https://dx.doi.org/10.22161/ijaers.73.1 *ISSN: 2349-6495(P) | 2456-1908(O)*

Challenges in medication administration by gavage in the intensive care unit: A literature review

Yara Silveira, Rodrigo Disconzi Nunes, Sara Falcão de Sousa*, Natallia Moreira Lopes Leão, Saulo José de Lima Júnior, Andreisa Prieb, Millena Pereira Xavier, Vinicius Lopes Santana, Jaqueline Cibene Moreira Borges, Larlla Veruska Arrates Pires

University of the Gurupi -UnirG, Avenue. Rio de Janeiro. Nº 1585 - Sector. Central., Gurupi, Tocantins, Brazil

Corresponding Author: Sara Falcão de Sousa

Abstract*—Introduction: Enteral nutrition therapy and a key therapeutic option in the care for hospitalized patients. The route intended for enteral nutrition (NE) is also used for drug administration. It is suggested that the administration of drugs in this way needs to be monitored, aiming to improve the therapeutic results. Objective: To discuss the main challenges in medication administration by gavage in the Intensive Care Unit. Material and Methods: We performed a literature review searched the electronic databases Medline, Bireme, Lilacs, and Scielo, including national and international recent articles, the keywords used were: "enteral nutrition", "Intensive Care Units" and "Therapy Nutrition ". It was given preference for articles published between the years 2005 and 2014 looking always prioritize the most current jobs. Results: The results showed that errors in the administration of high surveillance medications are associated with the prescription, transcription, handling, route of administration, dosage form and the technique used. In case of errors can cause permanent damage leading to death. Adopt policies, guidelines, clinical protocols, training and training of the teams, are some alternatives that need to be used by healthcare organizations. Final thoughts: Therefore reduce and prevent mistakes and seek strategies to ensure quality and safety should be part of the daily work process responsible for health professionals, particularly pharmacists.*

***Keywords*—Enteral nutrition, Intensive Care Units, Nutritional Therapy.**

I. INTRODUCTION

In Health Care Services, the Intensive Care Unit (ICU) is established as a center for continuous monitoring of patients in serious condition, with decompensation of one or more organ systems, where there is a probability of restoring homeostasis, through highly technical support and intensive treatment by the specialized multidisciplinary team.[1] In the ICU it is common for patients unable to receive medications orally, having the option to receive the oral drug therapy prescribed through probes inserted inside the gastrointestinal tract.[2−3−4]

In daily practice with patients receiving enteral nutrition (NE) by probes, the technique for administering oral medicines basically consists of crushing tablets or opening capsules and dissolving the contents in water for later Administration. Controlled releasing solid medicines with coating or gelatinous capsules may happen to be crushed, and it is possible that the pharmacological properties of the drug are not guaranteed.[5−6]

With this, appropriate drug presentations to patients with swallowing difficulties can become a challenge in clinical practice.[7−8−9]

Other complications can also happen, such as tube obstruction and the interaction between drugs and nutrients from enteral nutrition.[3] It is estimated that the best way to avoid obstruction is the use of liquid forms of the drug, such as solution, suspension or master formulas. Obstructions can lead to the need to exchange the probe, increase nursing workload, decrease quality inpatient care, loss of medication administration, reduction of nutrients ingested, increase cost and increase patient's anxiety

https://dx.doi.org/10.22161/ijaers.73.1 *ISSN: 2349-6495(P) | 2456-1908(O)*

status[10−11]. Although responsibility for the administration of drugs by the probe is primarily of the nursing team[8], all professionals involved in patient care need to be careful to avoid efficacy problems, promoting interventions that improvements aimed at patient

safety[12]. In this sense, the performance of the clinical pharmacist also improves the safety of care provided to the patient[13].

The pharmacist is the professional graduated to suggest the most effective management regimen, with the least probability of interference, be it chemical, therapeutic, physicochemical or physical. It is difficult to prevent the results of the simultaneous administration of enteral nutrition and drugs by the probe, which highlights the essential importance of pharmacists in monitoring the appropriate administration of these drugs and monitoring their effectiveness[14]. As for example, pharmaceutical interventions carried out in the ICU of HUOL (University Hospital Onofre Lopes - Natal RN) that seeks to standardize procedures, together with the multidisciplinary team, in order to reduce the effects of drug/food interactions on patients fed via enteral nutrition probe (PNE)[15].

In order to avoid such problems, before the use of drugs, a pharmacological and pharmacological analysis is required. Therefore, this approach is prevented in clinical practice due to the insufficiency of information found in the literature on this theme, as well as in the specifications of drug manufacturers.[3]

Thus, this study aimed to discuss the main challenges in the administration of drugs by a probe in the Intensive Care Unit.

II. MATERIALS AND METHODS

To perform this research, a search was conducted in the scientific literature of the main problems related to the administration of drugs by a probe in patients in the Intensive Care Unit. For this, it was used by scientific journals, published preferably from 2005 to 2014 obtained through the Bireme databases (Regional Library of Medicine), Scielo (Scientific Electronic Library Online), Lilacs (Literature Latin American and the Caribbean in Health Sciences) and Google Scholar. The descriptors used were: "Enteral nutrition", "Intensive Care Units" and "Nutritional Therapy". This work was not submitted to the Research Ethics Committee because it is a literature review.

III. RESULTS AND DISCUSSION

Enteral nutritional therapy is administered through NES, nasogastric tube (SNG) or ostomy.[16] However, these devices are not specific for the administration of enteral nutrition because they are commonly also used for drug administration[15].

In the care context of intensive care, one factor that needs attention is the administration of probe drugs to patients in NE therapy. increased adverse effects or incompatibility of the drug with NE components.[1]

In the study by Martins et al.,[1] in a teaching hospital it was verified that of the 909 medicines intended for oral administration, 806 (88.8%) were prescribed for administration via nutrition probe. Regarding the type of probe that patients used during hospitalization another study, it was found that 78.26% of the drugs were administered by SNG and 21.74% by NeS[2]. However, Carvalho et al.,[17] demonstrated that 55.4% of the patients had NES and 44.6 % with SNG.

In the lima and negrini[3] research, the data obtained regarding the problems associated with the administration of drugs via enteral probe were divided into alteration of drug pharmacokinetics (38); damage to the TGI (9); obstruction of the probe (40); drug-nutrient interaction (7); biological risk (5) and without information (33). Thus totaling 132 possible problems with the administration of medicines in this way. The management and care related to the probe are extremely significant since they can influence the time of its use and, as a result, its durability. If the drugs administered by the probe are adequately crushed and, after each administration, the probe is washed, there are greater possibilities for it to be stored in an appropriate state for a longer period of time.[18]

In a survey with critically ill patients, it was observed that 57% of patients with nasogastric positioned probe and 24% of those with a gastrojejunal positioned probe had gastrointestinal complications[18]. For Carvalho et al.,[17] in relation to the location of the probe, it is perceived that the more distal in the small intestine, the lower the frequency of episodes of gastroesophageal regurgitation, duodenogastric reflux and pulmonary microaspiration, and the diet is in the distal intestine capable of preventing this type of complication.

Hence the importance of investigating in which portion of the gastrointestinal tract (stomach or intestine) the drug

https://dx.doi.org/10.22161/ijaers.73.1 *ISSN: 2349-6495(P) | 2456-1908(O)*

has its highest absorption rate, thus verifying whether the position of the probe contributes or impairs its absorption.[8] In a few cases,

there was confirmation by methods proper to the positioning of the probe. This becomes critical when we know that there are changes in the absorption of the drug when it is released in different anatomical sites.[3]

Obstruction of the nasoenteral tube is also part of mechanical complications, managing to be associated with the retention of enteral formula residues in its lumen, due to the formation of insoluble formula-drug complexes; of high osmolarity; tablets misled and injected by the probe and precipitation of the formula due to the acidity of gastric content[11].

Gorzoni, Torre and Pires,[7] found in their research some solid medicines unfit for use in probes, such as lactulone, captopril, phenytoin, ranitidine, omeprazole, complex B, folic acid, tramadol, bromoprida and nifedipine. Alternative presentations were found for 15 (65.2%) of the 23 drugs unfit by this route.

In the research by Carvalho et al.,[17] the solid pharmaceutical form was used in most drug prescriptions. Liquid forms had a low prevalence of use, only 16% of patients' prescriptions.

In the work of Martins et al.,[1] 572 prescriptions were analyzed, which contained 5,283 medications. Of these, 909 (17.2%) were oral medications, which could be classified into two distinct pharmaceutical forms: 551 (60.61%) solid and 358 (36.52%) Net. Hoefl and Vidal[9] found 52 different drugs administered by probes in their research, 47 of which in solid form (92%) with a prevalence of simple tablets.

In Brazil, Heydrich[14] showed the prevalence of enteral therapy in a hospital unit that was 12.4%, where 95% of patients received some solid oral drug to be administered by the probe.

According to Carvalho et al.,[17] the frequency of prescription of drugs orally in patients admitted to ICUs was low in relation to the other routes of administration. Therefore, with regard to drugs for oral administration, there was a predominance of the solid pharmaceutical form, which frames with data found in the literature.

According to Lima and Negrini[3], solid pharmaceutical forms had a high prevalence (above 80%) of use in this study, similarly to that verified by other studies already mentioned, therefore, this fact is conflicting with the information in the literature that recommend so-called liquid pharmaceutical forms as preferred.

According to Heydrich14 and Phillips and Nay[19], there are several solid drugs with liquid pharmaceutical choices. Despite this, the amount of prescriptions of solid shapes by the probe continues to grow. However, the lack of knowledge of the prescriber in relation to existing standardization or regarding the loss of effect of the use of solids via enteral can be analyzed.

When manipulating medicines for administration by probes, it is necessary to be aware that liquid pharmaceutical forms are the most appropriate, because they are easily absorbed and cause little obstruction. Although they are the most appropriate, liquid forms also present limitations, such as problems associated with viscosity, osmolarity and excipients contained in the formulations, especially sorbitol, which increases the risk of intolerance of the tract Gastrointestinal.[6]

However, the use of liquid formulas does not solve problems related to errors in nutrition. In the Lisbon, Silva and Matos research,[6] errors were found related to dilution with medications in liquid form and all referred to the fact that the technician did not dilute the liquid medication. This mistake focused on emulsions and syrups. In the first group was mineral oil and in the second, lactulose and potassium chloride.

Nutritional therapy is not simple, in addition to obstructions, medications should be analyzed singularly as the need for fasting, medications with restrictions of use and possible interactions. As noted in the Lisbon, Silva and Matos research,[6] among the administration of medicines that required relative fasting and enteral diet infusion, there was no pause in 116 doses of medicines (33.14%), with captopril, sodium warfarin, sodium levothyroxine, digoxin and sodium phenytoin.

According to Silva and Lisboa[5], one of the frequent problems is the interaction of medicine /food, which can lead to changes in the expected therapeutic response. Carvalho et al.,[17] found that of the drugs used, 33% were susceptible to interaction with nutrition. Lisbon, Silva and Matos[6] also analyzed the possible interactions, where 48 varieties of medicines were found. For 17 medications (36%), there are data in the literature on their possible interactions with nutrients, while for three (6%), no available data was found and, in relation to 28

https://dx.doi.org/10.22161/ijaers.73.1 *ISSN: 2349-6495(P) | 2456-1908(O)*

medications (58%), no information on interaction with nutrients was observed.

In the material selected by Silva and Lisboa[5], some procedures are commented that can reduce interactions between drugs and NE, as well as: never administer medicines directly in the enteral nutrition formula; obstruct the administration of enteral nutrition at least 30 minutes before and after administration of medications; wash the probe with 15-30 ml of water before and after administration of any medicine and between drugs; do not associate two types or more of medicines in the dilution process; whenever possible, administer drugs in liquid form, a fact that avoids the need to modify the form of presentation of the drug as macerations of tablets.

Adaptations considered inadequate due to interaction with food according to Nunes et al.,[15] included: nimodipine, captopril, propanolol, levothyroxine, warfarin, diltiazem, furosemide, phenytoin, rifampicin, calcium carbonate, paracetamol, pantoprazole and ivermectin.

Regarding drugs that have restrictions for nutrition probe administration, a better understanding of this information by the multidisciplinary team is imperative so that the choice for the use of these drugs by this route is appropriate and safe.[1]

Another important aspect is that sometimes more than one drug is used at a time, and drug interactions may occur that intervene in therapy[20]. A study revealed that in the administration of more than one drug at the same time, 68% of the interviewees administered them together, rather than separately, increasing the possibility of drug interactions. Approximately 15% crushed tablets with an enteric coating, altering the pharmacokinetics to which the drug proposes; 57% did not wash the probe before administration of the drug and may cause contamination and 19% did not consult the pharmacist about the availability of using liquid formulas[21]. Another study reports that 51% of the sample administers the drugs scheduled at the same time, and with the same syringe.[8]

Among solid medicines, the prevalent error was crushing, with the undue crushing of hard gelatin capsules (19.35%) and all release tablets controlled and coated. Insufficient milling errors (without turning thin powder) occurred with folic acid (73.33%), amiodarone hydrochloride (58.97%) and bromopride (50.00%). The mixture with other medicines occurred mainly with bromopride (66.66%), amlodipine besylate (53.33%), bamifiline (43.47%), folic acid (40.00%) and acetylsalicylic acid (33.33%). Among liquids, the only category of error was the absence of dilution in 67.85% of the doses.[6]

Carvalho et al.,[17] it was observed that 88.2% of prescriptions with up to five prescribed drugs had potential drug interactions, as well as 99.3% of those with six to ten prescription drugs and 100% of those containing more than ten drugs prescribed medicines. Evaluating the prescriptions of the 65 patients studied, 62 potential interactions (95.4%) were observed, that is, most prescriptions had drugs that had the potential to interact with nutrition. It was also observed that seven drugs, of the 48 prescribed, would be involved in 98.4% of potential drug interactions. With this, it is important the presence of the clinical pharmacist in this environment, since it is the competent professional to minimize these aspects.[13]

In observing the technique of preparation and administration of medications in the units, Farias et al.,[20] it was contacted that: nursing technicians were always responsible for the preparation technique, of these, 23.7 % wore gloves, but 21% did not use any PPE; 71% did not perform any type of asepsis; 56.6% used gral and pistil in the preparation technique; 47.4% made the technique near the sink; the drug is always transferred to the probe with the syringe and at 77.6% of the time 20 mL of water is administered after administration of the drug, however only 7.9% used water before administration of the drug. Lisbon, Silva and Matos[21] claim that washing the probes before and after administering medications is based on an effective preventive attitude of obstruction.

The multidisciplinary nutritional therapy team should develop a protocol for the administration of medicines in patients using enteral nutritional therapy, as this is an important instrument to prevent drug-nutrition interactions enteral in the context of ICUs.[13]

The participation of the pharmacist as a component of the nutritional therapy team is fundamental to prevent problems associated with medications in individuals with enteral therapy. For this, measures to benefit the appropriate administration of drugs by probe should be carried out, such as: preparing a list of drugs that cannot be crushed; develop, together with the nursing team, a protocol for drug administration for patients using enteral nutrition; advise members of the nutritional therapy team on interactions, incompatibilities, availability or feasibility to prepare liquid pharmaceutical forms and others associated with drug administration.[22]

https://dx.doi.org/10.22161/ijaers.73.1 *ISSN: 2349-6495(P) | 2456-1908(O)*

According to Farias et al.,[20] pharmacists still do not contemplate in their routines the follow-up of patients using drugs by the probe. It would be of great clinical importance to effective pharmaceutical interference in this practice, achieving them to start with screening and evaluating prescriptions until visiting and daily face-to-face monitoring of manipulation and administration of these drugs. For this, it is essential that the managers of the institutions grow the staff of professionals and qualify them for clinical and care activities focused on patients. It has been proven that whenever necessary we should prefer the use of drugs in alternative routes to the probe. If it does not constitute it, guidance should always be sought to try available therapeutic or pharmaceutical options. The development of internal protocols and educational work in health institutions help in the prescriptive conduct of solid drugs for probed patients.

Regarding the orientation of patients discharged from the hospital, the pharmacist plays an important role, especially when it comes to patients on the contribution of NE, in which there is a need to instruct them adequately on the derivation of pharmaceutical forms and dilution of liquid pharmaceutical forms. The knowledge acquired by the patient and caregiver with guidance is one of the most important variables for obedience or not of the prescribed drug regimen.[23]

IV. CONCLUSION

To prevent problems associated with the administration of drugs by probes in Intensive Care Units, it is necessary to encourage research and modernize the health team as nurses and the pharmacist on this theme. The creation and adoption of protocols can collaborate, assisting in the proper selection of the pharmaceutical form of the drug and the administration technique, in addition to analyzing incompatibilities and interactions.

REFERENCES

[1] Martins MR, Soares AQ, Modesto ACF, Carvalho RF, Melo VV, Duarte IP. Análise de medicamentos administrados por sonda em unidades de terapia intensiva em hospital de ensino. Rev. Eletr. Enf. 2013;15(1):191-6.

[2] Renovato RD, Carvalho PD, Rocha RSA. Investigação da técnica de administração de Medicamentos por sondas enterais em hospital geral. Rev. enferm UERJ. 2010;18(2):173-8.

[3] Lima G, Negrini NMM. Assistência farmacêutica na administração de medicamentos via sonda: escolha da forma farmacêutica adequada. Einstein. 2009;7(1 Pt 1):9-17.

[4] Borges RM, Nonino-Borges CB, Campos AD, Basile-Filho A. Incidência de complicações em terapia nutricional enteral de pacientes em estado grave. RBTI - Revista Brasileira Terapia Intensiva. 2005;17(2):98-103.

[5] Silva LD, Lisboa CD. Consequências da interação entre nutrição enteral e fármacos administrados por sondas: uma revisão integrativa. CogitareEnferm. 2011;16(1):134-40.

[6] Lisboa CD, Silva LD, Matos GC. Investigação da técnica de preparo de medicamentos para administração por cateteres pela enfermagem na terapia intensiva. RevEscEnferm USP. 2013;47(1):53-60.

[7] Gorzoni ML, Torre AD, Pires SL. Medicamentos e sondas de nutrição. RevAssocMed Bras. 2010;56(1):17-21.

[8] Mota MLS, Barbosa IV, Studart RMB, Melo EM, Lima FET, Mariano FA. Avaliação do conhecimento do enfermeiro de unidade de terapia intensiva sobre administração de medicamentos por sonda nasogástrica e nasoenteral. Rev. Latino-Am. Enfermagem. 2010;18(5):1-8.

[9] Hoefler R, Vidal JS. Administração de medicamentos por sonda. Boletim Farmacoterapêutica. 2009;(03 e 04):1-6.

[10] Schweigert ID, Pletsch MU, Dallepianne LB. Interação medicamento nutriente na prática clínica. RevBrasNutrClin. 2008;23(1):72-7.

[11] Matsuba CST. Obstrução de cateteres nasoenterais em pacientes cardiopatas [dissertação]. São Paulo (SP): Universidade Federal de São Paulo; 2003.

[12] Heydrich J, Heineck I, Bueno D. Observação de preparação e administração de drogas por auxiliares de enfermagem em pacientes com tubo de alimentação enteral. Braz J PharmSci. 2009;45(1):117-120

[13] Reis AMM, Carvalho REFL, Faria LMP, Oliveira RC, Zago KSA, Cavelagna MF et al. Prevalência e significância clínica de interações fármaco-nutrição enteral em unidades de terapia intensiva. RevBrasEnferm. 2014; 67(1): 85-90.

[14] Heydrich J. Padrão de prescrição, preparo e administração de medicamentos em usuários de sondas de nutrição enteral internados em um hospital universitário [Dissertação de mestrado]. Porto Alegre(RS): Universidade Federal do Rio Grande do Sul; 2006.

[15] Nunes MS, Valença RCA, Gurgel RKC, Silva EIL, Barreto LMD, Saldanha V, et al. Análise das solicitações de comprimidos adaptados para pacientes críticos de um hospital universitário. Rev. Bras. Farm. Hosp. Serv. Saúde. 2013;4(4): 23-30.

[16] Santos CM, Costa JM, Netto MUQ, Reis AMM, Castro MS. Acompanhamento farmacoterapêutico de pacientes em uso de sonda nasoenteral em um hospital de ensino. RevBrasFarmHospServ Saúde. 2012;3(1):19-22 .

[17] Carvalho AMR, Oliveira DC, Martins BCC, Neto JEH, Vieira VMSF, Silva LIMM et al. Análise da prescrição de pacientes utilizando sonda enteral em um hospital universitário do Ceará. R. Bras. Farm. Hosp. Serv. Saúde. 2010;1(1):17-21.

[18] Heydrich J. Padrão de prescrição, preparo e administração de medicamentos em usuários de sonda de nutrição enteral. 2008. 108p. Dissertação de mestrado. Faculdade de Farmácia, Universidade Federal do Rio Grande do Sul, Porto Alegre.

[19] Phillips NM, Nay R. A systematic review of nursing administration of medication via enteral tubes in adults.J. Clin. Nurs. 17: 2257-2265, 2008.

[20] Farias Md'Avila, Didonet J, Predebon S, Schwarzbold CV. Estruturação de orientação farmacêutica para com medicamentos

https://dx.doi.org/10.22161/ijaers.73.1 *ISSN: 2349-6495(P) | 2456-1908(O)*

por sonda nasoenteral: um estudo de caso. Rev. Bras. Farm. 2011;92(4):378-383.

[21] Boullata J. Drug administration through an enteral feeding tube. Am. J. Nurs. 109: 34-42, 2009.

[22] Chan LN. Drug-nutrient interactions in transplant recipients. Journal Parenteral and Enteral Nutrition, 2001, v.3, p. 132-141.

[23] Araujo ALA, Pereira LRL, Ueta JM et al. Perfil da assistência farmacêutica na atenção primária do Sistema Único de Saúde. CiêncSaúdeColetiva, 2008, 13 (Sup): 611-617.