(Source: Photo walkabout, June 3, 2014)

The computerized prescription system resulted in a distance between the medical and nursing teams, who reported miscommunication regarding the inclusion and removal of medication from patient prescriptions. The system had no mechanism to warn the nursing team about such changes. The participants also reported prescription errors in the computerized documents:

(...) But not only about error, or administering the wrong medication... Even the prescriptions, I was there with a patient whose wristband read that he was allergic to Plasil, with Plasil prescribed right there... (P3).

(Source: Focus Group 1, January 28, 2014)

We only look at the prescription at the end of the day… nobody looks at the prescriptions all the time, if there has been a change. If you don't inform me about the change you made this morning, there's no way I'm going to know… (P7).

(…) The nurse arrives at 6 pm. If there is no prescription, she will print out the prescription, then they arrive and write the prescription at 18:30. But they don't tell us and nobody goes there to print another prescription. (…) So there's an antibiotic missing… because we were not informed of this inclusion. They don't tell us, so the next morning they come in and want to know why we didn't start the antibiotic the previous night (P7).

(Source: Focus Group 2, June 27, 2014)

The second category – **medication administration in relation to work shift organization** – consisted of themes that portrayed how the nursing team organized itself to carry out the final phase in the medication process, medication administration. Participants reported that medica-

tion administration was a central task in their work shift. In general, it was always the first activity to be verified and carried out, as illustrated in the excerpt below:

(…) This is where shift handoffs happen…and step by step, this is what we do: we arrive at the unit, check the patient transfer schedule, bed distribution, and then we get our work material: which is a spreadsheet. Then we go through the drawers with the medical prescriptions. Then we get the prescriptions and the patient labels (P5).

(Source: Photo Walkabout, June 03, 2014)

The activities in a given nursing shift began by setting apart the medications to be administered to patients during their work shift. Figure 2 illustrates the packaging of individualized medications by patient bed, each drawer corresponding to a three-bed ward and each compartment containing a patient's medication for a period of 24 hours. This figure also shows the nursing technician's medication cart that is transported to the patient's bedside.
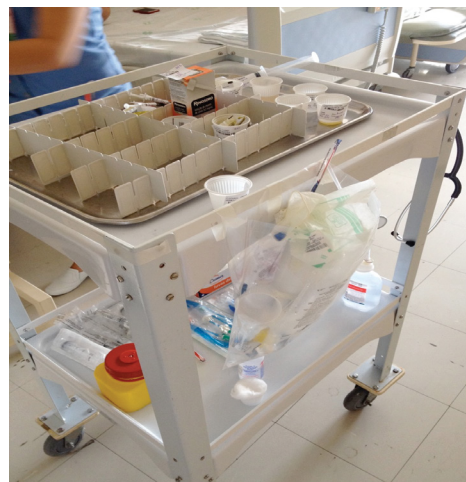

Figure 2 - Medication drawer at the nurses' station and a cart prepped for administration - Porto Alegre, Rio Grande do Sul, Brazil, 2014. (Source: Photo Walkabout, June 02, 2014)

The focus group discussions emphasized that organizing and retrieving drawers and preparing medications took up much of the work shift. In addition to these activities, they also had set aside time to fill out each medication identification label by hand, take the drugs to the patient and administer them. At the moment of patient admission, the labels are automatically printed out with a barcode, the patient chart number and the patient's full name. However, nursing technicians must fill in the name of the medication, dose, day, administration time and signature by hand.

According to the participants, this task demands much attention and concentration, as they were responsible for verifying a great amount of medication, filling out the labels and prepping them for administration. They did not know

the exact number of medication prepared per shift, but they knew the average number of patients cared for per shift.

The printed label contains only the patient's name, so then we have to get it, write the name of the medication, the patient's bed, the dose, and so much time is lost writing it all down. And we have seven or eight patients… (P10).

(Source: Focus Group 1, January 28, 2014)

(…) Filling out all that information which, I repeat, brings us security, but this process of filling them out takes up time that is later reflected at the patient's beside (P1).

(Source: Focus Group 2, June 27, 2014)

Medication was prepared at the nurses' station, close to the medication drawers. The pills were dispensed by the hospital's pharmacy in individual packages. Other types of medication were aspirated, reconstituted, diluted, fractioned or ground by nursing technicians for administration. In this phase, there were many doubts about drug dilution, dose calculation and the instructions contained in the pharmacy manual, which were not easy to understand, as shown in the following excerpts:

> (...) That little book on drug dilution is sort of complicated too… Granted, we need to think, but you have to think too much with that thing. You even have to ask the university students for help (P2).

> (...) No, it's the instruction. You can't cut the medication, you have to dilute the whole thing and aspirate the content that you need. That's the right way to do it, that's what the instructions say. (P7).

> (Source: Focus Group 1, January 28, 2014)

> (...) How are we supposed to dilute the drug if the powder falls under the syringe when you're doing it, how are you going to dilute the right dose? (P5).

> (Source: Focus Group 2, June 27, 2014)

After this phase, medications were ready to be taken and administered to patients. During the group discussions, participants underscored that this process required a high level of concentration, but that the workplace dynamics usually did not allow nursing technicians to follow through with their initial plan and meet all of them within the established deadlines, resulting in delays in medication administration. These interruptions and changes in the shift activities were due to patient and family requests, changes in medication prescription, lack of availability of equipment or materials, in addition to other patient care procedures, such as baths, hygiene, dressings, and feeding.

> Then we're going to administer an injection, we have to put everything away or else it's not possible: let the phone ring… sometimes you have the medication, the phone is ringing, a family member is calling, then you drop everything to do something else and in the meantime you forget what you were doing (P2).

> Because it's a very complex process, you take a shift, then you go see a patient, you prepare administration, then you have to administer it, then there's the bath, diaper change, you lots of things to do (P11).

> (Source: Focus group 1, January 01, 2014)

> (...) We have many tasks, many tasks to carry out at the same time…Then you leave with that tray, with a whole bunch of medication, and sometimes you end up mixing up patients, mixing up the medication, because it's a lot to do at the same time (P5).

> (Source: Focus Group 2, June 27, 2014)

According to the technicians, the hospital had made some improvements, but several structural aspects still needed to be reviewed in order lend more precision to the administration phase. The new compartments for the trays used to separate the medications were mentioned as a positive strategy. However, the quality of the compartments and the size of the trays were still inadequate for patient safety considering the amount of patients and medication administered.

> There's this one patient that has ten little medication cups for just him alone, each one has to be diluted, each pill in a separate cup (P9).

> (Source: Focus Group 1, January 28, 2014)

> The trays are too small for such big compartments. So we have to get three trays in order for the compartments to fit and then we place a whole lot of medication. And three trays don't fit on these carts (P2).

> (Source: Focus Group 2, June 27, 2014)

The third category, **the use of new technologies to reduce medication errors**, contained ideas relative to computerized records on patient medication, in addition to the automated medication dispensing system in the inpatient units. The participants reported that the introduction of these dispensing systems had improved the safety of the medication process. Such equipment was first used in one of the researched units. The machines had helped reduce trips to the pharmacy for medication and increased precision when retrieving drugs from the equipment drawers, through the barcode verification of each medication prescribed to each patient, including controlled substances such as psychotropic drugs. This system had also made it easier to be aware of drug exclusions, as the prescription reading were always up to date. The following excerpts and Figure 3 illustrate these points:

> (...) Even the controlled ones, now we don't have to do all that distribution, just some dilutions. But the pills too, they are all in the dispensing machine. We count them: if we need to remove a "diazepam", open the drawer, count how many pills will stay, close it and there you go (P4).

> (...) This has really reduced traffic to the pharmacy; problems with medications have decreased (P6).

> She said that it makes it so much easier, at first it's a bit complicated to adapt to, but then it's the best thing ever. We don't have to keep fetching medication, we just scan the barcodes and the exact number comes out, correct for each patient (P8).

> (Source: Focus Group 1, January 28, 2014)

> (...) In this regard, the machine improved things. Because if a drug [prescription] is removed, for example, which the resident [doctor] did not prescribe, it won't be dispensed (P4).

> (Source: Focus Group 2, June 27, 2014)

Participants reported that the use of computerized systems to record vital signs preceding decisions regarding the administration of some drugs, in addition to gathering com-

plementary information about the administered drugs and assessing their effectiveness were tools that helped improve patient safety. However, participants also pointed out issues that influenced nursing work organization and workload.

> We spend more time today recording things on the computer…you spend more time in front of the computer than with the patient, that's true. We spend more time prescribing, scheduling and updating charts, you know. It's recording, recording, recording… (P7).

> (…) There's the machine, there's the computer system, the labels (…) and there's patient care, at the bedside (…) you're leaving the room and answering the patient's questions at the same time, because you have to be somewhere else, there's someone calling you… We have become very bureaucratic and patient care is reduced…there are patients who feel better after a conversation (P8).

> (Source: Focus Group, June 27, 2014)

Figure 3 - Withdrawing medication from the automated dispensing machine – Porto Alegre, Rio Grande do Sul, Brazil, 2014. (Source, Photo Walkabout, June 03, 2014)

DISCUSSION

The results of the present study point to the central role and complexity of the medication process in hospital inpatient units. Medication management and administration has become one of the increasingly complex activities in organizing patient care, and are factors that can contribute to increasing demands on the nursing team.

Drug transport, organization, storage, preparation, disposal, and records are part of the nursing professional's routine, taking up a significant portion of the work shift. In each of these phases, there is the chance for medication error to occur.

The perception of the participants in this study converges with data from other studies that show that 40% of the nursing team's time in clinical inpatient units is dedicated to the medication administration process, throughout which nurses can administer up to 50 medications. Actions related to medication administration represent an important component when measuring nursing workload and when determining adequate nursing staff allocation in order to comply with the correct times for administrating patient care. These studies have shown that more appropriate staff allocation results in lower rates of adverse events[20-22].

The difficulties described in this study in terms of the number of patients, amount of prescribed medication, the need for manual labeling, drug preparation and dilution, in addition to errors in medical prescriptions and difficulties in communication between doctors and the nursing teams were also indicated in other studies, which identified that

errors in the medication process of hospitalized patients are a consequence of numerous factors[23-24].

When commenting on the workplace dynamics, participants considered that the medication process and its impact on workload, in addition to the high demand of other tasks and caring for a large number of patients had a negative impact on the timeliness of the medication schedule. Other risks listed were those related to wrong dose errors and mixing up drugs, labels, syringes or bottles on the medication tray. These findings corroborate the results of a study that indicated that wrong dose errors (24.3%) and wrong time errors (22.9%) were among the most common types of medication errors in a Brazilian university hospital[25].

The nursing staff plays a primary role in the medication process and, more specifically, at the end of the process, when medication is administered to patients. This phase consists of preparing, administrating and determining the effectiveness of the drug regimen and documenting all care activities conducted.

This phase represents the last chance to prevent prescription and dispensing errors from affecting patients, increasing the responsibility of nursing professionals involved in the process. Furthermore, it is considered more difficult to detect and intercept errors in this phase, as there are few electronic or computerized systems at the patient's bedside that can help professionals identify errors in the processes that precede medication administration or prevent human error when performing this type of patient care[26-27].

Errors can occur in all phases of the process and have the potential to affect patients. However, errors are more

easily detected and intercepted in the initial phases, those of medication prescribing and dispensing, due to the use of electronic and computerized systems that verify medication, including potential drug interactions[27].

Employing new technologies can contribute to increasing precision and reducing error in medication processes, as illustrated in this study. However, these processes must be closely monitored in order to determine strategies that can diminish their impact on nursing workload and to redesign care processes in order to avoid reducing time for direct patient care activities.

The medication process involves professionals from at least three different areas: medical, nursing and pharmacy. Investigating the theme based only on the perspective of the nursing staff was one limitation of this study. Another limitation relates to the impossibility of generalizing our results, as they are limited to the characteristics in a specific context.

CONCLUSION

By means of the ecological restorative approach and the combined use of focus groups and participatory photo-elicitation methods, participants pointed to the hospital's medication prescription and dispensing system and situations of risk in medication administration phase as system vulnerabilities. The central role of the medication process, which acts as an organizing element based on which all other nursing care were aligned was recognized as a factor that increased the demands on the nursing team. Automated dispensing machines, equipment that were implemented to confer greater precision and, consequently, greater safety to the process, were assessed favorably by their users. However, this equipment alone cannot eliminate all error from the process.

Due to its interface with other areas involved in the process and especially due to its front-line position in health care delivery, being in direct contact with patients, the nursing team carries great responsibility regarding medication administration. These professionals must be supported by the hospital structure and organization in order to ensure patient safety. Furthermore, new studies must be conducted to underline strategies that can help improve the process.

RESUMO

Objetivo: Levantar pontos críticos do processo de medicação, suas repercussões nas demandas de trabalho da equipe de enfermagem e riscos para a segurança dos pacientes. **Método:** Estudo descritivo, com abordagem qualitativa, na perspectiva ecológico-restaurativa. Os dados foram coletados por meio de grupos focais e fotografias. Participaram enfermeiros e técnicos de enfermagem. **Resultados:** Três categorias emergiram da análise temática: Desafios nos processos de prescrição e dispensação de medicamentos; Administração de medicamentos – organização no turno de trabalho; Uso de novas tecnologias para diminuir erros de medicamentos. Os resultados apontam que o processo de medicação assume um caráter de centralidade na organização do trabalho da equipe de enfermagem, sendo que estes profissionais configuram-se como a última barreira para detectar falhas de prescrição e dispensação de medicamentos. **Conclusão:** Para a identificação de vulnerabilidades na etapa de administração de medicamentos, o uso de tecnologias, sem dúvida, agrega valor para o processo de cuidado seguro.

DESCRITORES

Carga de Trabalho; Equipe de Enfermagem; Sistemas de Medicação no Hospital; Erros de Medicação; Segurança do Paciente.

RESUMEN

Objetivo: Tuvo por objetivo levantar los puntos críticos del proceso de medicación, sus repercusiones en las demandas de trabajo del equipo de enfermería y los riesgos para la seguridad de los pacientes. **Método:** Estudio descriptivo, con abordaje cualitativa en la perspectiva ecológico restaurativa. Los datos fueron recolectados por medio de grupos focales y fotografías. Han participado enfermeros y técnicos de enfermería. **Resultados:** Del análisis temática han emergido tres categorías: Desafíos en los procesos de prescripción y despacho de medicamentos; Administración de medicamentos – organización en el turno de trabajo; Uso de nuevas tecnologías para disminuir los errores de medicación. Los resultados apuntan que el proceso de medicación asume un carácter de centralidad en la organización del trabajo del equipo de enfermería, siendo que estos profesionales se configuran como la última barrera para detectar fallas de prescripción y despacho de medicamentos. **Conclusión:** Para la identificación de vulnerabilidades en la etapa de administración de medicamentos, el uso de tecnologías, sin duda, agrega valor para el proceso del cuidado seguro.

DESCRIPTORES

Carga de Trabajo; Grupo de Enfermería; Sistemas de Medicación en Hospital; Errores de Medicación; Seguridad del Paciente.

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