Original Article

Medication interaction: knowledge of nurses in intensive care units*

Interação medicamentosa: conhecimento de enfermeiros das unidades de terapia intensiva

Interacción medicamentosa: conocimiento de enfermeros de las unidades de cuidados intensivos

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ABSTRACT

Objective: To evaluate adult intensive care unit (ICU) nurses' knowledge of medication interactions (IM) in three public hospitals in Goias. **Methods:** A cross-sectional study was conducted using a population of 64 and a sample of 51 nurses. An instrument was constructed to collect data, using information from the database MICROMEDEX ®. **Results:** Regarding the knowledge of clinical management of IM, there was approximately the same number of right and wrong answers among 50% of the nurses. Nurses had better knowledge about drugs with sedative and analgesic action; nurses demonstrated less knowledge about drugs with anti-infective and anti-hypertensive actions. **Conclusion:** It is necessary to sensitize the authorities and professionals about the importance of IM in the ICU, and to implement actions for patient safety related to drug therapy.

Keywords: Safety management; Safety; Drug interactions; Knowledge

RESUMO

Objetivo: Avaliar o conhecimento das interações medicamentosas (IM)de enfermeiros que atuam em unidades de terapia intensiva de adultos, de três hospitais públicos de Goiás. **Métodos**: Estudo descritivo, transversal. População 64 e amostra, 51 enfermeiros. Construiu-se um instrumento de coleta de dados, utilizando informações da base de dados MICROMEDEX®. **Resultados**: Sobre o conhecimento de IM e manejo clínico, houve uma relação de acertos e erros de, aproximadamente, 50% dos enfermeiros. As duplas de medicamentos que os enfermeiros mais acertaram foram relativas a medicamentos com ação sedativa e analgésica e as que apresentaram mais erros, foram as de ação anti-infecciosa e anti-hipertensiva. **Conclusão:** É necessário sensibilizar autoridades e profissionais sobre a importância das IM na UTI e implementar ações para a segurança dos pacientes na terapêutica medicamentosa.

Descritores: Gerenciamento de segurança; Segurança; Interação medicamentosa; Conhecimento

RESUMEN

Objetivo: Evaluar el conocimiento de las interacciones medicamentosas (IM) de enfermeros que actúan en unidades de cuidados intensivos de adultos, de tres hospitales públicos de Goiás. **Métodos**: Estudio descriptivo, transversal. Población 64 y muestra 51 enfermeros. Se construyó un instrumento de recolección de datos, utilizando informaciones de la base de datos MICROMEDEX®. **Resultados**: Sobre el conocimiento de IM y manejo clínico, hubo una relación de aciertos y errores de, aproximadamente el 50% de los enfermeros. El par de medicamentos que los enfermeros aciertan más fueron los relativos a medicamentos con acción sedante y analgésica y los que presentaron más errores, fueron los de acción anti-infecciosa y anti-hipertensiva. **Conclusión:** Es necesario sensibilizar a las autoridades y profesionales sobre la importancia de las IM en la UCI e implementar acciones para la seguridad de los pacientes en la terapéutica medicamentosa.

Descriptores: Administración de la seguridad; Seguridad; Interacciones de drogas; Conocimiento

** The study was carried out in three public hospitals in Goiânia: Hospital Geral de Goiânia, Hospital das Clínicas from Universidade Federal de Goiás and Hospital de Urgências de Goiânia.*

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INTRODUCTION

Currently, in intensive care units (ICU), the exposure of patients to situations in the clinical practice that can affect their health condition has become a concern. The main aggravating factor for this exposure is the multiple drugs these patients receive, together with their physiological imbalance. Drug interactions (DI), when they are not promptly prevented or treated, are among the main problems connected with the use of drugs in intensive care units, and can cause irreparable harm to patients. Studies point out that DI is frequent in ICU patients with higher indexes compared to patients admitted to other units[1].

From a professional stand point, the nursing team has a unique work in the prevention of DI, because it is responsible for scheduling, preparing, administering and following-up drug effects. However, they must have knowledge and must know how to identify the possible DI so that patients are not exposed to unwanted situations.

So, considering that the knowledge of DIs is an important tool to optimize nursing care, the present study was carried out to assess the knowledge of nurses working in adult intensive care units of three public hospitals in Goiás about drug interaction.

METHODS

Cross-sectional, non-experimental, descriptive study carried out in adult ICUs in three public hospitals from Goiás. The population was formed by 62 nurses, working in the adult ICU who were all invited to take part in the study, however, the sample was formed by 51 nurses.

The study met the Ordinance no 196/96 of the Ministry of Health. Before the nurses had answered the data collection instrument, they were asked to give their written consent.

The data collection instrument was built based on data from a multicenter project *"Potenciais interações medicamentosas em UTIs e a segurança de pacientes: análise do planejamento dos horários de administração de medicamentos"* (Potential drug interactions in ICUs and patients' safety: analysis of the planning of the times drug are delivered), carried out in ICUs of two institutions in Goiania. The study identified potential DIs that occurred in the ICUs of the hospitals studied[2]. To identify the interactions and to prepare the alternatives of the data collection instrument, we have used the information from MICROMEDEX® Healthcare Series data base[3]. For this study, we have considered the most frequent severe and moderate DIs in the three ICUs studied. Before data collection, the content validity of the instrument was carried out with the participation of five judges specialized in this theme. Frequency and percentage analysis of the nurses' answers were performed using the program Microsoft Excel 2002 (version 10.26142624), after the development of a spreadsheet for data coding and typing.

RESULTS

Fifty-one nurses took part in the study, 8 (15.7%) from Hospital A, 16 (31.4%) from Hospital B and 27 (52.9%) from Hospital C. Women were the majority 43 (84.3%). The age group ranged from 25 to 55 years old, with mean of 38.9 years. As for the time working in nursing, it ranged from 2 to 31 years, with an average of 12 years. The smallest amount of time working at ICU was 1 month and the maximum was 26 years, with an average of 7.6 years. Of the total amount of nurses, 5 (9.8%) had less than one year of experience in ICU, and among them 4 (7.8%) had been working in the unit for only 1 month. As for the others, 19 (37.3%) had been working for less than 5 years and 27 (52.9%) had more than 5 years of experience in ICU.

As for the technical-scientific work, 41 (80.4%) answered they needed update. Regarding scientific events, 12 (23.5%) nurses answered they had taken part in events related to ICU and 10 (19.6%) reported they had not taken part in any event and more than half 35 (68.6%) had taken part in scientific events recently. About pharmacological education, of the 51 participants, 29 (56.9%) said they had regular education and 17 (33.3%) considered their education insufficient. As for the need for pharmacological capacity building, 49 (96.1%) answered they needed capacity building.

To assess the occurrence or absence of DI and the proper clinical management of these interactions, we have asked nurses to answer about a series of drug pairs in the data collection instrument. In the data of Table 1 the pairs, the results of nurses' answers about the occurrence of DI, and its proper clinical management are presented.

According to Table 1, we could identify that, from the pairs where there is DI occurrence, only eight were correctly answered by more than 50% of the nurses, both in the DI and in the clinical management: fentanyl + morphine; midazolam + phenobarbital; midazolam + morphine; fentanyl + midazolam; captopril + furosemide; gentamicin + vancomycin; clopidogrel + enoxaparin; carvedilol + dobutamine.

As for the pair of drugs that interact and that more than 50% nurses answered incorrectly both in the DI and in the clinical management, the following stood out: amiodarone + fentanyl; amiodarone + simvastatin; gentamicin + magnesium sulfate; hydrocortisone + levofloxacin; furosemide + gentamicin; citalopram + heparin; regular insulin + norfloxacin; carbamazepine + omeprazole; amiodarone + metronidazole; omeprazole + digoxin.

Table 1 – Distribution of nurses' answers (correct, incorrect and null) on the occurrence of DI and the adequate clinical management of a series of pair of drugs simultaneously administered Goiânia, 2010. N=51

Interaction or not	Pairs	Answers											
		Drug interactions						Clinical management					
		Correct		Incorrect		Null		Correct		Incorrect		Null	
		n	%	n	%	n	%	n	%	n	%	n	%
Drugs that interact when simultaneously used	Fentanyl + Morphine	44	86.3	7	13.7	0	0.0	36	70.6	14	27.5	1	2.0
	Midazolam + Phenobarbital	41	80.4	10	19.6	0	0.0	35	68.6	16	31.4	0	0.0
	Midazolam + Morphine	39	76.5	12	23.5	0	0.0	32	62.7	17	33.3	2	3.9
	Fentanyl + Midazolam	36	70.6	15	29.4	0	0.0	43	84.3	8	15.7	0	0.0
	Captopril + Furosemide	34	66.7	17	33.3	0	0.0	32	62.7	18	35.3	1	2.0
	Gentamicin + Vancomycin	33	64.7	18	35.3	0	0.0	30	58.8	19	37.3	2	3.9
	Clopidogrel + Enoxaparin	28	54.9	22	43.1	1	2.0	32	62.7	19	37.3	0	0.0
	Carvedilol + Dobutamine	28	54.9	22	43.1	1	2.0	28	54.9	23	45.1	0	0.0
	Amiodarone + Fentanyl	21	41.2	30	58.8	0	0.0	24	47.1	26	51.0	1	2.0
	Amiodarone + Simvastatin	21	41.2	30	58.8	0	0.0	2	3.9	49	96.1	0	0.0
	Gentamicin + Magnesium sulphate	19	37.3	31	60.8	1	2.0	0	0.0	50	98.0	1	2.0
	Hydrocortisone + Levofloxacin	17	33.3	33	64.7	1	2.0	1	2.0	49	96.1	1	2.0
	Furosemide + Gentamicin	16	31.4	35	68.6	0	0.0	6	11.8	45	88.2	0	0.0
	Citalopram + Heparin	16	31.4	30	58.8	5	9.8	21	41.2	29	56.9	1	2.0
	Regular Insulin + Norfloxacin	12	23.5	39	76.5	0	0.0	17	33.3	33	64.7	1	2.0
	Carbamazepine + Omeprazole	12	23.5	38	74.5	1	2.0	10	19.6	40	78.4	1	2.0
	Amiodarone + Metronidazole	10	19.6	41	80.4	0	0.0	4	7.8	47	92.2	0	0.0
	Omeprazole + Digoxin	9	17.6	42	82.4	0	0.0	11	21.6	40	78.4	0	0.0
Drugs that do not interact when simultaneously used	Vancomycin + Regular insulin	43	84.3	8	15.7	0	0.0	40	78.4	10	19.6	1	2.0
	Vancomycin + Dobutamine	41	80.4	10	19.6	0	0.0	36	70.6	15	29.4	0	0.0
	Cefepime + Sodium nitroprusside	41	80.4	10	19.6	0	0.0	40	78.4	10	19.6	1	2.0
	Clonidine + Imipenem	37	72.5	14	27.5	0	0.0	35	68.6	16	31.4	0	0.0
	Diazepam + Ranitidine	35	68.6	16	31.4	0	0.0	42	82.4	9	17.6	0	0.0
	Clindamycin + Calcium Gluconate	34	66.7	17	33.3	0	0.0	30	58.8	20	39.2	1	2.0
	Captopril + Morphine	33	64.7	18	35.3	0	0.0	29	56.9	22	43.1	0	0.0
	Sodium nitroprusside + Sodium Chloride	25	49.0	25	49.0	1	2.0	26	51.0	25	49.0	0	0.0
	Nitroglycerin + Nifedipine	18	35.3	33	64.7	0	0.0	21	41.2	30	58.8	0	0.0
	Nitroglycerin + Clonidine	16	31.4	35	68.6	0	0.0	18	35.3	33	64.7	0	0.0
	Dobutamine + Sodium nitroprusside	14	27.5	35	68.6	2	3.9	13	25.5	38	74.5	0	0.0
	Sodium nitroprusside + Nitroglycerin	11	21.6	40	78.4	0	0.0	12	23.5	39	76.5	0	0.0

DISCUSSION

According to the sociodemographic characteristics and the time working at ICU, we have observed that most nurse teams are formed by young female adults with work experience. But the data have shown that a small group of nurses had less than 1 year of experience in ICU. With this regard, the study carried out to check

the effects of the lack of experience of the work of nurses in ICU showed that it contributed to the occurrence of incidents, with a negative influence in safety and quality of nursing care[4].

As for the pharmacological education and the need for capacity building, the data have shown that despite the dissatisfaction with academic education, nurses want to acquire new knowledge and this condition is a positive edge for the work in nursing.

In the knowledge assessment on DI and its clinical management at ICU, the following results have been observed.

Regarding the pairs that were correctly answered by more than 50% of the nurses, both in DI and its clinical management, the following stood out: fentanyl + morphine 44 (86.3%) of 51 nurses that answered correctly in the DI and 36 (70.6%) answered correctly about the clinical management; midazolam + phenobarbital that 41 (80.4%) answered correctly in the DI, and 35 (68.6%) answered correctly in the clinical management; midazolam + morphine, 39 (76.5%) answered correctly about the DI and 32 (62.7%) answered correctly about the clinical management; fentanyl + midazolam, 36 (70.6%) nurses answered correctly DI and 43 (84.3%), answered correctly the clinical management.

Regarding these drugs, they are sedative and analgesic, classified as opioids, barbiturates or benzodiazepines, with a high frequency of correct answers. Although these drugs interact and can cause harm to patients, sometimes they are necessary because the benefits they bring to patients may outweigh their risks, such as the case of the use of sedation in prolonged mechanical ventilation. On the clinical management of these interactions, the MICROMEDEX® Healthcare Series database[5] recommends to monitor patients' respiratory depression, or to repeat the dose of one or both drugs; requiring a medical management in this last case.

Also in ICU when these drugs are simultaneously administered, there is a sedation purpose, therefore, in most cases these patients are under mechanic ventilation. For that reason, nurses need further attention, because in addition to respiratory monitoring, they have to assess the sedation level, monitoring very closely patients' blood pressure and heart rate. To search for non-pharmacological strategies to avoid the use of analgesic and sedatives can be discussed with the ICU team. Researchers recommend actions to decrease the noise in the unit, and to promote comfort and sleep to patients. In addition to these recommendations, the use of clinical protocols and sedation assessment scales can avoid excessive or inadequate sedation and decrease the incidence of side effects and potential complications in patients[6].

Regarding the pair of drugs captopril + furosemide, 34 (66.7%) nurses answered correctly about the DI and 32 (62.7%), answered correctly about the clinical management, when they were asked about the occurrence of this DI. The literature highlights that the simultaneous use of captopril and furosemide can lead to a hypotensive additive effect and trigger severe hypotension. Thus, when these two drugs have to be used together, one should start with a very low dose of the angiotensin-converting enzyme inhibitors at night and follow-up closely the blood pressure for 4 hours after the initial dose, because a severe hypotensive response may occur[5,7]. In this case, it is necessary to monitor signs and symptoms of hypotension, body weight, and to perform water control, up to 2 weeks, after dose adjustment as a nursing care plan.

A measure that has been widely recommended for DI prevention is to conciliate drugs in the transition of care at the time patient is discharged from the ICU to less complex units[8]. Thus, the follow-up of patients in drug therapy should occur not only at the time of ICU admission, as well as when they are discharged from the unit, warning the other teams about the need to monitor certain drugs.

As for the occurrence of DI in the pair of drugs gentamicin + vancomycin, of the 51 nurses, 33 (64.7%) answered correctly about the DI and 30 (58.8%) about the clinical management. Studies have proven that the simultaneous use of vancomycin and an aminoglycoside antibiotic is associated with a higher incidence of nephrotoxicity compared to each drug being used alone[5]. It is important to point out that when this association is necessary, nurses can avoid undesired reactions in patients by a careful monitoring of the renal function and observing the signs of nephrotoxicity. Therefore, the most common signs and symptoms of this type of DI are oliguria, back pain, hypotension, rash, skin discoloration, edema, excessive thirst, among others. In more severe cases, patients can present respiratory rales, dyspnea, tachypnea and altered mental status.

Regarding the pair clopidogrel + enoxaparin, just over half of nurses answered correctly about it, 28 (54.9%) for DI and 32 (62.7%), for clinical management. The literature highlights that the simultaneous use of low molecular weight heparins and anticoagulants increase the risk for bleeding in patients. Thus, when these drugs are used simultaneously, the patient should be monitored due to the risk of bleeding, especially gastrointestinal bleeding. In such a case, nurses should look for the following signs and symptoms: nauseas, vomiting, hematemesis, melena, hypotension, among others[5].

As for the use of carvedilol + dobutamine, 28 (54.9%) nurses answered correctly, both about DI and clinical management. The literature points out that when

used together, carvedilol antagonizes the activity of dobutamine, decreasing its efficacy. So, patients' blood pressure and heart rate should be monitored[5]. Nurses' monitoring this type of DI is important because if carvedilol decreases the efficacy of dobutamine, you may loose the following desired effects of these drugs: increase in myocardial contractility and the ejection volume by the use of dopamine or, blood pressure may not be normalized by the use of carvedilol, which may compromise patients' positive evolvement.

As for the pair of drugs that interact and that 50% of the nurses have answered incorrectly both about the DI and its clinical management, the pair of drugs amiodarone + fentanyl stood out, 30 (58.8%) out of 51 nurses have answered incorrectly in the DI and 26 (51.0), answered incorrectly about the clinical management. The simultaneous use of these drugs can lead to cardiotoxicity and increase the risk for toxicity of the fentanyl, leading to central nervous system and respiratory system depression. Thus, the clinical management for this type of interaction is to monitor cardiovascular complications, to increase respiratory frequency and the depression of the central nervous system. Therefore, nurses should pay attention especially to changes, such as the presence of peripheral edema, jugular vein distention, tachycardia, precordial pain, changes in cardiac auscultation, changes in blood pressure and loss of consciousness, among others[5].

Regarding the simultaneous use of amiodarone + simvastatin, 30 (58.8%) nurses have answered incorrectly the DI and most, 49 (96.1%), answered incorrectly about the clinical management. The use of these drugs together can lead to an increase in the risk for myopathy or rhabdomyolysis. In the clinical management, it is recommended to monitor patients for signs and symptoms of rhabdomyolysis or myopathy such as: muscular pain, sensibility or weakness, and dark diuresis[9].

As for the pair of drugs, gentamicin + magnesium sulphate, 31 nurses (60.8%) answered incorrectly about DI and almost all answered incorrectly about its clinical management 50 (98.0%). A study carried out with animals have demonstrated that these drugs can lead to neuromuscular blocking when used simultaneously, because of a decrease in the release of acetylcholine, affecting the neuromuscular transmission and the decrease of the motor nervous impulses[5]. If patients are under sedation, as in the case of induced come, it is hard to detect the effects of some DIs, such as for example neuromuscular blocking. Therefore, in this situation, the actions of the team should be geared to prevention of DI, thus, ensuring patients' safety.

It is concerning that most nurses have answered incorrectly about the clinical management of the DI because these are commonly used drugs in the ICU and their consequences cause serious clinical changes in patients. This result shows the need to offer subsidies, so that nurses make adequate judgments and clinical assessment, before administering some drugs simultaneously, therefore, being aware of this DI is very important since more severe decompensation in patients can be avoided.

Regarding hydrocortisone + levofloxacin, 33 nurses (64.7%) answered incorrectly about the DI and most, 49 (96.1%) answered incorrectly about the clinical management. For this type of DI, the American reports on medicine surveillance have warned of the increased risk for tendon rupture in patients treated with fluoroquinolone and corticosteroids simultaneously, especially in elderly patients. Tendon rupture can occur during or after treatment with quinolones. The recommendation for the use of these drugs is to observe signs and symptoms of pain, inflammation or tendon rupture in patients[5]. Age is an aggravating factor among the risk factors for DI. Elderly patients are more susceptible and are usually the majority of patients admitted to the ICU, because of that, they need to be closely followed-up by nurses to avoid these complications.

When DI occurs for the pair furosemide + gentamicin, 35 nurses (68.6%) have answered incorrectly about it, and 45 (88.2%) about its clinical management. According to the literature, the simultaneous use of both drugs can lead to an addictive effect, increasing the risk for nephrotoxicity and ototoxicity in patients, as well as changing the plasma levels of gentamicin. Therefore, monitoring signs and symptoms of ototoxicity and nephrotoxicity is recommended[5]. The data is an important warning because furosemide is a loop diuretic frequently used in ICUs, and it may present interaction with other drugs. Many times, due to ICU patients' clinical condition, the follow-up of DI effects is difficult. Therefore, both the knowledge of adverse events of DIs and the careful involvement of nurses in the administration of certain drugs, such as furosemide, are important. For the care with this type of DI, nurses can observe the signs and symptoms of nephrotoxicity such as oliguria, rash, pallor, edema, excessive thirsty among others: and for ototoxicity they should observe the presence of nausea, vomiting, vertigo, tinnitus, hyperacusis, dizziness and other symptoms.

Because of the complexity of the multiple schemes of drugs ICU patients receive, the role of nurses is essential to help diagnosing DIs and to minimize their negative impact in the ICU[10].

Regarding the pair citalopram + heparin, 30 nurses (58.8) answered incorrectly about DI and 21 (41.2%) about the clinical management. These drugs have antidepressant and anticoagulant action and when they

are simultaneously administered, they increase the risk for patients' bleeding. As for the clinical management, we recommend to check signs and symptoms of bleeding such as: epistaxis, bruises, petechiae and fatal bleeding[11].

Another pair of drugs that drew our attention because of the amount of incorrect answers was the interaction between regular insulin + norfloxacin. In this pair of drugs, 39 nurses (76.5%) answered incorrectly about DI and 33 (64.7%) about the clinical management. Studies point out that when antidiabetic agents are used with fluorinated quinolones, changes in blood glucose levels, hypoglycemia and hyperglycemia can significantly occur. Regarding the clinical management, the literature recommends to carefully monitor the blood glucose levels and to observe signs and symptoms of hypoglycemia and hyperglycemia[12].

Regarding the drugs carbamazepine + omeprazole, 38 nurses (74.5%) answered incorrectly about DI and 40 (78.4%) about its clinical management. Studies show that the simultaneous use of these two drugs can result in risk of toxicity by carbamazepine. Although there are some controversies, omeprazole increases the elimination time and serum concentration of carbamazepine. In this last aspect, it is recommended to observe signs of toxicity by carbamazepine such as: ataxia, nystagmus, diplopia, headache, vomiting, apnea, seizures and coma[5,7].

As for the occurrence of DI in the pair of drugs amiodarone + metronidazole, 41 nurses (80.4%) answered incorrectly about the DI and most, 47 (92.2%), answered incorrectly about the clinical management. The simultaneous use of these drugs is not recommended because they can lead to changes in the ECG with QT prolongation and *torsades de pointes*, and immediate arrhythmia[13]. This is concerning information because it represents a more severe interaction and it is life threatening for patients. Despite the dangers of its use, this interaction has been frequently found in other studies carried out in ICU[2,14]. The fact that most nurses have answered incorrectly about this pair of drugs is a sign that there is the need to instrument them so that there is greater safety in the process to administer drugs. Thus, nurses should supervise the action of administering drugs and should interpret the therapeutic plan, prepare patients, and observe the effects and possible reactions of the drugs.

As for the pair of drugs that nurses presented a greater number of incorrect answers, omeprazole + digoxin, 42 nurses (82.4%) have answered incorrectly about the DI and 40 (78.4%) about the clinical management. This DI occurs because omeprazole causes the inhibition of gastric acid secretion, leading to an increase in the bioavailability of digoxin, triggering its toxicity[15]. Considering the clinical importance of this DI, and the frequent use of these drugs in the ICU, the nursing team should be alert for the possibility of this type of complication; therefore, an attitude that can help the team in the prevention of DI is to be alert about the determination of times drugs are administered because scheduling several drugs to be given at the same time can favor especially the occurrence of DI involving absorption.

From these results, we have observed the frequency of incorrect answers on DIs presenting clinical importance to patients. This is a warning to some types of drugs commonly used in the ICU, such as those discussed here. Therefore, intensive care nurses should know the interactions that can occur more frequently in the ICU, as well as the main risk factors for their occurrence, especially on commonly administered drugs[16].

Regarding the pair of drugs that do not interact, although they offer no risk for patients, they each require special care from the nursing team in their preparation and administration.

CONCLUSION

The results obtained in the present investigation have showed that there is a knowledge gap about DIs and drew attention to the need for information regarding the most commonly administered drugs in the ICU.

Regarding pharmacological education, we hope that universities and other institutions make people aware of the need for spreading and promoting an adequate pharmacological knowledge to nurse professionals, since patients' safety in the drug therapy should be a priority in the context of health and teaching institutions.

As for the knowledge of nurses regarding DI and its clinical management, the results have showed that nurses answered correctly, but the pair of drugs that present interactions of drugs with sedative and analgesic action had a higher number of incorrect answers when associated with anti-infective and cardiovascular action drugs. This is a concerning result, since these drugs are commonly used in the ICU, especially those with a cardiovascular action, due to the hemodynamic instability of patients.

Thus, intensive care nurses inserted in their several routine activities have to be aware of their role in the safe use of drugs. Therefore, they must know the pharmacological priorities of drugs and must have access to information that enable them to identify the contraindications of their simultaneous use, so that it is easier to forecast the possibility of the occurrence of DI with the prescription of several drugs in the ICU.

In this perspective, to be able to achieve an efficient and safe measuring system requires a collaborative effort

of the professionals and health institutions, centered especially on the characteristics of critical patients. Thus, employers need to supply an environment that favors learning, making available ways for professionals to settle questions about the drugs most commonly administered in the ICU.

REFERENCES

1. Cruciol-Souza JM, Thomson JC. A pharmacoepidemiologic study of drug interactions in a Brazilian teaching hospital. Clinics. 2006;61(6):515-20.
2. Cassiani SHB, Silva AG, Reis AMM, Zago KSA, Faria LMP, Lima REF, et al. Interações medicamentosas em unidades de terapia intensiva e a segurança de pacientes: análise do planejamento dos horários de administração de medicamentos. Ribeirão Preto: [s.n.], 2008. (Relatório científico, 1º/2008).
3. Micromedex Healthcare Series. Interactions. 1974-2009. Available from: http://www.thomsonhc.com/hcs/librarian/ND_T/HCS/ND_PR/Main/CS/E85C9E/DUPLICATIONSHIELDSYNC/F487EB/ND_PG/PRIH/ND_B/HCS/ND_P/Main/PFActionId/hcs.Interactions.FindDrugInteractions
4. Morrison AL, Beckmann U, Durie M, Carless R, Gillies DM. The effects of nursing staff inexperience (NSI) on the occurrence of adverse patient experiences in ICUs. Aust Crit Care. 2001;14(3):116-21.
5. Micromedex Healthcare Series. Interactions. 1974-2010. Available from: http://www.thomsonhc.com/hcs/librarian/ND_T/HCS/ND_PR/Main/CS/E85C9E/DUPLICATIONSHIELDSYNC/F487EB/ND_PG/PRIH/ND_B/HCS/ND_P/Main/PFActionId/hcs.Interactions.FindDrugInteractions
6. Mencía SB, López-Herce JC, Freddi N. Analgesia and sedation in children: practical approach for the most frequent situations. J Pediatr (Rio J). 2007;83(2 Suppl):S71-82. Comment in: J Pediatr (Rio J). 2007;83(4):387; author reply 386-7.
7. Fonseca AL. Interações medicamentosas. 4a ed. São Paulo: EPUB; 2008.
8. Moyen E, Camiré E, Stelfox HT. Clinical review: medication errors in critical care. Crit Care. 2008;12(2):208. Review.
9. Ricaurte B, Guirguis A, Taylor HC, Zabriskie D. Simvastatin-amiodarone interaction resulting in rhabdomyolysis, azotemia, and possible hepatotoxicity. Ann Pharmacother. 2006;40(4):753-7.
10. Boucher BA, Wood GC, Swanson JM. Pharmacokinetic changes in critical illness. Crit Care Clin. 2006;22(2):255-71, vi.
11. Wallerstedt SM, Gleerup H, Sundström A, Stigendal L, Ny L. Risk of clinically relevant bleeding in warfarin-treated patients—influence of SSRI treatment. Pharmacoepidemiol Drug Saf. 2009;18(5):412-6.
12. Biggs WS. Hypoglycemia and hyperglycemia associated with gatifloxacin use in elderly patients. J Am Board Fam Pract. 2003;16(5):455-7.
13. Kounas SP, Letsas KP, Sideris A, Efraimidis M, Kardaras F. QT interval prolongation and torsades de pointes due to a coadministration of metronidazole and amiodarone. Pacing Clin Electrophysiol. 2005;28(5):472-3.
14. Lima REF. Interações medicamentosas potenciais em pacientes de unidade de terapia intensiva de um hospital universitário do Ceará [dissertação]. Ribeirão Preto: Escola de Enfermagem de Ribeirão Preto da Universidade de São Paulo; 2007.
15. Kiley CA, Cragin DJ, Roth BJ. Omeprazole-associated digoxin toxicity. South Med J. 2007;100(4):400-2. Comment in: South Med J. 2007;100(4):345-6.
16. Nishi FA. Avaliação do conhecimento dos enfermeiros em relação às catecolaminas de infusão contínua [dissertação]. São Paulo: Escola de Enfermagem da Universidade de São Paulo; 2007. 70 f.