UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
FACULDADE DE MEDICINA
PROGRAMA DE PÓS-GRADUAÇÃO EM MEDICINA: CIÊNCIAS MÉDICAS

Avaliação do procedimento de inserção de sonda enteral

Dória Migotto Leães

Porto Alegre, novembro de 2012.

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
FACULDADE DE MEDICINA
PROGRAMA DE PÓS-GRADUAÇÃO EM MEDICINA: CIÊNCIAS MÉDICAS

Avaliação do procedimento de inserção de sonda enteral

Dória Migotto Leães

Orientador: Prof. Dr. Elza Daniel de Mello

Dissertação apresentada ao Programa de Pós-Graduação em Medicina, UFRGS, como requisito parcial para obtenção do grau de Mestre.

Porto Alegre, novembro de 2012.

CIP - Catalogação na Publicação

Migotto Leães, Dória
Avaliação do procedimento de inserção de sonda enteral / Dória Migotto Leães. -- 2012.
68 f.

Orientadora: Elza Daniel de Mello.

Dissertação (Mestrado) -- Universidade Federal do Rio Grande do Sul, Faculdade de Medicina, Programa de Pós-Graduação em Medicina: Ciências Médicas, Porto Alegre, BR-RS, 2012.
1. Sonda Enteral. 2. Enfermagem. 3. Métodos . I. Daniel de Mello, Elza, orient. II. Título.

Elaborada pelo Sistema de Geração Automática de Ficha Catalográfica da UFRGS com os dados fornecidos pelo(a) autor(a).

Dedico este trabalho aos meus pais, Maria de Lourdes e Carlos Roberto.

“*Em tempos em que quase ninguém se olha nos olhos, em que a maioria das pessoas pouco se interessa pelo que não lhe diz respeito, só mesmo agradecendo àqueles que percebem nossas descrenças, indecisões, suspeitas, tudo o que nos paralisa, e garantam um pouco de sua energia conosco, insistindo.”*

Marta Medeiros

AGRADECIMENTOS

Primeiramente, agradeço a Deus, pois nos dias mais difíceis foi com ele que me refugiei.

Agradeço a minha orientadora Profª. Drª. Elza Daniel de Mello, pela oportunidade de realização deste estudo, e também pelos ensinamentos, dedicação e confiança.

A Profª. Drª. Mariur Gomes Beghetto, por acreditar no meu potencial e por todos os ensinamentos.

Aos colegas do Serviço de Nutrologia do Hospital de Clínicas de Porto Alegre, agradeço pela ajuda, conselhos e, principalmente, pela amizade. Em especial a Aline, Débora, Rita, Pablo, Gabriela e Michelli.

As minhas irmãs, em especial a Odith e Lídia, que nas horas mais difíceis estiveram ao meu lado, insistindo.

Enfim, dedico esta página a todos que estiveram, ao menos um dia, ao meu lado, insistindo.

SUMÁRIO

LISTA DE ABREVIATURAS E SIGLAS

SE – Sonda enteral

NE – Nutrição enteral

SNE - Sonda nasoenteral

NOX - Medida desde a ponta do nariz até o lóbulo da orelha, somando o comprimento deste até o apêndice xifoide.

TE – Terapia enteral

RX- Raio-x

ICU - *Intensive Care Unit*

LES – *Lower esophageal sphincter*

NEX – *Distance from tip of nose to earlobe and from there to the xiphoid*

FT- *Feeding tube*

EF- *Enteral feeding*

TCLE - Termo de consentimento livre e esclarecido

SNE - Sonda nasoenteral

RESUMO

Pacientes impossibilitados de usar a via oral, ou com ingestão oral insuficiente são beneficiados com a utilização da sonda enteral (SE). As possíveis complicações associadas ao mau posicionamento da SE e o impacto destas complicações indicam a necessidade da avaliação da atual técnica de inserção, assim como conhecer a capacidade preditiva dos métodos de avaliação do posicionamento adotados à beira do leito.

Foram avaliados 80 procedimentos de inserção de SE, bem como, os testes empregados para verificação do posicionamento à beira do leito, entre outubro de 2010 e maio de 2011. Identificou-se que em 50% dos procedimentos os enfermeiros adotaram a estimativa padrão, com taxa de sucesso de inserção de SE nas diferentes porções do trato gastrintestinal de 97,5% (n=78) e 2,5% (n=2) de posicionamentos inadvertidos. A média das estimativas de medida dos enfermeiros foi 65,8±7,4, da estimativa padrão foi 58,2±4,6, e da estimativa sugerida por Hanson 49,3±2,95. Houve correlação fraca entre a estimativa padrão e dos enfermeiros ($p<0,001$).

Em conclusão, a fraca associação entre as mensurações torna-se inexequível a indicação de uma estimativa perfeita.

ABSTRACT

Patients unable to use oral, oral ingestion or insufficient benefit from the use of nasogastric tube. Possible complications associated with malposition of nasogastric tube and the impact of these complications indicate the need to evaluate the current insertion technique, as well as knowing the predictive ability of the methods for evaluating the position adopted at the bedside.

We evaluated 80 of the insertion procedure enteral feeding as well, the tests used to check the positioning at the bedside, between October 2010 and May 2011. It was found that in 50% of procedures nurses adopted the standard estimate, with a success rate of inserting enteral feeding in different portions of the gastrointestinal tract of 97.5% (n=78) and 2.5% (n=2) inadvertent placement. The average estimate of measure of the nurses was 65.8 ± 7.4, the standard estimate was 58.2 ± 4.6, and the estimate suggested by Hanson 49.3 ± 2.95. There was a weak correlation between the estimate and standard of nurses ($p < 0.001$). In conclusion, the weak association between measurements becomes unenforceable indication of a perfect estimate.

LISTA DE FIGURAS

ARTIGO ORIGINAL

LISTA DE QUADROS

ARTIGO ORIGINAL

INTRODUÇÃO

1. INTRODUÇÃO

A sonda enteral (SE) é utilizada para fornecer nutrição enteral a pacientes que apresentam impossibilidade na utilização da via oral, ou uma ingestão oral insuficiente. Estima-se que, anualmente nos Estados Unidos e no Reino Unido, um milhão de SE sejam inseridas em pacientes adultos e pediátricos (BECKSTRAND, 2005; MEDICINES AND HEALTHCARE PRODUCTS REGULATORY AGENCY, 2004). A literatura descreve que as complicações relacionadas ao procedimento de inserção de SE alcançam 4%, e segundo Agência Reguladora de Medicamentos e Produtos do Reino Unido, a incidência de mortes relacionada à inserção pode aproximar-se a 1/100.000 (BECKSTRAND, 2005; ELLETT MLC, 1998; MEDICINES AND HEALTHCARE PRODUCTS REGULATORY AGENCY, 2004; HANSON, 1979).

Os procedimentos envolvidos na inserção e posicionamento adequado da SE foram incorporados à prática dos enfermeiros sem estudos suficientes, especialmente de validação. Nesse sentido, a falta de estudos de validação destas estimativas de comprimento de SE podem, por si só, explicar as taxas de mau posicionamento das SE. A presente dissertação se propõe a avaliar a técnica padronizada no Hospital de Clínicas de Porto Alegre para a inserção de SE em adultos, quanto à concordância entre o comprimento externo da SE e o posicionamento da sonda no estômago.

REVISÃO DA LITERATURA

2. ARTIGO DE REVISÃO

Artigo aceito para publicação Nutriton and Health – SAGE

Enteral Feeding Tubes: are insertion techniques and positioning based on anatomical evidence?

Sonda Enteral: técnicas de inserção e de posicionamento anatômico são baseadas em evidências?

Leães Migotto, Dória[1]

Mello, Elza[2]

Beghetto, Mariur[3]

Assis, Michelli[4]

1. Enfermeira, mestranda do Programa de Pós-Graduação ciências médicas: Medicina – Universidade Federal do Rio Grande do Sul - UFRGS.

2. Professora Adjunta do Departamento de Pediatria da UFRGS, Chefe do Serviço de Nutrologia e Coordenadora do Suporte Nutricional do Hospital de Clínicas de Porto Alegre - HCPA.

3. Professora Adjunta da Escola de Enfermagem – UFRGS

4. Enfermeira, Hospital de Clínicas de Porto Alegre.

Dória Migotto Leães
E-mail: doria.migotto@gmail.com
Endereço: rua Riachuelo 956 apt. 21 CEP: 90010-272
Telefone: (51) 84032782

Abstract: Patients receiving energy intake below their daily needs orally may develop malnutrition and its complications, such as increased infection rates, length of hospitalization, and death. Enteral feeding is beneficial for these patients. However, this therapy is not without complications related to insertion and placement of enteral feeding tubes. This review aims to identify in literature the different techniques for insertion and the methods used to evaluate the placement of enteral feeding tubes.

Keywords: Enteral nutrition, nursing, methods

INTRODUCTION

The maintenance of a healthy nutritional status is important in the clinical progress of hospitalized patients. It is known that malnutrition in hospital patients is associated increased hospital infection rates, increased length of hospitalization, and death.[1] To maintain a healthy nutritional status, nutritional support should be sufficient to meet the demands of basal energy expenditure, physical activity, and stress.

If oral intake is not possible or is insufficient, enteral therapy (ET) is the first choice to ensure that more steps of the digestive process remain involved.[2] However, the use of enteral feeding tubes (EFTs) is not without complications. Sorokin and Gottlieb[3] evaluated 2000 insertions in adults and identified that 1.3% of tubes were misplaced; furthermore, two deaths could be directly attributed to improper placement. Ellet et al.[4] reported a complication rate of 4%. In two other studies the prevalence of errors in the placement of tubes ranged from 20.9% to 43.5%.[5,6] Such complications occur mainly because of inadvertent positioning of the EFT in the airway, causing aspiration, pneumothorax, atelectasis, pleural effusion and/or bronchopleural fistula.[3,4] Annually, 1 million tubes are inserted in adult and pediatric patients in the United States.[7] In Brazil there is no quantification of this procedure. In our institution, Hospital de Clínicas de Porto Alegre, approximately 50 adults and 50 pediatric patients use EF daily, accounting for 13% of all hospitalized patients. The nurse is the professional responsible for the procedure of inserting the EFT.[8] The use of standard techniques and

methods of confirmation of the positioning after the insertion of the EFT and before the administration of the feeding are recommended.[8] It is also recommended that the nurse, after the insertion of the EFT and before the administration of the feeding, should assess the positioning of the tube, using different tests at the bedside.

The present study aims to review the literature regarding the techniques of insertion of EFTs as well as the predictive capacity of methods to assess the positioning of the EFT adopted at the bedside.

METHODS

Between April and August of 2010, two independent evaluators (DML and MCSA), following the same criteria and procedures, accessed the PubMed database in search of original articles, on humans, in Portuguese, English, and Spanish. The following terms were adopted as keywords: # # enteral nutrition feeding tube nasogastric intubation # proceeding nurse # method accuracy and their combinations with each other. In the initial stage, the selection of articles was undertaken based on the evaluation of the title, followed by reading of the abstract. This was followed by a consensus between the evaluators, which consisted of reading the complete articles and defining the types of articles to be included in the review. Articles that addressed historical aspects of the subject, identified in references, were also included.

RESULTS

Feeding tubes were first introduced about 3500 years ago, when the Greeks

and the Egyptians practiced rectal feeding of patients.[9] In the sixteenth century, Fabricius ab Aquapendente, professor of anatomy, used a silver tube in the digestive tract of his patients; however, the indication is unknown. In the eighteenth century, John Hunter fed his patients with a hollow soft leather tube inserted into the stomach.[10] In 1800, in Philadelphia, Philip Syng Physick introduced the idea of using a tube for gastric lavage.[11] In 1822, English surgeon Mr. Jukes adopted a tube called the stomach pump a 2m long rubber tube with weight and perforations at the distal extremity.[11] For many years this device was used for gastric emptying and irrigation. Only since 1921 has the use of Levi tubes been widespread.[11] Complications associated with the use of the feeding tubes led to the development of polyethylene, polyvinyl, silicone, and polyurethane feeding tubes.[11] EFTs can be inserted into the stomach or small intestine (duodenum, jejunum, and ileum).[12] There is no consensus regarding the best location for administration, although the stomach is generally preferred.[2] The position of a postpyloric EFT is indicated by evidence of delayed gastric emptying and/or the presence of gastroesophageal reflux.[13] And, regardless of where the tube is inserted, the most important thing is the proper positioning of the patient and the slow infusion of feed.[10]

In general, the technique of insertion of an EFT consists of (a) positioning the patient at 45 degrees unless this is contraindicated, (b) taking external measurements before tube insertion, and (c) lubricating the tube and bending the head of the patient to facilitate insertion of the EFT.[3,7] Several particularities for the insertion of the EFT are described: (a) standard

technique, (b) technique with air insufflation into the stomach, (c) insertion guided by magnetic device and (d) use of prokinetics.

In the standard technique, the patient is first positioned at 45 degrees or as close to this as possible (provided there are no contraindications). External measurements are then taken to determine the size of the EFT to be introduced. The lubricated tube is inserted through a nostril, bending the patient's head to facilitate progression through the pharynx, and 20 ml of air is injected through the tube and the epigastric region auscultated to determine if the EFT is in the stomach. Finally, the EFT is fixed. The most commonly used measurements are from the tip of the nose to the earlobe and from the tip of the nose to the xiphoid process via the earlobe. It is not known where these measurements originated, although they continue to be published in textbooks and taught in undergraduate nursing programs.[7] This measurement dates from 1979, when Hanson[12] sought to determine the relationship between different external measures, including the distance between EFT in the positioning of the distal tip of the tube in 99 cadaver and five living volunteers, obtaining a success rate of 92% in gastric positioning. Thus, the author recommends a 50 cm mark at the distal tip of the EFT and then measure the xiphoid process and the midpoint between the measures, which would determine the position of the EFT in the gastric region.[12]

AIR INSUFFLATION INTO THE STOMACH

The technique of air insufflation into the stomach is designed to move the distal tip of the EFT into the duodenum. Salasidis et al.[14] conducted a prospective

randomized study in order to estimate the length of EFT required to reach the fourth part of the duodenum. The entire EFT, except for 10 cm, was inserted, and 500 ml of air was insufflated into the stomachs of the patients, who were kept in the right lateral decubitus position. After 2 hours, the patients were placed in the supine position and control radiography was performed.[14] Using this technique, 21 of the 32 tubes were placed successfully, whereas among patients who underwent the standard technique, only 12 of 34 tubes were placed successfully ($p < 0.02$). The success rate at 24 hours was 25 out of 32 with air insufflation and 16 out of 34 with the standard technique ($p < 0.02$). Out of the 21 tubes inserted into the antrum, body, or fundus of the stomach, three moved into the duodenum the next day, compared with 5 out of 12 tubes initially placed in the pylorus ($p < 0.075$). The authors concluded that the insertion of the EFT is facilitated by air insufflation; however, the presence of abdominal distension makes the use of this technique impossible.[12,14] In children, the pioneers of this technique were Spalding et al.,[15] who compared the technique of air insufflation with one described as standard in 50 children admitted to an intensive care unit. The tubes were placed successfully on the first attempt in 23 out of 25 patients who underwent the air insufflation technique (a success rate of 92%); however, in patients subjected to the standard technique, only 11 out of 25 insertions were successful (a success rate of 44%) ($p ¼ 0.001$). Lenart and Nayak[16] achieved a success rate of 67% using the technique of air insufflation and 40% with administration of metoclopramide in 60 adults. This technique shows a high success rate for the insertion of post pyloric tubes; however, the associated adverse effects are not described.

MAGNET-GUIDED TUBES

The technique of inserting magnet-guided tubes requires the use of an external device that is 7.5 cm in diameter and 9 cm in length and works both as a magnet and as a tube; at the distal is has a magnet that is directed by the external device. The study that showed this new technique included 35 adults and described the steps to insert the tube, as follows. Position the external magnet at the right upper quadrant of the abdomen, in the midclavicular line, just below the bottom edge of the costal margin, then insert 25 cm of the EFT into the patient's nostril. During the insertion of the tube, move the external magnet, reproducing what should be the path of the tube to its position. The tube should then be rotated 90 degrees clockwise, leading the outer magnet down to the suprapubic region. The authors achieved a success rate for duodenal insertion of 88% at the first attempt.[17] Boivin et al.[18] used the same technique and the same device in 166 patients and obtained a 60% (93/156) success rate when inserting the tube into the postpyloric region; in contrast, in the case of insertion into the duodenum, the success rate was only 32% (50/156). It is worth considering that the success rate with the standard technique is 92%; thus, it appears that adoption of this device, which also requires additional resources, confers no advantage.

PROKINETIC AGENTS

Prokinetic agents stimulate the smooth muscle of the gastrointestinal tract, through the antagonism of dopamine and facilitation of peristalsis, leading to a acceleration of gastric emptying and intestinal transit and, consequently, facilitating the migration of the EFT.16 In clinical practice, several drugs are

used for this purpose, such as metoclopramide, domperidone, and erythromycin.18–20 In one study, 70 adults were divided into two groups, which received either placebo or intravenous metoclopramide (10 mg), administered immediately after insertion of the EFT. The authors reported a success rate, defined as placement in the postpyloric position, of 60% (21/35) in the metoclopramide group, compared with 49% (17/35) in the placebo group; however, the difference was not statistically significant.19 Darell et al.20 evaluated 105 cases of administration of metoclopramide before the insertion of and EFT and obtained a postpyloric success rate of 54% (32/59) and failure of 46% (27/46), a difference of 8% (p= 0.38) . Gharpure et al.21 compared the effectiveness of erythromycin and placebo in 74 critically ill children fitted with an EFT. Among the erythromycin group, the EFT was placed in the postpyloric region in 23 of the 37 patients, whereas in placebo group, 27 of 37 EFTs were postpyloric 4 hours after insertion. However, the evidence is insufficient to say that metoclopramide is superior to placebo in the migration of an EFT.[21]

After the insertion of the EFT and/or prior to administration of the food, it is essential to assess the anatomical positioning of the EFT to minimize mechanical complications. For this reason, different clinical and imaging tests are incorporated into care routines to evaluate the anatomical site of the distal position of the EFT: auscultation of the epigastrium; evaluation of the appearance of residue aspirated; evaluation of the pH aspirated and verification of the presence of bilirubin; capnography; ultrasound; and radiography.

AUSCULTATION OF THE EPIGASTRIUM

We found no studies in which the position of the EFT was verified by auscultation of the epigastrium. The technique consists of injecting approximately 15 ml of air through the EFT and epigastric auscultation with a stethoscope.[22] The technique of auscultation is used by nurses at the bedside to confirm that the EFT is not in the respiratory tract. However, this method cannot be used to determine the position of the EFT in the gastrointestinal tract. Metheny et al.[23] recorded 123 auscultations of 85 patients and requested that four nurses indicate the anatomical positioning of the EFT by listening to these recordings. It was reported that it was impossible to distinguish between the gastric and intestinal location of the distal tip of the EFT based on the intensity of the sound.[24,25]

VOLUME AND APPEARANCE OF THE ASPIRATED RESIDUE

Evaluation of the volume and appearance of the aspirated residue is another technique used to confirm the position of the EFT. It consists of analysis of the aspirated contents of the EFT. According to Nyqvist et al.,[26] aspiration of the secretion varies depending on the location of the distal tip of the EFT. Metheny et al.[24] present descriptions of the most commonly found characteristics: gastric – green (cloudy), whitish or bloody beige or brown, or still colorless or transparent; intestinal – light yellow or bile stained and generally clear; pleural – light yellow or dyed red (blood). Phipps et al.[27] reported that tracheobronchial aspirate is mainly characterized by the presence of mucus and is whitish, opaque or tan in color. In another study, Metheny et al.[24] described that the analysis of the appearance of the aspirate is not a

widely used practice because of the difficulty of obtaining consensus on the actual characteristics of the aspirate. They also reported that the residues from the small intestine are usually smaller than the gastric volume; thus, the increase in the residual volume may signal a displacement of the distal tip of the EFT from the small intestine to the stomach. The need for material to perform the analysis makes the failure to obtain it a limiting factor. In this sense, Sabry et al.[17] administered 5 ml of water via the EFT in order to aspirate the same amount. However, Darell et al.[20] claim that the aspiration test is useful to highlight the inadvertent placement of the EFT in the bronchi.

PH OF ASPIRATED RESIDUE AND PRESENCE OF BILIRUBIN

The evaluation of the pH of the residue aspirated and verification of the presence of bilirubin is another method used to infer the location of the EFT, but also requires aspiration of material through the EFT. Reference values of gastric pH are 5 in the stomach and approximately 6.6 in the intestine.[28] Metheny et al.[29] report that the reference values of pH are 7.35 + 0.6 in the intestine, 7.73 + 0.4 in the lung, and 3.9 + 0.15 in the stomach. Bilirubin values range from 1.28 + 0.25 mg/dl in the stomach and 0.8 + 0.02 mg/dl in the lungs to 12.73 + 0.91 mg/dl in the intestine.[29] After excluding the placement of the EFT in the respiratory tract, it is necessary to identify where the distal tip of the EFT is placed; however, no method is 100% accurate.[30]

CAPNOGRAPHY

Capnography is a technique widely used in intensive care units for verification

of endotracheal tube placement. It is a noninvasive technique that measures the CO2 exhaled through the tube, with the aid of a device connected to the endotracheal tube. In this way, it can be used to verify the CO2 exhaled by the EFT, which would suggest a tracheal position.[4,31] Kindopp et al.[31] examined the use of capnography in 25 patients and identified with accuracy all the inadvertent placements of the EFT. Another test that uses CO2 as the standard is colorimetry, in which a device is inserted into the tip of the EFT and a chemical reaction changes the color of the marker. A purple color indicates that the distal extremity of the tube is not in the respiratory tract and a color yellow indicates that it is.[4,31]

ULTRASOUND

Ultrasound is usually used in diagnostic tests; however, it has also been used to aid insertion and/or monitoring of the position of the EFT. Hernandez-Socorro et al.[32] compared a manual bedside method of EFT insertion with the technique that used ultrasound in 35 patients. The blind manual method was successful in 9 of 35 (25.7%) patients while the technique using ultrasound was successful in 22 of 35 (84.6%) patients. The average time for placement of the EFT with the manual technique was 13.9 +7.4 min (range 5–30 min) and with the technique of ultrasound it was 18.3 + 8.2 min (rang 5–35). This study demonstrated that ultrasound can be used to evaluate the positioning of the tube, and may replace radiography, thus reducing exposure to radiation.

RADIOGRAPHY

Radiography is the test recommended for identifying the anatomical location

of the distal portion of the EFT. However, it is not ideal as it may take some time to perform, delaying the onset of ET and exposing the patient to radiation. In addition, the EFT can be unintentionally pulled, or even displaced, which would result in the need to perform the technique again on each of these occasions.[23]

CONCLUSION

Although the administration of enteral feeding is an important modality in nutritional therapy, the procedures involved in the insertion and positioning of the EFT are incorporated into the practice of nurses without sufficient studies, especially validation studies. Thus, it is necessary to critically evaluate the proposed insertion techniques as well as the techniques proposed for determining the anatomical position of the distal end of the EFT. As the use of EFTs is extremely common, the technique of insertion and positioning should be better grounded scientifically.

REFERENCES

1. Stephan M. Wildi, Christoph Gubler, Stephan R. Vavricka, Michael Fried, Peter Bauerfeind. Transnasal endoscopy for the placement of nasoenteral feeding tubes: does the working length of the endoscope matter? Gastrointest *Endosc*. 2007;66:225-9.

2. Varsha Gharpure, Kathleen L Meert, Ashok P Sarnaik, Norma A. Metheny. Indicators of postpyloric feeding tube placement in children. *Crit Care Med*. 2000; 28(8):2962-66.

3. Sorokin Rachel, Gottlieb Jonathan E. Enhancing patient safety during feeding-tube insertion: A review of more than 2000 insertions. *JPEN* 2006; 30:440-45.

4. Ellett Marsha, Woodruff Kellie, Stewart Dan. The use of carbon Dioxide Monitoring to determine orogastric tube placement in premature infants. *Gastroenter Nursing*. 2007;30(6): 414-417.

5. Ellett ML, Beckstrand J. Examination of gavage tube placement in children. Children. *Journal of the Society of Pediatric Nurses*. 1999;4(2):51-60.

6. Ellet MLC, Maahs J, Forsee S. Prevalence of feeding tube placement errors associated risk factors in children. *The American Journal of the Maternal Child Nursing*. 1998;23(5):234-9.

7. Marsha L. Beckstrand, Joyce Flueckiger, Susan M. Perkins, Cynthia S Johnson. Predicting the insertion distance for placing gastric tube. *Clin Nurs Res*. 2005;14(1):11-27.

8. BRASIL, Resolução RCD 63, Ministério da Saúde, Agência Nacional de Vigilância Sanitária (ANVISA) – 6 DE JULHO DE 2000.

9. Chernoff R. History of tube feeding: An overview of tube feeding: From ancient times to the future. *Nutr Clin Pract*. 2006;(21)4:408- 10.

10. Phillips NM. Nasogastric tubes: an historical context. *Medsurg Nurs*. 2006;15(2):84-8

11. Da Silva PS, Paulo CS, de Oliveira Iglesias SB, de Carvalho WB, Santana e Meneses F. Bedside transpyloric tube placement in the pediatric intensive care unit: a modified insufflation air technique. *Intensive Care Med*. 2002;28(7):943-6.

12. Hanson RL. Predictive Criteria for Length of Nasogastric Tube Insertion for Tube Feeding. *JPEN* 1979;3(3):160-163.
13. Beckstrand J, Cirgin Ellett ML, McDaniel A. Predicting internal distance to the stomach for positioning nasogastric and orogastric feeding tubes in children. *J Adv Nurs*. 2007;59(3):274-89.
14. Salasidis, Robert MD; Fleiszer, Timothy; Johnston, Richard MD, Air insufflation technique of enteral tube insertion: A randomized, controlled trial. *Crit Care Med*. 1998;26(6):1036-1039.
15. Spalding HK, Sullivan KJ, Soremi O, Gonzalez F, Goodwin SR. Bedside placement of transpyloric feeding tubes in the pediatric intensive care unit using gastric insufflation. *Crit Care Med*. 2000;28(6):2041-4.
16. Lenart Sylvia, Polissar Nayak, Comparison of 2 methods for postpyloric placement of enteral feeding tubes. *A J Crit Care*. 2003;12:357-60.
17. Sabry Gabriel A, Ackermann Richard J, Castresana Manuel R. A new technique for placement of nasoenteral feeding tubes using external magnetic guidance. *Crit Care Med.* 1997;25(4):641-45.
18. Boivin M, Levy H, Hayes J. A multicenter, prospective study of the placement of transpyloric feeding tubes with assistance of a magnetic device. The Magnet-Guided Enteral Feeding Tube Study Group. *JPEN*. 2000;24(5):304-7.
19. Kittinger Joseph, Sandler Robert, Heizer Willian. Efficacy of metoclopramide as an adjunct to duodenal placement of small-bore feeding tubes: A randomized, placebo-controlled, double-blind study. *JPEN* 1987;11:33-7.
20. Darell E Heiselman, Thomas Hofer, Robin R Vidovich. Enteral feeding tube placement success with intravenous metoclopramide administration in ICU patients. *Chest* 1995;107:1686-88.
21. Gharpure Varsha, Meert Kathleen, Sarnaik Ashok. Efficacy of erythromycin for postpyloric placement of feeding tubes in critically ill children: A randomized, double-blind, placebo controlled study. *JPEN* 2001;25:160-65.
22. Metheny Norma, Wehrle Mary Anne, Wiersema Laurel, Clark Joan. Testing feeding tube placement: Auscultation vs. Ph. Method. 1998;98(5):37-42.

23. Metheny Norma, Mcsweeney Maaryellen, Wehrle Mary Anne, Wiersema. Effectiveness of the auscultatory method in predicting feeding tube location. *Nurs Res*. 1990;39(5):262-67.

24. Metheny NA, Schnelker R, McGinnis J, Zimmerman G, Duke C, Merritt B, et al. Indicators of tubesite during feedings. *J Neurosci Nurs*. 2005;37(6):320-5.

25. Yamaguchi Kazuya, Yamaguchi Taketo, Odaka Takeo, Saisho Hiromitsu. Evaluation of gastrointestinal motility by computerized analysis of abdominal auscultation findings. *J Gastroenterology and Hepatology*. 2006;21:510-14.

26. Nyqvist KH, Sorell A, Ewald U. Litmus tests for verification of feeding tube location in infants: evaluation of their clinical use. *Jour of Clin Nurs*. 2005;14:486-95.

27. Phipps LM, Weber MD, Ginder BR, Hulse MA, Thomas NJ. A randomized controlled trial comparing three different techniques of nasojejunal feeding tube placement in critically ill children. *JPEN.* 2005;29(6):420-4.

28. Metheny NA, Smith L, Stewart BJ. Development of a reliable and valid bedside test for bilirubin and its utility for improving prediction of feeding tube location. *Nurs Res*. 2000;49(6):302-9.

29. Metheny NA, Stewart BJ, Smith L. Ph and concentration of bilirubin in feeding tube aspirates as predictors of tube placement. *Nursing Research*. 1999;48(4):189-96.

30. Metheny N , Reed L , Berglund B , Wehrle MA . Visual characteristics of aspirates from feeding tubes as a method for predicting tube location. Nurs *Res*. 1994 Sep-Oct;43(5):282-7.

31. Kindopp AS, Drover John W, Heyland DK, Capnography corfirms correct feeding tube placement in intensive care unit patients. *Can J Anesth*. 2001;48(7):705-10.

32. Hernandez-Socorro; Carmen Rosa; Marin Jose; Ruiz-Santana Sergio; Santana Luciano; Manzano Jose Luis. Bedside sonographi-guided Versus blind nasoenteric feeding tube placement in critically ill patients. *Crit Care Med*.1996; 24(10): 1690-94.

JUSTIFICATIVA

3. JUSTIFICATIVA

Considerando-se o grande número de usuários, as possíveis complicações associadas ao mau posicionamento da SE e o impacto destas complicações torna-se necessário avaliar a atual técnica de inserção de SE.

OBJETIVOS

4. OBJETIVOS

4.1 GERAL

1. Avaliar a técnica padronizada no Hospital de Clínicas de Porto Alegre para a inserção de SE em adultos, quanto à concordância entre o comprimento externo da sonda (determinado pelo enfermeiro) e o posicionamento da sonda no estômago (mediante confirmação por RX).

4.2 OBJETIVOS ESPECÍFICOS

1. Comparar as medidas recomendadas por Hanson às adotadas pelos enfermeiros, avaliando a técnica a ser seguida.
2. Comparar as medidas recomendadas pelos fabricantes das SE às adotadas pelos enfermeiros.

ARTIGO ORIGINAL

5.1 ARTIGO ORIGINAL

Agreement between different methods for estimating feeding tube insertion length in adults

Short title. Estimating feeding tube insertion length.

Leães Migotto, Dória. Nurse, Masters student in Medical Sciences: Medicine – Universidade Federal do Rio Grande do Sul - UFRGS. doria.migotto@gmail.com

Mello, Elza. Professor of Pediatrics, UFRGS, Head of Nutrology and Nutritional Support Manager at the Hospital de Clínicas de Porto Alegre - HCPA. elzadmello@gmail.com

Beghetto, Mariur. Professor of Nursing – UFRGS. mbeghetto@hcpa.ufrgs.br

Corresponding author: Dória Migotto Leães. Address: Rua Riachuelo, 956 apt. 21 CEP: 90010272, Brazil; Tel: (+55) 51 8403 2782 E-mail: doria.migotto@gmail.com

Submitted for journal NUTRITION.

Background & Aims: A feeding tube must be inserted before enteral feeding can be initiated. The objectives of this study were to investigate the techniques and anatomic landmarks nurses use to measure feeding tube insertion length and evaluate agreement between different measurement methods. **Methods**: Cross-sectional study. **Results**: The study found that 50% of nurses observed used the institution's standard method for measuring feeding tube insertion length. Mean lengths were as follows: estimated by nurses: 65.8±7.4; according to the standard method: 58.2±4.6; and according to the Hanson method: 49.3±2.95. There was strong correlation between lengths estimated by the Hanson and standard methods, but there was a significant difference between means ($p<0.001$). Nurses' estimates had weak correlation with the standard method and there was a significant difference between means ($p<0.001$). In 70% (n=56) of patients the tube was detected in the gastrointestinal tract by x-ray. However, two tubes were observed in patients' respiratory tracts. Bland-Altman plots indicated weak agreement between the Hanson and standard methods and between the nurses' estimates and the standard method. **Conclusions**: Nurses followed the standard estimation procedure in 50% of insertions. Agreement between methods was so weak that no preferred estimation technique could be identified.

Keywords: nutritional support, feeding tube, insertion, position.

INTRODUCTION

Hospital malnutrition has clear and consistent negative impacts on healing speed, infection rates, hospital stay lengths and death rates.[1] This means that nutritional support is indicated if it is not possible to feed via the oral route, or when oral feeding alone is insufficient, and enteral feeding (EF) is the option of choice because it preserves a greater number of the stages of digestion.[2] A million feeding tubes (FT) are inserted into adult and pediatric patients annually in the United States.[2] There are no figures currently available on the procedure in Brazil. At our institution, which has around 800 beds, approximately 100 patients are on FT on any given day, equating to 12.5% of hospitalized patients.[3]

Before EF can be initiated, it is necessary to insert an FT. The procedure demands skill and the use of technical standards and methods to confirm the anatomic position of the FT.[1,2,4] If complications such as pneumothorax, pulmonary abscesses , pneumonia and even death caused by administering the diet to the respiratory tract are to be avoided, correct positioning of the distal point in the digestive tract must be confirmed not only soon after the insertion procedure, but also before each feed is given.[1,2,5] There have been reports over the years of errors being committed during FT insertion[6] and the literature includes findings of FTs positioned in inappropriate anatomic locations.[2,5,7] Ellet et al.[8] have reported rates of complications related to the FT insertion procedure as high as 4%, while Sorokin and Gottlieb[7] assessed 2000 tube insertions in adults and found that 2.4% of the FT were incorrectly positioned and two deaths were directly attributable to incorrect insertion.

Currently, the FT insertion technique is described differently in different nursing textbooks.[9,10] The lack of validation studies of these methods for estimating the correct length of FT may alone be responsible for the rate of incorrect FT insertion. In 1979, Hanson[11] conducted a clinical study to establish the true length (in centimeters) between the tip of the nose and the lower esophageal sphincter (LES) and correlated the measurement with seven other measurements based on different anatomic landmarks. To achieve this, he examined 99 cadavers and five adult volunteers. He measured the length directly while autopsying the cadavers. The volunteers' LES were located by continuous pressure recording, using a cannula full of water, connected to an FT and monitored via a transducer, providing a signal to generate a graph of a continuous recording. When the cannula tip passes through the LES, a pressure zone is sensed and can be identified in the recording. According to Hanson, the high pressure zone was 2 to 3 cm from the distal extremity of the anatomic junction between sphincter and stomach. After analyzing the results, Hanson[11] concluded his article by recommending the following method for estimating the length of FT that should be inserted in order to place its tip in the correct gastric position: *starting from the distal tip, measure 50 centimeters along the tube and then add the distance from the tip of the patient's nose to their earlobe and from there to the xiphoid (NEX). The midpoint between the 50 cm mark and NEX is the correct insertion length.* It is important to point out that no further studies were conducted after Hanson's (in which the majority of the sample were cadavers) in order to establish techniques based on external measurements that could determine the correct position of the distal tip of the FT in the gastric position in adults. Hanson's study[11] is therefore the most

recent reference on which the FT insertion techniques (modified or otherwise) employed in routine daily care all over the world are based.

It is this lack of validated FT insertion techniques for adults that has motivated the present study, designed to achieve the following objectives: (1) to evaluate the techniques used by nurses at a University Hospital and the landmarks they use to estimate FT length, and (2) to determine the degree of agreement between Hanson's method and the standard technique (NEX + 5 cm) and between the various techniques employed by the nurses investigated and the standard technique.

METHODOLOGY

This was a cross-sectional study investigating adult patients who underwent FT insertion for tube feeding in an Intensive Care Unit (ICU) between October 2010 and May 2011. Patients were excluded if they were in for head and neck surgery, had diagnoses of cancer of the esophagus and/or stomach or had any other anatomic abnormality that could interfere with the FT insertion procedure.

One of the researchers (DLM) was informed whenever a doctor prescribed an FT and, depending on her availability, presented at the ICU to observe. Before each insertion, she measured the FT and recorded the manufacturer's recommended insertion lengths, according to the radiopaque markings on the FT. Each treating nurse was free to choose their preferred FT insertion technique, including the method for estimating the insertion length, and the researcher observed each insertion after measuring the insertion length chosen by the treating nurse. Measurements were taken using an inextensible retracting tape measure. The researcher then calculated the FT length

according to Hanson's proposal, using the equation: NEX/2 + 50cm. The researcher also measured the patient's NEX, independently of the treating nurse, before adding 5 cm to obtain the recommended insertion length according to our institution's standard routine. All of these lengths were recorded immediately after each measurement on a dedicated form. The true anatomic position was confirmed on a standard stomach x-ray, performed until two hours of insertion of the nasogastric, analyzed by a doctor who was blind to all other data collected. She recorded her findings on a third dedicated form, separate from the forms completed by the research nurse and the treating nurses.

SAMPLE SIZE CALCULATION

Based on data collected by Hanson,[11] who observed a 72% success rate in gastric FT insertions using the same standardized method used at the HCPA, and in order to achieve a Kappa of 0.8, confidence interval of 0.3, significance level of 5%, and 80% statistical power, it was estimated that 79 patients would be needed (158 paired observations).

STATISTICAL ANALYSIS

Initially, a descriptive analysis of the data was performed for the entire patient sample (n=80). Continuous variables with normal distribution are expressed as mean±standard deviation (SD). Next, frequencies were calculated for each insertion technique chosen by the treating nurses and their respective final FT positions, as shown on the control x-rays. Differences between means were evaluated using the *t* test for paired samples. Correlations between study variables were analyzed using Pearson's linear correlation coefficient. Bland-Altman plots were used to analyze the difference between methods.

RESULTS

A total of 80 FT insertion procedures were observed in 80 different patients who were aged 55.8±18.1 years (50% elderly) and were predominantly men (61.3%). The majority of them were on mechanical ventilation (61.3%) and metoclopramide on the date of FT insertion (83.8%).

Each treating nurse was free to choose the method for estimating FT insertion length. When the estimation methods chosen were analyzed it was found that in 50% of procedures the nurses used the standard method. In 22.5% they used an estimate based on NEX plus the distance to the umbilical scar; in 6.25% they used the markings on the tube (second manufacturer's measurement); in 5% the distance from the tip of the nose to the earlobe and on to the xiphoid plus 5 cm; in 5% the distance from the earlobe to the tip of the nose and on to the xiphoid plus the palm of the hand; in 3.75% the distance from the earlobe to the tip of the nose and on to the xiphoid; in 2.5% the markings on the tube (first manufacturer's measurement); in 1.25% the distance from the tip of the nose to the earlobe and on to the xiphoid plus 10 cm; in 1.25% the distance from the tip of the nose to the earlobe and on to the xiphoid; in 1.25% the markings recommended by the manufacturer; and in 1.25% of insertions the nurses used the distance from the earlobe to the tip of the nose and on to the xiphoid plus 10 cm. All of the FT insertion length estimates and the lengths used are shown in Chart 1.

The control x-rays showed that in 70% (n=56) of insertions the distal tip of the FT was in the stomach; in 23.70% (n=19) the tip was in the duodenum; in 3.80% (n=3) it was in the pyloric region; in 1.35% (n=1) it was in the final third of the esophagus; and in 1.35 % (n=1) of insertions the tube tip was in a lung.

According to the Hanson technique, the mean insertion length for the distal tip of the FT to reach the gastrointestinal tract was 49.3±2.95 cm, using the standard technique mean insertion length was 58.2±4.6 cm and the mean length according to all of the techniques chosen by the nurses taken together was 65.8±7.4 cm.

Although there was a strong correlation between means for the Hanson and standard techniques ($r=0.92$; $p<0.001$), we observed a significant difference between their means (-9.0cm; 95%CI: -9.5 a -8.5cm; $p<0.001$) (Figure 1).

There was a weak correlation between standard-method estimates and the nurses' estimates ($r=0.33$; $p=0.003$) and the difference between them was significant (7.5cm; 95%CI: 5.92 to 9.17cm; $p<0.001$) (Figure 2).

The length indicated by the manufacturer's first radiopaque marking was greater than the length estimated by the standard method (4.9cm; 95%CI: 3.8 to 5.9cm; $p<0.001$) and the difference between the manufacturer's second marking and the length estimated by the standard method was even greater still (16cm; 95%CI: 15.1 to 17.3cm; $p<0.001$).

When we analyzed the agreement between the means for the standard measurement and the true FT position, we found that in eight gastric procedures the length inserted was shorter than the mean (±1SD), in 27 the length was within the mean (±1SD), and in 21 gastric procedures the length inserted was longer than the mean (±1SD). In five enteric procedures the insertion length was shorter than the mean (±1SD), in five it was within the mean (±1SD) and in 12 enteric procedures the length inserted was longer than the mean (±1SD). It can be observed from Figure 3 that in two procedures (in

red) the FT was located in the wrong anatomic location, despite the lengths inserted being within and greater than the mean (±1SD) respectively.

Analyzing the lengths estimated by the Hanson method, we observed seven gastric procedures in which the length was shorter than the mean (±1SD); 43 within the mean (±1SD), and six longer than the mean (±1SD). In one enteric procedure the length inserted was shorter than the mean (±1SD), in 19 it was within the mean (±1SD) and in two it was longer than the mean (±1SD) (Figure 4).

The estimated lengths calculated by the nurses were shorter than the mean (±1SD) in 10 gastric procedures, within the mean (±1SD) in 38 and longer than the mean in eight gastric procedures (±1SD). The length estimated by the nurses for enteric procedures was shorter than the mean (±1SD) in two cases, within the mean (±1SD) in 13 and longer than the mean (±1SD) in seven gastric procedures (Figure 5). It can be observed from Figures 4, 5 and 6 that insertion lengths were not associated with FT position, since identical measurements were recorded for distinct positions.

A Bland-Altman graph was plotted to calculate the coefficient of agreement. Figure 6 illustrates the bias of -8.98 and shows the extent to which the differences between the Hanson and standard methods stray from zero. The upper limit of agreement is -5.52 and the lower limit of agreement is -12.44, indicating a weak association between the estimates. Figure 7 also indicates a weak association, this time between the nurses' estimates and the standard method. The bias is 7.54, the upper limit of agreement is 20.66 and the lower limit of agreement is -5.58.

DISCUSSION:

In contrast with what we had expected, in 50% of the procedures the nurses chose methods other than the standard procedure. This is possibly the result of nursing courses using different textbooks, which in turn contain different recommendations.[9,10]

In this study we observed that the nurses tended to overestimate the correct FT insertion length (65.8±7.4) while Hanson's method tended to underestimate the FT insertion length, which is evidence that Hanson's method[11] is not accurate enough to be adopted in practice.

The overall success rate for inserting the FT into different portions of the gastrointestinal tract was 97.5% (n=78), but the control x-rays showed that two FTs had been inserted into patients' respiratory tracts. This is a similar rate of malpositioned FTs to that observed by Sorokin and Gottlieb,[7] who analyzed 2000 FT insertions and observed that 2.5% (n=50) were malpositioned, although they did not list the methods used to estimate insertion length.

Bland and Altman[12] introduced a statistical method for assessing agreement between two variables. It is a visual test in which the data are plotted on a graph, with the difference between the two measurements on the y-axis and the means of the differences on the x-axis. For this study, we compared the nurses' measurements with the standard measurement and the Hanson[11] method estimates with the standard measurement. Each plot provides two important parameters. The first is the mean of the differences between the results of the two methods, where a zero value means perfect agreement and values other than zero indicate better agreement the closer they approach to zero. The second parameter is defined by the upper and lower limits of 95% agreement

between different methods, where narrower deviation ranges indicate greater degrees of agreement. One advantage of this method is that isolated values outside of the limits of agreement do not unduly affect the test, as they would with a correlation test. The importance of outlying data points can be evaluated clinically. Our results showed that there were weak associations between the methods compared, meaning that is was not possible to determine which measurement should be used or which estimation method is more accurate.

LIMITATIONS:

There is a need for further research in this area in order to bridge the knowledge gap left by the lack of studies designed to obtain measurements from which to estimate the correct insertion length for patients.

CONCLUSIONS:

We conclude that half of the nurses studied did not use the standard procedure for estimating insertion length and that the association between different methods was so weak that no preferred estimation technique could be identified.

ETHICAL CONSIDERATIONS

This is an observational study, which were not expected greater risks than those classified as "minimal" for patients, given that the verification measures of the estimates. Routine care was not modified. All nurses who consented to participate in this project fulfilled the term of consent.

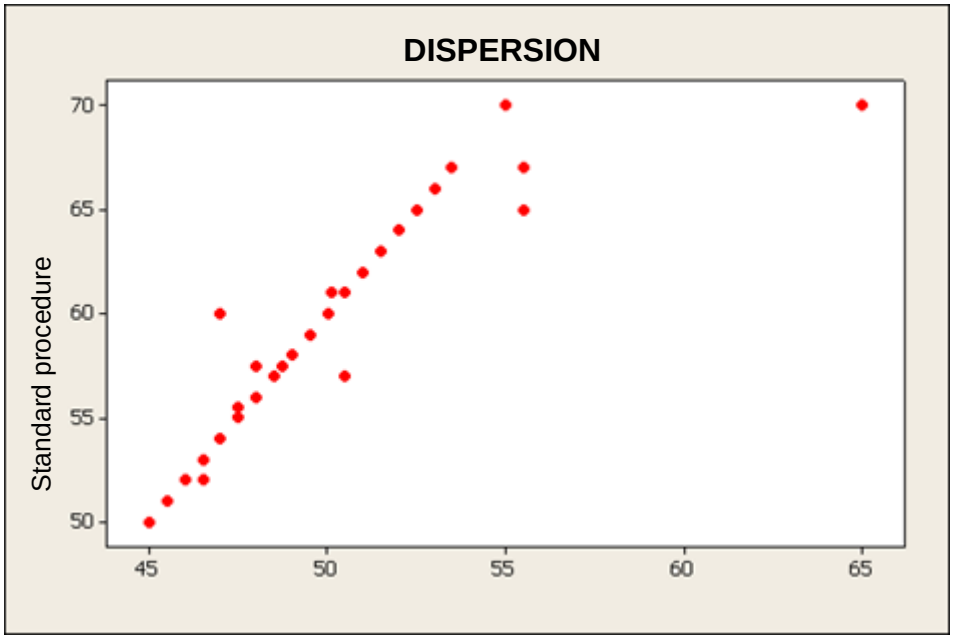

Figure 1 – Dispersion graph of estimates according to standard procedure against estimates according to the Hanson method.

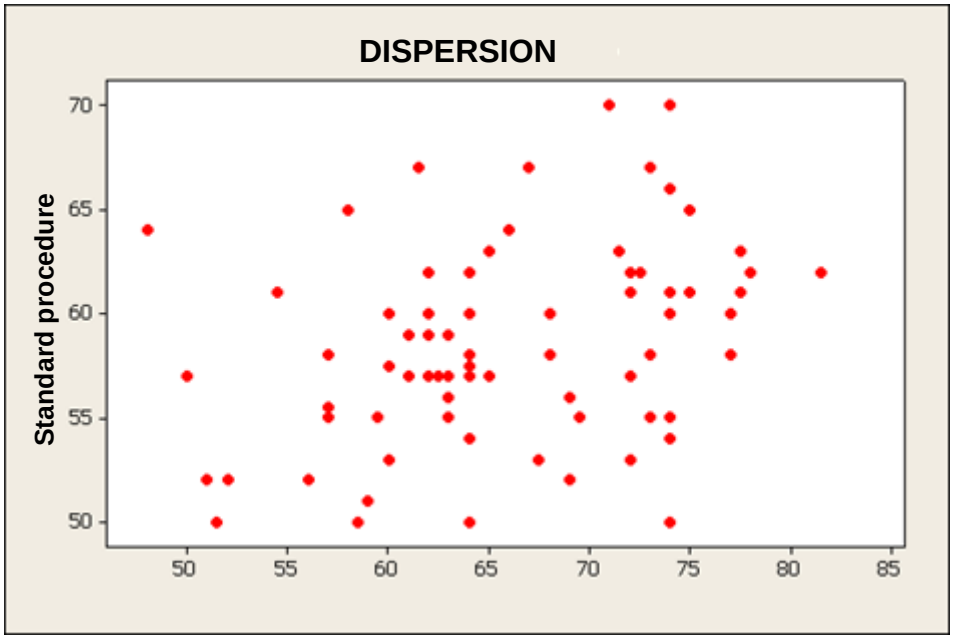

Figure 2 – Dispersion graph of estimates according to standard procedure against estimates made by nurses.

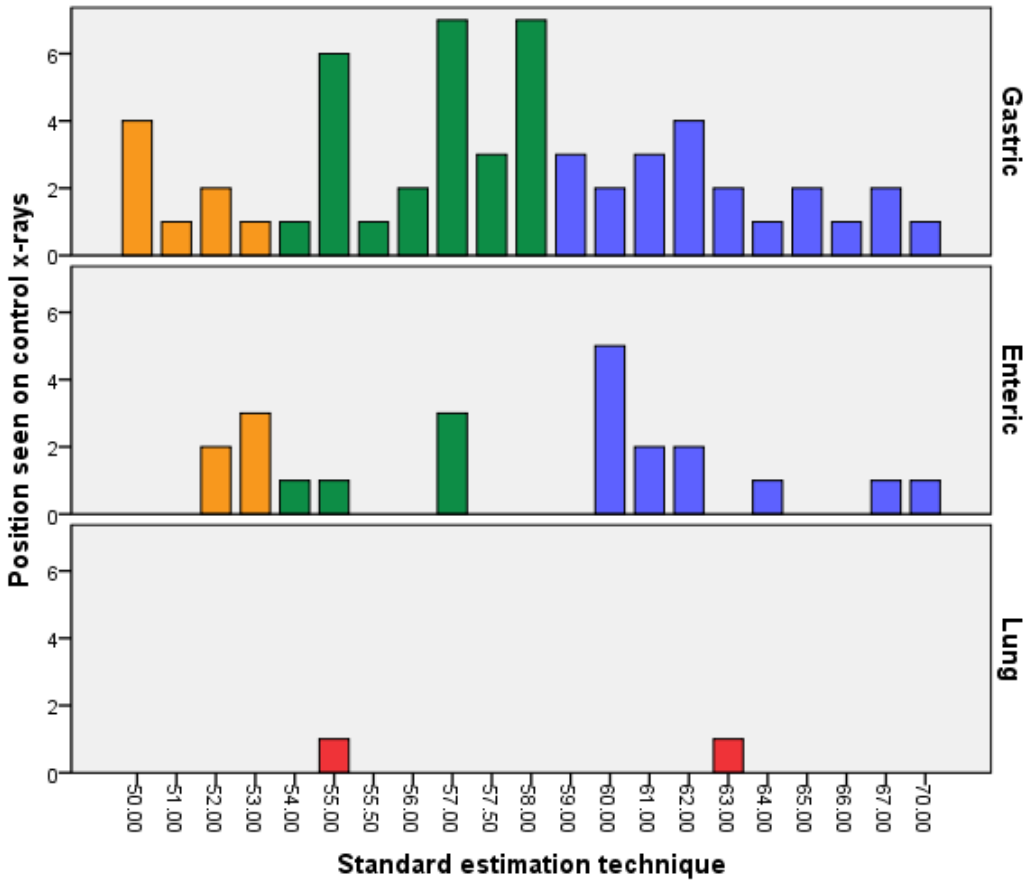

Figure 3 – Lengths estimated by standard procedure (in centimeters) and the true position seen on control x-rays. In the gastric and enteric sections amber indicates lengths shorter than the mean (<53.5), green indicates lengths within the mean (≥53.5 and ≤58.5) and blue indicates lengths longer than the mean (≥ 58.5). Red indicates malpositioning.

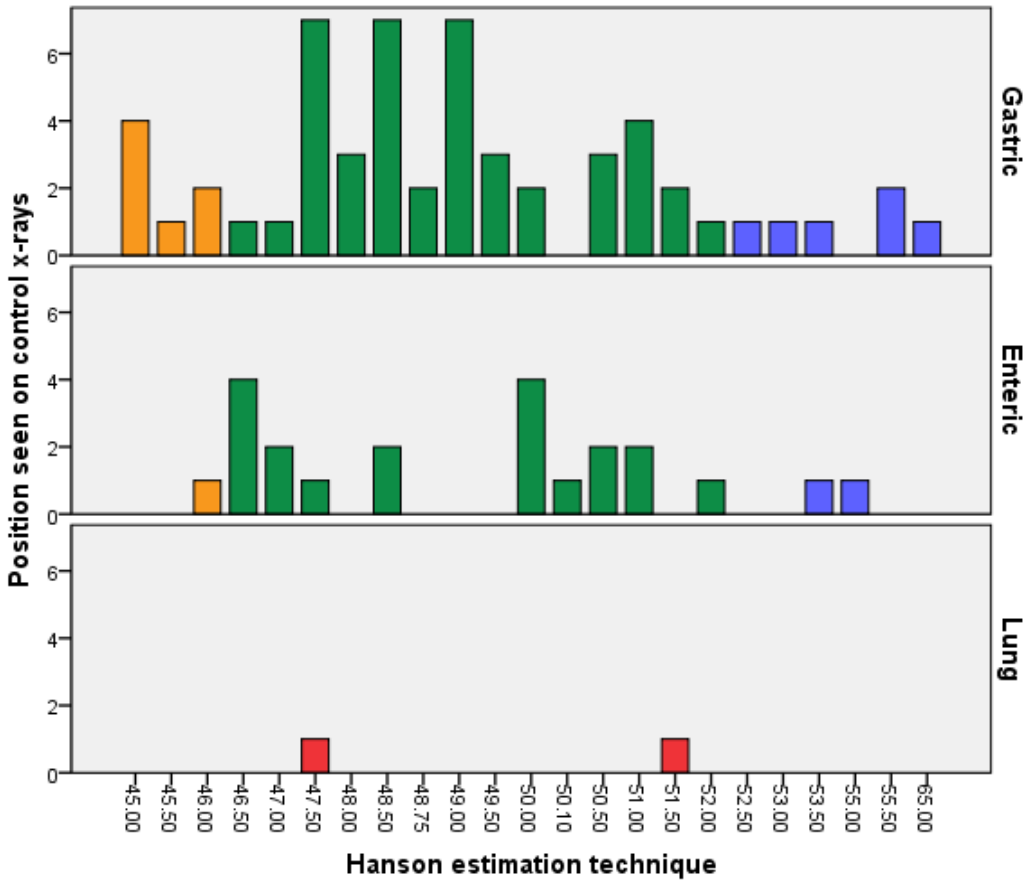

Figure 4 – Lengths estimated by the Hanson method (in centimeters) and the true position seen on control x-rays. In the gastric and enteric sections amber indicates lengths shorter than the mean (<46.25), green indicates lengths within the mean (≥46.25 and ≤52.25) and blue indicates lengths longer than the mean (≥ 52.25). Red indicates malpositioning.

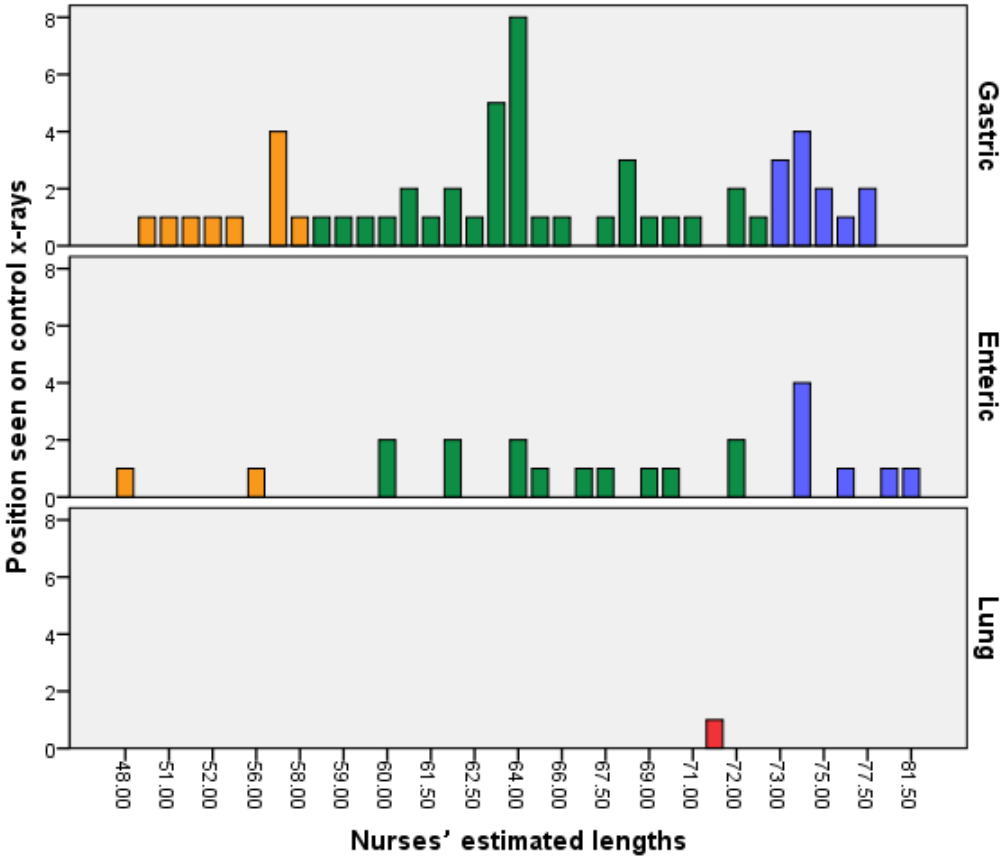

Figure 5 - Lengths estimated by Nurses' method (in centimeters) and the true position seen on control x-rays. In the gastric and enteric sections amber indicates lengths shorter than the mean (<58.00), green indicates lengths within the mean (≥58.00 and ≤72.50) and blue indicates lengths longer than the mean (≥ 72.50). Red indicates malpositioning.

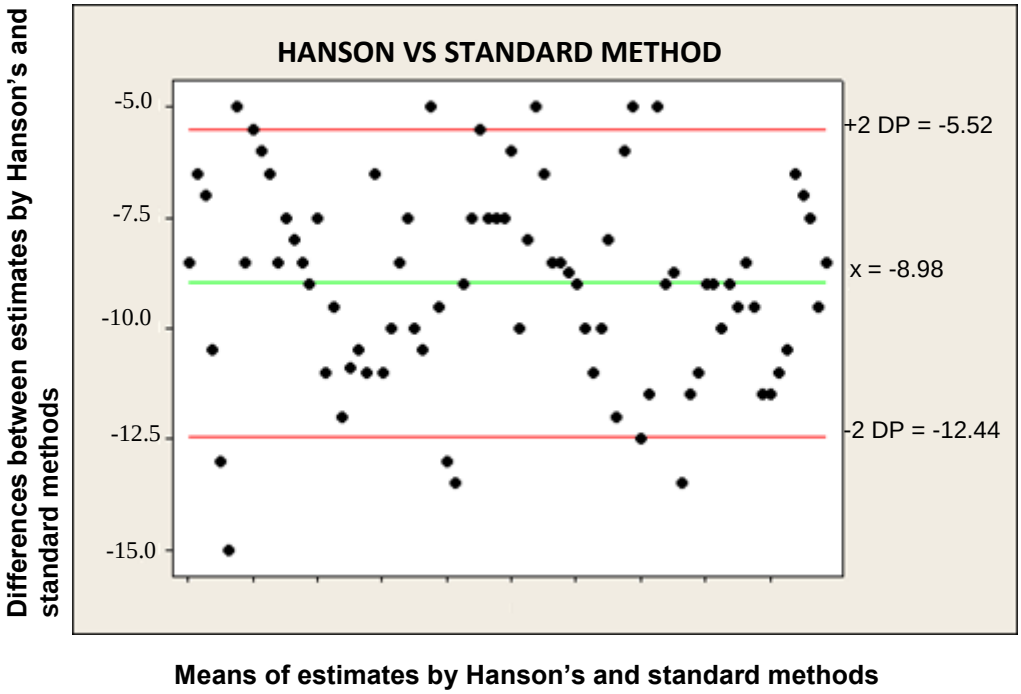

Figure 6 – Bland-Altman plot comparing estimates made by Hanson's method with standard method estimates. The mean (central horizontal line) and upper and lower limits of agreement are shown. Measurements are in centimeters.

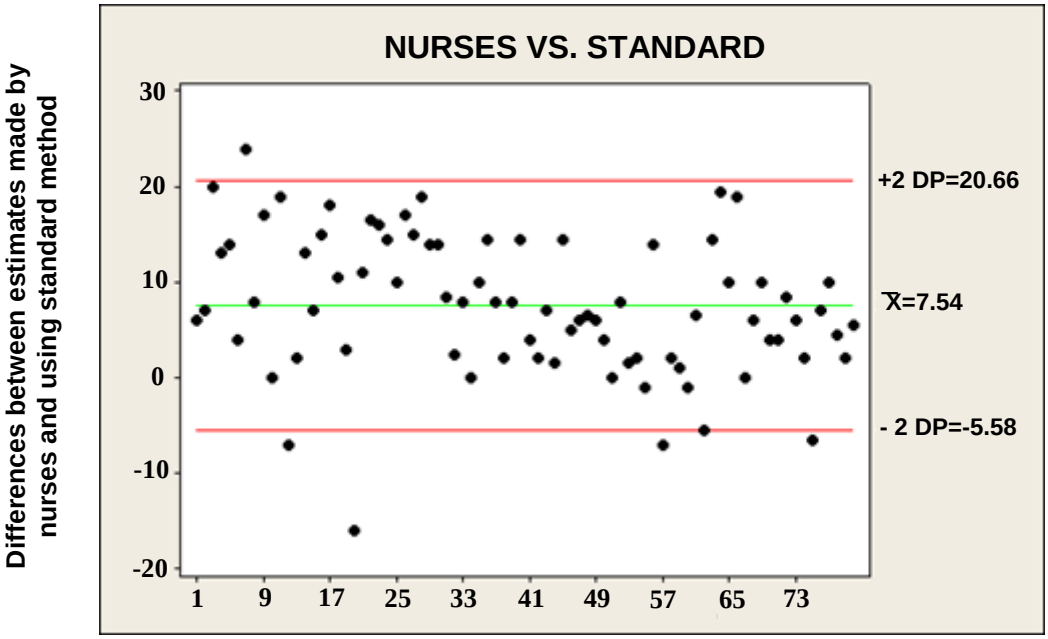

Figura 7 – Gráfico de Bland & Altman – Bland-Altman plot comparing estimates made by nurses with estimates by standard method. The mean (central horizontal line) and upper and lower limits of agreement are shown. Measurements are in centimeters.

Chart 1 – Methods for determination of FT insertion length used by nurses in an ICU with absolute and mean FT insertion length in centimeters.			
Technique chosen	Frequency	%	cm
1. Distance from earlobe to tip of nose and on to xiphoid + 5 cm	40	50.1	64.9±7.05
2. Distance from earlobe to tip of nose and on to umbilical scar	18	22.5	66.6±8.7
3. Distance from tip of nose to earlobe and on to xiphoid + 5 cm	4	5.0	61.12±2.01
4. Markings on tube – 2nd manufacturer's measurement	5	6.3	74*
5. Distance from earlobe to tip of nose and on to xiphoid + palm of hand	4	5.0	73.7±1.25
6. Distance from earlobe to tip of nose and on to o xiphoid	3	3.8	64.16±8.54
7. Markings on tube – 1st manufacturer's measurement	2	2.5	63*
8. Distance from tip of nose to earlobe and on to xiphoid + 10 cm	1	1.3	62.5
9. Distance from tip of nose to earlobe and on to xiphoid	1	1.3	54.5
10. Between manufacturer's markings	1	1.3	65
11. Distance from earlobe to tip of nose and on to o xiphoid + 10 cm	1	1.3	69.5
Total *** Fixed measurements.**	80	100	

References:

1. Kreymann KG, Berger MM, Deutz NEP, Hiesmayr M, Jolliet P, Kazandjiev G, et al. ESPEN Guidelines on Enteral Nutrition: Intensive care. Clin Nutr 2006;25(2):210-23.

2. Ellett MLC, Beckstrand J, Flueckiger J, Perkins SM, Johnson CS. Predicting the insertion distance for placing gastric tubes. Clin Nurs Res. 2005;14(1):11-27.

3. Assis MCS, Beghetto M, Silva SMR, Leães DM, Novello CL, Silveira CR M, Mello Elza. Nutrição enteral: diferenças entre volume, calorias e proteínas prescritos e administrados em adultos. RBTI. 2010; 22(4):346-50.

4. Schulz MA, Santanello SA, Monk J, Falcone RE. An improved method for transpyloric placement of nasoenteric feeding tubes. Int Surg. 1993 ;78(1):79-82.

5. Stroud M, Duncan H, Nightingale J. Guidelines for enteral feeding in adult hospital patients. Gut. 2003;52 Suppl 7:vii1-vii12.

6. Dobranowski J, Fitzgerald JM, Baxter F, Woods D. Incorrect positioning of nasogastric feeding tubes and the development of pneumothorax. Can Assoc Radiol J. 1992;43(1):35-9.

7. Sorokin R, Gottlieb JE. Enhancing patient safety during feeding-tube insertion: a review of more than 2,000 insertions. JPEN J Parenter Enteral Nutr. 2006;30(5):440-5.

8. Ellett MLC, Woodruff KA, Stewart DL. The use of carbon dioxide monitoring to determine orogastric tube placement in premature infants: a pilot study. Gastroenterol Nurs. 2007;30(6):414-7.

9. Brunner LS, Suddarth DS. Textbook of Medical-Surgical Nursing, 12th Edition. Lippincott Williams & Wilkins, 2009.

10. Potter PA, Perry AG. Fundamentals of Nursing, 8th Edition. Mosby Company; 1985.

11. Hanson RL. Predictive criteria for length of nasogastric tube insertion for tube feeding. JPEN 1979;3(3):160-3.

12. Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. Lancet. 1986 8;1:307-10.

CONCLUSÕES

6. CONCLUSÕES

Apesar de 50% dos enfermeiros não adotarem a técnica padrão observamos 97,5% dos posicionamentos nas diferentes porções do trato gastrintestinal.

As medidas recomendadas por Hanson tendem a subestimar as medidas de inserção dos enfermeiros, diferentemente das medidas recomendadas pelo fabricante que tendem a superestimar tais medidas.

A observação de dois posicionamentos inadvertidos reforça a importância da utilização do RX de controle para confirmação do correto posicionamento.

CONSIDERAÇÕES GERAIS E LIMITAÇÕES

7. CONSIDERAÇÕES GERAIS E LIMITAÇÕES

A fraca associação entre as estimativas obtidas neste estudo inviabiliza a recomendação de uma medida perfeita. Portanto, fazem-se necessários a realização de novos estudos acerca deste assunto.

8. REFERÊNCIAS DA INTRODUÇÃO DA DISSERTAÇÃO

Ellet MLC, Maahs J, Forsee S. Prevalence of feeding tube placement errors associated risk factors in children. *The American Journal of the Maternal Child Nursing*. 1998;23(5):234-9.

Marsha L. Beckstrand, Joyce Flueckiger, Susan M. Perkins, Cynthia S Johnson. Predicting the insertion distance for placing gastric tube. *Clin Nurs Res*. 2005;14(1):11-27.

Medicines and Healthcare products Regulatory Agency (2004) Enteral Feeding Tubes (Nasogastric), MDA 2004/026. London.

Hanson RL. Predictive Criteria for Length of Nasogastric Tube Insertion for Tube Feeding. *JPEN* 1979;3(3):160-163.

Turgay AS, Khorshid L. Effectiveness of the auscultatory and pH methods in predicting feeding tube placement. J Clin Nurs. 2010 jun;19(11-12):1553-9.

ANEXOS

METODOLOGIA

DELINEAMENTO DO ESTUDO

Trata-se de um estudo transversal.

PACIENTES

Foram incluídos 80 pacientes adultos internados no Centro de Terapia Intensiva (CTI) do Hospital de Clínicas de Porto Alegre (HCPA), entre outubro de 2010 e maio de 2011, que tiveram indicação de inserção de sonda nasoenteral (SNE) para início de dieta.

Foram excluídos pacientes submetidos à cirurgia de cabeça e pescoço, com diagnóstico de câncer de esôfago e/ou estômago ou com outra alteração anatômica que pudesse interferir o procedimento de inserção da SE.

MATERIAIS E MÉTODOS

Antes do inicio do estudo, todos os enfermeiros (as) dos diferentes turnos do CTI receberam informações sobre o projeto de pesquisa, os mesmos foram convidados a participar. Os enfermeiros que aceitaram participar assinaram o termo de consentimento esclarecido (TCLE) (Apêndice 1).

Após o médico assistente prescrever a SNE, uma das pesquisadoras (DLM) era avisada pela enfermeira assistencial e comparecia à CTI. Antes de todos os procedimentos, a pesquisadora media a SNE, conferindo o comprimento sugerido pelo fabricante para inserção da SNE no estômago, de acordo com as marcas radiopacas presentes na SNE (MEDICONE®). Cada enfermeira assistencial era livre para escolher a técnica de inserção de SNE, incluindo o modo com o qual estimaria o comprimento da mesma a ser introduzido no

paciente e a pesquisadora acompanhou todas as inserções de SNE, tendo mensurado antes da inserção, todos os comprimentos de SNE determinados pelas enfermeiras assistenciais. Para tanto, foi utilizada uma fita métrica retrátil e não extensível. Para cada paciente, a pesquisadora determinou o comprimento da SE proposto por Hanson, seguindo a equação: NOX/2 + 50cm. Também, para cada paciente, de modo independente da enfermeira assistencial, a enfermeira pesquisadora mediu o comprimento do NOX, somando a este valor mais 5 cm (comprimento recomendado na técnica de inserção padrão do HCPA). Os registros de todos esses comprimentos foram efetuados imediatamente após cada aferição, em um formulário específico (Apêndice 2).

CALCULO DO TAMANHO DA AMOSTRA

Baseado nos dados obtidos por Hanson (12) que encontrou 72% de sucesso de inserções das sondas em porção gástrica utilizando-se da mesma técnica de inserção padronizada no HCPA, e para obter o Kappa de 0,8, com intervalo de confiança de 0,3, considerando um nível de significância de 5%, poder estimado de 80%, necessita-se de 79 pacientes (158 pares de observações).

ANÁLISES ESTATÍSTICA

Inicialmente, foi procedida análise descritiva das características gerais dos pacientes, respeitando-se as características e distribuição das variáveis. A concordância entre a impressão dos enfermeiros do CTI quanto ao posicionamento da SE e o diagnóstico da posição anatômica da SE visualizada

pelo RX foi avaliada por meio de coeficiente Kappa. Igualmente, a concordância entre os enfermeiros do CTI e a enfermeira pesquisadora, foi avaliado por meio de coeficiente Kappa.

CONSIDERAÇÕES ÉTICAS

Trata-se de um estudo observacional, onde não foram esperados riscos maiores que os classificados como “mínimos” para os pacientes, tendo em vista que a verificação das estimativas de medidas. A rotina assistencial não foi modificada. Todos os enfermeiros que consentiram em participar do presente projeto preencheram o termo de consentimento livre e esclarecido (Apêndice 1).

APÊNDICES

Apêndice 1

Prezado Enfermeiro (a)

Estamos realizando um estudo com o objetivo de comparar diferentes medidas para inserção de sonda na posição gástrica. Caracteriza-se por um estudo observacional, com utilização de questionários.

Nosso instrumento de pesquisa será a observação da técnica com o preenchimento de um questionário pré-estabelecido com as medidas obtidas pelo profissional enfermeiro responsável, não interferindo na rotina do hospital.

A logística segue com a enfermeira pesquisadora acompanhando o profissional enfermeiro(a) que realizará o procedimento e também preencherá um questionário dando sua impressão sobre o posicionamento da sonda, este cego para o pesquisar. A enfermeira pesquisadora também preencherá um questionário com a sua impressão sobre o posicionamento da sonda, cego para o enfermeiro do CTI.

Serão incluídos adultos que necessitarem inserir sonda para inicio de dieta enteral internados nos Centros de Terapia Intensiva (CTI) do Hospital de Clínicas de Porto Alegre.

Para tanto, gostaríamos de convidá-lo a participar do estudo. Sua participação implicará em ser observado durante a inserção de sonda nasogástrica e em nenhum momento esta observação fará parte de avaliação funcional. Alem disso será convidado a responder algumas perguntas para registro no banco de dados. O estudo não irá identificá-lo, tendo liberdade se desejar, desistir de participar em qualquer momento do estudo.

Se você necessitar de qualquer outro esclarecimento, entre em contato pelo telefone com Mariur Gomes Beghetto (51) 33598199 ou com Enf. Dória (51) 84032782.

Declaro que estou ciente e concordo em participar do Estudo que irá comparar diferentes medidas para inserção de sonda na posição gástrica.

Data: _____

Nome _____Assinatura _____

Pesquisador responsável: Elza Daniel de Mello
Mariur Gomes Beghetto fone: (51) 33598199
Pesquisador Enf. Dória Leães fone: (51) 84032782

Apêndice 2: Respondido pelos enfermeiros do CTI

Técnica utilizada pelo enfermeiro da CTI
(1). Lóbulo da orelha até a ponta do nariz até o AP. Xifóide mais 5 cm ou 2 dedos.
(2). Medida recomendada por Hanson
(3). Marcas externas já existentes na Sonda recomendada pelo fabricante.
(4). Outra técnica:
Ângulo da cama:_____graus

MEDIDAS DE CONTROLE DE POSICIONAMENTO
**** Marcar com X se a medida foi adotada pelo enfermeiro da CTI**
( ) Ausculta
( ) Avaliação das características residuais:
( ) Ph
( ) Volume ____ ml
( ) Teste de Presença de borbulha ( ) positivo ( ) negativo

Impressão do enfermeiro da CTI sobre o posicionamento da sonda:
( ) Região gástrica
( ) Entérica
( ) Via aérea
( ) Não sabe

DADOS DO ENFERMEIRO	
Nome do enfermeiro:	Turno:
Data de inserção da sonda:	Hora: