Length of gastric tube insertion in newborn: nurse's practices

Comprimento de inserção de sonda gástrica em recém-nascidos: práticas dos enfermeiros

Longitud de inserción de sonda gástrica en neonatos: prácticas de enfermería

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ABSTRACT
Objective: to evaluate the practice of nurses from a neonatal unit on measuring the length of gastric tubes. **Method:** cross-sectional study, carried out in four public neonatal units from Recife. Data were collected through a questionnaire and submitted to descriptive and analytical statistical analysis. Research protocol approved by the Research Ethics Committee. **Results:** the ear-nose-xiphoid measurement appeared as the most frequent for orogastric tube (28.4%) and the nose-ear-xiphoid measurement for nasogastric tube (35.8%); 7.5% of nurses reported using the currently recommended tube measurement strategies for both the oral and nasogastric routes. There was no significant association between the choice of appropriate measurement strategies and training time, length of experience in neonatology, additional training or unit of work. **Conclusion:** the practice of perform gastric tube in newborns, by most professionals, is out of line with current evidence that recommends the use of nose-ear-half the distance between xiphoid and umbilicus.
Descriptors: Neonatal Nursing; Infant, Newborn; Intensive Care, Neonatal; Enteral Nutrition; Catheters.

RESUMO
Objetivo: avaliar a prática de enfermeiros que atuam em unidade neonatal sobre a mensuração do comprimento de sondas gástricas. **Método**: estudo transversal, realizado em quatro unidades neonatais públicas do Recife. Os dados foram coletados por meio de questionário e submetidos à análise estatística descritiva e analítica. Protocolo de pesquisa aprovado pelo Comitê de Ética em Pesquisa. **Resultados:** a medida orelha-nariz-xifoide apareceu como a mais frequente para sondagem orogástrica (28,4%) e a medida nariz-orelha-xifoide para sondagem nasogástrica (35,8%); 7,5% dos enfermeiros declararam usar as estratégias de medição de sonda atualmente recomendadas tanto para via oral quanto para nasogástrica. Não houve associação significativa entre a escolha das estratégias de medição adequadas e tempo de formação, tempo de experiência em neonatologia, formação complementar ou unidade de atuação. **Conclusão**: a prática de sondagem gástrica em recém-nascido, da maior parte dos profissionais, está desalinhada com as atuais evidências que recomendam o uso da medida nariz-orelha-metade da distância entre xifoide e cicatriz umbilical.
Descritores: Enfermagem Neonatal; Recém-Nascido; Terapia Intensiva Neonatal; Nutrição Enteral; Cateteres.

RESUMEN
Objetivo: evaluar la práctica de los enfermeros que actúan en una unidad neonatal en cuanto a la medición de la longitud de las sondas gástricas. **Método:** estudio transversal, realizado en cuatro unidades neonatales públicas de Recife. Los datos se recolectaron a través de un cuestionario y se sometieron a análisis estadístico descriptivo y analítico. El Comité de Ética en Investigación aprobó el protocolo de investigación. **Resultados:** la medida oído-nariz-xifoideo apareció como siendo la más frecuente en cuanto a la sonda orogástrica (28,4%) y la medida nariz-oído-xifoideo respecto a la sonda nasogástrica (35,8%); el 7,5% de los enfermeros informó que utilizan las estrategias de medición de sonda actualmente recomendadas tanto para la vía oral y como para la nasogástrica. No hubo asociación significativa entre la elección de estrategias de medición apropiadas y el tiempo de formación, la duración de la experiencia en neonatología, la formación adicional o la unidad de trabajo. **Conclusión:** la práctica del sondaje gástrico en recién nacidos, por la mayoría de los profesionales, no se ajusta con la evidencia actual que recomienda el uso de la medida nariz-oreja- mitad de la distancia entre el xifoides y la cicatriz umbilical.
Descriptores: Enfermería Neonatal; Recién Nacido; Cuidado Intensivo Neonatal; Nutrición Enteral; Catéteres.

INTRODUCTION

Gastric tubes are used in newborns (NB) hospitalized in Neonatal Units (NNU) for various purposes, such as: gastric decompression, medication administration, gastric lavage, gastric rest after surgery, bleeding monitoring, and mainly for feeding. They may be indicated due to immaturity and, consequently, incoordination of suction-swallowing-breathing in premature NBs, as well as in newborns who, regardless of gestational age, are tachypneic or dyspneic, with the aim of reducing the risk of bronchoaspiration[1].

Enteral nutrition is commonly offered through a tube, introduced orally (orogastric: OGT) or nasally (nasogastric: NGT) positioned in the gastric or duodenal region (enteral)[1]. Adequate indication and correct application can improve the child's nutritional status and prevent complications[2].

Precise placement of the tube is important to ensure safe and effective enteral feeding and depends mainly on the measurement strategy used. Tube location errors are described in the literature and the insertion length has traditionally been estimated by imprecise external morphological measurements[3,4].

An integrative review on gastric tube measurement procedures in NB concluded that the use of the NEX measurement considerably increases the risk of positioning the tube tip above the gastroesophageal junction. In addition, the study states that this measurement should be replaced by NEMU, until clinical trials test the effectiveness of measurement methods based on weight and height, which are considered promising[5].

None of the available measurement strategies is absolutely accurate, but the NEMU measurement, despite mixed results, is currently the most reliable for measuring the insertion length of a gastric tube in newborns6-8. Assuming that there is no standard practice to predict the insertion length of gastric tubes, as well as to verify their positioning in the neonatal population, exposing newborns to the risk of possible complications, the following study question arises: what are the nurses' practices to determine the length of gastric tube insertion in newborns?

It is noted that it is still common in clinical practice, significant variation of strategies to determine the length of the tube to be inserted and scarcity in the literature of studies that demonstrate how nurses perform this procedure. This fact motivated this research.

The identification of factors related to the inadequate performance of the gastric tube procedure can provide subsidies for the training of more qualified professionals and for the development and improvement of care and that is why there is a need for an instrument that evaluates the practices of nurses on the tube insertion measurement, enabling assessment of the need for intervention.

Thus, this study aimed to evaluate the practice of nurses working in a neonatal unit on measuring the length of gastric tubes.

METHOD

Cross-sectional study carried out in four Neonatal Units of Teaching Hospitals in the city of Recife (PE), with a profile of high demand for hospitalization of newborns. Data collection was carried out between September and November 2020 and January and February 2021.

The inclusion criteria used were: nurses working in the Neonatal Units of the hospitals that make up the study, including the Neonatal Intensive Care Unit (NICU), Intermediate Care Unit (ICU) and Kangaroo Care Units (KCU). Nurses who perform only administrative functions, those who were on vacation or on leave during the data collection period, in addition to those who had no effective employment relationship with the institutions participating in the study, were excluded.

The number of participants was determined by sample calculations for a finite population. With the sample universe estimated at 82 nurses and a confidence index of 95%, 67 participants were selected. The sample of nurses who participated in the study was randomly stratified, related to the number of these professionals in each hospital, ensuring the proportionality of participants.

The selection process of participants was carried out by random drawing of the days of the week and work shifts (day and night) in which the hospital was visited. All participants voluntarily signed the ICF and were guaranteed anonymity.

Data on the practice of nurses that were collected through the instrument developed and validated in the previous stage of the study were processed, organized and tabulated using Microsoft Excel® 2019 and STATA®/SE 12.0 software.

The results were presented in tables or graphs, with a description of the relative (%) and absolute (n) frequencies of the classes of each qualitative variable.

To verify possible associations between the dependent/outcome variable (NEMU or MEMU strategies for OGT and NEMU for NGT) and the independent variables (time since graduation, time of experience in neonatology, complementary training and unit of work), the Fisher's exact test was applied. Through Fisher's exact test, the test significance results were presented through the p-value. Results whose descriptive levels (p-values) were less than 0.05 (p-value<0.05) were considered statistically significant.

The research protocol was approved by the Research Ethics Committee (REC) of the institution, in compliance with the guidelines of Resolution nº 466/12, of the National Health Council, which provides for the guidelines and regulated standards for research involving human beings and had data collection previously authorized by standard document of each institution.

RESULTS

The demographic data that characterized the sample of participants are described in Table 1.

TABLE 1: Sample characterization (n=67). Recife, PE, Brazil, 2021.

VARIABLES	n	%
GENDER		
Female	64	95.5
Male	3	4.5
TIME SINCE GRADUATION IN YEARS		
< 5 years	12	17.9
5 - 10 years	23	34.3
> 10 years	32	47.8
COMPLEMENTARY TRAINING		
Specialization	35	52.2
Master's degree	12	17.9
Specialization in Neonatology	17	25.4
None	3	4.5
TIME OF EXPERIENCE IN NEONATOLOGY IN YEARS		
< 5 years	32	47.8
5 - 10 years	19	28.4
> 10 years	16	23.9
OTHER PERFORMANCE IN NURSING		
Yes	34	50.7
No	33	49.3
TYPE OF UNIT IN WHICH THE PERSON WORKS		
Neonatal intensive care / NIC	38	56.7
Conventional Intermediate Care / CIC	46	68.7
Kangaroo Intermediate Care / KIC	17	25.4

Of the 67 nurses, 95.5% (n=64) self-assessed the level of knowledge about gastric tube in NB as excellent or good, while 89.2% (n=58) stated that they had no doubts about how to measure the gastric tube. Graduation in nursing appeared as the main source of contribution in the formation of knowledge on the subject for 77.6% (n=52) and 37.3% (n=25) of the participants claimed to have acquired this knowledge in the graduate course.

The ENX strategy for OGT and NEX for NGT emerged as the nurses' most frequent choices for measuring the tube.

The strategies for measuring gastric tube insertion length used by nursing professionals are shown in Table 2.

TABLE 2: Frequency of strategies for measuring gastric tube insertion length. Recife, PE, Brazil, 2021.

	OROGASTRIC TUBE		NASOGASTRIC TUBE	
STRATEGIES	n	%	n	%
NEX	14	20.9	24	35.8
ENX	19	28.4	21	31.3
NEMU	2	3.0	10	14.9
ENMU	1	1.5	7	10.4
EMX	6	9.0	1	1.5
EMMU	6	9.0	2	3.0
MEX	14	20.9	0	0.0
MEMU	5	7.5	1	1.5
Minimum Comp.	2	3.0	1	1.5
Age/height	0	0.0	0	0.0

Legend: NEX (nose-ear-xiphoid), ENX (ear-nose-xiphoid), NEMU (nose-ear-half the distance between xiphoid and belly button), ENMU (ear-nose-half the distance between xiphoid and belly button), EMX (ear-mouth-xiphoid), EMMU (ear-mouth-half the distance between xiphoid and belly button), MEX (mouth-ear-xiphoid), MEMU (mouth- ear- half the distance between xiphoid and belly button), Minimum Comp. (13cm for NB <750g, 15cm for NB weighing between 750g and 999g, 16cm for NB between 1000g and 1449g, 17cm for NB between 1250g and 1499g), age/height. Observation: Two nurses chose more than one answer

Of the 67 participating professionals, only five declared using the currently recommended measurement strategies to measure both nasogastric and orogastric tubes, as shown in Figure 1.

Nurse	Strategy for OGT	Strategy for NGT	Nose as a reference point	Ear as a reference point	Mouth as a reference point	Point on the tube where the measurement starts
A15	NEMU	NENU	Apex	Lobe	Does not use it	After holes
B10	MEMU	NEMU	Apex	Lobe	Commissure	Distal end
C13	MENU	NEMU	Nostril	Lobe	Tuber	After holes
D3	MENU	NEMU	Apex	Lobe	Commissure	Distal end
D9	MENU	NEMU	Apex	Lobe	Commissure	After holes

FIGURE 1: Appropriate measurement strategies for NGT and OGT and anatomical reference points, Recife, PE, Brazil, 2021.

No statistically significant association was found between the choice of NEMU/MEMU strategies for OGT and NEMU for NGT with time since graduation, length of experience in neonatology, additional training and unit of work, as shown in Table 3.

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TABLE 3: Association analysis of the appropriate choice for measuring the orogastric and nasogastric tube with independent variables, Recife, PE, Brazil, 2021.

| Variables | Adequate strategies for OGT and NGT | | p-value * |
| | Yes | No | |
	n (%)	n (%)	
Time since graduation (years)			
< 5 years	0 (0.0)	12 (100.0)	0.572
5 - 10 years	3 (13.0)	20 (87.0)	
> 10 years	2 (6.3)	30 (93.8)	
Time working in neonatology (years)			
< 5 years	2 (6.3)	30 (93.7)	0.187
5 - 10 years	3 (15.8)	16 (84.2)	
> 10 years	0 (0.0)	16 (100.0)	
Complementary training			
Specialization	4 (11.4)	31 (88.6)	0.508
Master's degree	1 (8.3)	11 (91.7)	
Specialization in Neonatology	0 (0.0)	17 (100.0)	
None	0 (0.0)	3 (100.0)	
Neonatal intensive care / NIC			
Yes	3 (7.9)	35 (92.1)	1.000
No	2 (6.9)	27 (93.1)	
Intermediate Conventional Care / ICC			
Yes	4 (8.7)	42 (91.3)	1.000
No	1 (4.8)	20 (95.2)	
Kangaroo Intermediate Care / KIC			
Yes	2 (11.8)	15 (88.2)	0.595
No	3 (6.0)	47 (94.0)	

(*) Fisher's Exact Test

Figure 2 shows the proportion of professionals who make the appropriate choice to measure the gastric tube both orally and nasally.
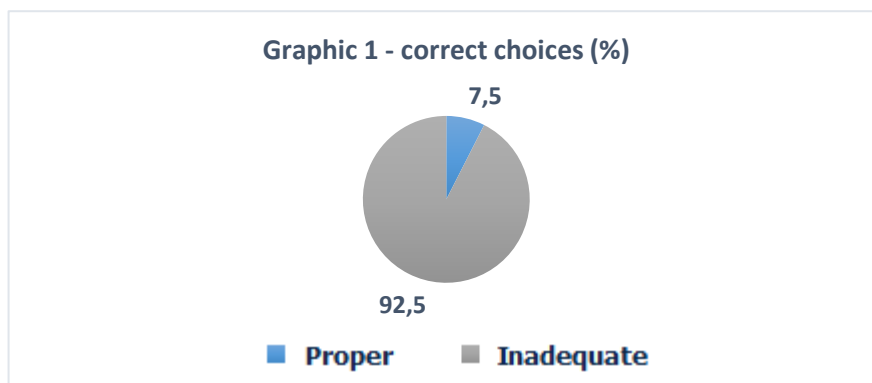

FIGURE 2: Proportion of professionals who make the appropriate choice for orogastric and nasogastric tube measurement and sample universe. Recife, PE, Brazil, 2021.

Auscultation of the epigastric region and the presence of aspirated residue appear as the most frequent procedures used by nurses to check the gastric placement of the tube. As for the time when this check is carried out, after insertion, at the beginning of each shift, before each use, in the presence of regurgitation, changes in the appearance of the aspirate as well as in the initial appointment were cited. The frequency of these procedures is described in Table 4.

TABLE 4: Procedure for checking gastric tube positioning, Recife, PE, Brazil, 2021.

VARIABLES	n	%
PROCEDURE		
Auscultation of the air sound injected by syringe	51	76.1
Coloring of the aspirated residue	7	10.4
Presence of aspirated residue	46	68.7
Thoracoabdominal X-ray	3	4.5
PH of gastric residue	1	1.5
Capnography	0	0.0
Observation of the appearance of bubbles when placing the end of the tube submerged in water	5	7.5
Ultrasound	0	0.0
Other	0	0.0
MOMENT		
At the time of insertion	54	80.6
At the beginning of each shift	2	3.0
Before administration of diet and/or medication by this site	44	65.7
Other: Regurgitation	3	4.5
Alteration of Gastric Residue	1	1.5
Marking	2	3.0

DISCUSSION

It was observed that a high percentage of nurses considered the level of knowledge about gastric tubes in NB as good or excellent. However, an equally high percentage declared measuring the tube inappropriately.

No reference was found to validate the ENX strategy that appeared as the most frequent to measure the length of the orogastric tube.

It was found that the NEX strategy continues to be widely used for the insertion of an orogastric tube (20.9%) and for NGT, as well as the NEX variation for OGT (MEX) cited by 20.9%, although there is already enough evidence to recommend its replacement by NEMU[3,6,9,10].

Parker found a similar result when interviewing 60 neonatal nurses who work in Florida-USA, in which 32% of professionals declared using the NEX[6] strategy. In the study by Lopes, carried out with 52 professionals from the nursing team of the Neonatal Unit of a university hospital in Rio de Janeiro, the NEX strategy also appeared as the most frequent choice of nurses (52%) to measure NGT and MEX (42%) for OGT[11].

Although the NEX measurement has been used for many years, it has not been validated in the literature and several studies have shown that the tubes measured this way are poorly positioned, especially in the esophagus, and their use should be abandoned[3,5,12,13]. A comparative study of the gastric positioning accuracy rates between the NEX, NEMU and ARBH methods (equations based on the length of the NB), carried out with 173 NB, showed only 60.6% accuracy with the NEX measure, 90.9% accuracy using NEMU and 78% accuracy with ARBH[3].

In the surveyed sample, only 14.9% (n 10) nurses declared using the NEMU strategy for NGT and 10.4% (n 7) measure OGT by NEMU or MEMU. There was no statistically significant association between the choice of NEMU or MEMU strategies for OGT and NEMU for NGT with time since graduation, length of experience in neonatology, additional training and unit of work.

As for the separation of measurement techniques according to the insertion route, whether orogastric or nasogastric, more nurses 53% (n 36) use the nose as a reference point to measure the tube inserted via orogastric route, while 46% (n 31) declared using the mouth as a reference. As for measuring the nasogastric tube, 5.9% (n 4) declared using the mouth as a reference point. It must be recognized that there is an anatomical disproportion of the distance between the tip of the nose and the earlobe (nasal insertion), in comparison with the distance from the labial commissure to the earlobe (oral insertion), even if the difference is minimal for the NB and especially for the PTNB, it can interfere with the correct positioning of the tube[11].

In the literature review, this measurement division regarding the route of insertion was proposed by the ARHB[3] equations and the formula based on weight: for OGT (3x[weight in kg]+12) and for NGT (3x[weight in kg]+13), which succeeded in positioning in 84% of the cases4. In these studies, it was proven that the implementation of a simple estimate, such as considering the mouth to start measuring the tube inserted orally, significantly improves the rates of good positioning of OGT[14].

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Regarding the point of the tube where the measurement starts, 55.4% (n 36) consider the distal end and 44.6% (n 29) start the measurement after the holes. Of the five nurses who take the proper measurement in both insertion routes, three start the measurement after the holes.

No text refers to the precautions to be taken if the tube has several holes at its distal end. The articles bring "insertion length" and not "insertion length minus the holes", being relevant information, it should be described. Since this description does not exist, it is recommended to consider the total length, including the holes, that is, that the measurement starts from the distal end. It is important to point out that a catheter that has been developed specifically for this purpose must always be used. So, it must be an infant gastric tube or catheter. The use of a urethral tube or tracheal aspiration tube, for example, may compromise the measurement, as there are differences in the standardization of the holes.

The various brands of gastric tubes sold in Brazil do not favor adequate enteral nutrition. The product does not have a distal hole and the side holes are located at different heights depending on the brand and caliber of the tube. These characteristics may favor two situations: one hole inside the stomach and the other in the esophageal area, exposing the newborn to the risk of aspiration of the contents into the respiratory system, and one hole inside the stomach and another in the duodenum, causing part of the content not to undergo the enzymatic action of pepsin, gastric lipase and renin[15].

Aiming at the need to ensure gastric placement of all holes and avoid complications, the NEMU measure is recommended by the National Association of American Neonatal Nurses and by the Neonatal Resuscitation Program of the American Academy of Pediatrics[13].

A study with the objective of evaluating the effectiveness of measuring the tube using the NEX technique, discounting the distal holes of the tube for gastric positioning in newborns, carried out through the analysis of 60 radiographs identified, on average, the correct location in the stomach in 78% and concluded that although the positioning inadequacy indices are similar to those found in the literature, they are high values that can compromise the safety of the NB, highlighting the high number of tubes with post-pyloric positioning, which allows us to conclude that it should not be an encouraged strategy[16].

Regarding the accuracy and safety of using alternative methods to radiological examination to check the location of the tube, it is known that auscultation of the epigastric area, the most cited method in the studied sample is not reliable and its discontinuity has been advised against. The simple presence of secretion on aspiration, as well as the assessment of the color and appearance of this content, can be sensitive in confirming the location of the tube, but without established specificity and is a confounding factor, since endotracheal and bronchial secretions can have the same color and appearance as gastric secretion[17].

Currently, there is consensus among experts that checking pH with dipsticks at the bedside is the safest method available and recommended as the first choice to confirm tube placement. When interpreting pH test results, values ≤5.5 point to correct gastric positioning, while values >5.5 would require radiological confirmation[17].

It is important to point out that the availability of pH strips for the purpose of measuring the acidity of the gastric aspirate is not part of the reality of the studied hospitals, being cited by only one nurse.

As for the moment(s) in which the placement of the tube is evaluated, 65.7% of professionals (n 44) state that they do so before each use. Regurgitation (4.4%), residue alteration (1.5%) and external marking (3%) were also mentioned as situations in which the location needs to be confirmed.

Clifford considers it necessary to ensure correct location after placement and before each use to minimize the risks associated with inappropriate placement, such as bronchosuction. The same author states that it is imperative to check the positioning before each use[13]. In addition, even when they are initially positioned inside the stomach, the tubes are easily displaced in this population and small displacements such as 0.5 cm may be enough for the tube to migrate out of the stomach[6].

CONCLUSION

A total of nine different strategies were cited to measure the length of the gastric tube to be inserted. The ENX (ear-nose-xiphoid) strategy was the most frequent to measure OGT, but this strategy is not referenced in the literature. The NEX measure (nose-ear-xyphoid) emerged as the nurses' most frequent choice for measuring NGT. The current literature recommends discontinuing use and excluding the NEX measurement from the protocols as well as the auscultation of air injection in the epigastric area to confirm positioning.

The current recommendation is that the NEMU strategy be used to determine insertion length, that placement be confirmed at each use by a combination of two or more strategies such as pH <5, light, whitish, slightly green or brown coloration and/or verification of the external length of the tube.

It was verified that there is divergence in the choice of the point of the tube where the measurement should start (with discounts of the holes or the distal end). As there are differences between the distance between these holes between different brands and tube calibers, further studies are needed for this standardization. As for the anatomical points used as a reference to measure the tube, no significant variations were found.

Auscultation of the sound of air injected by syringe, although no longer recommended, is still the most used procedure to check the placement of the tube and a still low percentage checks the placement of the tube before each use, a procedure considered essential for the safety of the patient.

It is necessary that the practice be reviewed and that continuous training become routine in health services, especially in those that care for critical neonatal patients. Considering the assumption that academic training has contributed to these results is regrettable, it is essential that professional training is more consistent with the needs of practice so that quality care is provided to the patient.

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