# Practice Perspectives of Healthcare Professionals Regarding Common Dilemmas Associated with Enteral Nutrition

## *Sağlık Çalışanlarının Enteral Nütrisyon Uygulamalarındaki Çelişkileri*

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## Abstract

**Objective:** No study has been conducted in Turkey to assess the practical management of enteral nutrition (EN), specifically diarrhea, aspiration, and gastric residue. The aim of this study was to identify practice perspectives regarding EN and its associated complications and compare these trends between doctors and nurses.

**Material and Methods:** A cross-sectional study was conducted at a university hospital in Turkey in January 2017. A written survey that was designed by the researchers consisting of 12 questions was administered to doctors and nurses (face-to-face) in different services who routinely participate in EN.

**Results:** In total, 100 nurses and 94 doctors completed the survey. With respect to diarrhea, the doctors and nurses often used different definitions and strategies for relieving symptoms. Gastric residual volume (GRV) measurement is routinely performed 4 times a day. When managing high GRV, participants were inclined to reduce feeding rates, but nurses were more likely to stop feeding and consult the nutrition support team compared to doctors, who were more likely to administer prokinetics. Nurses were more likely to specify the commonly accepted GRV thresholds. Healthcare professionals preferred to start feeding 12 to 24 hours after gastrostomy placement. Aspiration was attributed to incorrect positioning of the patient by almost all the nurses, while about one-half of the doctors indicated the lack of GRV measurement as the leading cause. Approximately one-half of participants stated that adequate fluid requirements could be delivered through EN and water flushes.

**Conclusion:** Doctors and nurses have different perspectives regarding the management of EN-related complications. Information obtained from this study can be used to develop interventions and tailor educational programs to improve EN management in Turkey.

**Keywords:** Enteral nutrition, diarrhea, aspiration

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## Öz

**Amaç:** Türkiye'de, enteral nütrisyon (EN) uygulamalarında; özellikle ishal, aspirasyon ve gastrik rezidü yönetiminin değerlendirilmesi konusunda yapılan bir çalışma bulunmamaktadır. Bu çalışmanın amacı, EN uygulamaları ve ilişkili komplikasyonlardaki uygulamaları belirleyerek, doktorlar ve hemşireler arasındaki eğilimi karşılaştırmaktır.

**Gereç ve Yöntemler:** Bu çalışma, bir Üniversite Hastanesi'nde Ocak 2017'de kesitsel bir çalışma olarak gerçekleştirilmiştir. Farklı bölümlerde EN sürecine dahil olan doktor ve hemşirelere, araştırmacılar tarafından hazırlanmış ve toplam 12 sorudan oluşan yazılı bir anket yüz yüze uygulanmıştır.

**Bulgular:** Yüz hemşire ve 94 doktor anketi tamamlamıştır. İshal gelişimi ve hafifletmeye yönelik stratejiler konusunda doktor ve hemşirelerin farklı tanımları kullandıkları görülmüştür. Gastrik rezidü hacmi (GRH), rutin olarak günde 4 kez ölçülmektedir. Yüksek GRH'nin yönetiminde, katılımcılar beslenme hızının azaltılmasını tercih ederken; hemşireler, genellikle beslenmeyi durdurmayı ve nütrisyon destek ekibine danışmayı tercih etmişlerdir. Doktorlar prokinetik ajanların kullanılmasını daha fazla tercih etmişlerdir. Hemşireler, yaygın olarak kabul edilen GRH eşik değerlerini daha iyi belirlemektedir. Sağlık çalışanları gastrostomi uygulaması sonrasındaki 12-24 saat içerisinde beslenmeye başlamayı tercih etmektedir. Hemen hemen tüm hemşireler, yanlış baş pozisyonunun aspirasyona neden olduğunu belirtirken, doktorların yarısı GRH ölçümünün eksikliğini neden olarak işaret etmektedir. Katılımcıların yaklaşık yarısı yeterli sıvı ihtiyacının EN ürünleri ve yıkamada kullanılan su ile karşılandığını belirtmiştir.

**Sonuç:** Doktorlar ve hemşireler EN ile ilgili komplikasyonların yönetiminde farklı bakış açılarına sahiptir. Bu çalışmadan elde edilen bilgiler, ülkemizde EN yönetimi ve eğitim programları geliştirilmesinde yol gösterici olabilir.

**Anahtar sözcükler:** Enteral nütrisyon, ishal, aspirasyon

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**Ethics Committee Approval:** Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).
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## Introduction

Enteral nutrition (EN) or "tube feeding" is the preferred choice of nutritional support for patients with a functional gastrointestinal tract who are not able to consume a normal oral diet. Monitoring patients' tolerance of EN and minimizing complications are essential for better patient care, although there is a lack of consensus regarding best practices (1).

Enteral nutrition can be provided through a feeding tube by various administration routes. The transnasal route is optimal for patients requiring short-term nutritional support, whereas endoscopic or surgical routes are ideal for long-term feeding. Percutaneous endoscopic gastrostomy (PEG) has been used since the 1980s and is faster, safer, and more cost effective than the more invasive surgically placed gastrostomies (2, 3) Feeding initiation after PEG tube placement varies in current practice and its benefits compared to starting later are not well validated. However, the initiation of early PEG feeding (often considered within 12 hours of placement) is generally considered safe and has positive impacts on patient outcomes, such as reduced infections and earlier discharge have been demonstrated (1, 4, 5). In fact, current guidelines recommend starting feeding within 2 hours after placement (1). A lack of consensus exists in practice regarding early or delayed feeding after PEG placement (6).

Fluid and electrolyte replacement is a mainstay of nutritional support; thus, determining patient-specific requirements is an important component of evidence based care (7). Water may be given in the form of flushes and may be required to dilute medications and/or the EN product for maintaining hydration. Furthermore, the water source, either sterile, distilled, or tap water, may vary according to each patient's need (1). Although sterile water is free of microbial contaminants, its use is mostly considered unnecessary and more costly then potable tap water. Of note, the gastrointestinal system has innate defense mechanisms against infectious microorganisms, which minimize the risk of infection during oral or tube feedings. Therefore, the use of potable tab water is recommended in otherwise healthy, immunocompetent patients (8).

One of the mechanical complications of enteral feeding is aspiration and the complications associated with pulmonary aspiration can be severe. Patients in the supine position or those with decreased consciousness, other neurologic abnormalities, or gastrointestinal reflux are at a higher risk for aspiration. Other risk factors include giving bolus or intermittent feedings, placing the PEG tube before the pyloric sphincter, and acquiring high residual volumes (150-500 mL) (9). Assessing gastric residual volume (GRV) is often routinely used in clinical practice to prevent the risk of aspiration; however, research shows conflicting results about the efficacy of monitoring the residue. No routine monitoring has been suggested for stable patients, although measurement should be considered when EN is started and in patients with risk factors for aspiration. Furthermore, EN should be interrupted if vomiting occurs (10-12). Practice recommendations and approaches vary with respect to how and when to measure GRV (13, 14).

Diarrhea is one of the most common complications of EN and occurs in up to 95% of the patients (15). Although no standard definition for diarrhea is universally accepted, "stool with increased frequency of more than 3 times a day" or "stool with increased volume of >200 g/day" or "stool with increased water content (>200 g/day) of more than 2 times a day" are commonly used definitions of diarrhea in literature (16). The content (eg, the type and amount of fiber, amount of fat, osmolality, and calorie content), administration (eg, fast infusion rates), and contamination of EN products can lead to diarrhea (17). However, EN is not always the culprit in patients experiencing nosocomial diarrhea. Other causes, such as medications (eg, antibiotics, sorbitol, and magnesium), should be considered as a cause of diarrhea. Erroneously attributing EN as the cause of diarrhea can lead to the unnecessary interruption or cessation of nutritional support in patients who warrant therapy (17, 18).

The different practice approaches, lack of consistency in the literature, and need for updated guidelines may increase the likelihood for variability in the clinical management of EN and its complications. To our knowledge, no study has been conducted in Turkey to assess the practical management of EN and the common dilemmas related to its use. This study aims to identify practice perspectives regarding EN and its associated complications and compare these practice trends between doctors and nurses.

## Material and Methods

This cross-sectional study was conducted at a university hospital in Turkey during January 2017. A written survey was administered to medical doctors and nurses on different services who are routinely involved in the EN process. The nurses and doctors were verbally informed in the wards about the study and were invited to participate in the survey. The survey was completed or submitted on the same day. Participation was voluntary and a written informed consent was obtained from participants. The survey questions were developed by research pharmacists who are members of the institution's nutrition support team and provide education and answer questions from other healthcare professionals regarding EN and drug administration when needed. A total of 12 questions were included, which were related to participant demographics and their perspectives regarding the clinical management of EN and the complications of diarrhea, gastric residue, and aspiration. The survey questions were initially tested on 10 healthcare professionals (4 nurses and 6 doctors) during the regular nutrition support team meeting before administering the survey broadly. The survey consisted of multiple choice-type questions, and the participants were allowed to choose more than one option where applicable.

The study assured the principles set forth in the Declaration of Helsinki 1975.

### Statistical Analysis

Data were evaluated using descriptive statistics, and analysis was performed using the IBM® Statistical Package for Social Science (SPSS®) Statistics for Macintosh Version 23 program (IBM Corp.; Released 2015, Armonk, NY, USA) after normalization test was implemented. The results were reported with appropriate statistical tests with the level of significance as a p value of $<0.05$.

## Results

The survey was delivered to 200 nurses and 190 doctors involved in EN and the response rate was 50% and 49%, respectively. The demographics of participants are summarized in Table 1.

**Table 1. Demographics of participants**

| | Nurses (n=100) | Doctors (n=94) |
|---|---|---|
| Female:male | 93:4 | 36:57 |
| Mean (±SD) age, years | 29.5 (±6.3) | 28.5 (±3) |
| Mean (±SD) years in profession, years | 7.2 (±5.2) | 3.2 (±2.4) |
| **Services in hospital** | | |
| General medicine | 50 | 30 |
| Intensive care | 17 | 20 |
| Oncology | 14 | 11 |
| Surgery | 18 | - |
| Others | - | 5 |

SD: standard deviation

**Table 2. Practice perspectives of healthcare professionals regarding EN**

| | Nurses n (%) | Doctors n (%) | p* |
|---|---|---|---|
| **Diarrhea** | | | |
| **Potential reasons of diarrhea in patients receiving EN** | | | |
| Drug side effects | 57 (57) | 55 (58) | 0.76 |
| Change in flora due to concurrently used antibiotics | 69 (69) | 76 (81) | 0.04 |
| Sorbitol content of drugs administered via the feeding tube | 23 (23) | 49 (52) | <0.001 |
| Content of the nutritional product | 88 (88) | 84 (89) | 0.78 |
| Fast infusion of the EN | 43 (43) | 57 (60) | 0.01 |
| Administration of a cold EN product | 52 (52) | 21 (22) | <0.001 |
| Contamination of the EN products | 65 (65) | 43 (46) | 0.009 |
| **Probable reasons of diarrhea related to EN product** | | | |
| Product contains lactose | 33 (33) | 44 (47) | 0.04 |
| Product contains no fiber | 50 (50) | 34 (36) | 0.06 |
| Product contains a high amount of fat | 64 (64) | 41 (44) | 0.06 |
| A hyperosmolar product | 19 (19) | 82 (87) | <0.001 |
| A hypercaloric product | 8 (8) | 12 (13) | 0.26 |
| **General approach toward diarrhea in patients receive EN** | | | |
| The EN product should be changed | 39 (39) | 44 (47) | 0.07 |
| Potential causes of diarrhea should be evaluated | 72 (72) | 34 (36) | 0.49 |
| No changes should be made | 2 (2) | 41 (44) | 0.60* |
| Consult the nutrition support unit | 53 (53) | 57 (60) | 0.31 |
| **Gastric residue** | | | |
| **Frequency of residue control in patients with feeding tubes** | | | |
| Not being done | 2 (2) | 9 (10) | 0.02 |
| Once a day | 21 (21) | 11 (12) | 0.05 |
| Twice a day | 19 (19) | 13 (14) | 0.35 |
| Four times in a day | 31 (31) | 40 (43) | 0.08 |
| Six times in a day | 21 (21) | 19 (20) | 0.92 |
| **Duration of intermittence before feeding is resumed to control residue** | | | |
| No need to have intermittence to control residue | 49 (49) | 28 (30) | 0.007 |
| 30 minutes | 26 (26) | 23 (24) | 0.84 |
| 1 hour | 19 (19) | 14 (15) | 0.46 |
| 2 hours | 5 (5) | 18 (19) | 0.002 |
| 3 hours | - | 4 (4) | 0.01* |
| **GRV threshold amount for interrupting feeding** | | | |
| ≤50 mL | 1 (1) | 7 (7) | 0.17* |
| 100 mL | 6 (6) | 24 (26) | <0.001 |
| 150 mL | 2 (2) | 14 (15) | 0.001 |
| 200 mL | 19 (19) | 17 (18) | 0.74 |
| ≥250 mL | 69 (69) | 29 (30) | <0.001 |
| **General approach toward managing GRV** | | | |
| Stop tube feeding | 68 (68) | 32 (34) | <0.001 |
| Change to jejunal administration route | 1 (1) | 3 (3) | 0.27* |

**Table 2. Practice perspectives of healthcare professionals regarding EN (continued)**

| | | | |
|---|---|---|---|
| Reduce the rate of feeding | 40 (40) | 41 (44) | 0.56 |
| Administer a prokinetic agent, such as metoclopramide | 12 (12) | 28 (30) | 0.003 |
| Consult the nutrition support unit | 40 (40) | 22 (23) | 0.01 |
| Change to parenteral nutrition | 5 (5) | 4 (4) | 0.81* |
| **General approaches to EN** | | | |
| **Duration to start feeding after the gastrostomy is placed** | | | |
| Instantly | 8 (8) | 9 (9) | 0.88 |
| 3–4 hours | 8 (8) | 11 (13) | 0.37 |
| 6–8 hours | 9 (9) | 16 (17) | 0.09 |
| 12–24 hours | 78 (78) | 59 (63) | 0.02 |
| **Potential reasons for aspiration** | | | |
| Patient's head is not placed in a 30–45° position | 97 (97) | 68 (72) | <0.001 |
| Bolus administration of a product | 17 (17) | 17 (18) | 0.81 |
| Use of a nasoenteral tube | 9 (9) | 11 (12) | 0.68 |
| GRV measurement is not performed | 17 (17) | 44 (47) | <0.001 |
| **Preferred method of hydration in patients** | | | |
| No need for additional fluid; patient requirements are met by the enteral product alone | 10 (10) | 1 (1) | 0.008 |
| Fluid requirements are ensured by the EN product and water used for flushing the tube | 45 (45) | 38 (40) | 0.56 |
| Intravenous hydration should be given during EN | 10 (10) | 6 (6) | 0.37 |
| Additional fluid (eg, distilled or potable water via feeding tube) should be given in additionto the EN product to ensure adequate hydration | 51 (51) | 46 (49) | 0.83 |
| **Preferred fluid for additional hydration** | | | |
| Distillate water | 17 (17) | 13 (14) | 0.42 |
| Tap water | 34 (34) | 30 (32) | 0.93 |

*if an assumption is not violated (<20%) Pearson Chi-square test is used; if an assumption is violated (>20%) likelihood ratio of Fisher's exact test is used for analysis

EN: enteral nutrition; GRV: gastric residual volume

Practice perspectives of healthcare professionals with regard to EN and its associated problems are presented in Table 2. With respect to the complication of diarrhea, about one-half of participating doctors defined it as "more than 3 times a day defecation" (p=0.04), whereas 39% of nurses classified it as "stool with increased water content regardless of its frequency" (p=0.25).

The doctors and nurses had different perceptions about the reasons of diarrhea, except for the content of nutritional products (89% and 88%) and drug side effects (58.5% and 57%), which were both acknowledged by doctors and nurses, respectively. Doctors were more aware of the antibiotics' potential to alter gut flora and for sorbitol to increase the probability of diarrhea, while nurses were more likely to attribute administration-related reasons to diarrhea development. If diarrhea is considered to be a result of the EN product, doctors are more likely to be concerned regarding osmolarity (p<0.001) and lactose content of a product (p=0.04). Overall, 44% of doctors indicated that no changes should be implemented to manage diarrhea in patients receiving EN.

According to collective survey results, GRV measurement is often performed 4 times a day and 49% of the nurses and 30% of the doctors believe that there is no need to interrupt feeding when managing residue (p<0.001). While in another question, 68% of the nurses compared to 34% of the doctors preferred to stop feeding if a high volume of residue had been detected (p<0.001). Doctors were more likely to administer a prokinetic agent, such as metoclopramide, in these situations (p=0.003), whereas nurses were more inclined to recommend consulting the nutrition support unit (p=0.01). Nurses were also more likely to identify the commonly accepted thresholds for GRV (p<0.001).

Healthcare professionals (78% nurses and 63% doctors) prefer to start feeding 12-24 hours after gastrostomy placement in patients receiving nutritional support, despite evidence suggesting that even earlier initiation is utilized. With regard to aspiration risk during tube feeding, there were significant differences between nurses' and doctors' perceptions. Of note, almost all nurses attributed incorrect positioning of the patient's head to aspiration, while one-half of the participating doctors indicated lack of GRV control as the culprit.

Interestingly, nurses and doctors have uncertain perceptions on hydration during EN. In total, 45% of the nurses and 40% of the doctors expressed that the EN product and water used for flushing the tube ensure all fluid requirements of patients; however, 51% of the nurses and 49% of the doctors mentioned that additional fluid (distilled or potable water) should be given through the feeding tube along with EN to ensure all fluid requirements.

## Discussion

Similarities and differences in the attitudes of healthcare professionals in EN and its complications have been previously reported (15). Given that patient populations, healthcare professional training, and

access to resources can vary across geographical regions, assessing practice approaches in specific locations is helpful in identifying gaps in knowledge and clinical care. To our knowledge, this is the first study evaluating EN practice approaches in Turkey.

Regarding diarrhea, our findings are consistent with those of Majid and colleagues who found that nurses tending to patients on EN experiencing diarrhea are more inclined to monitor hygiene practices to minimize contamination versus dietitians who are more likely to change the enteral formula (15). No clinical trials have demonstrated the best method of managing diarrhea, but stopping EN, reducing the rate of delivery, using fiber-containing products, not using fermentable carbohydrates, or evaluating concomitant drugs can be considered management strategies. Many participants seemed to be aware of the various options available for mitigating diarrhea, although doctors and nurses seemed to have different strategies with respect to diarrhea management. These practices may be explained by the difference seen in defining diarrhea. Results suggest that more education needs to be provided regarding the potential complications associated with prolonged diarrhea and the various and relatively simple strategies available to minimize the risk. Although EN products are often regarded the contributing reason for diarrhea in patients with EN, other potential reasons for diarrhea should be assessed individually for patients.

Gastric residual volume control is often recommended to reduce the risk in patients on EN who are at an increased risk of aspiration. Kuppinger et al. (19) showed that 90% of critical care nurses routinely measure GRV and modify nutritional support when the GRV exceeds 250 mL, whereas in other studies, nurses have waited until GRV is >500 mL (10). Metheny et al. (20) indicated that the frequency of aspiration is increased in patients with risk factors when GRV is >250 mL once or if GRV is measured as >200 mL more than once. This threshold is often used in practice. In this study, nurses (69%) were more likely to modify nutrition when GRV exceeded 250 mL and then stop feeding (68%) if a high volume was detected, whereas 44% of the doctors preferred to reduce the rate of feeding in such situations.

As seen in our survey, the initiation of tube feeding after PEG placement is often delayed intentionally by healthcare professionals due to the theoretical risk of complications with early initiation. Studies have shown no difference in complications, such as death within 72 hours, peritoneal leakage, peritonitis, and GRV (during day 1) between early (<3 hours or 3–6 hours of placement) or delayed (after 12 hours of placement) feedings (21-23). The American Society for Parenteral & Enteral Nutrition and current guidelines suggest that PEG feedings may begin within few hours of placement (12). In one study, 41% of gastroenterologists were aware of the recommendation but still only 9% started feeding within 3 hours (4, 21). Our study confirms that delayed feeding is often seen in practice. The participating nurses (78%) and doctors (63%) were inclined to start feeding 12–24 hours after the placement of gastrostomy.

This study has certain limitations. The small patient sample size at one institution limits the external validity of the findings. However, it is worth noting that doctors and nurses who have experience with EN across different services participated in the survey. Prospectively evaluating the actual practice management of the EN process would be ideal. However, this cross-sectional study provides a quick "snap shot" of healthcare professional perceptions regarding practice management and serves as a good foundation for future research. The questions in the survey were not validated; however, the questions were revised for clarification on the draft version by the nutrition support team members. Finally, medical doctors who participated in the survey had been practicing for a shorter period of time (3.2±2.4 years) than nurses who completed the study (7.2±5.2 years).

The study demonstrated that there are gaps in clinical care related to EN, and healthcare professionals have different perceptions regarding the management of EN-related complications. Therefore, the results of this study may be used to develop more robust professional educational programs tailored to both nurses and doctors regarding EN in hospital settings. Information gleaned from this study can also be used to develop clinical practice interventions and other evidence-based educational strategies to improve EN management.

## Conclusion

Healthcare professionals seem to have various preferences in the management of EN, including diarrhea management, aspiration risk, GRV threshold and control, and hydration maintenance. A nutrition support team can be a valuable information source on EN and the evidence-based management of its complications. Complications related to EN may be prevented by implementing standard protocols by healthcare professionals, which include definitions of symptoms, timing of tube placement, frequency of gastric residue measurement, and appropriate selection and adjustment of nutritional products. The protocols should also incorporate evidence-based strategies that address the patient's medical status and treatment requirements. Finally, healthcare professionals should be vigilant about identifying the complications of EN and work collaboratively to resolve them.

## References

1. Bankhead R, Boullata J, Brantley S, , et al. Enteral nutrition practice recommendations. JPEN J Parenter Enteral Nutr 2009; 33: 122-67. [CrossRef]
2. Virnig DJ, Frech EJ, DeLegge MH, et al. Direct percutaneous endoscopic jejunostomy: a case series in pediatric patients. Gastrointestinal Endoscopy 2008; 67: 984-7. [CrossRef]
3. Harbrecht BG, Moraca RJ, Saul M, et al. Percutaneous endoscopic gastrostomy reduces total hospital costs in head-injured patients. Am J Surg 1998; 176: 311-4. [CrossRef]
4. Ali T, Le V, Sharma T, et al. Post-PEG feeding time: a web based national survey amongst gastroenterologists. Dig Liver Dis 2011; 43: 768-71. [CrossRef]
5. de Souza e Mello GF, Lukashok HP, Meine GC, et al. Outpatient percutaneous endoscopic gastrostomy in selected head and neck cancer patients. Surg Endosc 2009; 23: 1487-93. [CrossRef]
6. Dubagunta S, Still CD, Kumar A, et al. Early initiation of enteral feeding after percutaneous endoscopic gastrostomy tube placement. Nutr Clin Pract 2002; 17: 123-5. [CrossRef]
7. Sobotka L, Allison SP, Stanga Z, et al. Enteral ve Parenteral Nütrisyonda Kullanılan Substratlar. Sobotka L, Korfalı G. Klinik Nütrisyon Temel Kavramlar. LOGOS Yayıncılık. Üçüncü baskı. 2004: 163-6.
8. Parrish RH, 2nd, Mirtallo JM, Fabri PJ. Behavioral management concepts with application for home parenteral nutrition patients. Drug Intell Clin Pharm 1982; 16: 581-6. [CrossRef]
9. Chen S, Xian W, Cheng S, et al. Risk of regurgitation and aspiration in patients infused with different volumes of enteral nutrition. Asia Pac J Clin Nutr 2015; 24: 212-8.
10. Montejo JC, Minambres E, Bordeje L, et al. Gastric residual volume during enteral nutrition in ICU patients: the REGANE study. Intensive Care Med 2010; 36:1386-93. [CrossRef]
11. Poulard F, Dimet J, Martin-Lefevre L, et al. Impact of not measuring residual gastric volume in mechanically ventilated patients receiving early enteral feeding: a prospective before-after study. JPEN J Parenter Enteral Nutr 2010; 34: 125-30. [CrossRef]

12. Bankhead R. ASPEN Recommendations for Enteral Nutrition: Practice Is the Result of Potential Benefits, Harms, Clinical Judgment, and Ethical Issues Response. Journal of Parenteral and Enteral Nutrition 2010; 34: 104. [CrossRef]
13. Edwards SJ, Metheny NA. Measurement of gastric residual volume: state of the science. Medsurg Nurs 2000; 9: 125-8.
14. Hasselmann M, Barnoud D, Bouteloup C, et al. Measurement of gastric residual volume at the onset of continuous enteral feeding. Nutrition Clinique Et Metabolisme 2009; 23: 85. [CrossRef]
15. Majid HA, Emery PW, Whelan K. Definitions, attitudes, and management practices in relation to diarrhea during enteral nutrition: a survey of patients, nurses, and dietitians. Nutr Clin Pract 2012; 27: 252-60. [CrossRef]
16. Majid HA, Cole J, Emery PW, et al. Additional oligofructose/inulin does not increase faecal bifidobacteria in critically ill patients receiving enteral nutrition: a randomised controlled trial. Clin Nutr 2014; 33: 966-72. [CrossRef]
17. Halmos EP, Muir JG, Barrett JS, et al. Diarrhoea during enteral nutrition is predicted by the poorly absorbed short-chain carbohydrate (FODMAP) content of the formula. Aliment Pharmacol Ther 2010; 32: 925-33. [CrossRef]
18. Luft VC, Beghetto MG, de Mello ED, et al. Role of enteral nutrition in the incidence of diarrhea among hospitalized adult patients. Nutrition 2008; 24: 528-35. [CrossRef]
19. Kuppinger DD, Rittler P, Hartl WH, et al. Use of gastric residual volume to guide enteral nutrition in critically ill patients: a brief systematic review of clinical studies. Nutrition 2013; 29: 1075-9. [CrossRef]
20. Metheny NA, Schallom ME, Edwards SJ. Effect of gastrointestinal motility and feeding tube site on aspiration risk in critically ill patients: a review. Heart Lung 2004; 33: 131-45. [CrossRef]
21. Szary NM, Arif M, Matteson ML, et al. Enteral Feeding Within Three Hours After Percutaneous Endoscopic Gastrostomy Placement A Meta-analysis. J Clin Gastroenterol 2011; 45: 34-8. [CrossRef]
22. Bechtold ML, Mir FA, Boumitri C, et al. Long-Term Nutrition: A Clinician's Guide to Successful Long-Term Enteral Access in Adults. Nutr Clin Pract 2016; 31: 737-47. [CrossRef]
23. Vyawahare MA, Shirodkar M, Gharat A, et al. A comparative observational study of early versus delayed feeding after percutaneous endoscopic gastrostomy. Indian J Gastroenterol 2013; 32: 366-8. [CrossRef]