J Crit Intensive Care 2021;12:53–59
https://doi.org/10.37678/dcybd.2021.2578

A Survey of Percutaneous Endoscopic Gastrostomy Procedures in The Intensive Care Units of Turkey

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Cite this article as: Acar Cinleti B, Saritas A, Yavuz T, Ozkarakas H, Senoglu N. A Survey of Percutaneous Endoscopic Gastrostomy Procedures in The Intensive Care Units of Turkey. J Crit Intensive Care 2021;12:53–59

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Received: Jan 10, 2021
Accepted: Feb 03, 2021
Available online: Mar 29, 2021

ABSTRACT

Objective: Percutaneous endoscopic gastrostomy (PEG) is one of the most frequent procedures performed in the intensive care unit. There is no national study in day about the practice patterns of clinicians so we aimed to evaluate the most common indications and complications associated with PEG feeding and to detect variability in pratices of sedation, antibiotic prophylaxis and nutritional support protocols.

Methods: A survey was sent randomly to clinicians working in national intensive care units in Turkey. The survey, which consisted of 23 questions, had 101 responders.

Results: The main indication for PEG was prolonged nasogastric tube feeding. The most frequent complication was periostomal leak. The PEG tubes were most frequently placed 4-6 weeks after ICU admission. The majority reinitiated enteral feeding 24 hours after the procedure and about half initiated parenteral nutrition support in the fasting period in order to avoid inadequate calorie intake. Regarding antibiotic use before PEG, 61,4% of clinicians claimed to use prophylactic antibiotics. When asked about pre-procedural antiplatelet drugs, 59% of clinicians reported to cessate acetylsalicylic acid.

Conclusion: Among intensive care units, there are differences regarding the placement of PEG tubes and there is no spesific algorythm about the procedure. More definitive recommendations about PEG procedure and periprocedural care are in need.

Keywords: Intensive care, gastrostomy, survey, critical care

Introduction

Percutaneous endoscopic gastrostomy (PEG) is one of the most frequent procedures performed in patients in the intensive care unit (ICU). PEG is an effective way of enteral feeding in patients with normal gastrointestinal tracts but inadequate oral intake (1). As the number of patients with neurological diseases with unsafe swallowing and palliative care patients have grown, PEG insertion has become more common in ICUs. However, there is no national study to date about intensivists practice in PEG tube feeding in ICU patients.

In our study, we aimed to evaluate the most common indications and complications associated with PEG feeding and to detect preferences in sedation, antibiotic prophylaxis, cessation of antithrombotic drugs and nutritional support protocols.

Materials and Methods

This survey study was approved by the institutional ethics committee of Tepecik Training and Research Hospital (03.05.2017, 4/19).

After obtaining the approval of the local ethics committee, our survey was sent randomly to clinicians working in national ICUs in Turkey. Questions were prepared by a web-based survey tool (www.surveymonkey.com). The link of the website was e-mailed or messaged to the mobile phones of the clinicians. Our survey consisted of 23 questions. The survey was sent to 260 physicians who work in ICUs and there were 101 respondents (38,8%). We asked questions varying from the type and degree of ICU, the number of PEG insertions undertaken to PEG aftercare and prophylactic antibiotic usage. Intensivists were given 4 weeks to answer the questions and the answers were retrieved from the website and statistically analyzed afterwards.

Survey answers were analyzed with SPSS version 22 software (SPSS, Inc., Chicago, IL, USA) with standard description charts. Descriptive statistics was used to analyze data for categorical variables, frequencies were described with percentages and shown in variable's frequency distribution table. The Pearson Chi-Square test was used to analyze if there was an association between categorical variables. A two sided p value < 0.05 was considered as significant.

Results

The characteristics of the hospitals in which the respondents work are demonstrated in Table 1. The majority practice in level 3 anaesthesiology and reanimation ICUs of training and research hospitals. The second most frequent work place is the general ICU. 1 respondent skipped this question. The majority of respondents were currently working in a level III ICU (89%). Only one respondent worked at level I ICU. The participants had a mean critical care bed capacity of 18. Table 1 also demonstrates the number of critically ill patients hospitalized in the ICU per year and the number of PEGs inserted in the past year. 99% stated that they had an informed consent signed prior to the procedure.

The majority of respondents considered this procedure between 4-6 weeks after ICU admission. Only 3% considered PEG in the first 2 weeks (Figure 1). There was no statistically significant difference between the ICU level at and the time of PEG placement (Table 2). The most common cause for PEG placement was prolonged tube feeding (74%), the most frequent complication was peristomal leakage (46.5%), as demonstrated in Table 3. One person indicated that the most common indication was impaired consciousness. Surgical placement was not an option for 48.5% of the respondents. 16.1% chose the surgical technique at the preference of the general surgeon. Of the 14.1% of respondents that selected the "other" option, 9.1% stated that the surgical method was chosen when the percutaneous method was contraindicated (anatomical issues, history of abdominal surgery) and 3% stated that the surgical technique was considered when the percutaneous technique was unsuccessful.

There was a wide variety of answers regarding the timing of re-initiation of enteral feeding after the procedure. Seven

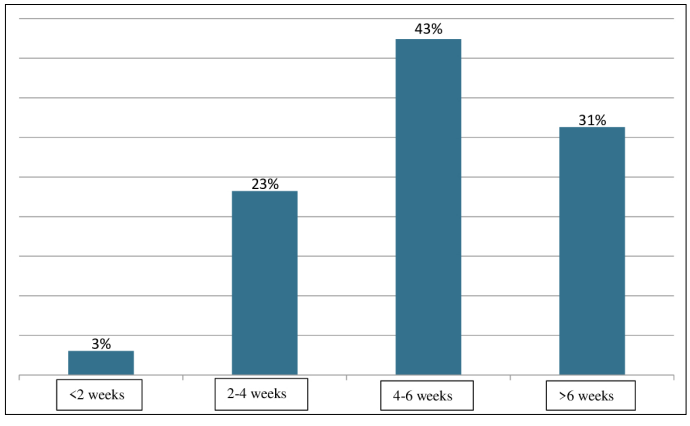

Figure 1. Timing of PEG placement.

Table 1. Hospital and Intensive Care Unit Characteristics

	n (%)
Type of hospital (101 responses)	
Private	10 (9,9%)
State hospital	15 (14,9%)
University	28 (27,7%)
Training and research hospital	48 (47,5%)
Type of ICUs (100 responses)	
Anesthesiology	52 (52%)
General	28 (28%)
Surgical	8 (8%)
Internal medicine	7 (7%)
Pulmonary	2 (2%)
Neurological	3 (3%)
Level of ICUs (101 responses)	
1	1 (1%)
2	10 (9,9%)
3	90 (89,1%)
Patients Admitted to the ICU in the past year (99 responses)	
≤300	17 (17.2%)
301-600	44 (44.4%)
601-999	23 (23.2%)
≥1000	15 (15.2%)

Table 2. ICU Levels and Timing of PEG Placement

	<2 weeks	2-4 weeks	4-6 weeks	> 6 weeks	p
Level 1	0	1	0	0	
Level 2	1	1	7	1	0,15
Level 3	2	21	36	30	

Table 3. Indications, Complications and Method of PEG Placement

	n (%)
Cause of PEG placement (100 responses)	
Prolonged tube feeding	74 (74)
Dysphagia secondary to neurological diseases	51 (51)
Esophageal diseases	3 (3)
Trauma	3 (3)
Other	1 (1)
Complications (99 responses)	
Peristomal leakage	46 (46,5)
Blockage of the PEG tube	24 (24,2)
Wound site infections	24 (24,2)
Bleeding	17 (17,2)
Peristomal infections	11 (11,1)
Tube dislodgement	9 (9,1)
Ulceration	2 (2)
Aspiration pneumonia	2 (2)
Buried bumper syndrome	1 (1)
Other complications	8 (8,1)
Surgical PEG Placement (99 responses)	
Insufficient experience in the percutaneous method	14 (14,1)
No gastroenterologist in the hospital	13 (13,1)
According to the preference of the surgeon	16 (16,2)
Surgical PEG placement is not an option	48 (48,5)
Other reasons	14 (14,1)

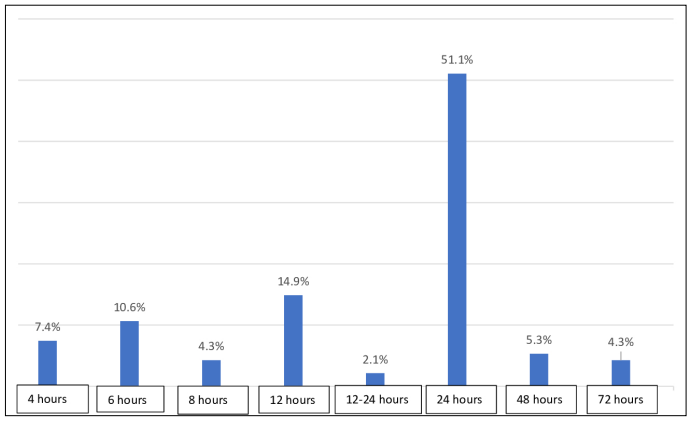

Figure 2. Time of initiation of feeding after PEG placement.

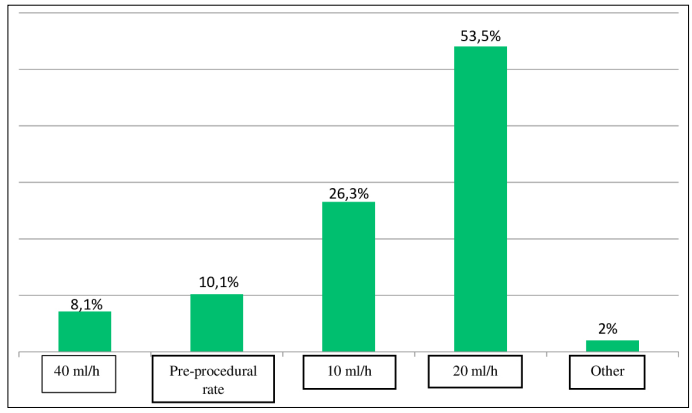

Figure 3. Initiation dose of feeding after PEG placement.

respondents skipped this question. Commonly, patients were fed 24 hours after the procedure (51.1%), whereas 4.3% waited for up to 72 hours to initiate feeding (Figure 2). 62.9% of the clinicians continued with the same enteral feeding product after the procedure. None of the respondents preferred hyperosmolar products, whereas 34% used iso-osmolar products and 3.1% used hypoosmolar products. 4 respondents skipped this question. 10.1% directly initiated feeding with the pre-procedural infusion rate. The most common rate of initiation preferred was 20 cc/h [54% (Figure 3)]. When asked about their approach to parenteral feeding in the periprocedural fasting period, 51% claimed to initiate parenteral nutrition. The most frequently preferred sedatives were midazolam, propofol, ketamine and thiopental (74%, 69%, 7% and 2%, respectively). The respondents were allowed to mark more than one choice. One respondent skipped this question and one used pethidine most commonly. The most commonly used intravenous analgesics were fentanyl, remifentanil, morphine and alfentanil (76.5%, 10.2%, 6.1%, 1%, respectively). Of the respondents, 4% did not prefer to use sedatives and 21.4% did not administer intravenous analgesics. 72.7% of participants claimed to use local anaesthetics. The rate of applying neuromuscular blocking agents during the procedure was 24.5%. The most frequently preferred neuromuscular blocking agents were rocuronium, vecuronium and atracurium (20.4%, 2%, 2%, respectively). 75,5% of the participants found it non obligatory to use neuromuscular blockers. For antibiotic prophylaxis, 16.8% initiated antibiotics if the patient had no antibiotics in their order, 44.6% continued with the antibiotic that had already been ordered for the patient and 38.6% did not use routine prophylaxis.

Regarding withdrawal of antiplatelet drugs before the procedure, 59% discontinued acetylsalicylic acid (ASA) and 89% discontinued P2Y12 inhibitors (clopidogrel, ticlopidine, prasugrel, ticagrelor).

Discussion

Intensive care training has gained great importance in recent years and the number of intensive care specialists, ICUS and ICU beds is gradually increasing day by day. Efficient nutritional support is the keystone for healing, preventing infections, improving the quality of life, decreasing length of stay and preventing malnutrition. Nowadays, more patients become chronic critically ill and have a prolonged length of ICU stay due to good patient care and better healthcare resources. Nutrition may be delivered in different ways. Currently, enteral feeding is the method of choice for the nutritional support of critically ill patients. PEG has become the method of choice for long term feeding. PEG is used in a wide range of general medical and surgical conditions.

PEG tube insertion is one of the most frequently performed invasive procedures in the ICU. The benefits and possible complications of the procedure should be described in detail to both the patient and the caregiver(s) (2). In our survey, 99% had an informed consent signed prior to the procedure. Obtaining informed consent with improved understanding from patients or their legal surrogate decision makers is essential in invasive procedures and the vast majority of the participants obtained an informed consent before PEG tube placement in our study.

Although PEG is one of the most frequent invasive procedures in ICU, there is no consensus on some details regarding the procedure. The timing for PEG tube insertion is still controversial in ICU patients. The ideal timing is not discussed in the most recent guidelines concerning clinical nutrition in intensive care patients (3). The timing of PEG tube insertion depends on the clinicians' decision, some clinicians may prefer early PEG tube insertion (≤7 days of admission), whereas others may prefer standard (8-14 days) or late (>14 days) insertion (4). According to ESPEN (European Society for Clinical Nutrition and Metabolism) guidelines, PEG should be considered if the patient's nutritional intake is likely to be inadequate and supplementary artificial enteral nutrition is necessary for a period exceeding 2–3 weeks (5). This guideline involves the general patient group and is not specific for critically ill patients. In our study, 97% of the respondents had a PEG inserted after 2 weeks, which is consistent with guideline recommendations and studies. Prolonged NG tube feeding due to dysphagia arising from neurological diseases is the most frequent reason for PEG insertion in our study and 43% waited 4-6 weeks, 31 % waited as long as over 6 weeks for this procedure. There was no significant difference regarding the timing of PEG placement within the ICU level. This might be due to the intensivists' expectation of the patient regaining swallowing function and the resolving of

dysphagia, underlying infections and sepsis, and giving priority to the acute critical condition.

The most frequent indication was prolonged NG tube feeding (74%), followed by dysphagia secondary to neurological diseases (51%). Respondents were allowed to mark more than one choice. Inadequate oral intake due to dysphagia or altered consciousness is the leading cause for PEG tube insertion. Neurological diseases causing bulbar dysfunction, especially with acute settings like cerebrovascular diseases may require PEG placement and neurological diseases constitute an important etiology of PEG placements (6). Also, traumatic brain injury (especially severe forms) may cause prolonged coma and may require PEG placement. According to a study by Rahnemai-Azar et al., the most common causes for PEG placement are conditions that cause altered mental status and eventually prolonged nasogastric tube feeding (2). In our survey, the most common indication for placement of the gastrostomy tube was prolonged nasogastric tube feeding and this is consistent with the finding of the study mentioned above.

Although it is considered a safe procedure, as in any invasive procedure, PEG tube insertion may have complications. Several studies have explored PEG-related complications. In a study conducted in our country, Turkey, by Gundogan et al., the most frequent complication during PEG insertion was bleeding in the insertion site (4%) (7). Inconsistent with this study, bleeding was the third most frequent complication (17,2%) in our study. This may be attributed to clinicians perceiving this question as bleeding both during the PEG placement and in the follow-up period. In a prospective study including 390 patients carried out by Zopf et al, the peristomal infection rate was 34% (8). In our study it was lower (11.1%) and peristomal infections were the second most common complication. In Blomberg et al's study, abdominal pain was the most common early complication (13%), followed by peristomal infection (11%) whereas peristomal leakage was the third most common complication (10%) (9). Differing from these studies, peristomal leakage was the most common complication in our study (46.5%). Of the respondents that chose the "other" option, 2% of the clinicians declared that inadvertent gastrostomy tube removal was the most common complication. In the ICU setting, delirium is extremely common and according to our opinion, delirium should be diagnosed and treated rigorously in order to prevent such a complication. According to a study conducted by Cyrany et al., the incidence of buried bumper syndrome (BBS) is around 1% (0.3%-2.4%) (10). In our study, only 1% of our respondents indicated buried bumper syndrome as the most common complication, which is compatible with the literature. BBS is considered to be a chronic complication, so respondents may have not encountered this complication if the PEG was newly inserted in the ICU. However, regardless of the PEG tube placement time, BBS prevention is possible with good care; by ensuring that the external bolster of the gastrostomy tube is left 1-2 cm from the abdominal wall. We believe that complications may be associated with the experience of the physician performing the procedure, the technique performed and patient-related factors. Interestingly, 7.1% of the respondents experienced no complications during the ICU stay. This may be because this procedure is performed during the most stable state of the patient and the patients are discharged to the ward or home a short time afterwards. In a study conducted by Shneider et al., 73% of the patients had not experienced any complications (11). If we had asked the question as the rate of complications, we might have received a different answer. This may be the other reason for the statement of no complications.

Surgical placement was not an option for 48.5% of the respondents. This may be attributed to the fact that the surgical technique is mostly considered when the percutaneous method is contraindicated or if the percutaneous attempt has been unsuccessful. Some institutions may not have a gastroenterology specialist or endoscopy unit, so every hospital plans the procedure considering the technical ability of the hospital and its staff.

In our study, 51.1 % delayed re-initiation of feeding until the following day (24 hours) of the procedure. A retrospective study of 444 patients by Cobell et al. demonstrated that there was no statistically significant difference in early (≤4 hours) feeding versus the delayed (>4 hours) feeding in terms of complications and mortality (12). In a study performed by Vyawahare et al., there was no statistically significant difference in the early feeding group (first 3 hours) and delayed feeding group (16-24 hours). In our study, 7.4% stated that they initiated feeding within the first 4 hours after PEG placement, which is consistent with the study that reported results that feeding as early as 4 hours is as safe as feeding the patient in the next day (13). In a study, there was no significant difference in duration of hospitalization and number of complications between initiation of feeding at 3 hour and 8 hour post-PEG placement (14). In our study, a total of 22.4% fed the patients in the first 8 hours. There is a great difference between critically ill patients in the ICU and patients in the general ward. Since PEG is usually a nonurgent procedure in the ICU, clinicians' fear about causing harm, given that this patient group may have many pre-existing comorbidities. Critically ill patients may have gastrointestinal dysmotility (vomiting, gastric retention, absent/abnormal bowel sounds, diarrhea, distension, ileus) and this is the major concern about post-procedural initiation of feeding (15). We believe the clinician's decision to delay feeding until the next day might be due to fear of peristomal leakage risk after feeding or the gastroenterologist's/operator's choice.

In our study, the majority of clinicians (62.9%) initiated post-procedural feeding with the previous enteral feeding product and 34.3% used iso-osmolar products. According to the ASPEN nutrition in adult critically ill patients guidelines, using a standard polymeric formula when initiating EN in the ICU setting is suggested (16). 51% of our respondents initiated parenteral nutrition in the periprocedural period, before transition to enteral nutrition. In the ASPEN guideline, supplemental parenteral nutrition is recommended to be considered after 7-10 days, if unable to meet >60% of energy targets. We believe the tendency to initiate parenteral nutrition may be associated with the time they choose to cessate feeding before the procedure, and the time of initiation of feeding after the procedure.

There are no guideline recommendations or clinical studies about the osmolarity of enteral feeding products to be used after the tube placement. We believe that intensivists might

have been cautious about hyperosmolar feeding due to gastrointestinal complications such as feeding intolerance, diarrhea, increased gastric residual volume, nausea and vomiting added to the complications of PEG. Since there is a short period between the cessation of feeding before the procedure and initiation of feeding after the procedure, it is not a surprise for the majority of the respondents to continue with the well tolerated, pre-procedural feeding product. There is no recommendation about the post-procedural feeding rate and the majority of our respondents initiated enteral feeding with a low dose (10-20 ml/hour). There is no data to suggest the amount of feeding after PEG, but the probable reason that intensivists initiate enteral nutrition at a low dose is that they are cautious about gastric intolerance and aspiration. We believe that it is very important to ensure that the calorie intake is sufficient and underfeeding is avoided in the pre- and post-procedural period.

PEG insertion is considered safe and well-tolerated in endoscopy units with sufficient equipment and staff qualified for intravenous sedation and analgesia. An Italian based survey conducted with 494 respondents revealed that the most employed sedation pattern for esophagogastroduodenoscopy was light sedation with benzodiazepines (50.8%) (17). Similar to this survey, midazolam was the most commonly chosen agent in our study. In a study conducted in Korea, with two groups; midazolam+propofol and propofol alone, revealed no difference in procedure time, recovery time and complications (18). The possible reason that propofol is the second most common intravenous anaesthetic choice may be the fear of hypotension and the absence of an antidote. In a study by Steed et al., patients who underwent unsedated PEG tube insertion with only pharyngeal and local anaesthesia were included and the patients who were able to respond stated that the procedure was not as unpleasant as they expected and if they had this procedure performed again, they would prefer the same method (19). In our study, 3% did not administer sedatives. This may be because ICU patients may have significant comorbidities and respiratory involvement and are at increased risk of morbidity and mortality during the procedure. In addition, intubated or tracheostomized patients without hemodynamic compromise ensure a safe airway and eliminate the risks of respiratory depression. Abdominal pain following PEG placement is a recognized complication. Even though many critically ill patients are unconscious and non-responsive, they still experience pain. In a study by Oppong et al., 70 patients were evaluated for post-procedural pain. Fentanyl was administered to 1%, midazolam and fentanyl were administered to 53%, whereas sedation with only propofol or midazolam was applied to 43%. Despite the administration of sedatives and/or analgesics, 82% reported pain in 24 hours (20). In our study, within the 78.6 % who used intravenous analgesics, fentanyl was the most commonly used. Remifentanil was the second most common preference. Even though remifentanil has a shorter half life, fentanyl might have been preferred due to cost-effectiveness, as remifentanil is much more expensive than fentanyl. In ESPEN guidelines, although there is no recommendation about systemic analgesics, adequate local anaesthetic administration is stressed (5). In our study, 73.5% of participants claimed to administer local anaesthetics. There are not many studies about the anaesthetic management of the procedure and there is no present study about the necessity of neuromuscular blocking agents during the procedure. In our study 76.3% found it unnecessary to use neuromuscular blocking agents during the procedure.

Bacteremia can occur after both endoscopic and surgical PEG insertion. ICU patients undergoing PEG tube placement are vulnerable to infections because of age, compromised nutritional intake, immunosuppression, and underlying medical conditions. A Cochrane database systematic review of randomized, controlled trials evaluating the use of prophylactic antibiotics including 1637 patients indicated a statistically significant reduction in the incidence of peristomal infection with administration of prophylactic antibiotics (21). In studies, the primary endpoint for antibiotic prophylaxis is peristomal infections. In a recent study with 106 patients, the occurrence of wound infection was 5% in the antibiotic group and 21% in the placebo group (22). In the American Society for gastrointestinal endoscopy guideline, antibiotic prophylaxis is recommended in all patients undergoing PEG tube placement (23). In our study, interestingly, only 61.4% of the respondents initiated or continued the readily prescribed antibiotics before the procedure, despite publications that recommending prophylactic antibiotic use. Despite the majority of studies recommending the use of prophylactic antibiotics to prevent wound infections in patients undergoing PEG, there are studies that recommend against the use of prophylactic antibiotics. In a randomised controlled trial with 91 patients conducted by Adachi et al., there were two groups of patients undergoing PEG, in one of the group received a prophylactic antibiotic, ampicillin (n=45, 49.5%) and the other group received a placebo (n=46, 50.5%) (24). There was no significant difference between the 2 groups in peristomal infection within 7 days and overall infection rate. In our study, in contrast with guideline recommendations, 38.6% did not use pre-procedural routine antibiotic prophylaxis. Patients in the ICU frequently have at least one antibiotic treatment. In our study, only %11.1 of the respondents stated that peristomal infections were the most common complication they experienced. This might be due to the antibiotic prophylaxis administered before the PEG tube insertion.

Percutaneous endoscopic gastrostomy is considered a high risk procedure in terms of potential hemorrhagic risk (25). Since a large number of ICU patients have a high risk for thrombosis, before interrupting antiplatelet agents, clinicians weigh the risk and benefits in each patient. In case of antithrombotic agents, the American Society for Gastrointestinal Endoscopy (ASGE) has suggested that low doses of ASA may be continued safely; P2Y12 inhibitors should be discontinued for at least 5 to 7 days (ticagrelor 3-5 days) before the procedure or switching to ASA monotherapy and continuing until the thienopyridine can be safely resumed (26). However, in our study, 59 % of the respondents discontinued aspirin, and 89 % of the respondents discontinued P2Y12 inhibitors. In a retrospective study including 1625 patients, ASA was cessated in 34%, whereas P2Y12 inhibitors were cessated in 74% of the patients. The discontinuation of antiplatelet agents is lower than our study (27). In addition, respondents were more cautious about P2Y12 inhibitors than they were to ASA. This finding is consistent with the well known fact that P2Y12 inhibitors cause a higher risk of bleeding than ASA.

Finally, the current study is the first survey study to date on PEG-related preferences of physicians working in the ICU in our country. It gives a general picture about the practice of clinicians working in different levels and types of ICUs and draws attention to the need for research about PEG in ICU patients. This study has several limitations. First, the response rate was low and this number can not be generalised to all ICU physicians. As in all survey studies, the answers may not be consistent with clinical practice.

Conclusion

PEG feeding is an effective way to deliver nutritional support to those who are unable to meet their nutritional needs orally. Improved nutritional status and survival have been demonstrated in selected subgroups of patients. The present study is the first survey about PEG tube insertion in ICU patients in Turkey. Further prospective studies focused on nutrition and PEG tube feeding in critically ill patients are essential to establishing clear guidelines regarding the optimal pre-procedural and post-procedural care. As evidence based medicine guided clinical practice reduces complications, standardises practice and improves the quality of healthcare.

AUTHOR CONTRIBUTIONS:

Concept: AS, BAC, NS; **Design:** BAC, HO, TY, AS; **Supervision:** AS, NS; **Data Collection and/or Processing:** AS, BAC, HO; **Analysis and/or Interpretation**: HO, BAC; **Literature Search:** TY, HO, BAC; **Writing Manuscript**: BAC, TY; **Critical Review:** AS, NS.

Ethics Committee Approval: This study has been approved by Health Sciences University İzmir Tepecik Training and Research Hospital intitutional review board. Ethics Committe approval number: 03.05.2017/19

Informed Consent: Informed consent was obtained from all participants.

Peer-review: Externally peer-reviewed.

Conflict of Interest: Authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

This study has been presented at the 53rd National Neurology Congress, Antalya, Turkey

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