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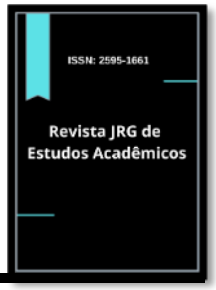

Solid medications administered via feeding tube: scoping review

Medicamentos sólidos realizados através de sonda: revisão de escopo

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Abstract
The objective was to map protocols for administering solid medications via nasoenteral and na-sogastric tubes. As a method, a scoping review was conducted, applying the PRISMA-ScR: Exten-sion for Scoping protocol, with a time frame from 2018 to 2023. In addition to scientific databases such as Lilacs, Pubmed, Scielo, and JBI, Google Scholar and repositories of Higher Education In-stitutions were also used to access grey literature. As a result, 17 scientific papers were selected. It is recognized, finally, that there is a high frequency of errors in the administration of solid med-ications via tube, whether enteral or nasoenteral, which can lead to losses in drug bioavailability and compromise good practices in drug therapy. In this context, the presence of a clinical phar-macist is essential, particularly for implementing evidence-based practices, with a view to care quality, patient safety, service efficiency, and sustainability.

Keywords: *Hospital, Solid medication, Nasoenteral tube, Nasogastric tube, Procedures, Safety.*

Resumo
O objetivo foi mapear protocolos de administração de medicamentos sólidos por sonda nasoenteral e nasogástrica. Como método, utilizou-se da revisão de escopo, aplicando o protocolo PRISMA-ScR: Extension for Scoping, tendo como recorte temporal o período de 2018 a 2023. Além das bases cientificas Lilacs, Pubmed, Scielo, JBI; assim como, o Google Scholar e os repositórios de Instituições de Ensino Superior para acesso a literatura cinzenta. Como resultado foram selecionados 17 trabalhos científicos. Reconhece-se, por fim, que há uma alta frequência de erros quando da administração de medicamentos sólidos por sonda; seja enteral ou nasoenteral, o que pode levar a perdas na biodisponibilidade do fármaco e comprometer as boas práticas da terapia com medicamentos. Nesse contexto, a presença de um farmacêutico clínico é essencial, em especial para implantar práticas baseadas em evidências, na perspectiva da qualidade assistencial, segurança do paciente, eficiência e sustentabilidade dos serviços ofertados.

Palavras-chave: Hospital, Medicamento sólido, Sonda nasoenteral, Sonda nasogástrica, Procedimentos, Segurança.

1. Introduction

Nasoenteral and nasogastric tubes are indicated for enteral nutrition therapy and the administration of medications that cannot be taken orally. Since the placement and maintenance of these tubes are invasive procedures with specific techniques and indica-tions, their use must be limited and supervised by the multidisciplinary team involved in patient care (Gorzoni; Della-Torre; Pires, 2010).

The practice of administering medications through enteral tubes is quite common in hospitals and provides an alternative oral route for administering medications in patients with clinical conditions that prevent the usual use of this route, such as swallowing dis-orders of neurological or mechanical origin (Martínez-Vázquez; Piñeiro-Corrales; Martínez-Olmos, 2002).

It is recognized that not all solid oral medications can be prepared in solution to be administered as such (Cleary et al., 1999). The pharmacokinetic aspects of these medications must be con-sidered when choosing this route for administration. For example, enteric-coated or ex-tended-release medications, when crushed, lose the

technology applied to their formula-tion, as well as their desired pharmacological effect, increasing the risk of causing adverse reactions in the patient (Peters et al., 2020).

The development of an oral formulation does not consider the administration of such medications through tubes. This information is a critical factor that should not be over-looked when choosing this practice. Few medications have their administration via tube described and approved by the producing laboratories; therefore, the decision to adminis-ter medications through this alternative route is considered an off-label practice. Admin-istering medications through a tube is clearly a different route from oral administration and requires evaluation to ensure safe and effective treatment for the patient. In this con-text, the objective of this study was to map protocols for administering solid medications via nasoenteral and nasogastric tubes.

2. Materials and Methods

This is a Scoping Review, a type of literary study that aims to broadly map and ex-plore the research field related to a specific topic (Peters et al., 2020). Its purpose is to identify the extent, diversity, and characteristics of existing studies on the subject. In simple terms, a scoping review represents a preliminary and comprehensive investigation of the available litera-ture in each research area, without the intention of conducting a detailed synthesis of study results.

The PRISMA-ScR: Extension for Scoping Reviews protocol was applied (Tricco et al., 2018). Scientific databases such as Lilacs, PubMed, SciELO, and JBI were used, as well as Google Scholar and repositories from higher education institutions to access gray literature, with a time frame covering the years 2018 to 2023.

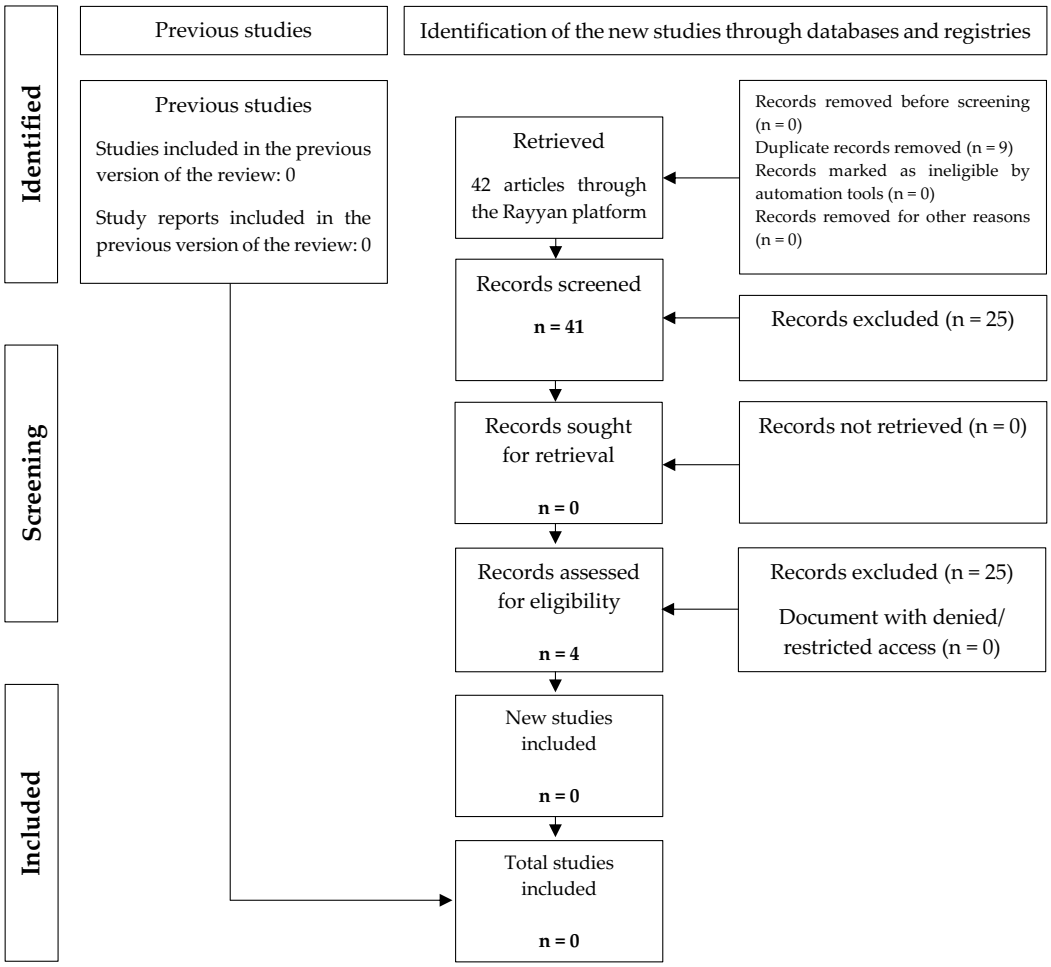
Descriptors such as Hospital, Solid medicine, Nasoenteral tube, Nasogastric tube, Procedures, Security were used, combined with the Boolean operator AND. Studies pub-lished in Portuguese, English, and Spanish were included, all of which were freely acces-sible.

The reference manager Mendeley Desktop® and the review manager Rayyan® were used to select and retrieve the articles. After retrieval, the titles and abstracts were inde-pendently analyzed by the authors based on the inclusion criteria, and discrepancies were resolved by consensus.

Data extraction was carried out using an Excel® spreadsheet. The quality of the arti-cles was assessed using the checklist from the Critical Appraisal Skills Program (2018). The level of evidence was identified using the model proposed by Murad et al. (2016). The PROGRESS framework (2014) was used to analyze equity. This tool addresses as-pects such as study location, ethnicity, occupation, gender, religion, education, economic status, and social capital. By applying an equity approach in the considered studies, it was possible to report relevant issues related to unfair disparities in the outcomes of in-terest. The review was registered in the Open Society Foundations (https://osf.io/x65cv/).

A total of 42 scientific papers were retrieved, which underwent a screening process to eliminate duplicates. Subsequently, the studies were evaluated based on their titles and abstracts, resulting in the exclusion of 25 articles that did not meet the inclusion criteria. As a result of this process, 17 scientific papers were selected for review, presented accord-ing to the PRISMA Flow Diagram (2021) (Figure 1).

Figure 1. Study selection process



Source: Adapted from Page *et al.* (2021).

3. Results

17 articles were selected. Table 1 presents the profile of the studies.

Table 1. Profile of the studies

Author/Year	Method/Objective	Level of Evidence
Klang *et al.* (2023) [12].	Cross-sectional study. Develop guidelines for the extemporaneous preparation of pharmaceutical forms suitable for passage through a feeding tube.	4
Lisboa *et al.* 2023 [13].	Cross-sectional study. Analyze errors occurring in the preparation of medications via enteral tubes in intensive care.	4
Pereira *et al.* 2023 [14].	Cross-sectional study. Assess the impact of a QIP on reducing the frequency of tube obstructions during the periods of 2014, 2015–2017, and 2018–2019. Additionally, predictor variables for this safety incident were analyzed, and an economic estimation of the costs related to the QIP for the same periods was conducted.	4

Silva *et al*. 2023 [15].	Integrative review. Identify the main recommendations for the preparation and administration of medications in hospitalized patients using enteral tubes, to guide the development of a manual for adjusting standardized oral medications within the institution for administration via enteral tube.	5
Souza, 2023 [16].	Integrative review. Conduct a literature review to identify the main recommendations for the preparation and administration of medications in hospitalized patients using enteral tubes, to guide the development of a manual for adjusting standardized oral medications within the institution for administration via enteral tube.	5
Gois *et al*. 2022 [17].	Cross-sectional study. Develop a care protocol for the administration of medications via enteral tubes, as well as evaluate the criteria for pharmacotherapy applied in patient care in home care settings.	4
Mascarenhas *et al*. 2022 [18].	Cross-sectional study. Evaluate pharmaceutical interventions and guidance related to the use of medications via enteral tubes in Intensive Care Units (ICUs).	4
Oliveira *et al*. 2022 [19].	Integrative review. Describe recommendations for the preparation and administration of medications via enteral catheter.	5
Zuccari *et al*. 2022 [20].	Integrative review. Develop a practical guide with information on the prescription, handling, and administration of medications via enteral tube.	5
Souza *et al*. 2021 [21].	Integrative review. Identify off-label formulas that can be reproduced for use in patients who cannot use capsules and emphasize occupational risks.	5
Facioli *et al*. 2020 [22].	Cross-sectional study. Reduce the frequency of non-conformities in the preparation and administration of oral medications via nasogastric/enteric tubes after implementing a quality improvement program.	4
Martinez *et al*. 2020 [23].	Integrative review. Assess the practice of using enteral tubes among the patient care team.	5
Spezia, Matheus, 2020 [24].	Cross-sectional study. Analyze the presence of incompatibilities in medications prescribed via enteral tube in an adult emergency and urgent care unit, describe the interventions performed, and develop a table for consultation on the administration of medications via tube by pharmacists.	4
Santos *et al*. 2019 [25].	Cross-sectional study. Analyze the profile and factors associated with limitations in administering medications via enteral tube for patients undergoing gastrointestinal and abdominal wall surgeries.	4
Spezia, 2019 [26].	Cross-sectional study. Evaluate medications prescribed via enteral tube in an emergency and urgent care unit and develop reference materials on the administration of medications via tube, based on the literature, to assist the team in this process.	4

Carré, 2018 [27].	Cross-sectional study. Conduct a retrospective evaluation of medication administration via nasoenteric tube in patients hospitalized in a medical clinic.	4
Fernandez, 2018 [28].	Cross-sectional study. Optimize the administration of medications via enteral nutrition tube in patients hospitalized in a high-complexity pediatric hospital.	4

§ = Adapted from: Murad *et al.* (2016).

Table 2. Quality evaluation

Author Year	Evaluation Criteria																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	R
Klang *et al.* (2023) [12].	+	+	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+	14/17
Lisboa *et al.* 2023 [13].	+	+	-	+	+	N/A	+	+	+	+	+	+	-	-	+	+	+	13/17
Pereira *et al.* 2023 [14].	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	15/17
Silva *et al.* 2023 [15].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Souza, 2023 [16].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gois *et al.* 2022 [17].	+	+	-	+	N/A	N/A	+	+	+	+	+	+	-	-	+	+	+	12/17
Mascarenhas *et al.* 2022 [18].	+	+	-	+	+	N/A	+	+	+	+	+	+	-	-	+	+	+	13/17
Oliveira *et al.* 2022 [19].	+	+	-	+	+	N/A	+	+	+	+	+	+	-	-	+	+	+	13/17
Zuccari *et al.* 2022 [20].	+	+	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+	14/17
Souza *et al.* 2021 [21].	+	+	-	+	N/A	N/A	+	+	+	+	+	+	-	-	+	+	+	12/17
Facioli *et al.* 2020 [22].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Martinez *et al.* 2020 [23].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spezia, Matheus, 2020 [24].	+	+	-	+	+	N/A	+	+	+	+	+	+	-	-	+	+	+	13/17
Santos *et al.* 2019 [25].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spezia, 2019 [26].	+	+	-	+	+	N/A	+	+	+	+	+	+	-	-	+	+	+	13/17
Carré, 2018 [27].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fernandez, 2018 [28].	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Legend: + = criterion met; - = criterion not met; NA = Not applicable. R = Result.

Note: Questions adapted from: Critical Appraisal Skills Programme (2018)7: 1. What is the main objective of the research? 2. Who conducted the research, and are they reputable? 3. How was the research funded? Are there any potential conflicts of interest? 4. How was the study designed? 5. Was the sample size large enough to provide accurate results? 6. Were the participants or subjects selected appropriately? 7. What data collection methods were used, and were they reliable and valid? 8. Were the data analyzed with accuracy and rigor? 9. Were the results and conclusions directly drawn from the data, or were there any assumptions made? 10. Can the results be generalized to the broader population? 11. How does this research contribute to the existing knowledge in the field? 12. Were

ethical standards maintained throughout the study? 13. Was any potential bias considered in the design, data collection, or analysis? 14. Did the researchers suggest directions for future research based on their findings? 15. Are the research results replicable? 16. Are there any implications for policy or practice based on the research findings? 17. Were all aspects of the research clearly explained and detailed?

Table 3 presents aspects related to equity. The PROGRESS[9] acronym is used as a tool to help ensure that social stratification factors are considered in the conduct, reporting, and utilization of research and interventions, as these factors can play a role in contributing to inequalities in health outcomes.

Table 3. Equity

Author/Year	P	R	O	G	R	E	S	S	Country
Klang *et al*. (2023) [12].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	EUA
Lisboa *et al*. 2023 [13].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Pereira *et al*. 2023 [14].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Silva *et al*. 2023 [15].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Souza, 2023 [16].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Gois *et al*. 2022 [17].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Mascarenhas *et al*. 2022 [18].	(+)	(-)	(+)	(-)	(-)	(-)	(-)	(-)	Brazil
Oliveira *et al*. 2022 [19].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Zuccari *et al*. 2022 [20].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Italy
Souza *et al*. 2021 [21].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Facioli *et al*. 2020 [22].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Martinez *et al*. 2020 [23].	(+)	(-)	(+)	(-)	(-)	(-)	(-)	(-)	Spain
Spezia, Matheus, 2020 [24].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Santos *et al*. 2019 [25].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Spezia, 2019 [26].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Carré, 2018 [27].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Brazil
Fernandez, 2018 [28].	(+)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	Chile

Legends: P = Place of residence; R = Race/ethnicity/culture/language; O = Occupation; G = Gender/Sexual orientation; R = Religion; E = Education; S = Socioeconomic status; S = Social capital. High, middle, and low-income countries, particularly Brazil, lack information on whether individuals live in urban or rural areas. (+) Information presented, (-) No information.

Note: Adapted from O'Neill et al. (2014).

4. Discussion

Klang et al. (2023) reports that thirty-six medications were identified as unsuitable for administration via feeding tube, and another 46 medications were deemed inappropriate for direct jejunal administration. The information produced by this study allows physicians to make informed choices in selecting, preparing, and flushing medications through feeding tubes. By using the developed model, they will also be able to evaluate an unstudied medication for potential issues in feeding tube administration.

Lisboa et al. (2023) identified errors in the preparation of 480 doses (66.66%). Coated tablets and hard gelatin capsules were improperly crushed in 100% of the doses analyzed, and 54% of plain tablets had insufficient crushing. Insufficient dilution oc-curred in 100% of syrup doses. The most prevalent error was the crushing of solid medi-cations. The authors conclude that the preparation of medications showed a high

fre-quency of errors, which may lead to losses in drug bioavailability and compromise good practices in enteral medication therapy.

Pereira et al. (2023) report a significant improvement in the frequency of tube ob-structions, from 41.1% in 2014 to 57.9% in 2015–2017, and 9.6% in 2018–2019 (p=0.0010). After implementing the improvement program, the estimated cost of preparing doses was reduced from R$1,067.50 in 2014 to R$719.80 in 2015–2017 and R$433.10 in 2018–2019. The authors conclude that by restoring the processes of preparation and administration of medications via nasoenteric tube, through the acquisition of appropriate equipment for crushing hard tablets, along with educational activities for the nursing team, a reduction in tube obstructions and process costs can be observed.

Silva et al. (2023) reports that the most frequent recommendations were related to dilution (81.25%; n=26), crushing (81.25%; n=26), and necessary precautions before and after drug administration via device (50.00%; n=16). The less addressed aspects were drug-drug incompatibility (12.5%; n=4) and the risks involved in handling medications for device administration by the nursing team (15.63%; n=5). Given the complexity of us-ing medications via enteral devices, this approach is mandatory, especially in the context of comprehensive patient care. However, despite understanding these points, the findings suggest that many standardized clinical practice documents on this topic require more information to achieve their goals, particularly regarding risks. Additionally, there is a need for collaborative, multidisciplinary construction that addresses facilitators and bar-riers to implementing recommendations. The study concludes that evidence-based prac-tices in hospital settings are essential from a safety and quality care perspective.

Sousa (2023) reports that, at times, oral medication administration is either im-possible or not advisable. In these cases, using alternative administration routes can be quite convenient. However, issues such as tube obstruction, drug-enteral diet incompati-bilities, increased adverse effects, and reduced drug efficacy and safety may arise. These problems can be minimized with proper guidance from a clinical pharmacist regarding the correct selection of the drug, pharmaceutical form, administration route, drug interac-tions, and incompatibilities with enteral nutrition. The manual is intended to assist the multidisciplinary team in choosing the appropriate pharmaceutical form for enteral tube administration, contributing to patient care and safety.

Gois et al. (2022) report that patients receiving home care exhibit a complex pharmacotherapeutic profile due to the challenges of using medication, in addition to the use of enteral tubes and Enteral Nutritional Therapy (ENT). This practice involves a quali-fied multidisciplinary team providing care services aimed at reducing potential adverse events such as enteral tube obstruction, pharmaceutical form incompatibilities, and drug-nutrient interactions, which can impair treatment quality. In this context, 108 stand-ardized oral solid medications were identified. Of these, 83.3% can be administered, 31.5% have a suggested substitution for a liquid pharmaceutical form, and 18.5% present drug-nutrient interactions. Among the medications that cannot be administered (16.7%), 16.6% have modified-release formulations, 22.3% cannot be crushed, and 61.1% lack liter-ature data supporting their administration. They infer that this study may provide sup-port to the multidisciplinary health team for better understanding the processes and ap-propriate technical criteria related to enteral tube administration, thus avoiding problems related to effectiveness and safety.

Mascarenhas et al. (2022) report that out of 102 medical records evaluated by pharmacists, most patients were male (52.5%) and elderly (55.4%). Of these, 24.8%

re-ceived guidance on the use of medications via feeding tube, 7.8% had interventions con-traindicating the use of medications via tube, and 9.5% of the patients had drug-diet in-teractions noted in their records. The most prevalent pharmaceutical guidance regarding tube use involved medication dilution (89.1%), drug-diet interactions (80%), and the in-terruption of the diet for medication administration (75%). Most medications involved in the guidance/interventions acted on the cardiovascular system (49.3%) and the nervous system (20.7%). The authors conclude by highlighting the importance of the clinical pharmacist's role in providing interventions and guidance regarding the use of enteral tube medications in ICU patients.

Oliveira et al. (2022) report that administering medications via feeding tube in dysphagic patients often involves using off-label drugs due to the lack of suitable formulations. This situation puts healthcare professionals in the dilemma of choosing a formulation whose manipulation may not alter the medication's effectiveness. In this context, a practical guide on prescribing, handling, and administering medications via enteral feeding tube could be highly useful. By studying 1,047 solid oral formulations included in the San Paolo Hospital formulary in Savona, Italy, they concluded that 95% of the medications are concerningly used off-label, and 40% must be managed by hospital pharmacists without adequate manufacturer instructions or literature studies. To address this gap, they developed a protocol based on pharmaceutical experience and evidence-based prac-tices, aiming to standardize pharmacological therapies.

Zuccari et al. (2022) report that tretinoin, indicated for remission induction in Promyelocytic Leukemia, is not available as an oral solution. It is considered a hazardous drug by major international agencies and poses a higher risk of causing significant harm to patients if used incorrectly. They conclude that patients using formulations prepared from capsules, based on experience with the preparation and administration of these ex-temporaneous formulations, achieve results like those in other national and international hospitals.

Souza et al. (2021) notes that over time, the use of enteral feeding tubes has evolved alongside modern medicine. This continuous progress has led to the implemen-tation of different modalities tailored to the needs of each patient. Despite this evolution, the administration of medications through these tubes is conditioned by various factors: catheter care, manipulation of pharmaceutical forms, and lack of expertise in therapeutic alternatives, among others. Likewise, enteral nutrition plays a crucial role since the pas-sage of nutrients occurs through the same tube as medications. Each factor must be con-sidered to prevent issues like interactions, blockages, digestive symptoms, which can impair the patient’s health. It was found that most errors committed were associated with a significant lack of training among the healthcare professionals involved. The study recommends multidisciplinary collaboration, with pharmacists integrated into the team, as well as the inclusion of electronic aids to record necessary recommendations for the development of good practices.

Facioli et al. (2020) reports that before the implementation of the quality im-provement program, the frequency of tube obstructions was 33.3% per month. After the tested changes, this frequency decreased to 7.4% per month. Furthermore, the cost of pre-paring and administering oral medications via nasogastric/nasoenteric tubes per dose decreased from R$ 1.03 to R$ 0.33, in addition to the reduction in time spent by the nurs-ing team executing both techniques. The cost of obstructions in Phase I was R$ 1,251.75 per month, which was reduced to R$ 23.31 per month in Phase II. The study concludes that the collaborative quality improvement approach, based on PDSA (Plan, Do, Check, Act) cycles—an iterative problem-solving method

focused on enhancing business process efficiency—contributed to the reduction of non-conformities in the preparation and ad-ministration of oral medications via nasogastric/nasoenteric tubes. The technical product was the development and implementation of a best practice guide for the preparation and administration of oral medications via nasogastric/nasoenteric tubes, the training of the entire nursing team, the replacement of aluminum mortars and pestles with porcelain, and the standardization of 20 ml syringes in sterile individual packaging. These changes significantly impacted the frequency of tube obstructions, and the costs associated with this important safety incident. The methodology from the Institute for Healthcare Improvement is valuable for improving care processes and patient outcomes in resource-limited settings without incurring significant costs. Finally, the study presents the Standard Operating Procedures Manuals for prescribing, preparing, administering, and monitoring solid medications administered via nasogastric/nasoenteric tubes.

Martinez et al. (2020) present techniques for preparing various pharmaceutical forms for administration via enteral catheter; techniques for catheter care before, during, and after medication administration; and techniques for administering medications via enteral catheter to assist healthcare professionals in performing these procedures. Addi-tionally, the preparation and administration of medications through enteral catheters are of utmost importance in complex care settings and must be properly adapted and quali-fied according to where they are performed.

Spezia and Matheus (2020), upon analyzing 47 prescriptions involving 138 medications prescribed for administration via feeding tube, found that 18.8% of these medications had some restrictions for administration via feeding tube. The most common problems observed were loss or reduction of therapeutic effect in 61.6% of cases, followed by 30.8% of drug-food interactions. The most frequent pharmaceutical intervention was the request for a change in pharmaceutical form (36%), followed by guidance on inter-rupting enteral feeding (30.2%). In developing a guide for the healthcare team, they ana-lyzed the 181 standardized medications in the hospital; of these, 33.1% had some re-striction for administration via feeding tube, and only 35% had an alternative pharmaceu-tical form for substitution. They conclude that the importance of pharmaceutical interven-tion in evaluating prescriptions to identify errors and prevent future issues, thus ensuring patient safety, was evident.

Santos et al. (2019) sought evidence regarding the individual limitations in the preparation and administration of medications via feeding tube. Analyzing 341 prescrip-tions from 40 patients (average of 8.52 prescriptions per patient), they identified that 725 medications had been prescribed for administration via feeding tube, corresponding to 44 different types of medications. Due to the scarcity of articles and the lack of a database fo-cused on medication administration via feeding tube, this study becomes a highly rele-vant tool for the pharmacotherapeutic care process, and the quality and safety of the treatment provided to patients. The number of identified limitations was small, but its as-sociation with advanced age and the severity of the studied population underscores the importance of identifying and managing these limitations. Finally, the study highlights the need for more research in this area, especially involving surgical patients, whose more complex condition demands greater attention.

Spezia (2019), when evaluating 47 prescriptions involving 138 medications prescribed via enteral tube in an emergency unit, found that 18.1% of the medications had some type of restriction. The most observed issues were loss or reduction of therapeutic ef-fect (61.5%). Among the most frequent pharmaceutical interventions was the request for a change in pharmaceutical form (36%). The study highlighted the

importance of pharma-ceutical evaluation of prescriptions to identify errors and prevent future issues in patient care. Additionally, the development of reference materials helps and optimizes the pro-cess of medication administration via feeding tube, ensuring the safety and effectiveness of pharmacotherapy.

Carré (2018) reports that biopharmaceutical factors, information on formulation, and the type of pharmaceutical form used by the hospital assist in analyzing the prepara-tion and administration of medications to be administered via feeding tube. A challenge that may be encountered in this analysis is the inconsistency of manufacturers used by the hospital, as formulation compositions vary. Understanding the characteristics of the drug, the pharmaceutical form, and factors affecting it's in vivo disposition is crucial for decisionmaking regarding the preparation and administration of medications via enteral nu-trition tubes, especially for drugs with a narrow therapeutic index; depending on the drug, monitoring of plasma concentrations, laboratory parameters, or physiological conditions may be required. Additionally, this assessment should be related to the patient's clinical condition and, therefore, performed individually, on a case-by-case basis.

Fernández (2018) worked on strategies to optimize the administration of medications via enteral nutrition tubes in patients hospitalized in a high-complexity pediatric hospital. The procedures for the preparation and administration of medications via enter-al tubes, performed by the nursing team, were evaluated to detect the number of medication errors through a quasi-experimental study comparing before and after an intervention. In the pre-intervention stage, of the 103 observations, 93.2% had at least one medication error, totaling 140 errors. Of these, 68.6% were errors in administration techniques, 15.0% in the choice of pharmaceutical form, 11.4% in preparation techniques, and 7% in other categories. After the intervention, 51.9% of the 102 observations had at least one error, and the total number of errors was 94, representing a reduction of 41.3%. In the nomi-nal group, the nursing team identified the lack of liquid formulations as the most signifi-cant problem, followed by the tendency of some medications to easily clog the syringe. The study concludes that the strategies employed optimized the administration of medications via enteral nutrition tubes, as evidenced by the 41.3% reduction in errors.

Limitations and Bias: There is a potential limitation concerning the temporal scope, language restrictions, and the possibility that eligible articles may have been missed due to synonyms of the descriptors used. Potential bias is inferred based on the methods em-ployed, types of analyses, and outcomes of the selected studies.

5. Conclusions

It is recognized that there is a high frequency of errors in the administration of solid medications via enteral or nasoenteric tubes, which can lead to losses in drug bioavaila-bility and compromise best practices in drug therapy. In this context, the presence of a clinical pharmacist is essential, particularly for implementing evidence-based practices from the perspective of quality of care, patient safety, efficiency, and sustainability of the services provided.

In addition, knowledge of biopharmaceutical factors, formulation information, and the type of pharmaceutical form used—which aid in the analysis of the preparation and administration of medications via nasoenteric and nasogastric tubes—requires the clini-cal pharmacist to ensure the correct selection of the medication, pharmaceutical form, route of administration, drug-drug interactions, potential drug-laboratory diagnostic in-terference, and drug-food incompatibilities or interactions with enteral nutrition.

The implementation of protocols and/or manuals and/or standard operating proce-dures should be constant and based on scientific evidence, as well as the qualification of the multidisciplinary team, aiming to standardize pharmacological therapies adminis-tered via tubes.

Due to the scarcity of articles and the lack of a database focused on medication ad-ministration via tubes, there is a need for additional studies, especially involving surgical patients, whose more complex conditions demand greater attention and care.

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