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Relationship between occupational profile of nursing workers and medication errors

Relação entre o perfil profissional dos trabalhadores de enfermagem e os erros de medicação
Relación entre el perfil profesional de los trabajadores de enfermería y los errores de medicación

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ABSTRACT

Objective: to verify the relationship between social and occupational characteristics of nursing workers and the occurrence of medication errors. **Methodology:** it is a longitudinal observational study conducted between August and December 2014 in two clinical units. The sample was composed of 32 nursing professionals and 320 doses of medicines observed with a check-list type instrument aid in different work shifts averaging ten observations per professional. The research was approved by the Ethics Committee with CAAE: 26723314.2.0000.5054. **Results:** it was identified that administration and preparation errors were the most frequent, 280 (87.5%) and 200 (62.5%). Among the socio-occupational characteristics, the occurrence of errors was significantly correlated with age, length of time acting in the institution and time of professional experience ($p=0.01$; $p=0.02$; $p=0.02$). The variables gender, number of work load and work shift in the institution did not present a statistical significant relation with the errors. **Conclusion:** the relation between some socio-occupational characteristics and medication errors should be considered in institutional policies for error reduction and patient safety.

Descriptors: Patient Safety. Nursing. Medication Errors.

RESUMO

Objetivo: verificar a relação entre as características sociais e ocupacionais dos trabalhadores de enfermagem e a ocorrência de erros de medicação. **Metodologia:** estudo observacional longitudinal conduzido entre agosto e dezembro de 2014 em duas unidades clínicas. A amostra foi composta por 32 profissionais de enfermagem e 320 doses de medicamentos observadas com o auxílio de um instrumento do tipo check-list em diferentes turnos, com média de dez observações por profissional. A pesquisa foi aprovada pelo Comitê de Ética com o CAAE: 26723314.2.0000.5054. **Resultados:** identificou-se que os erros de administração e preparação foram os mais frequentes, 280 (87,5%) e 200 (62,5%), respectivamente. Entre as características sócio-ocupacionais, a ocorrência de erros correlacionou-se significativamente com a idade, tempo de atuação na instituição e tempo de experiência profissional ($p=0,01$; $p=0,02$; $p=0,02$). Já as variáveis sexo, número de atividades/tarefas e turno de trabalho na instituição não apresentaram relação estatisticamente significativa com os erros. **Conclusão:** a relação entre algumas características sócio profissionais e erros de medicação deve ser considerada nas políticas institucionais para redução de erros e segurança do paciente.

Descritores: Segurança do Paciente. Enfermagem. Erros de Medicação.

RESUMÉN

Objetivo: verificar la relación entre las características sociales y ocupacionales de los trabajadores de enfermería y la ocurrencia de errores de medicación. **Metodología:** estudio observacional longitudinal conducido entre agosto y diciembre de 2014 en dos unidades clínicas. La muestra fue compuesta por 32 profesionales de enfermería y 320 dosis de medicamentos observados con la ayuda de un instrumento del tipo check-list en diferentes turnos, con media de diez observaciones por profesional. La investigación fue aprobada por el Comité de Ética con el CAAE: 26723314.2.00.00.5054. **Resultados:** se identificó que los errores de administración y preparación fueron los más frecuentes, 280 (87,5%) y 200 (62,5%), respectivamente. Entre las características socio-ocupacionales, la ocurrencia de errores se correlacionó significativamente con la edad, tiempo de actuación en la institución y tiempo de experiencia profesional ($p=0,01$; $p=0,02$; $p=0,02$). Las variables sexo, carga de trabajo/actividades y turno de trabajo en la institución no presentaron una relación estadísticamente significativa con los errores. **Conclusión:** la relación entre algunas características socio-profesionales y errores de medicación debe ser considerada en las políticas institucionales para reducción de errores y seguridad del paciente.

Descritores: Seguridad del Paciente. Enfermería. Errores de Medicación.

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INTRODUÇÃO

Among the factors that contribute to medication errors, three categories stand out: environmental, contextual and individual. The latter includes the body of knowledge acquired by the professional about drugs and about the complex system in which their use is involved. However, there is little evidence of the strong relationship between individual/contextual factors and these errors⁽¹⁾.

Human error in the health context is related to factors that goes from causes inherent to the patient himself to institutional, financial and structural issues and human factors, such as the lack of knowledge and skills. In this sense, it is assumed that the best way to prevent human error is to know the possibility of its occurrence, and typify them in order to list their causes and consequences⁽²⁾.

Nurses are among the main professionals dealing with drugs. They represent the largest workforce in health services in Brazil, with nearly 1,500,000 active professionals in the national territory⁽⁴⁾. This large number of workers implies a direct relation of the category with patient safety and error prevention strategies with regard to the preparation and administration of medicines. As they are responsible for a large part of the workload, they are under increased probability and exposure to errors.

The reasons for the occurrence of errors are very diverse, including lack of knowledge about medications, lack of information about patients, memory lapses, error in prescription, failure to verify doses, inappropriate storage, lack of labeling, inappropriate environment of preparation, interruption during the preparation, work overload, among others⁽⁵⁾.

In this sense, the interest in ensuring the safe use of medicines must permeate the whole process of which they are part. This includes preventive work through continuing education strategies and measures to strengthen actions aimed at knowing the factors that predispose to risk⁽⁶⁾.

With regard to the preventive work of the health team, a research study⁽⁷⁾ emphasized the importance of the nursing work in this prevention. The study listed medication errors, pointing out that human factors such as fatigue, *turnover*, inadequacy of materials and work equipment, inattention and inadequate proportion of number of professionals and patients can be potential causes of these errors.

Still, the work environment can present various usually stressor elements usually associated with professional performance. Among these stressors stand out the relationships established at the workplace, the structure and organization of the institution, the degree of complexity of the tasks, the working hours, and the type and number of employment bonds⁽⁸⁻⁹⁾.

Professional qualification in an attempt to minimize knowledge deficiency may reduce patient harm⁽¹⁾. Thus, it is necessary to carry out a situational diagnosis in order to understand the main types of errors and their relation with other factors so that future interventions may be made.

In this sense, the objective of this research was to verify the relationship between socio-occupational characteristics of nursing workers and the occurrence of medication errors.

METODOLOGIA

This is a longitudinal observational study performed in all clinical units of a teaching hospital that offers high-complexity care, located in Fortaleza/CE, Brazil.

The target population (N = 45) consisted of nursing workers who prepared and administered medicines on all shifts and medical units. The inclusion criteria were: to have employment bond with the Federal University of Ceará; to be assigned to the units where the research was carried out; to prepare and administer medications and be on the service schedule in the months from August to December 2014, in which the data collection was carried out. Nursing workers who were absent or who did not complete the preparation and administration of the medication were excluded. The sample consisted of 32 nursing technicians.

The sample size of the number of doses that should be observed was also estimated following the criteria established in a study on drug errors developed in Brazil⁽⁷⁾. For this purpose, the institution's hospital pharmacy service was requested to provide information on the number of doses of antibacterial medicines per shift dispensed to clinical units during a period of thirty days prior to the start of data collection. This resulted in 320 doses.

The activity of preparing and administering drugs in the reality of Brazilian institutions has been the responsibility of nursing technicians and assistants. Thus, in this study, the 320 doses of the sample were observed when performed by nursing technicians, distributing ten observations per professional.

An instrument of the *checklist* type applied in another research on medication errors was used for the present data collection⁽⁹⁾. The instrument addressed personal data with questions related to: sex, age, work shift at the institution, training time, length of time acting in the institution, time of professional experience and work load.

To define categories of the errors, the taxonomy of the *National Coordinating Council about Medication Error and Prevention (NCCMERP)*⁽¹⁰⁾ was used, namely: Administration errors: failures in administration of medication, that is, aseptic technique, choice of route, site of application, rate of infusion, infusion therapy accessories, drug incompatibility, and administration of incorrectly prescribed medications; Preparation errors: drug incorrectly formulated or handled prior to administration, inadequate storage of the pharmaceutical form, failure of the asepsis technique, and inadequate selection of infusion accessories; Dose error: administration of higher or lower doses than the prescribed and administration of extra or duplicate doses of the drug; Wrong choice of medication: incorrect choice of the prescribed medication but which was not administered to the patient; Time error: error resulting from the non-

compliance of the time previously established by professionals for drug administration, extrapolating the confidence interval established by the institution for each drug.

Observers were previously trained to collect data and the observations made during a period of 30 days were disregarded to avoid *Hawthorne* effects, in order to verify the clarity in the applicability of the instrument.

After the survey, data were organized in a database in the *Statistical Software for the Social Science* (SPSS) 20.0 and submitted to statistical analysis. The relationship between the frequency of errors and the variables studied was checked through the bivariate analysis of the *Pearson* and *Spearman* correlations, and the distribution of the number of errors observed followed the descriptive presentation.

The study complied with the formal requirements set by national and international regulatory standards for research involving human beings⁽¹¹⁾, and was approved in the ethics committee with CAAE 26723314.2.0000.5054

RESULTS

All errors identified during the observations were typified according to the moment they were made, i.e. whether they were observed at the time of preparation or administration. Thus, as can be observed in Table 1, administration errors were the most frequent, detected in 280 (87.5%) of the doses observed. The number of administration, preparation and dose errors was greater than the amount of doses observed. This occurs because it is common to several stages observed in the survey.

Table 1 - Types and frequency of medication errors. Fortaleza, CE, Brazil, 2015

Type of error	N (%)
Administration error	280 (87.5%)
Preparation error	200 (62.5%)
Dose error	157 (49%)
Wrong choice of medication	62 (19.4%)
Time error	30 (9.4%)

It is important to note that the main situations that led to the classification presented here, based on the NCCMERP criteria, were: in the case of administration error, noncompliance with the semitechnique; in the preparation, improper use of devices and solutions for dilution; in the dose, leftovers were frequently observed in the vials or equipment at the end of the infusion; and in the time error, some drugs were administered more than two hours after the scheduled time.

The information on the socio-occupational profile revealed predominance of the age group between 31 and 40 years, with 17 professionals (53.1%). This demographic variable showed a statistically significant correlation with the number of medication errors ($p = 0.01$) (Table 2).

Table 2 - Distribution of socio-occupational characteristics of nursing professionals and correlation with the occurrence of medication errors. Fortaleza, CE, Brazil, 2015

Variables	N	%	p-value
Age			$p=0,01^*$
20-30 years	6	18.8	
31-40 years	17	53.1	
> 40 years	9	28.1	
Sex			$p=0,21^{**}$
Female	28	87.5	
Male	4	12.5	
Work shift in the institution			$p=0,11^{**}$
Day	18	56.2	
Night	14	43.8	
Time elapsed after completing training			$p=0,08^*$
< 10 years	10	31.3	
10 - 20 years	20	62.5	
21 - 30 years	1	3.1	
> 30 years	1	3.1	
Length of time acting in the institution			$p=0,02^*$
< 10 years	19	59.4	
10 - 20 years	12	37.5	
21 - 30 years	1	3.1	
Time of professional experience			$p=0,02^*$
< 10 years	13	40.7	
10 - 20 years	17	53.1	
21 - 30 years	1	3.1	
> 30 years	1	3.1	
Work load			$p=0,31^{**}$
Works only in this institution	13	40.7	
Works in 2 institutions	9	28.1	
Works in this institution and also studies	3	9.4	
Works in 2 institutions and also studies	7	21.8	
Total	32	100.0	

**Pearson* correlation test; ** *Spearman* correlation test.

No statistically significant correlations were found for the variables sex ($p = 0.21$) and work load ($p = 0.31$). However, in spite of this inference, it is necessary to consider that the burden of tasks related to having more than one job and/or concomitant study activities can lead to physical and mental exhaustion, favoring an increase in the risk of error due to strenuous workload, physical and mental tear.

The time of service in the institution is an important parameter to be evaluated in the occurrence of errors, since the lack of knowledge of typical care processes of the place can cause distortions in the execution of certain practices, culminating in nonconformity actions. In this study, it was observed that 19 (59.4%) of the nursing technicians had been working in the institution for less than 10 years, and this variable presented a statistically significant relation with the frequency of errors ($p = 0.02$).

As for the training time, it was observed that 20 participants (62.5%) had between 10 and 20 years

elapsed after completing their training. Contextualizing the local reality, it is important to point out that some professionals currently attended higher education courses in the health area, thus demonstrating their willingness for technical-scientific improvement in the care activity, which may contribute to minimize the occurrence of errors during health care.

Regarding the time of professional experience, 17 (53.1%) nursing technicians had between 10 and 20 years of general accumulated professional experience, whether in the investigated or in other institutions. There was a statistically significant relationship ($p = 0.002$) for this variable with medication errors.

DISCUSSION

Monitoring the quality of care is undoubtedly one of the great goals of contemporary hospital care. In this sense, indicators presenting the number and categorization of medication errors are of paramount importance due to the seriousness implied by their occurrence. Recent research confirms that the incorrect manipulation of these therapeutic substances cooperates to increase the length of hospital stay, increases the degree of functional dependence of patients and generates a climate of insecurity throughout the care process⁽¹²⁻¹³⁾.

In this sense, this study showed that there are conditions that can negatively influence the work dynamics of professionals, such as distractions and facilitated occurrence of lapses, of which the following stand out: the socio-occupational profile of professionals; the environmental interference to which they are subjected; the inadequate architectural dimension of the spaces and the extreme oscillations of climatic conditions.

As for the socio-occupational profile of the professionals, it was observed that the predominant age group comprised those in the range between 31 and 40 years. This data corroborates similar studies⁽¹⁴⁾. This information reveals that professionals are in an age group considered the peak of productive life, do not belong to the groups with vulnerability and risk for chronic diseases typical of aging, theoretically have good eye health and preserved capacity of concentration and attention. All of these are essential for tasks such as handling medications.

Contrary results were found in the literature, in a study carried out in a hospital in the city of São Paulo-SP where the relationship between quality of life and medication errors was observed. With this, it was observed that although nursing professionals presented general health status and adequate functional capacity; as well as compromised levels of vitality, pain and mental health. Significant differences were found between the groups with and without error and the domains: physical aspects ($p=0.02$), general health status ($p=0.02$), vitality ($p=0.01$), social aspects ($p = 0.01$), emotional aspects ($p=0.01$) and mental health ($p=0.01$); as well as "alterations and health disorders" ($p=0.01$) evaluated using the SF-36 instrument⁽¹⁵⁾.

With regard to sex, 28 professionals belong to the female sex, which reflects a reality found in most nursing teams in Brazilian institutions. Thus, some studies indicate that this excessive journey linked to social changes culminates in professional rigidity and, consequently, stress and decreased physical and mental energy, which ultimately contribute to the occurrence of errors in health services⁽⁴⁾. Moreover, medication errors are attained associated with greater number of employment bonds, as well as with lower income⁽¹⁶⁾.

Another important aspect that should also be considered when analyzing factors that predispose the occurrence of errors relates to the work shift. In the present study, there was a higher concentration of labor in the daytime shift. This is also common practice in most hospital institutions, but it is worth noting that inadequate or disproportionate sizing during the night period results in a greater accumulation of activities for nursing professionals. At night, institutions drastically reduce the offer of general services, such as maintenance, image, laboratory and professional resources and materials that make nursing assistance feasible, to the detriment of the real needs of provision of care to the clientele⁽¹⁷⁾.

However, appropriate sizing is not enough to address this problem. Assimilating the work processes, understanding the dynamics of the sector and knowing the main medicines commonly used to treat patients are fundamental points to strengthen health care security. The literature reports that factors such as time of professional experience and time working at the institution or unit can lead to different perceptions about organizational culture in a directly proportional relationship⁽¹³⁾.

A survey carried out in hospitals in the city of Fortaleza on the factors that affect the safety culture according to the nursing team's view showed that the high turnover rates of employees, uncertainty generated by the permanence in employment and the scarce investment in practical training are aspects that greatly cooperate for the occurrence of failures in the provision of care, including drug handling⁽⁸⁾.

Similarly, we can state that employees who work for more than 20 years at the same institution have higher satisfaction with their jobs and are able to develop care routines with greater fluidity⁽¹⁸⁾. In this research, the majority of nursing technicians had been for less than 10 years working in the institution.

The professional experience between 10 and 20 years was more prevalent. This is a frequent relevant parameter considered at hiring in health services nowadays, since it is understood that the skill and ability to perform certain procedures acquired throughout the professional trajectory can minimize the chance of making errors.

We can say also that more experienced professionals have more developed skills and are, therefore, able to respond quickly to the demands caused by unprecedented situations. This means to have prudence while improvising to meet complications that may come up during the working day⁽¹⁴⁾.

The theoretical knowledge and experience acquired during the exercise of the profession contribute to higher accuracy and, thus, greater safety to the users of the health services⁽¹⁴⁾. However, an integrative review based in 21 international articles showed that professional experience can also create an excess of self-confidence and greater difficulty to assimilate new routines and protocols, which would inevitably cause common errors to pass unnoticed, as they became part of the *modus operandi* of the work of those individuals⁽¹⁹⁾.

Just over one-third of the professionals of this research work only in one institution, which is in agreement with the information presented in the report of the Brazilian nursing profile, which showed that 63% have only one activity/job⁽⁴⁾. However, research⁽²⁰⁾ report that some percentage undergoes double or triple work journeys, influenced by social devaluation and low wages. These journeys may reach up to 61 hours of weekly work distributed in more than one institution.

Thus, the exhaustive working days and multiplicity of tasks associated with physical and emotional exhaustion to which they are subjected may affect not only the health of the worker, but also that of the patients who need care, jeopardizing the safety of the care⁽¹⁵⁾. In this study there was no significant correlation of the errors with workload, which differs from other studies⁽¹⁻²⁾.

In the present study it was observed that administration and preparation errors were the most frequent. This trend has been confirmed in studies, as a survey where the rate of medication errors was 68.8 percent of 1,031 doses observed, being the highest rate of errors found in the administration of drugs (37.6%)⁽¹⁶⁾.

Other researchers confirm these statistics. A study assessing the security climate in a hospital at Ribeirão Preto noted that high rates of turnover and work overload are directly associated with the occurrence of adverse events such as medication errors, nosocomial infections and falls. The study also showed that the overwhelming tasks assigned for nursing technicians are directly related with problems in the preparation of medicines⁽¹⁸⁾. With this, it is possible evident that excessive work represents a triggering factor of stress, lack of attention and fatigue, conducing to and facilitating an environment for the occurrence of errors.

CONCLUSION

The most common medication errors in this study were of the administration type, 280 (87.5%), and preparation type, 200 (62.5%). These results indicate the need for restructuring the semitechnical practices and/or restructuring the design of the institution's medication system.

The research indicates that the variables age ($p=0.01$), length of time working in the institution ($p=0.02$) and time of professional experience ($p=0.02$) are statistically correlated with medication errors. Thus, socio-occupational components should

be considered in the institutional policies for error reduction and patient safety.

As a limitation, it should be emphasized that the study reveals a local reality observed in a period that preceded the reorganization of the administration and of some work processes, as well as the creation of the patient safety committee in the institution.

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