ree

ORIGINAL ARTICLE

Distractions and interruptions in medication preparation and administration in inpatient units

Distrações e interrupções no preparo e na administração de medicamentos em unidades de internação hospitalar

Weslen Carlos Junior de Freitas[1], Vanessa Cristina Alves[1], Jeferson Silva Ramos[1], Samantha Rodrigues Garbis Chagas[1], Luciana Regina Ferreira da Mata[2], Aline Carrilho Menezes[1], Helen Cristiny Teodoro Couto Ribeiro[1]

ABSTRACT

The objective was to identify distractions and interruptions during medication preparation and administration by the nursing staff in medical-surgical inpatient units. This is a quantitative, cross-sectional study in which the systematic observation technique was used for data collection. In total, were observed 342 preparations and 364 administrations of medication, with identification of 252 distractions that occurred mostly during drug preparation, related to parallel conversation, and the nursing staff was the largest source. Interruptions occurred in 111 moments, mostly during medication preparation, parallel conversation was the main cause and initiated by third parties (professionals of the nursing team and others, patients and caregivers). Such events interfere with patient safety and the quality of the work environment. It is important to address this topic in the curriculum of health professionals' courses and in the strategic planning of health institutions.

Descriptors: Patient Safety; Nursing; Medication Errors.

RESUMO

Objetivou-se identificar as distrações e as interrupções durante o preparo e a administração de medicamentos pela equipe de enfermagem em unidades de internação médico-cirúrgica. Trata-se de estudo quantitativo, do tipo transversal com técnica de observação sistemática para a coleta de dados. Observou-se 342 preparos e 364 administrações de medicamentos. Foram identificadas 252 distrações, a maioria ocorreu durante o preparo de medicamentos, esteve relacionado à conversa paralela e a equipe de enfermagem foi a maior fonte. As interrupções ocorreram em 111 momentos, semelhantemente às distrações ocorreram em sua maioria no preparo dos medicamentos, a conversa paralela foi a principal causa e foi iniciada por terceiros (profissionais da equipe de enfermagem e outros, pacientes e acompanhantes). Tais eventos interferem na segurança do paciente e na qualidade do ambiente de trabalho, importantes de se abordar nos currículos dos cursos dos profissionais de saúde e no planejamento estratégico das instituições de saúde.

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

[1]Federal University of São João del-Rei — Divinópolis (MG), Brazil. E-mails: weslen.ufsj@hotmail.com, vanessaalvescapelini@yahoo.com.br, jefersonsilvaramos@hotmail.com , samanthagarbisdivi@gmail.com , alinecarrilhomenezes@gmail.com, helen.cristiny@ufsj.edu.br

[2]Federal University of Minas Gerais — Belo Horizonte (MG), Brazil. E-mail: lucianarfmata@gmail.com

How to cite this article: Freitas WCJ, Alves VC, Ramos JS, Chagas SRG, Mata LRF, Menezes AC, et al. Distractions and interruptions in medication preparation and administration in inpatient units. Rev. Eletr. Enferm. [Internet]. 2019 [cited on: _____];21:53621. Available at: https://doi.org/10.5216/ree.v21.53621.

Received on: 10/19/2018. Accepted on: 10/192019. Available on: 12/31/2019.

INTRODUCTION

Patient safety is one of the dimensions of quality health care. The *To Err Is Human: Building a Safer Health System* report from the United States Institute of Medicine (IOM) found that approximately 100,000 people died as a result of iatrogenesis each year in the US[1]. In 2004, the World Health Organization (WHO) launched the World Alliance for patient safety with the aim to increase political involvement in good care practices in health services.

In Brazil, the Ministry of Health has instituted the National Patient Safety Program with mandatory actions for the promotion of patient safety and quality improvement[2]. Some of the actions are specifically aimed at safety in the medication system.

The WHO third Global "Medication Without Harm" Challenge proposes to reduce 50% of preventable drug-related harm worldwide by 2022[3]. The International Patient Safety Classification defines error as the failure to perform an action that was planned or the incorrect development of a plan[4]. Among errors that occur with patients in health institutions, medication errors (ME) are estimated to affect seven million patients worldwide each year[5].

Drug administration is a complex and multidisciplinary process. Physicians prescribe, pharmacists dispense, and nursing has primary responsibility for administration[6]. Medication errors can occur in any of these phases, and it is essential to improve the medication system and create strategies to minimize them[7,8].

The main causes of ME are work overload, fatigue, poor labeling of medication, misapplication of the 10 rights of medication administration, illegibility of prescriptions, and distractions and interruptions[8,9]. Distractions and interruptions break the focus and concentration of professionals in the exercise of some activity. Professionals exposed to interruptions are more susceptible to errors. The occurrence of interruptions is related to the increase and severity of medication errors[9].

In many studies, the terms "distraction" and "interruption" are used as synonyms[10]. In the present study, distraction is the behavior observed when diverting attention while performing a primary task, or in situations of verbal responses to a secondary task associated or not with the activity being performed, without interrupting the primary activity. For example, the quick diverted attention to see who enters or leaves the nursing station while preparing medications. Self-distraction was considered the event of attention distraction caused by the own professional, such as starting a conversation with the colleague or patient during medication preparation or administration.

The adopted concept of interruption, either internal or external, was the rupture of the main task. External interruptions may be by a co-worker or by the patient/family member who needs help in a secondary task, thereby resulting in interruption of medication preparation or administration[5]. An internal interruption or self-interruption is self-induced (by the individual him/herself) and occurs when the professional, by personal choice, interrupts the primary task to perform a secondary task, thus not completing the main task[5]. For example, by answering the institutional telephone or the own mobile phone.

Discussions on the nature and consequences of distractions and interruptions in the nursing work process are scarce in the literature, and there is a lack of knowledge about this theme in Brazil. Investigation of distraction and interruption events provides better quality of service, supports the creation of tools for managing medication errors, and cooperates for the safety of all involved in the process[11].

In addition, from the findings of these studies, nursing educational programs may redirect the pedagogical methods used in the training process of future health professionals regarding management of medication errors. Incorporating interruption management skills into curricula has been recommended in the scientific literature[5].

In addition, studies aimed at identifying distractions and interruptions in medication administration are justified because health professionals' knowledge about the subject can raise awareness of the dynamics of the problem and lead to behavioral changes[5].

In this sense, the question is: how is the configuration of distractions and interruptions during the process of medication preparation and administration by the nursing staff in medical-surgical inpatient units? The objective of this study was to identify distractions and interruptions during medication preparation and administration by the nursing staff in medical-surgical inpatient units.

METHOD

This is a descriptive, quantitative, cross-sectional study conducted through systematic observation. It was performed in two inpatient units of a general hospital in the inlands of the state of Minas Gerais/Brazil. Inpatient units are for adults and serve clinical and surgical patients in intermediate and semi-intensive care of the private and supplementary network. The institution has 400 beds and assists approximately 1,220,000 inhabitants. The justification for choosing this scenario was the fact that they are clinical teaching units of nursing undergraduates of the study institution, where medication administration is one of the most frequent actions, hence the relevance of the reality description for future interventions.

All 28 professionals in the nursing staff of the units under study were considered as potential participants, and 20 agreed to participate. However, during data collection,

there were two sector transfers and eight professionals did not perform medication preparation or administration functions. Thus, the final sample consisted of 10 nursing professionals. The inclusion criteria for participation in the study were: being a nursing professional, providing direct patient care and working in the department for at least three months. Professionals on vacation or any type of leave during the data collection period were excluded.

Data collection was performed in three phases between December 2016 and June 2017. In the first phase, professionals were recruited through a meeting with the entire nursing team, when the objectives and justification of the study were presented and was made the invitation to participate. Subjects who accepted signed the Informed Consent form (IC) and answered a questionnaire regarding sociodemographic data (age, marital status, schooling, training time and working time in inpatient units of the institution). The second phase included the research team training and application of the pretest in order to improve the data collection instrument prepared from literature data[12].

This instrument was used in the third phase. It was structured with identification data of the observation (date, time, collection department); questions to characterize distractions and interruptions, namely, in relation to origin (self-distraction, self-interruption, originated by professionals, patients or caregivers), the reason for interruption/distraction (use of institution or staff telephone, overlapping tasks, lack of medication or material, parallel conversation, ambient noise, instruction to other professionals or students) and if the practitioner allowed the distraction or interruption during medication preparation and administration. The duration of distraction and interruption was measured using a stopwatch. To this end, given the rapid occurrence of events, three observation periods were established, namely: less than one minute; one to three minutes; and over three minutes.

The observation unit was considered as each episode of medication preparation and administration. All medication administration routes were included. The research team consisted of one teacher and five properly trained academics. Each researcher observed one professional at a time at the times intentionally chosen according to researchers' availability (at 11, 14 and 17 hours). The researcher remained at the nursing station to record the observation of medication preparation then, followed the professional to the wards for observation of medication administration. Sometimes, the researcher interrupted the observation in the preparation step because the professional doing it did not continue with performance of medication administration. This monitoring was performed silently to avoid interference in the process of medication preparation and administration.

The observer's permanence in the wards during invitation to participants and the pretest contributed to diminish the Hawthorne effect (behavioral change when under observation), because researchers became part of the context and professionals began to see them as team members[13]. Data were processed in Excel® version 2016 spreadsheets to perform descriptive analyzes regarding absolute, relative and mean frequency.

The project was approved by the Research Ethics Committee of the proposing institution and the scenario institution of this study, under opinion number 1.885.341 and CAAE number 58517316.4.3001.5130.

RESULTS

Of the ten nursing professionals observed, most were female and nursing technicians. The average age of professionals was 31.7 years and half reported being married. The average working time in the nursing area was 5.2 years, ranging from six months to 18 years. Working time at the institution was of 2.2 years on average, ranging from seven months to six years. The average working time in inpatient units where the collection was performed was of two years, ranging from seven months to six years (Table 1).

The total duration of observations was 1,469 minutes and the average observation time was of 146.9 minutes per professional. The preparation of 342 and administration of 364 medications were observed, in which were recorded 252 distraction situations and 111 interruptions. The average number of patients per professional was 5.5.

Of the 252 distraction situations, 69.0% occurred during preparation and 31.0% during administration of medication. The main reason for distractions was related to parallel conversation and originated from third parties, and other nursing team professionals were the cause of more distractions to those preparing or administering medications (Table 2).

Interruptions occurred at 111 times; 64.0% during preparation and 36.0% during administration of medication. Parallel conversation, as in distracting situations, was the main source of interruption. Most interruptions occurred by third parties (nursing staff, patients, caregivers and other professionals) (Table 3).

DISCUSSION

The study participants have similar sociodemographic characteristics to nursing professionals described in another study in relation to predominance of females, age, schooling and training time[14].

The number of observations in the present study was higher than that of a study conducted in Germany, in which observations lasted 524 minutes[15]. Researchers could observe more preparations, of 431 medications. The difference in the number of medication preparations and administrations observed per participant in the present study was due to the

process fragmentation. The professional observed during the preparation did not always proceeded to medication administration, so the researcher did not continue with the observation. Such fragmentation can facilitate the occurrence of errors, because the professional administering an already diluted drug cannot identify if preparation was correct.

Table 1. Sociodemographic characteristics of professionals observed during medication preparation and administration (n=10). Minas Gerais, Brazil, 2017.

Characteristics	n	%
Sex		
Male	2	20.0
Female	8	80.0
Professional Category		
Nurse	3	30.0
Nursing Technician	4	40.0
Nursing Assistant	3	30.0
Age (years)		
20 to 25	1	10.0
26 to 30	4	40.0
31 to 35	1	10.0
36 to 40	4	40.0
Training Time		
<1 year	1	10.0
1 to 5 years	6	60.0
5 to 10 years	2	20.0
>10 years	1	10.0
Working Time in the Area		
<1 year	2	20.0
1 to 5 years	5	50.0
5 to 10 years	2	20.0
>10 years	1	10.0
Working Time at the Institution		
<1 year	3	30.0
1 to 5 years	6	60.0
5 to 10 years	1	10.0
>10 years	0	0.0
Working Time in the Department		
<1 year	3	30.0
1 to 5 years	6	60.0
5 to 10 years	1	10.0
>10 years	0	0.0

Table 2. Reasons and source of distractions in medication preparation and administration. Minas Gerais, Brazil, 2017.

Distractions	n	%
Reason for Distractions		
Parallel conversation	196	77.8
Ambient noise (audible alarms, telephone sounds and conversation between people)	23	9.1
Consultation to medical record and/or prescription	20	7.9
Instruction to other professionals or students	13	5.2
Total	252	100.0
Origin of Distractions		
Nursing staff	94	37.3
Other professionals	45	17.9
Self-distraction	44	17.5
Caregivers	39	15.5
Patients	30	11.9
Total	252	100.0

Table 3. Reasons and source of interruptions in medication preparation and administration. Minas Gerais, Brazil, 2017.

Interruptions	n	%
Reason for Interruptions		
Parallel conversation	52	46.8
Consultation to medical record and/or prescription	20	18.0
Overlapping tasks	9	8.2
Instruction to other professionals or students	8	7.2
Lack of material	8	7.2
Ambient noise (audible alarm)	5	4.5
Lack of medication	5	4.5
Answering institution telephone	3	2.7
Answering or using personal telephone	1	0.9
Total	111	100.0
Source of Interruptions		
Self-interruption	46	41.4
Nursing staff	22	19.8
Other professionals	16	14.4
Caregivers	14	12.6
Patients	13	11.7
Total	111	100.0

There were 252 distracting situations in medication preparation and administration. In a study conducted in a neonatal intensive care unit (ICU) in Barcelona, distraction of the nursing staff was the predominant factor of medication errors[16]. In a study in Norway, distraction situations affected 20.5% of patient care[7].

In the present study, were found 111 interruption situations. In another Brazilian study conducted in an adult ICU, after 99 hours of observation of 739 activities, were identified 46.82% interruptions, which corresponds to 7.85 interruptions per hour[17]. In a Turkish study, in 95.9% of observations performed, occurred at least one interruption during medication preparation[18].

Parallel conversation was the main reason for distractions and interruptions. An international study concluded that most of the information transmitted is irrelevant to the context of activities being performed[19].

Ambient noise was the second cause of distraction and the fifth cause of interruption in this study. In an international literature review, the noise of equipment audible alarms was identified as a frequent distraction for nurses[13]. Although equipment noises cause a decrease in workers' concentration, these are important warning signs for professionals and should not be neglected.

Consulting patients' medical record and/or prescription was the third reason for distraction and the second cause of interruption. In a Turkish study, 25.5% of interruptions observed occurred because of pauses to check the medical record[20]. Consultation of the medical record and/or prescription is necessary before medication preparation and administration. Despite its importance, during nursing clinical practice, professionals should not be distracted by other information unrelated to the medicine being prepared or administered.

The pause for instructing other professionals and/or students was the fourth source of both distractions and interruptions observed. In a Turkish study, the teaching-learning process of nursing students was also shown as one of the main reasons for interruptions[18].

Nursing professionals were the first source of distraction and the second source of interruption. Self-interruption was the second most observed source of interruption situations and self-distraction was the third source of distractions. A study conducted in Australia also found that the main source of interruption was initiated by nurses themselves (40%), who sought information about patients or care flow, including asking questions, instructions, reporting information and asking for assistance in care[10].

Another international study identified self-interruption as one of the most frequent sources of interruption and nursing colleagues were responsible for almost half of all interruptions (49%)[15]. Similar data were found in a Brazilian integrative review that cited self-interruption as one of the main sources of interruption[21]. In a Norwegian study, nursing staff was also largely responsible for distraction and interruption in medication preparation and administration[6]. Nurses are the last safety barrier in the medication system thus, they should recognize distractions and interruptions in the medication system for preventing medication errors in hospitals[6].

Other professionals, such as physicians, physiotherapists and others were the second source of distraction and the third source of interruption. A Brazilian ICU study identified other professionals as the third most frequent source of interruption (16.5%)[17]. In another Brazilian study, the unanimous perception of interviewees was that the medical professional category was the most generator of distraction and interruption situations[21].

Caregivers and patients were the fourth and fifth sources, respectively, of both distraction and interruption situations. Another Brazilian study identified patients and family members as sources of interruptions, although with lower percentages, and family members accounting for only 0.5%[17]. In a Norwegian study, patients, family, physicians, secretaries, and self-distraction were considered the least common sources[6]. Even as a minor source of distraction and interruption, it is important that patients and family members/caregivers are made aware of the risks of distractions and interruptions.

In this study, distractions and interruptions occurred mainly during medication preparation and the reasons or causes were closely interrelated. In a study conducted in Australia, most interruptions also occurred during medication preparation (73.3%), while 26.7% occurred during administration[10]. Interruptions also affected intravenous medication preparation according to a study in Norway[6].

In this study, lack of medication was the fifth cause of interruption and lack of material was the seventh cause. A Canadian study observed that system failures, including lack of material, were the second source of interruptions during medication preparation[19]. Nurses are the professionals responsible for delegation of actions and care planning, prevision and provision of material and human resources, and nursing staff training, always aiming at the improvement and implementation of patient care[22]. Therefore, supervisor nurses together with the hospital management, should be aware of the lack of materials and/or medications, and promote actions for the sustainable supply of materials in order to create an appropriate and safe environment.

The use of institutional and personal (mobile) telephones were important sources of interruption, eighth and ninth causes, respectively. Other studies have also found mobile phone use as the main cause of distraction and interruption[11,21,22]. In a study conducted in a teaching hospital with the aim to investigate nurses' perceptions of

interruptions during work dynamics, telephone ringing was identified as the main source and a preventable interruption[11]. In addition to mobile phones being a cause of distraction and interruption, a Brazilian study conducted in a hospital ICU found they can act on the dissemination of multidrug-resistant microorganisms and lead to patient contamination[22]. Hence the need to develop rules and strategies to alert professionals about the use of mobile phones during medication preparation and administration. Professionals' awareness of the risks involved in this behavior is a critical factor for its successful change.

The results of this study showed that distractions and interruptions are present situations during medication preparation and administration. Such events directly and negatively impact clinical nursing practice, as they interfere with patient safety and the quality of the work environment of the multiprofessional team. Therefore, the need to raise awareness of health professionals and the hospital leadership regarding distractions and interruptions for the implementation of strategies to overcome these events.

Strategies should be focused on the entire team and the management of distraction and interruption events should be directed towards better care planning, prevention and mitigation of patient harm[23]. The main strategies described in the international literature for overcoming distractions and interruptions are defining a No Interruption Zone or separate medication rooms, electronic medical records during medication preparation, and double checking[12]. A Brazilian study showed that besides the lack of strategies to minimize distractions and interruptions, the studied hospital also lacked an effective enforcement mechanism for compliance with specific rules, such as restriction of mobile phone use by all employees[23].

CONCLUSION

In the present study, the presence of distraction and interruptions situations in medication preparation and administration was identified in clinical nursing practice. Such events directly affect patient safety and the quality of the work environment. Therefore, these are important points of discussion from the training of nursing professionals until continuing and lifelong education actions of health professionals. This theme should also be part of the agenda of the leadership of institutions, so that actions to minimize distractions and interruptions during medication preparation and administration and other activities of nursing clinical practice and the multiprofessional team are addressed within the strategic planning of health institutions.

Thus, studies on the occurrence of distractions and interruptions are fundamental for constructing a positive safety culture in health organizations with the aim to reduce harm to patients. The overcoming strategies should be discussed with the entire team and standardized by the institution's leadership for achieving legitimacy of these interventions and maximizing patient safety.

The main difficulty of the study was not observing all professionals who agreed to participate in the study because of staff turnover. Limitations include data collection restricted to day shifts and observations only at standardized times for medication preparation/administration. Thus, the amount and speed of distractions and interruptions occurrences may have implied a lower record of observed events. In contrast, the study contributes to the elucidation of distractions and interruptions in the scope of medication preparation and administration in medical-surgical inpatient units, signaling the need to discuss the occurrence of these events since professionals' training and in their daily work routine.

The strategy of recording the actions for further observation in future studies will provide greater reliability of the amount of distractions and interruptions. Finally, the performance of further studies is recommended for more depth of the theme in different departments and institutions, as well as performance of studies evaluating the strategies to minimize distraction and interruption events.

REFERENCES

1. Institute of Medicine. To err is human: building a safer health system. [Internet]. Washington (DC): National Academies Press; 2000. [access on: Oct. 7, 2017]. Available at: http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/1999/To-Err-is-Human/To%20Err%20is%20Human%201999%20%20report%20brief.pdf.
2. Brasil. Ministério da Saúde. Resolução nº 36, de 25 de julho de 2013. Institui ações para a segurança do paciente em serviços de saúde e dá outras providências. [Internet]. Diário Oficial [da União], Brasília (DF); 2013. [access on: Oct. 7, 2017]. Available at: http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2013/rdc0036_25_07_2013.html.
3. World Health Organization. Medication Without Harm: WHO's Third Global Patient Safety Challenge. [Internet]. Geneva, Switzerland: WHO; 2017. [access on: Oct. 7, 2017]. Available at: http://www.who.int/patientsafety/medication-safety/en/.
4. World Health Organization. World Alliance for Patient Safety International Classification for Patient Safety (ICPS). [Internet]. Geneva, Switzerland: WHO; 2011. [access on: Feb. 8, 2019]. Available at: http://www.who.int/patientsafety/taxonomy/en/.

5. Alteren J, Hermstad M, White J, Jordan S. Conflicting priorities: observation of medicine administration. J Clin Nurs [Internet]. 2018 [access on: Feb. 7, 2019];27(19-20):3613-21. Available at: https://www.researchgate.net/publication/325232687_Conflicting_priorities_Observation_of_medicine_administration. https://doi.org/10.1111/jocn.14518.
6. Jacobsen TF, Mussi, MM, Silveira, MPT. Análise de erros de prescrição em um hospital da Região Sul do Brasil. Rev Bras Farm Hosp Serv Saúde São Paulo [Internet]. 2015 [access on: Feb. 7, 2019];6(3):23-6. Available at: http://www.sbrafh.org.br/v1/public/artigos/20150603040000800BR.pdf.
7. Bucknall T, Fossum M, Hutchinson AM, Botti M, Considine J, Dunning T, et al. Nurses' decision-making, practices and perceptions of patient involvement in medication administration in an acute hospital setting. J Adv Nurs [Internet]. 2019 [access on: Feb. 9, 2019];75(6):1316-27. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/jan.13963. https://doi.org/10.1111/jan.13963.
8. Edwards S, Axe S. The 10'R's of safe multidisciplinary drug administration. Nurse Prescribing [Internet]. 2015 [access on: Feb. 9, 2019];13(8):398-406. 9p. Available at: https://www.magonlinelibrary.com/doi/abs/10.12968/npre.2015.13.8.398. https://doi.org/10.12968/npre.2015.13.8.398.
9. Schroers G. Characteristics of interruptions during medication administration: An integrative review of direct observational studies. J Clin Nurs [Internet]. 2018 [access on: Feb. 9, 2019];27(19-20):3462-71. Available at: https://www.researchgate.net/publication/326002751_Characteristics_of_Interruptions_During_Medication_AdministrationAn_Integrative_Review_of_Direct_Observational_Studies. https://doi.org/10.1111/jocn.14587.
10. Johnson M, Sanchez P, Langdon R, Manias E, Levett-Jones T, Weidemann G, et al. The impact of interruptions on medication errors in hospitals: an observational study of nurses. J Nurs Manag [Internet]. 2017 [access on: Feb. 9, 2019];25(7):498-507. Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/jonm.12486. https://doi.org/10.1111/jonm.12486.
11. Sassaki RL, Perroca MG. Interrupções e seus efeitos sobre a dinâmica de trabalho do enfermeiro. Rev Gaúcha Enferm [Internet]. 2017 [access on: Feb. 9, 2019];38(2):1-8. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1983144720170002004 23&lng=pt&tlng=pt. http://dx.doi.org/10.1590/1983-1447.2017.02.67284.
12. Bower R, Jackson C, Manning JC. Interruptions and medication administration in critical care. British Association of Critical Care Nurses [Internet]. 2015 [access on: Nov. 15, 2017];20(4):183-95. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26084432. http://dx.doi.org/10.1111/nicc.12185.
13. Kurtz SL. Measuring and accounting for the Hawtone effect during a direct overt observational study of intensive care unit nurses. American Journal of Infection Control [Internet]. 2017 [accesson: Feb. 11, 2019];45(9):995-1000. Available at: https://www.sciencedirect.com/science/article/pii/S0196655317302699. https://doi.org/10.1016/j.ajic.2017.03.022.
14. Souza AMN, Teixeira ER. Perfil sociodemográfico da equipe de enfermagem do ambulatório de um hospital universitário. Rev Enferm UFPE On Line. [Internet]. 2015 [access on: Nov. 15, 2017];9(Supl.3):7547-55. Available at: https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/10493. https://doi.org/10.5205/reuol.7049-61452-1-ED.0903supl201507.
15. Huckels-Baumgart S, Niederberger M, Manser T, Meier CR, Meyer-Massetti C. A combined intervention to reduce interruptions during medication preparation and double-checking: a pilot-study evaluating the impact of staff training and safety vests. Journal of Nursing Management [Internet]. Oct. 2017 [access on: Dec. 10, 2017];25(7):539-48. Available at: http://onlinelibrary.wiley.com/doi/10.1111/jonm.12491/full. https://doi.org/10.1111/jonm.12491.
16. Esqué Ruiz MT, Moretones Suñol MG, Rodríguez Miguélez JM, Sánchez Ortiz E, Izco Urroz M, Lamo Camino M, et al. Medication errors in a neonatal unit: One of the main adverse events. Anales de Pediatría [Internet]. 2016 [access on: Dec. 10, 2017]; 84(4): 211-17. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26520488. https://doi.org/10.1016/j.anpedi.2015.09.009.
17. Prates DO, Silva AEBC. Interrupções de atividades vivenciadas por profissionais de enfermagem em unidade de terapia intensiva. Rev Latino-Am Enferm [Internet] 2016. [access on: Dec. 10, 2017];24:e2802. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-11692016000100413&lng=pt&tlng=pt. https://doi.org/10.1590/1518-8345.0997.2802.
18. Duruk N, Zencir G, Eses I. Interruption of the medication preparation process and an examination of factors causing interruptions. Journal of Nursing Management [Internet] 2016. [access on: Dec. 10, 2017];24:376-83. Available at: http://onlinelibrary.wiley.com/doi/10.1111/jonm.12331/abstract. https://doi.org/10.1111/jonm.12331.

19. Biron AD, Lavoie-Tremblay M, Loiselle CG. Characteristics of Work Interruptions During Medication Administration. Journal of Nursing Scholarship [Internet]. 2009 [access on: Dec. 10, 2017];41(4):330-36. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1547-5069.2009.01300.x/epdf. https://doi.org/10.1111/j.1547-5069.2009.01300.x.

20. Bogo PC, Bernardino E, Castilho V, Cruz EDA. The nurse in the management of materials in teaching hospitals. Rev Esc Enferm USP [Internet]. 2015 [access on: Feb. 20, 2018]; 49(4):632-39. Available at: http://www.scielo.br/pdf/reeusp/v49n4/0080-6234-reeusp-49-04-0632.pdf. http://dx.doi.org/10.1590/S0080-623420150000400014.

21. Ribeiro HCTC, Rodrigues TM, Teles SAF, Pereira RC, Silva LLT, Mata LRF. Distrações e interrupções em sala cirúrgica: percepção de profissionais de enfermagem. Esc Anna Nery [Internet]. 2018 [access on: Feb. 13, 2019];22(4). Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1414-81452018000400210&lng=en. http://dx.doi.org/10.1590/2177-9465-EAN-2018-0042.

22. Reis ER, Silva W, Carvalho EV, Filho AC; Braz MR. Contaminação de telefones celulares da equipe multiprofissional em uma unidade de terapia intensiva. Saber Digital [Internet]. 2015 [access on: Feb. 20, 2018];8(1):68-83. Available at: https://pdfs.semanticscholar.org/445d/af20e6291c3a4e319020ae96c676eb848c23.pdf.

23. Monteiro C, Avelar AFM, Pedreira MLG. Interrupções de atividades de enfermeiros e a segurança do paciente: revisão integrativa da literatura. Rev Latino-Am Enferm [Internet] 2015 [access on: Feb. 20, 2018];23(1):169-79. Available at: http://www.revistas.usp.br/rlae/article/view/100054. https://doi.org/10.1590/0104-1169.0251.2539.