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Administration of medicines through enteral: Nursing knowledge and praxis in view of the therapeutic response

ABSTRACT | This is a descriptive study with a quantitative approach. It aimed to identify and discuss the knowledge of the nursing staff in the administration of medications through enteral route regarding the therapeutic response in the practice of nursing care. It was carried out in four public hospital institutions, in the cities of Cabo Frio and in Arraial do Cabo, in the State of Rio de Janeiro, Brazil. The subjects were 103 nursing professionals, among them: nurses, nursing technicians and nursing assistants from the sectors of medical and surgical clinic. Data were collected between February and April 2019, through a semi-structured questionnaire, and a descriptive statistical analysis of the data was performed. The pharmaceutical, legal, and technical implications of providing enteral medication are not widely understood by the nursing team. There was a need to recommend to the Nursing Councils the elaboration of manuals and/or protocols in order to avoid possible adverse events in the administration of medications through enteral route, increasing the safety and effectiveness of the therapy in question, helping to reduce damage to the patient.
Keywords: Nursing; Enteral; Adverse Events.

RESUMEN | Este es un estudio descriptivo con un enfoque cuantitativo. Su objetivo era identificar y discutir el conocimiento del personal de enfermería en la administración de medicamentos a través de la vía enteral con respecto a la respuesta terapéutica en la práctica de la atención de enfermería. Se llevó a cabo en cuatro instituciones de hospitales públicos, en las ciudades de Cabo Frio y en Arraial do Cabo, en el estado de Río de Janeiro, Brasil. Los sujetos fueron 103 profesionales de enfermería, entre ellos: enfermeras, técnicos de enfermería y auxiliares de enfermería de los sectores de la clínica médica y quirúrgica. Los datos se recopilaron entre febrero y abril de 2019, a través de un cuestionario semiestructurado, y se realizó un análisis estadístico descriptivo de los datos. El equipo de enfermería no comprende ampliamente las implicaciones farmacéuticas, legales y técnicas de suministrar medicamentos por vía enteral. Era necesario recomendar a los Consejos de Enfermería la elaboración de manuales y/o protocolos para evitar posibles eventos adversos en la administración de medicamentos por vía enteral, aumentando la seguridad y la eficacia de la terapia en cuestión, ayudando a reducir daño al paciente.
Descriptores: Enfermería; Enteral; Eventos Adversos.

RESUMO | Trata-se de um estudo descritivo de abordagem quantitativa. Teve como objetivos identificar e discutir o conhecimento da equipe de enfermagem na administração de medicamentos por via enteral quanto a resposta terapêutica na práxis da assistência de enfermagem. Foi realizado em quatro instituições hospitalares públicas, nas cidades de Cabo Frio e em Arraial do Cabo, no Estado do Rio de Janeiro, Brasil. Os sujeitos foram 103 profissionais da enfermagem, entre eles: enfermeiros, técnicos de enfermagem e auxiliares de enfermagem dos setores de clínica médica e cirúrgica. Os dados foram coletados no período entre fevereiro a abril 2019, através de questionário semiestruturado, e realizada a análise estatística descritiva dos dados. As implicações farmacêuticas, legais e técnicas do fornecimento de medicamentos via enteral não são amplamente compreendidas pela equipe de enfermagem. Verificou-se a necessidade de recomendar aos Conselhos de Enfermagem a elaboração de manuais e/ou protocolos com o intuito de evitar possíveis eventos adversos na administração de medicamentos por via enteral, aumentando a segurança e a eficácia da terapêutica em questão, auxiliando na redução de danos ao paciente.
Palavras-chaves: Enfermagem; Enteral; Eventos Adversos.

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INTRODUCTION

The use of enteral catheters in hospitalized patients is associated with their health-disease process that compromises prompt recovery, such as: lowering the level of consciousness, dysphagia, changes in the oral cavity, malnutrition, among others. The enteral route (duodenum and jejunum) is usually the first therapeutic option in nutritional intervention aimed at improving the patient's clinical condition.

However, the administration of oral medications by enteral route is a practice commonly performed in hospitals by the nursing team, involving the praxis of the preparation and administration of these medications by catheters. Such praxis is the action and, above all, the action ordered for a certain purpose (as opposed to knowledge, the theory), that is, it is a practice that goes against the theory[1].

In the Brazilian reality, the practice of medication administration is exercised by nursing technicians under the supervision of the nurse, who in the nursing team is the professional responsible for technical-scientific and ethical-professional decisions for their knowledge. Knowledge is one of the main elements that enables nurses to act with competence and skill in carrying out the entire care process, as it is up to them to plan, manage and evaluate care, as mentioned in Decree No. 94,406/87 of the exercise professional[2].

The practice of enteral administration can have several consequences. Two of them are linked to nursing care, which are the obstruction of the catheter lumen and the drug-nutrient interaction. However, the other consequence is related to the therapeutic response, which, in addition to requiring knowledge, requires multidisciplinary work with the medical and pharmaceutical team.

Regarding nursing praxis regarding the preparation of medications, these are crushed and diluted for their administration, without considering the chemical alteration of the drug. And, there are several aspects that restrict or contraindicate the administration of medications via enteral, such as: obstructions of enteral catheters, interactions, changes in pharmacokinetics, adverse gastrointestinal effects and reduction or loss of efficacy and safety in the dilution or transformation processes of the drug . Changes in pharmacokinetics may occur because the administration of medications through enteral catheters was not planned and, because administration through this route causes changes in the absorption of the drug[3].

Oral dosage forms were not developed to be administered enterally, representing an important potential for the development of adverse events, such as drug toxicity and subtherapeutic effect. As an example of toxicity, we can mention the prolonged-release nifedipine, which when crushed and administered enterally, the patient has pronounced hypotension, bradycardia, cardiorespiratory arrest and progresses to death[4].

Therefore, technical-scientific knowledge is required for the preparation and administration of medications via enteral route to guarantee the expected effect and treatment of the patient. For a positive therapeutic response, it is necessary to consider the solubility, liposolubility, dissolution rate, physical form, stability and pH of the gastrointestinal tract(5). It is worth mentioning that the duodenum has an alkaline pH and, when receiving a drug manufactured to be absorbed in the acidic environment, its effect will be compromised.

The nursing professional must be aware of the drugs that cannot be crushed, those that can be crushed accompanied by the appropriate technique, the drugs that are incompatible with enteral nutrition and the prolonged-release drugs. Some drugs that should not be crushed are those of slow release, as they present gradual release of the drug and if crushed, they can cause intoxication by releasing high doses immediately. The capsules with microgranules, as they present a potential risk of intoxication and obstruction of the catheter, as well as the solid forms of sublingual absorption, as it has rapid absorption and, in general, small dosage, if crushed, alter the bioavailability of the medication[6].

The Code of Ethics for Nursing Professionals, in Chapter III, Art. 78, states that it is forbidden for nursing professionals to administer medications without knowing the action of the drug and without making sure of the possibility of risks[7]. Therefore, administering medication responsibly is the function of the nursing team, which is highly representative in preventing errors.

However, for the preparation and administration of medication via enteral route, it is necessary that nursing professionals are supported technically and scientifically to carry out safe and effective practice. A study carried out in Europe proved that integrated multidisciplinary actions, involving nurses, pharmacists, doctors and nutritionists, promoted the correct application of drug therapy, especially in patients using enteral catheters[5].

In order to provide safe practices to the patient, the Ministry of Health and the National Health Surveillance Agency (ANVISA) launched in 2013 the National Patient Safety Program. In Appendix 3 of this program, we find the Safety Protocol for Prescribing, Using and Administering Medicines, whose purpose is to promote safe practices in the use of medications in health establishments. In this, we find the right nine as safe interventions for drug administration, although they do not guarantee the absence of errors in administration, but they contribute to the prevention of adverse events.

The right form of medication administration, item eight of the nine correct ones, is described that the pharmacy must provide the medication in unit dose or a manual for dilution, preparation and administration of medications and, if necessary, carry out the grinding and suspension of the medication for administration by nasogastric or nasoenteric catheter. In the sequence, item nine, right answer, addresses the need to care-

fully observe the patient, to identify, when possible, if the medication had the desired effect[8].

Seeking the knowledge of the nursing team regarding the therapeutic response of medication administered enterally is relevant so that, through the results, one can think about strategies for raising awareness and changing the paradigm.

In view of the above, the following guiding question arose: Does the nursing team know that medications administered enterally can modify the therapeutic response? Its objective is to identify and discuss the knowledge of the nursing team in the administration of medications through enteral route regarding the therapeutic response in the practice of nursing care.

This research aims to contribute to teaching, research and society with scientific production with regard to knowledge and safety in enteral drug therapy, as well as in stimulating new research in the area. A table of drugs that cannot be administered enterally or interact with enteral nutrition has been prepared, which scientifically supports the practice of administering medicines through enteral route.

METHODOLOGY

This is a descriptive-exploratory and multicenter study, with a quantitative approach. Descriptive-exploratory studies seek to record, analyze, interpret, and describe the observed facts, in addition to enabling the perception about the fact investigated. The quantitative approach determines a value in numbers, being calculated through information to be classified and analyzed, indicating the quantity of each answer[9].

The scenario was the sectors of medical and surgical clinic of four medium-sized public hospital institutions in the cities of Cabo Frio and Arraial do Cabo, in the state of Rio de Janeiro, Brazil. The participants comprised 103 nursing professionals, being nurses and nursing technicians, who were invited to participate in the research and, after voluntarily agreeing, they did so by signing the Informed Consent Form. Professionals who were not part of the sector's employees, on leave, vacation and maternity leave were excluded.

For data collection, a semi-structured questionnaire was used containing questions to characterize the participants and six questions to achieve the research objectives, three of which with an option to cite examples. Data were collected between March and May 2019. They were typed in Microsoft Excel and Word for Windows and presented in graphs and charts and, subsequently, a descriptive analysis was performed.

The research was approved by the Research Ethics Committee of the Veiga de Almeida University (CEP/UVA), Brazil, under opinion No. 3,451,135. It is worth mentioning that the research took place without causing harm to the participants, as well as no cost was generated to the institution and to the participants.

RESULTS

The research subjects were presented by professional category, as shown in Table 1, in order to identify and discuss the results according to their technical-scientific knowledge.

The results presented in Table 1 show that 62.13% of the interviewees are Nursing Technicians and 32.03% Nurses. The most prevalent age group was over 40 years old, accounting for 53.39%. Regarding the length of experience, 55.33% said they had between 2 and 10 years of experience, when only 1.94% of the participants had less than 1 year working in the profession.

Regarding the knowledge of the nursing staff in the administration of medications enterally facing the therapeutic response of the patient, in the practice of nursing care, it was found that when asked if the drugs that are prescribed orally can be administered orally. enteral, 90.09% of nurses and 97.14% of nursing technicians and nursing assistants said yes. Approximately 45.45% of Nurses replied that they did not know drugs that cannot be crushed so that they can be administered through the enteral catheter. While 62.85% of nursing technicians

Table 1. Distribution of the characterization of Nursing professionals. Cabo Frio, Arraial do Cabo, RJ, Brazil, 2019.

Caracterização dos Participantes	N = 103	%
Categoria Profissional		
Enfermeiro	33	32,03%
Técnico	64	62,13%
Auxiliar	06	5,82%
Idade		
20 a 30	08	7,76%
31 a 40	40	38,83%
Acima de 40	55	53,39%
Tempo de Atuação		
< 1 ano	02	1,94%
2 a 10 anos	57	55,33%
Acima 10 anos	44	42,71%

and nursing assistants also demonstrated this lack of knowledge.

About the existence of medications that interact with enteral nutrition, 72.72% of nurses and 88.77% of nursing technicians and nursing assistants showed they did not have this knowledge. It was also found that 93.93% of nurses and 85.17% of nursing technicians and nursing assistants did not experience any adverse effects of drugs administered enterally, although they were prescribed to be administered orally.

As for the factors that must be considered and observed before enteral administration to guarantee an expected therapy, 75.75% of Nurses showed to know these factors, while 24.24% showed not to know. Of the nursing technicians and nursing assistants, 52.85% replied having knowledge, while 47.14% replied not knowing these factors.

In four questions asked of the participants, they were asked to cite two examples of drugs to identify the knowledge regarding enteral administration in the practice of nursing care. However, not all participants collaborated, which puts their knowledge in doubt in the face of questions.

Considering that 90.09% of Nurses answered that the drugs prescribed orally can be administered enterally, 43.33% of these did not mention examples. In the category Nursing technicians and Nursing assistants, 64.07% mentioned, 35.29% did not mention and 22.72% mentioned only one example. Evidence of the lack of knowledge of the subject addressed.

When asked to nurses and nursing technicians and nursing assistants about medicines that cannot be crushed, 67% and 73.27% cited examples, 33.33% and 26.92% did not mention examples and only cited one example 33, 33% and 94.73%, respectively.

About the professionals who responded to knowing medications that interact with enteral nutrition, 44% of nurses and 37.50% of nursing technicians and nursing assistants cited examples, while 55.55% of nurses and 62.50% of nursing technicians and Nursing assistants did not mention and cited just one example 50% of nurses and 66.66% of nursing technicians and nursing assistants.

Regarding the factors to be considered and observed before enteral medication administration to guarantee the expected therapy, 80% of nurses and 64.86% of nursing technicians and nursing assistants cited examples, 20% nurses and 35.13 % Technicians and assistants did not cite, and 5% Nurses and 16.21% Nursing technicians and nursing assistants cited only one example.

The drugs that were cited by nursing professionals according to each item questioned are shown in Chart 1.

Chart 1. Medications cited by the nursing team about knowledge about enteral drug administration. Cabo Frio, Arraial do Cabo, RJ, Brazil, 2019.

Conhecimento	ENFERMEIRO		TÉCNICO	
	Medicamentos citados	Quantidade	Medicamentos citados	Quantidade
Medicamentos prescritos por via oral que podem ser administrados por via enteral.	Captopril**	9	Captopril**	17
	Losartana**	4	Losartana**	12
	Dipirona*	3	Omeprazol*	6
	Atenolol**	3	Furosemida**	6
	Omeprazol*	2	ASS**	5
	Nifedipino*	1	Dipirona*	2
	Sulfato ferroso***	1	Buscopan Comp*	1
	Outros		Atenolol** Outros	2
Medicamentos que não podem ser triturados para administrar por via enteral.	Omeprazol*	4	Omeprazol*	12
	Outros		Outros	
Medicamentos que interagem com a nutrição enteral.	Sulfato ferroso***	1	Omeprazol*	1
	Fenitoína**	1	Puran T4**	1
	Captopril**	1	Floratil**	1

Note: * Medicines that cannot be administered enterally and/or interact with enteral nutrition. ** They need to undergo changes in the preparation to be administered enterally. *** There are no studies on efficacy, safety, and pharmacokinetics

About the drugs that can be administered enterally, Captopril and Losartana were the drugs most cited by both nurses and nursing technicians and nursing assistants. The drugs Dipyrone, Atenolol, Omeprazole, Nifedipine, Ferrous Sulfate, Furosemide, Buscopan Compound, Puran T4, Floratil and Phenytoin presented are drugs that cannot be administered enterally and/or interact with enteral nutrition, which need to undergo changes in enteral nutrition. preparation to be administered enterally and that do not have studies on efficacy, safety, and pharmacokinetics.

The drugs represented by the word "others" were mentioned in a small quantity, but no less important to identify the professionals' knowledge, they are: Glibenclamide, Clopidogrel, Simvastatin, Capoten, Diazepam, Ranitidine, Carvedilol, Metformin, Fluconazole, Metildopa, Vastarel , Enalapril, Monocordil, Amlodipino, Folic Acid, Clonazepan, Bromopride, Simvastatin, Sodium Chloride Syrup And Propranolol, AAS, Captopril, Cejetex, Pyridium, Corticosteroids, Amoxiline and Depaken.

Thus, it was observed that 80% of nurses and 64.86% of nursing technicians and nursing assistants cited examples as to the factors that should be considered and observed before enteral medication administration to ensure the expected therapy.

According to the results, the catheter placement was mentioned by 25% of nurses and 8.33% of nursing technicians and nursing assistants. The washing of the catheter before and after administration by 30% of nurses and 20.87% of nursing technicians and nursing assistants. Regarding the observation factor of catheter obstruction, only 16.66% of nursing technicians and nursing assistants cited. Osmolarity and medicated pH were mentioned by nurses only in a quantity of 5%. The interaction, as well as toxicity were represented by 5% of nurses and 4.16% of nursing technicians and nursing assistants.

Relevant data appear regarding the factors that may compromise the patient's therapy after the drug is administered enterally. Participants were given five factors and an option like none of the alternatives. Catheter obstruction was the choice of a large percentage of professionals, showing 90.90% nurses and 84.28% of nursing technicians and nursing assistants. Only slightly more than half of Nurses, 54.54% and 28.57% of Nursing Technicians and Nursing Assistants opted for the destruction of the medication's protective coating as a factor that may compromise the therapeutic effect. The increased risk of morbidity and mortality was chosen by only 9.09% of nurses and 4.28% of nursing technicians and nursing assistants. As well as the subtherapeutic effect of the medication, that is, when it does not meet its objective, by 18.18% of nurses and 7.14% of nursing technicians and nursing assistants. However, drug toxicity showed a percentage of 33.33% Nurses and 35.71% Nursing technicians and Nursing assistants.

DISCUSSION

In this study, more than 90.09% of nurses and 97.14% of nursing technicians and nursing assistants responded that oral medications can be administered enterally. However, oral medications were not developed to be administered enterally, since the administration of medications in routes other than that indicated by the manufacturer may represent variation in the bioavailability of the drug and, therefore, modify the therapeutic response. Therefore, other routes must be considered in the administration of the drug for an effective therapeutic response - intravenous, intramuscular, inhalation, transdermal, sublingual, rectal[5-10].

Some medications, such as Captopril and Losartana, were the most cited by the nursing team, however, they cannot be administered enterally without their preparation being in accordance with what is recommended by the literature.

Nifedipino was mentioned by the nurse as being possible for enteral administration. However, this medication has a prolonged release, which when crushed loses its characteristic and, consequently, its therapeutic efficacy and safety, which may obstruct the catheter. When administered enterally, the patient has pronounced hypotension, bradycardia, cardiorespiratory arrest and progresses to death. Among other drugs mentioned, there is Omeprazole, which should also not be crushed due to the loss of therapeutic efficacy. Its active principle requires gastric acid to dissolve the protective shell of long action and release the microcapsules of enteric release, in addition to causing obstruction of the catheter. Buscopan Compound (Scopolamine Butylbromide 10mg + Dipyrone Sodica 250 mg CP) when crushed causes the loss of the coating, which may decrease the therapeutic effectiveness of the drug and also obstruct the catheter[4,11].

Some drugs cannot be crushed, as they have been specifically designed to maintain a constant blood level of active ingredient for 8, 12 or 24 hours. By changing one of these formulations before administration, it can influence the rate of absorption of the drug and, consequently, increase the blood levels of the drug and the potential toxic effects. It is worth mentioning that gastro-resistant tablets, too, should not be destroyed or the coating removed, as they were designed precisely to keep the medicine intact until it passes through the stomach and reaches the intestine, as absorption must occur in an alkaline environment. The coating is used to

prevent inactivation by gastric juices and protect the stomach from harmful effects. Changing these formulations can decrease the therapeutic effects of the drug, as well as generate potential adverse effects[12].

However, the bibliographic review showed that there is still a lack of national recommendations on the preparation and administration of medications through enteral routes, including the leaflets offered by manufacturers. Important information, such as the osmolarity of liquid drugs, was also observed, as they require a greater volume of water for the dilution to be homogeneous. Most of the available information comes from work carried out in other countries(13). This can be one of the factors that make it difficult for nursing professionals to have knowledge about the administration of medications through enteral route, consolidating the assistance praxis of the preparation and administration of medication.

The results show that the nursing staff believes that oral medications can be administered enterally, however, about 62.85% of nursing technicians and nursing assistants said they do not know drugs that cannot be crushed. This fact makes it a potential risk, since they are professionals who are linked to the preparation and administration of medicines. Like nurses, who are responsible for making decisions, 45.45% do not have such knowledge.

About the examples mentioned, three of them can be crushed if considering the necessary recommendations, they are: Amoxicillin, ASS and Captopril. Amoxicillin tablet can be crushed, and it is recommended to pause the diet, wash the catheter, administer the medication, and wash the catheter. As a possible replacement, it is suggested to replace the suspension. The AAS can be crushed, but it must be diluted in 10ml of filtered water, pause the diet and wash the catheter before and after administering the medication. Captopril can be crushed, but simultaneous administration with enteral nutrition reduces absorption by 30 to 40%. The diet should be paused 40 minutes before administration, crush the tablet, dilute in 10ml of filtered water, wash the catheter, administer the medication, wash the catheter and restart the diet after 40 minutes[11]. Of the three examples cited, only Captopril is specified in the literature with the time the diet is paused before and after medication administration.

In view of the above, the study emphasizes that the nursing team must exercise caution in the preparation and administration with regard to medicines that should not be crushed, as the lack of knowledge of these can cause several adverse effects to the patient. It is necessary to pay attention to the physical and chemical properties of each medication. When a solid form is derived in an extemporaneous preparation, there is a change in the bioavailability characteristics of the derived drug and the therapeutic response may be different from that expected[6].

Many dispensed drugs require a specific preparation and administration technique depending on the characteristics of the drug, such as its pharmaceutical form and the possibility of crushing or not. However, some nursing professionals only do what doctors prescribe, without making a critical assessment of the order made via prescription[13,14].

The nursing team showed to practice the assistance in the preparation and administration of medications in relation to drug-nutrient interactions, when 72.72% of nurses and 88.77% of nursing technicians and nursing assistants stated that they did not know the existence of medicines that interact with enteral nutrition. It is important to know the main aspects that restrict or contraindicate the administration of drugs in this way. The nurse is responsible for scheduling medication schedules, essential care for the prevention of potential interactions with the installation of the diet. However, due to the lack of knowledge, they do not recognize the possible errors and adverse effects arising from their practice, constituting a prominent factor in terms of patient safety.

Only six professionals cited an example of medications that interact with enteral nutrition. The following medications were mentioned by the six research participants: Omeprazole, Puran T4, Floratil, Captopril, Phenytoin and Ferrous Sulfate. As shown, more than 70% of nurses said they were unaware of medications that interact with enteral nutrition. According to the literature, the drugs with potential interaction with enteral nutrition are: Atenolol Captopril, Carbamazepine, Cephalexin, Metoclopramide hydrochloride, Efavirenz, Flunitrazepam, Furosemide, Isosorbide, Levodopa + cabidopa, Levothyroxine, Ritonavir. These when administered with enteral nutrition causes a decrease or increase in absorption. The drugs Isoniazid + rifampicin, Isoniazid + rifampicin + pyrazinamide + ethambutol chloride, Itraconazole, Metronidazole, Pyridoxine (vitamin B6), Rifampicin, Saquinavir, Atazanavir sulphate, Warfarin when administered with enteral nutrition cause the decrease or increase in bioavailability. Digoxin, Phenytoin and Posaconazole trigger the decrease or increase in serum concentration when administered together with enteral nutrition. And, chlorpromazine when administered with nutrition occurs precipitation due to incompatibility[11,13].

It is worth mentioning that in cases of administration of medications and/or food through enteral route, there

is a mixture of several active components, whose physical-chemical compatibility has not been confirmed. In addition, none of the drugs available on the market have been produced to access the enteral route directly to the stomach, duodenum or intestine. Technical and formal difficulties resulting from the administration of substances directly into the stomach or small intestine (bypassing various natural levels of the gastrointestinal system) are often overlooked[10].

Many drugs interact with diets and chemical diets used for enteral nutrition, for example warfarin or diet with sources of vitamin K. Interactions can occur at any stage of the drug's transit through the body-absorption, distribution, metabolism and elimination[11].

Of the nursing staff, 93.93% of nurses and 85.17% of nursing technicians and nursing assistants showed that they had never seen an adverse effect of medications administered enterally. However, the answer does not match the results that point to the lack of knowledge about the preparation and administration of medication through enteral route, contributing to an inadequate therapeutic response. If nursing professionals do not know the drugs that cannot be crushed and those that interact with enteral nutrition, there is no way to identify the adverse effects when administered.

The knowledge of the health team in choosing the appropriate pharmaceutical form for administration via enteral can contribute to the identification of adverse events related to administration via this route. The administration of medications via enteral is an off-label use, that is, drug manufacturers do not evaluate it and few references bring information on the subject[15]. According to the Federal Council of Medicine, the definition of off-label is not uniform, but in a simplified way it can be treated as a variety of situations including the administration of the drug by a different route than the one recommended[16]. It is up to the multidisciplinary team involved in the medication part of a patient to know the types of effects that each medication will cause, especially when they are administered through a different route than the one that was manufactured to be administered.

> “The pharmaceutical, legal and technical implications of administering medications through enteral route are not widely understood by doctors and nurses. Crushed pills can have detrimental effects for a patient and a staff member. This practice encompasses several situations in which the medication is used in non-compliance with the instructions on the package insert, including the administration of the medication in a different way than recommended.”

The pharmaceutical, legal and technical implications of administering medications through enteral route are not widely understood by doctors and nurses. Crushed pills can have detrimental effects for a patient and a staff member. This practice encompasses several situations in which the medication is used in non-compliance with the instructions on the package insert, including the administration of the medication in a different way than recommended. Overloading the medical and nursing staff with full responsibility for potential adverse reactions[10,17].

In Brazil, studies related to patient safety are recent and conducted largely addressing the topic of drug incidents. There is a lack of data regarding adverse events related to the subject, which makes this study proposal pertinent to expand knowledge from this perspective[18].

The professionals' knowledge about the main factors that must be considered and observed before enteral medication administration to guarantee the expected therapy is one of the main instruments in the prevention of adverse events. Approximately 75.75% of nurses and 52.85% of nursing technicians and nursing assistants said they knew these factors. The factors related to nursing care with the enteral catheter for medication and/or diet administration, such as: positioning the catheter in 25% and 8.33%, washing the catheter with 30% and 20.8% by Nurses and Technicians nurses and nursing assistants, respec-

tively, as well as observing catheter obstruction by only 16% of nursing technicians and nursing assistants.

It is considered that some adjustments are necessary in the technique of preparation and administration of medications, such as: increasing the volume of water for diluting the medication, a longer period of pause of the EN according to the active principle, maintaining its stability, ensuring efficacy and correct dilution to avoid catheter occlusion and interaction with the NE. Solid medications that are poorly soluble in water or liquid medications with high osmolarity require a larger volume of water for the dilution to be homogeneous; the stability of these drugs, after being prepared to be administered by catheters, is little discussed in the literature[13].

Some practices are recommended for administration of medications via enteral: assess factors related to the patient and the enteral feeding tube; evaluate factors related to the medication and its dosage form; avoid any medication in solid dosage form that would result in a significant change in the absorption of the active ingredient if opened (capsule) or crushed (tablet); evaluate each medication for its inherent solubility and release characteristics. If the destruction of the medication changes its release (for example, with enteric coating, prolonged release or new excipients for alternative delivery systems), consider an alternative dosage form, medication or route of administration[19].

The nurse must be attentive and have mastery over this care, as administering medications enterally requires knowledge in order to prevent catheter obstruction, interference with the stability of the medication, interaction with the diet, as well as further impairing the patient's prognosis . In addition to these factors, enteric-coated drugs deserve special attention, as they cannot undergo pharmaceutical derivations, which are made to pass through the stomach and arrive intact in the intestine. The time interval between one medication and another and between the period when the diet is running is also of fundamental importance so that there is no medication/food interaction and catheter obstruction[20].

Pharmaceutical interventions are decisive to identify and correct errors in medications prescribed via enteral, enabling the benefits of the proposed pharmacotherapy and the improvement of the patient. However, the inclusion of pharmaceutical alternatives, the establishment of a decision-making flowchart, tables, institutional protocol with guidelines for the transformation, dilution and administration of standardized drugs are decisive in preventing errors resulting from the administration of drugs via enteral, with important advances for the health team[3,21].

The destruction of protective coatings for medicines appeared in 54.5% by nurses. Drug toxicity, as well as an increased risk of morbidity and mortality and therapeutic effect, had a percentage below 40%. In fact, these were not considered important factors that can compromise the patient's therapy.

These results demonstrate that nursing professionals act in an empirical way and that the praxis of nursing assistance in drug therapy needs to be modified. The improvement of nursing teams regarding the therapeutic response, through studies aimed at enteral administration, should be considered an urgent matter. There needs to be the involvement of the multiprofessional team, where each one can contribute with their knowledge, multiplying the knowledge. Even if medication administration is the responsibility of the nursing staff, doctors and pharmacists cannot be exempted from this responsibility. It is up to the pharmacist to make medications available and prepare them to be administered by this route, when necessary.

Information on medications that are suitable for the use of catheters are not meticulously organized, consisting of scattered articles on the effectiveness and form of medication handling. For nurses and pharmacists who work daily in hospitals, decision making can be difficult because there is no organized and updated literature[11].

The importance of implementing continuing education programs is highlighted, making it necessary, above all, a commitment from the entire multidisciplinary health team so that the desired therapeutic results are achieved, as well as the creation of educational manuals that seek to improve the knowledge of the professionals involved. In addition, health services must provide drugs that meet institutional therapeutic needs, especially with regard to compatible pharmaceutical forms for use by a nutrition catheter, as well as therapeutic alternatives for cases in which use is restricted by this route[22].

Thus, there is a need for managers to be involved in the therapeutic process, due to the complexity and high clinical risk involved, requiring advanced, updated, and integrated skills. Continuous training must be effective for nursing awareness and competence in enteral therapeutic management.

CONCLUSION

The results of the present study demonstrated that the nursing team has a lack of knowledge regarding the administration of medications through enteral route, which does not guarantee the patient's therapeutic response. It is perceived that nursing professionals need support for the practice of preparation and administration of medications by enteral route to guarantee the expected therapy, as this practice

has been assigned to the nursing team without due pharmaceutical support and scientific knowledge, which it is exercised based on empiricism.

Therefore, it is worth mentioning that the pharmacy must provide the medication in a single dose or a manual for dilution, preparation and administration of medications and, if necessary, perform the grinding and suspension of the medication for administration by nasogastric or nasoenteric catheter. The shredding of drugs, if not in accordance with pharmacological indications, can be considered an inappropriate procedure, to be included among the possible errors of drug therapy. Pharmaceutical advice for checking alternative pharmaceutical forms should always be carried out. The updating of knowledge, the management of clinical risk, multidisciplinarity and the integration between the main health professionals, be they, doctor, nurse, pharmacist and risk manager, constitute the foundations for the correct management of the administration of enteral therapy.

The diversity of methods used for diluting and administering medications via the enteral route suggests the need for the availability of safe, up-to-date and easily accessible information, capable of providing input for the administration of medications via enteral route and contributing to the improvement of safe and effective practices. , is essential to reduce adverse events related to the administration of drugs in the enteral route.

It is desirable that the pharmaceutical industry has greater social responsibility and makes formulations available for use by the enteral route and that it develops scientific studies that support the administration of drugs through this route, certain that non-crushable tablets (coated, gastro-resistant, slow-release, etc.) and capsules are commonly used enterally in the hospital setting.

The COFEN and COREN should discuss and review the Professional Exercise of the nursing team in medication practice, as well as the Code of Ethics, as the nursing technician is assigned a practice that requires scientific knowledge which is not prepared. And, to the nurse, the leadership and responsibility with his team for the knowledge acquired during the Undergraduation.

In Nursing Undergraduation, the Pharmacology Discipline Applied to Nursing is geared towards nursing care, with reduced workload and without an approach in the pharmacotherapeutic follow-up, making nursing professionals vulnerable by the practice in the preparation and administration of medications by enteral route.

Therefore, there is a need to recommend to the Nursing Councils the elaboration of manuals and/or protocols to avoid possible adverse events in the administration of medications through enteral route. It is essential for the nurse, the understanding between scientific knowledge and its application in clinical practice, to improve the skills and competences focused on patient care using an enteral catheter and medication administration.

It highlights the importance of implementing continuing education programs to improve the knowledge of the professionals involved. It is important to understand that the safety of therapeutic assistance to the patient does not reside only in a professional area, but in a commitment by the entire multiprofessional health team to achieve the desired therapeutic results.

As a product, a chart (Chart 2) was created to assist health professionals, regarding medications that should not be administered enterally and those that interact with enteral nutrition. It is expected, therefore, that this instrument will contribute to improving patient care, in view of the scarcity of studies and bibliographic sources in the thematic area, reducing errors in medication administrations and increasing the quality of nursing care. The table is complementary and does not replace the search for continuing education on the part of the professionals who used it.

Chart 2. Medicines that cannot be administered enterally or that interact with enteral nutrition. Cabo Frio, RJ, Brazil, 2019.

Nome Genérico	Nome comercial	Forma	Não pode	Interage nutrição	Razão	Possíveis substituições
Ácido fólico + sulfato ferroso + ácido ascórbico	Iberin fólico	CP	X		Medicamento possui revestimento e excipientes que podem obstruir a sonda quando macerados.	-
Ácido valproico 250mg e 500mg	Depakene	CP	X		Medicamento perde sua eficácia farmacoterapêutica.	Ácido valproico xarope
Amiodarona 200mg	Ancoron	CP	X		O comprimido ao ser triturado pode perder sua eficácia terapêutica, não há estudos sobre segurança e farmacocinética.	-

Ampicilina 500mg	Amplacilina	CÁP	X		Não triturar nem abrir a cápsula, pois não há estudos sobre eficácia, segurança e farmacocinética.	Zitromax suspensão oral 200mg/5ml
Azitromicina 500mg	Zitromax	CP	X		Triturar o comprimido leva a perda do revestimento, podendo inativar o princípio ativo, pode levar a obstrução da sonda.	Keflex suspensão 100mg/ml
Bisacodil 5mg	Dulcolax	DRÁG	X		A trituração do comprimido leva a perda do revestimento entérico inativando o princípio ativo. A forma de drágea pode levar à obstrução da sonda.	Lactulona, tamarine-geléia e Dulcolax gotas
Captopril 12,5mg	Capoten	CP		X	Pode ser triturado. A administração simultânea a nutrição enteral reduz absorção em 30 a 40%.	-
Captopril 25mg	Capoten	CP		X	Pausar a dieta 40 minutos antes da administração, triturar o comprimido, diluir em 10mL de água filtrada, realizar a lavagem da sonda, administrar o medicamento, lavar a sonda e religar a dieta após 40 minutos.	-
Cefalexina 500mg	Keflex	CÁP	X		O princípio ativo perde seu efeito ao ser triturado, e o revestimento pode obstruir a sonda.	Cefalexina suspensão
Ciprofloxacino 500mg	Cipro	CP		X	Pausar a dieta 40 minutos antes da administração, triturar o comprimido, diluir em 10mL de água filtrada, realizar a lavagem da sonda, administrar o medicamento, lavar a sonda e religar a dieta após 40 minutos.	-
Cloreto de potássio 600mg	Slow-k	CP	X		Não deve ser macerado, pois perde a característica de liberação gradativa além de possuir revestimento que quando macerado causa a obstrução da sonda.	Cloreto de potássio 6% xarope.
Cumarina 15mg+ troxerrutina90mg	Venalot	DRÁG	X		A drágea ao ser triturada causa a perda e eficácia do princípio ativo e pode causar a obstrução da sonda.	-
Doxazosina 2mg	Carduran	CP	X		O comprimido ao ser triturado perde sua característica de liberação prolongada, perdendo sua eficácia terapêutica e segurança, e pode obstruir a sonda.	-
Doxiciclina 100mg	Vibramicina	DRÁG	X		A trituração da drágea leva a perda do revestimento inativando o princípio ativo. Pode causar a obstrução da sonda.	-
Escopolamina butilbrometo 10mg+dipirona sodica 250mg	Buscopan composto	CP	X		Ao triturar o comprimido causa a perda do revestimento, podendo diminuir a eficácia terapêutica do medicamento e obstruir a sonda.	-
Estrogênios conjugados 0,625mg	Premarin	CP	X		Existe um risco adicional e/ou aumentado que pode ser associado ao uso da terapia com estrogênio e progestogênio em relação ao uso de estrogênio isolado. Incluem-se o aumento do risco de infarto do miocárdio, embolia pulmonar, câncer de mama invasivo e câncer de ovário.	-

Fenazopiridina 200mg	Pyridium	DRÁG	X		A trituração da drágea leva a perda do revestimento inativando o princípio ativo. Pode causar a obstrução da sonda.	-
Fenitoína 100mg	Hidantal	CP		X	Pausar a dieta 40 minutos antes da administração, triturar o comprimido, diluir em 10mL de água filtrada, realizar a lavagem da sonda, administrar o medicamento, lavar e religar a dieta após 40 minutos.	
Isossorbida 5mg comprimido sublingual	Isordil sl	CP	X		Não deve ser triturado, pois perde suas características de liberação levando ao risco de manutenção inadequada do nível sérico do fármaco.	-
Levodopa+-carbidopa 250mg+25mg	Cronomet	CP	X		Não deve ser triturado, pois perde as características de liberação controlada levando ao risco de toxicidade, manutenção inadequada do nível sérico do fármaco, além do risco de obstrução da sonda	-
Levofloxacino 500mg	Tavanic	CP		X	Pausar a dieta 40 minutos antes da administração, triturar o comprimido, diluir em 10mL de água filtrada, realizar a lavagem da sonda, administrar o medicamento, lavar a sonda e religar a dieta após 40 minutos.	-
Nifedipino 10mg e 20mg	Adalatretard	CP	X		O comprimido ao ser triturado perde sua característica de liberação prolongada, perdendo sua eficácia terapêutica e segurança, e pode obstruir a sonda.	-
Norfloxacino 400mg	Floxacin	CP		X	Pausar a dieta 40 minutos antes da administração, triturar o comprimido, diluir em 10mL de água filtrada, realizar a lavagem da sonda, administrar o medicamento, lavar a sonda e religar a dieta após 40 minutos.	
Omeprazol 20mg	Losec	CÁP	X		O medicamento ao ser triturado perde sua eficácia terapêutica, o princípio ativo necessita do ácido gástrico para dissolver o invólucro protetor de ação prolongada e liberar as microcápsulas de liberação entérica. Pode obstruir a sonda.	Ranitidina cp/ susp ou omeprazol ev.
Pantopazol	Pantozol	CP	X		A perda do revestimento entérico pela trituração pode propiciar a inativação do princípio ativo e/ou favorecer a irritação da mucosa gástrica.	-
Pentoxifilina 400mg	Trenta	CP	X		O comprimido possui núcleo que impede a liberação imediata do medicamento, causando alteração da eficácia do medicamento.	-
Prometazina 25mg	Fenergan	CP	X		Não pode ser triturado.	Via parenteral via im

Ranitidina 150mg	Antak	CP	X		Medicamento possui revestimento e excipientes que podem obstruir a sonda quando macerados.	Label solução.
Sulfametoxazol/ trimetroprima 400mg/80mg	Bactrim f	CP	X		A trituração do comprimido leva a perda do revestimento inativando o princípio ativo. Pode causar a obstrução da sonda.	Bactrim ev
Teofilina 200mg	Talofilina	CÁP	X		Não deve ser triturado, pois perde as características de liberação controlada levando ao risco de toxicidade, manutenção inadequada do nível sérico, além do risco de obstrução da sonda.	-
Tiamina 100mg (vit. B1) + cianocobalamina 5000mg (vit. B12) + pirodoxina 100mg (vit.b6)	Citoneurin	CP	X		A trituração da drágea leva a perda do revestimento inativando o princípio ativo. Pode causar a obstrução da sonda.	-

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