Revista Contexto & Saúde
Editora Unijuí
Programa de Pós-Graduação em Atenção Integral à Saúde
ISSN 2176-7114 – v. 24, n. 48, 2024
http://dx.doi.org/10.21527/2176-7114.2024.48.13282
HOW TO CITE:
Higa CML, Cheade M de FM, Frota OP, Cardoso AI de Q. Good practices in the administration of drugs via tubes in neonates: a cross-sectional study. Rev. Contexto & Saúde, 2024;24(48):e13282.

ORIGINAL ARTICLE

Good Practice in the Administration of Medicines Via Probes in Neonates:
A Cross-Sectional Study

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Highlights:
(1) Specifically investigated the administration of medicines by tube in neonates
(2) The liquid pharmaceutical form is the most commonly used medicine in neonates.
(3) The night period is the safest because it is less prone to distraction.

ABSTRACT

In the literature, there are studies related to the administration of medication via gastric and enteral tubes which describe failures, especially in adult patient care units. However, research in neonatal units is scarce. This study aimed to assess the degree of compliance with good practice in the process of administering drugs via gastric and enteral tubes in neonates. This is a quantitative, cross-sectional study carried out in the neonatology department of a public teaching hospital in Mato Grosso do Sul. Data were collected from January to April 2019, using an observational script based on the recommendations of the American Society for parenteral and Enteral Nutrition. One-third of the processes (33.7%) were classified as inadequate. Nursing technicians adhered less to recommended good practices compared to nurses (p=0.02) and those who work during the day had more inadequacies when compared to the ones who work at night (p=0.01). It can be noticed that the nursing team needs to fully adhere to the good practices recommended for the administration of medicines to reduce possible adverse risks events that could affect neonates.

Keywords: Patient safety; Medication erros; Gastrointestinal intubation; neonatology.

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INTRODUCTION

The importance of the subject of patient safety is recognized today, as it is an area of knowledge constantly being improved due to its scope and relevance. Its general concept includes the investigation of potential risks to support the prevention of failures[1].

As the medication administration process is complex, it may be flawed. In this context, professionals must understand the actions taken, as adherence to good practices is considered an important factor in patient safety[2].

Among the routes of drug administration, the enteral route is considered safer and less expensive than the parenteral route. However, the administration of medicines via gastric or enteral tubes is not risk-free and might present failures that compromise both nutritional therapy and the safe use of medicines[3].

To administer medicines via gastric and enteral tubes, in some cases the original pharmaceutical forms need to be adapted. Because of this adaptation, it is necessary to prevent some potential problems, such as incompatibility between drugs, possible contamination, obstruction of the tube[3]. Therefore, for the process to be considered safe, the following skills are required: checking the location of the tube; appropriate preparation of the drug (either by grinding the solid pharmaceutical form or diluting viscous liquids); irrigation of the tube before and after administration and assessment of possible complications[4].

In the literature, there are studies related to the administration of drugs via gastric and enteral tubes that describe failures, especially in adult patient care units, while in neonatal units, research is scarce[5]. Administering drugs to neonates is a challenge, mainly for nursing, as many techniques are applied based on well-established experiences in other age groups. It also requires extra attention when preparing the medication due to the small and fractionated doses to be administered. It is worth mentioning that newborns are vulnerable to medication errors, given their physiological immaturity and small participation in studies involving medication, often using dosages extrapolated from the adult population[6].

In this context, nursing professionals who care for newborns in neonatal units and administer medication require full knowledge of work processes and professionals qualified in recommended safe practices.

On account of the arguments above this study aimed to assess the degree of compliance with good practices in the process of administering drugs via gastric and enteral tubes carried out by the nursing team in neonates.

MATERIALS AND METHODS

This is a quantitative, cross-sectional study carried out in a neonatology service comprising three units (Neonatal Intensive Care Unit, Conventional Neonatal Intermediate Care Unit, Kangaroo Neonatal Intermediate Care Unit) at a public teaching hospital in the city of Campo Grande, Mato Grosso do Sul.

Data collection took place from January to April 2019 and the research report was guided by the *Strengthening the Reporting of Observational Studies in Epidemiology* (Strobe) initiative, which includes skillful recommendations for describing observational studies[7].

The unit of measurement for data collection was the process of administering medication, which takes place from reading the medical prescription, involves preparing the medication to observe and applying the nine rights of administration (right patient, right drug, right route, right time, right dose, right record, right action, right form, right response), a stage that includes patient safety issues[8].

Forty-three nursing professionals (nurses and nursing technicians) who met the following criteria were included for convenience: they had been working in the neonatal area for a year or more and were usually responsible for administering medication via gastric and enteral tubes. Professionals on vacation or leave during the data collection period were excluded. Each professional was observed four times each, to avoid bias in terms of one professional being observed more often than another, with a total of 172 observations.

Based on the recommendations of the *American Society for parenteral and Enteral Nutrition* (Aspen), a data collection instrument was structured in two parts. The first covered the sociodemographic and occupational characteristics of the professionals and the second an observational *checklist* model script containing 37 items, distributed into five categories: probe characteristics (which described the gauge, type, location, insertion site, whether there was an external measurement and the fixation), drug administered (whether solid or liquid and the name of the drug), preparation (actions such as identification, alternative availability, compatibility, materials used, use of water, grinding, labeling, and dilution), administration (checking the positioning of the tube, irrigation, actions when on a diet or in the case of multiple drugs) and patient safety (application of the right nine, hand hygiene, time between preparation and administration, questions from professionals and incidents).

In the categories of the script, the observer analyzed in detail seven items about the characteristics of the probe, two items about the drug administered, ten actions taken during preparation, ten actions during administration and eight actions relating to patient safety. For each item or action there were two alternatives: “yes” and “no”. As 12 actions were optional, there was a third answer option: “not applicable”. Inconsistencies with the practices recommended by Aspen were considered inadequate. A pilot test was carried out to adapt the instrument.

Before observing the practice, each professional on the nursing team received guidance on the research and how to take part. Upon consent, they were asked to sign the Informed Consent Form (ICF), followed by the collection of sociodemographic data. The data was collected by passive and systematized observation (*checklist*) in the participants’ work environment, carried out by three observers (qualified and calibrated) on different days of the week and shifts.

To mitigate the participant’s *Hawthorne* effect (positive change in behavior) observed due to a lack of naturalness in their work process, the first six days of data collection were used for the observers to enter the unit’s routines so that the professionals would become familiar with their presence[9] .

The adequacy analysis used the rate of adherence to the instrument’s items per management process, with a cut-off point of 70%. Thusly processes with 70% or more adherence to the items observed were considered adequate and those below 70% not adequate[10].

The data was analyzed using descriptive and inferential statistics, using the EPI INFO software™ version 7.2.2.6. The association between categorical variables was examined using the Chi-square test (χ^2) or Fisher’s exact test, both with a significance level of 5%.

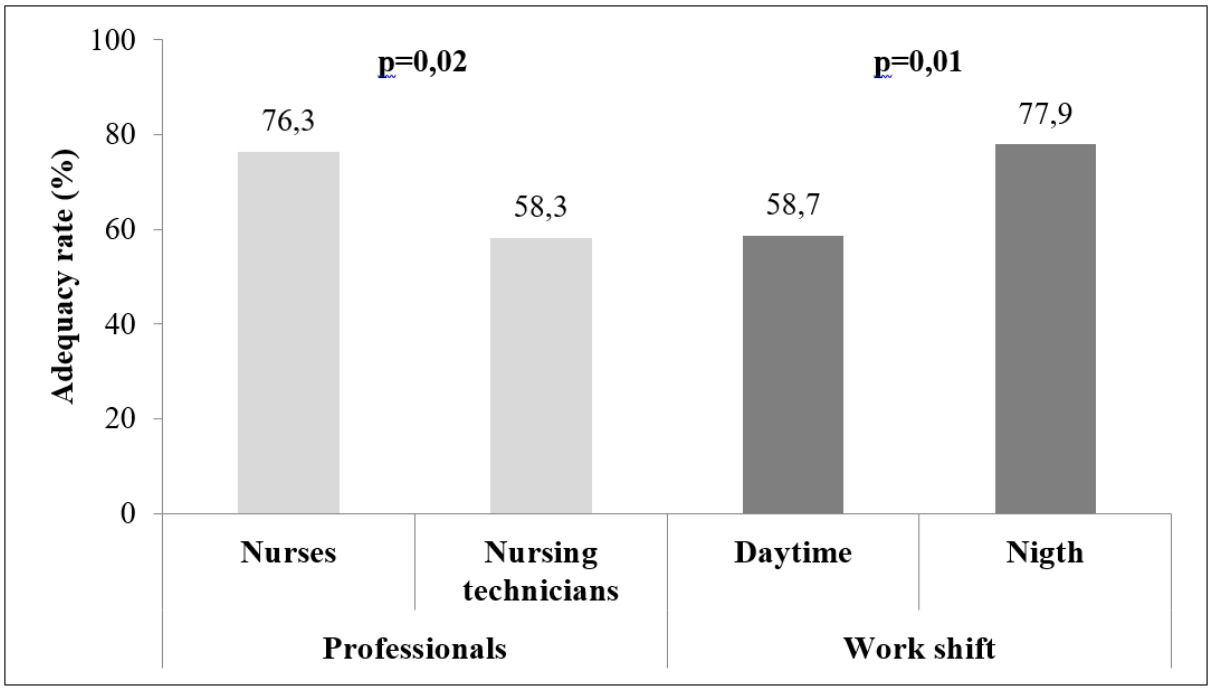
This study was approved by the Human Research Ethics Committee of the Federal University of Mato Grosso do Sul (CAAE 01478518.9.0000.0021).

RESULTS

Of the 43 professionals observed, the average age was 39.7 years (±7.35), professional experience 14.1 years (±6.14), specific experience in neonatology 7.3 years (±7.28). Females predominated (97.7%). Twenty-four participants were nursing technicians (55.8%) and 19 nurses (44.2%). Of all the professionals, 22 had postgraduate degrees (51.2%).

A total of 172 medication administration processes were observed for 21 neonates. In these observations, liquid medications accounted for 91.3% and solid medications only 8.7%. In the general analysis of the medication administration process, it was found that more than a third were classified as inadequate (33.7%).

The nursing technicians administered more drugs that were considered inappropriate than the nurses (p=0.02) and the professionals working during the day showed more often inappropriate actions than those working at night (Graph 1).



Graph 1 – Adequacy rate of medication administration processes via gastric and enteral tubes in neonates, according to professional category and work shift. Campo Grande-MS, Brazil, 2019 (n=172).

Tables 1 and 2 shows the actions analyzed that had significant associations with the classification of the management process.

The 4Fr caliber of the tube, the smallest used in the neonatology service, was not only the most prevalent (65.1%), but was also associated with inadequate processes compared to probes of other calibers (p=0.04). Incident-free processes were identified 82.6% (n=142) of the time, but the presence of incidents was associated with inadequate classification (p<0.0001).

Non-adequate observations were characterized by the absence of Aspen recommendations. Items and/or actions not carried out were more likely to reach more than 30% unsuitable in the overall analysis, so they were classified as not suitable processes.

Table 1 – Actions carried out in the preparation and administration of medicines, according to the classification of the process. Campo Grande, MS, Brazil, 2019 (n=172)

Preparation characteristics	Classification % (n)		p-value
	Not suitable 33,7 (58)	Adequate 66,3 (114)	
Drug labeling			
Yes	25,9 (15)	55,3 (63)	**0,0003***
No	74,1 (43)	44,7 (51)	
Prescribed dose accurately aspirated			
Yes	58,6 (34)	89,5 (102)	**0,000***
No	41,4 (24)	10,5 (12)	
Checking the positioning of the probe			
Yes	15,5 (9)	31,6 (36)	**0,03**
No	84,5 (49)	73,4 (78)	
Irrigation of the probe before administration			
Yes	17,2 (10)	33,6 (44)	**0,005***
No	82,8 (48)	61,4 (70)	
Irrigation of the probe after administration			
Yes	74,1 (43)	88,6 (101)	**0,03***
No	25,9 (15)	11,4 (13)	

*p<0,05

Table 2 – Nine certain aspects of drug administration, according to the classification of the process. Campo Grande, MS, Brazil, 2019 (n=172)

Nine certain medications	Classification % (n)		p-value
	Not suitable 33,7 (58)	Suitable 66,3 (114)	
Patient	100,0 (58)	100,0 (114)	1,0
Medicines	100,0 (58)	100,0 (114)	1,0
Via	100,0 (58)	100,0 (114)	1,0
Time	58,6 (34)	94,7 (108)	**0,000***
Dose	58,6 (34)	89,5 (102)	**0,000***
Registration	25,9 (15)	63,2 (72)	**0,000***
Action	96,6 (56)	99,1 (113)	0,26
Form	81,0 (47)	91,2 (104)	0,08
Answer	3,4 (2)	3,5 (4)	1,0

*p<0,05

DISCUSSION

By means of the information from this study made it is possible to analyze the adequacy of each stage in the process of administering medicines via gastric and enteral tubes in neonates. The general analysis of the process of administering medicines via gastric and enteral tubes revealed some worrying data, which one-third (33.7%) of the practices observed were classified as inadequate.

The liquid pharmaceutical form was the most commonly observed (91.3%), which differs from studies carried out with adults, whose drugs are predominantly administered via gastric and enteral tubes in solid form. However, this finding is corroborated in adult and neonatal intensive care units, where 97.7% of the drugs administered are in liquid form and only 8% in adult ICUs[11].

As the studies carried out before this research were conducted with adult clients, they dealt mainly with solid presentations and their implications, as well as difficulties in adaptation and administration. Liquid forms, the first choice for administration through probes, were abstracted and little discussed. Although its administration can be considered preferential when compared to solid forms, failure to follow the recommendations can entail risks and lead to an inappropriate process of drug administration[12].

It was observed that nursing technicians adhered less to the recommended practices than nurses (p=0.02). Although this is a routine nursing technique, it is generally assigned without distinction between the professional categories that make up the team[13]. It should be noted that the nurses in the study provided direct care to the newborn, without supervision. Twenty-four professional nurses and 19 nursing technicians represented values close to the opportunity to carry out the procedure. Thus, low adherence may be due to better academic qualifications being necessary for more complex and potentially dangerous procedures[14].

It is worth considering that almost half of the professionals were qualified with undergraduate and postgraduate degrees. Even so, planning specific training and reviewing care protocols is necessary, as strengthening patient safety processes in the administration of medicines related to adherence to good practices is relevant to guaranteeing qualified, risk-free care.

The procedures were better carried out at night. The daytime in the neonatology department is a place of work and research for various professionals and academic residents. In addition to the greater movement of people during the day, complementary exams and routine diagnostics. It's worth pointing out that health professionals who carry out procedures and are exposed to distractions may incur greater failures[15].

To strike a balance between teaching, research, the work of care and support staff, it is necessary to establish criteria, time limits, shift rotation to ensure safe practices for patients.

Smaller caliber probes were associated with practices classified as inadequate in this study. This has been described in another study, as the use of these probes increases the risk of drug residues inside the lumen, which can lead to obstruction and lower dosages being administered than prescribed. Therefore, smaller probes require greater nursing attention and additional care, with the need for rigorous dilution of the medication so that it reaches its destination in its entirety and the probe remains patent. In addition, irrigation of the tube should be systematic before and after slow administration, to ensure a risk-free procedure[16].

Accurate dosing for neonatal patients is crucial for the safe administration of drugs via gastric and enteral tubes. In this study, accurate aspiration of doses enabled more appropriate drug administration processes compared to inaccurate aspiration of doses (p<0.0001). It is important in this process that the hospital pharmacy service is adapted, with dispensing in unit doses, which is ideal for minimizing dosage errors via gastric and enteral tubes[4], but this is a limitation of the service observed.

For each dose, the nurses in the neonatology department in this study need to aspirate the medication and, if necessary, dilute it in 50ml disposable cups before transferring it to the syringes used for administration. These transfers can cause losses, present risks of contamination, also generate cascading effects in consecutive administrations, with lower or higher dosages than those prescribed.

One proposal would be to aspirate directly into the syringe in the case of liquid medication. Furthermore, nursing professionals must have knowledge of medication calculation, to avoid administering the wrong volumes[2].

It was found that the majority of professionals do not identify or partially identify medicines (54.7%), a fact also observed in other studies[10-16].

Low adherence to correct labeling after drug preparation led to inadequate processes compared to proper labeling (p=0.0003). The complete labeling of a drug to be administered prevents risks to patients, with greater safety for the team[10]. Standardizing labels and raising staff awareness through training are important tools to be applied.

When it came to irrigating the probes before and after drug administration, the low prevalence of action was reflected in the inadequate processes when compared to correct irrigation (p=0.005 and p=0.03, respectively). Poor irrigation practices can be harmful, as they allow for drug residue interaction and the absorption of lower doses than recommended[12].

Recommendations to irrigate probes before and after administration could be encouraged by improving and training all stages of the process. Further research is suggested to identify the causes of low adherence by professionals.

With regard to checking the positioning of the tube, this did not occur in 73.8% of the observations (p=0.03), since in the sector analyzed, this check only takes place at the beginning of each shift and not with each medication to be administered. The procedure of checking the positioning of the probe before administering medication is important to assess displacement, obstruction and false path of the probe[17].

The gold standard for checking the positioning of gastric and enteral tubes is abdominal radiography, but this test may not be available or may be inadvisable for babies who dislodge gastric and enteral tubes quickly. In these cases, it is possible to use the length measurement method with a note of the externalized value in centimeters, associated with the gastric pH test and/or visual observation of the aspirate. Auscultatory methods cannot distinguish between probes placed in the lung or coiled in the esophagus[4].

When it came to checking the nine right steps for the safe administration of medicines, the items “right time”, “right dose” and “right record” were carried out correctly in the majority of observations (82.6%, 79.1%, and 50.6%, respectively) and these actions made the processes more appropriate compared to the absence of the check (p<0.0001).

The importance of administering at the right time refers to guaranteeing the absorption of the medication under therapeutic conditions, and this condition depends on the organization of the preparation at the appropriate time. It’s worth noting that the nine correct doses of medication don’t certify the absence of failures, but they can improve the process since the team must plan their routine of tasks and prioritize key actions that promote a reduction in risk[16].

The limitations of this study are due to the short period of observations carried out, the reactivity effect typical of observational studies and the collection of data from a single neonatology service. The potential of this study lies in its pioneering approach to the proposed topic, which has few or often no inferenced, in addition to the methodological rigor followed in all the steps to guarantee the quality of the research.

As a proposal for improvement, a Standard Operating Procedure for the safe administration of drugs via gastric and enteral tubes was sent to the institution’s Multidisciplinary Nutritional Therapy Team.

CONCLUSION

The nursing team performs the procedure of administering drugs via gastric and enteral tubes to neonates, without fully adhering to the good practices described in Thé scientific literature. In this sense, education, training and awareness-raising strategies may be useful tools for expanding knowledge on the subject and implementing responsibility and awareness about to patient safety.

This study has brought together some important findings in the administration of gastrointestinal drugs in neonates. However, due to the scarcity of specific literature, future research in this area involving more neonatology services is needed to obtain more robust results, guarantee safety in the procedure and advise health professionals in their daily practices in the hospital environment.

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Submitted: April 20, 2022
Accepted: December 6, 2023
Published: July 22, 2024

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All authors approved the final version of the text.

Conflict of interest: There is no conflict of interest.

Financing: Does not have financing

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Editor: Christiane de Fátima Colet. PhD
Editor-in-chief: Adriane Cristina Bernat Kolankiewicz. PhD