

## Endoscopic approaches to enteral feeding and nutrition core curriculum

*This is one of a series of documents prepared by the American Society for Gastrointestinal Endoscopy (ASGE) Training Committee. This curriculum document contains recommendations for training, intended for use by endoscopy training directors, endoscopists involved in teaching endoscopy, and trainees in endoscopy. It was developed as an overview of techniques currently favored for the performance and training of endoscopy as it relates to enteral nutrition and to serve as a guide to published references, videotapes, and other resources available to the trainer. By providing information to endoscopy trainers about the common practices used by experts in performing the technical aspects of the procedure, the ASGE intends to improve the teaching and performance of endoscopy as it relates to enteral nutrition.*

### INTRODUCTION AND IMPORTANCE

Acquiring the skills to successfully place nasoenteric and percutaneous endoscopic enteral feeding tubes safely and effectively requires an understanding of the indications, risks, benefits, limitations of, and alternatives to, these procedures. As a prerequisite, competence in upper endoscopy is required, including visualization of the upper GI tract, minimizing patient discomfort, proper identification of normal and abnormal findings, and mastery of basic therapeutic techniques. The ASGE core curriculum document *Principles of Training in GI Endoscopy*<sup>1</sup> reviews requirements for endoscopic trainers and the training process itself. This document is recommended for all endoscopy trainers and trainees. Sections of the *Gastroenterology Core Curriculum*<sup>2</sup> (a combined effort of the ASGE, American College of Gastroenterology, and American Association for the Study of Liver Diseases) that review training in nutrition (pages 42-44) also are pertinent, because any decision to place enteral feeding access should be done in the setting of a full nutritional assessment and plan.

### GOALS OF TRAINING

#### The trainee and endoscopic experience

GI training programs should require trainees to have formal instruction in endoscopic placement of enteral nutrition access devices. Endoscopic access for enteral nutrition training should be incorporated into the standard 3-year gastroenterology fellowship program. The case volume necessary to demonstrate competence in enteral feeding tube placement will vary among trainees. We recommend, based on expert opinion, a minimum of 20 supervised endoscopic gastrostomy procedures before assessment of competency. There is increasing awareness that proficiency should be based on competency rather than absolute number of procedures performed, reflecting differences in individual learning curves; however, objective measures for assessment of competency in enteral feeding tube placement are yet to be defined and are currently based on expert opinion. Therefore, until objective measures are developed and validated, evaluation of competency will rely on subjective evaluation of direct observation by a qualified gastroenterologist. Competency should be demonstrated in both traditional two-provider and single-provider (where the percutaneous portion is assisted by a GI technician or nurse assistant rather than a second gastroenterologist) enteral feeding tube placement.

#### Faculty

Teaching faculty should not only be expert endoscopists who are committed to the entire training process (teaching and assessment) but are facile in the skills involved in instruction. The role of faculty in the training process of endoscopy is covered in depth in the document *Principles of Training in GI Endoscopy*<sup>1</sup> and is applicable to the endoscopic placement of devices for enteral nutrition as well. Program directors need to ensure that an adequate number of faculty who are qualified in the placement of enteral devices are available to ensure quality teaching and that some form of monitoring of faculty teaching occurs to ensure that the standards are maintained.

#### Facilities

Training programs must maintain an environment that is conducive to quality endoscopy education. This includes not only adequate procedural equipment, staffing, and compliance with work-hour guidelines but from a departmental and institutional standpoint as well. These issues

are addressed succinctly in the joint ASGE and American College of Gastroenterology document *Ensuring Competence in Endoscopy*<sup>3</sup> as well as the ACGME Program Requirements for Graduate Medical Education in Gastroenterology.<sup>4</sup>

## TRAINING PROCESS: ENDOSCOPIC PLACEMENT OF DEVICES FOR ENTERAL NUTRITION

### Overview

Trainees should have at least basic endoscopic skills (intubation of the upper esophageal sphincter, basic endoscopic tip control, use of buttons of the endoscope, passing devices down the working channel, etc) in diagnostic upper endoscopy before receiving training in enteral feeding tube placement. Trainees should have an appropriate balance of the technical aspects of enteral feeding tube placement as well as clinical patient care and didactics in nutrition during their training.

### Preprocedure assessment

**Ethics.** The ethics of enteral feeding remains a difficult issue, in part because the endoscopist not only performs the actual placement of the feeding device but also has to decide whether the individual patient will derive meaningful benefit from device placement for enteral nutrition. There is no evidence that tube feeding improves comfort, survival, or functional status or prevents aspiration in many patient groups, including those with dementia.<sup>5</sup> These complex issues should be introduced to the trainee during formal teaching sessions as well as during each consultation in which endoscopic enteral feeding access is considered. Assessing the expectations of patients, family, and other caregivers and weighing the risks, benefits, and alternatives of enteral feeding access is challenging, but it is the responsibility of the entire multidisciplinary care team, including the endoscopist.

**Indications, contraindications, and alternatives.** Trainees must understand indications and contraindications for all endoscopic techniques of enteral access. Many contraindications to percutaneous enteral gastrostomy (PEG) tube placement have been rendered relative, because careful patient selection and strict adherence to proper technique may allow successful PEG placement in some patients with ascites,<sup>6</sup> severe obesity,<sup>7</sup> or peritoneal metastasis, for example. Trainees must be aware of situations in which short-term nasoenteric feeding is preferable to more permanent access and conditions in which standard PEG placement will be unsuccessful or problematic, such as with gastric resection, GI outlet obstruction, gastric dysmotility, and severe reflux. Jejunal feeding access may be preferable in some of these patients. The trainee should understand that PEG feedings or PEG with jejunal extension tube feedings (see the following) do not reduce rates

of aspiration,<sup>5,8,9</sup> which is thought to be related to intragastric pressure.<sup>10</sup> The trainee should recognize when the patient would be better served by either a surgically or interventional radiology placed feeding tube such as in patients with severe obesity or multiple prior abdominal surgeries that may increase the risk of intestinal perforation.

**Preprocedure assessment.** The trainee needs to understand that special attention must be paid to issues of moderate sedation and airway assessment in these patients, many of whom have head and neck malignancies, stroke, altered mental status, or are elderly. ASGE clinical guidelines on *Training in Patient Monitoring and Sedation and Analgesia*<sup>11</sup> and *Modifications in Endoscopic Practice for the Elderly*<sup>12</sup> are important for trainees and trainers to review. As with all endoscopic procedures, a thorough understanding of the informed consent process, patient education, anticoagulation issues,<sup>13</sup> and antibiotic prophylaxis<sup>14</sup> is required of every endoscopy trainee. A thorough discussion of these issues is beyond the scope of this document and is covered in the respective ASGE guidelines referenced earlier.

## PROCEDURE CONSIDERATIONS AND TECHNIQUES

The ASGE Technology Committee *Technology Status Evaluation Report on Enteral Nutrition Access Devices*<sup>15</sup> describes in detail the techniques of performing the various procedures that follow and thus, will not be reiterated.

### Patient management and physician behavior during procedures

During endoscopic enteral access procedures, communication between the endoscopist and assistants is vital to ensure safety of the patient. It is important for the supervising endoscopist to recognize that this skill may be underdeveloped by the early trainee who is focused on the technical aspects of the procedure. As with any medical encounter, patient comfort, dignity, and privacy are of paramount importance and are skills best taught to the trainee by example and supplemented with constructive feedback.

### PEG

Trainees should be exposed to and aware of the variety of PEG tube sizes (12F-28F), numerous PEG manufacturers with varying kits, and the techniques used for PEG placement, including peroral “pull”<sup>16</sup> and “push”<sup>17</sup> methods (direct percutaneous technique<sup>18,19</sup> is another option less commonly used by gastroenterologists in the United States). Most manufacturers offer both push and pull kits, allowing for individual preferences, and there is little data to support use of one technique over another.<sup>20</sup> A step-by-step description of the various PEG techniques and available gastrostomy tubes is outlined in the ASGE Technology Review on enteral nutrition access devices.<sup>15</sup>

Whichever technique is used, the trainee must be made familiar with the contents of the particular kit, so that the procedure may proceed efficiently and safely. Trainers should emphasize the importance of a proper endoscopic examination prior to placement of the gastrostomy tube itself. This should include evaluation for gastric outlet obstruction, evidence of gastric dysmotility, postoperative anatomy, and gastric ulcer or malignancy, which may alter the decision to place the gastrostomy tube.

Techniques used to identify a safe percutaneous site for PEG placement also must be mastered by the trainee, with emphasis on the importance of one-to-one finger indentation and transillumination in assessing any potential site. The trainee should use the "safe tract" syringe aspiration technique during abdominal wall penetration. This involves applying continuous suction through a fluid-filled syringe attached to the angiocatheter or trocar as it passes through the abdominal wall. If bubbles are seen in the syringe prior to visualizing the trocar in the gastric lumen, the presence of bowel between the abdominal and gastric wall is assumed.

Once the PEG tube has been inserted via the chosen technique, the trainee should be educated specifically on noting the exact location of the external bolster on the PEG tube for ensuring correct positioning of the tube and for future reference. The trainee should be counseled on the pitfalls of improper placement of the external bolster, including buried bumper syndrome (discussed later) and bumper migration with resultant obstruction. Additionally, the trainee should be aware of the various replacement tubes available, including low profile or button tubes that are available in several diameters and lengths.<sup>15</sup>

Over the course of training, the trainee not only should master the endoscopic and percutaneous aspects of the procedure but also develop the ability to direct the procedure step-by-step. In training institutions, most PEGs are done by two physicians. The trainee should be aware that many endoscopists in community practice have adopted a method whereby the GI assistant performs the percutaneous portion of the PEG procedure, a practice supported by the Society for Gastrointestinal Nurses and Assistants.<sup>21</sup> If appropriate assistant expertise is available, the trainee may benefit from experience leading this so-called one-physician approach during the training period.

### PEG-jejunostomy

Jejunal feeding can be accomplished by placing a jejunal extension tube through a pre-existing PEG tube. This is referred to as a PEG-J.<sup>22</sup> PEG-J may be indicated for patients intolerant of gastric feedings or at higher risk for aspiration of gastric feedings, including those with gastroparesis, severe GERD, repeated aspiration in the past, gastric resection, or gastric outlet obstruction. The trainee should be aware that data regarding aspiration risk of gastric and jejunal feedings are conflicting. With this in mind, the trainee should understand that decisions to

place a PEG-J should be individualized. Although technical success rates are as high as 93%,<sup>23,24</sup> retrograde dislodgement of the jejunal extension has been reported to occur in as many as 33% of cases.<sup>24</sup> Endoscopic clip fixation of the distal portion of the tube to the jejunum may prevent dislodgement.<sup>23</sup> The trainee should be aware of this issue as well as the generally short functional duration of such tubes (approximately 55 days<sup>23</sup>) in consideration of performing PEG-J placement.

The trainer should alert the trainee to the wide variety of techniques available for PEG-J placement, including endoscopically grasping the jejunal tube and dragging it into the jejunum ("drag and pull" method), advancing the extension tube over an endoscopically placed guide-wire or stiffening catheter, or using an ultra-thin (5.3-mm) endoscope through the PEG for wire placement in the jejunum. Fluoroscopy may guide wire and tube placement. Endoscopic clips have varying success rates. Attention to the details of proper endoscope selection (pediatric colonoscope, enteroscope) and proper kit selection (9F vs 12F, built-in plug to occlude PEG lumen, etc) are important for trainees. These procedures can be technically challenging. Therefore, experience in therapeutic upper endoscopy and enteroscopy is helpful because control of endoscope movement while inside the mobile small bowel under suboptimal visual conditions frequently can be encountered during these procedures.

### Direct percutaneous endoscopic jejunostomy

Direct percutaneous endoscopic jejunostomy (DPEJ) is an alternative to PEG-J for jejunal feeding and may provide more stable jejunal access.<sup>25</sup> In general, DPEJ is becoming a more common procedure; however, this procedure still is performed much less commonly than is PEG. This method of long-term jejunal feeding tube placement is a modification of the basic PEG technique but is more technically difficult, given the mobile small bowel, and therefore should be reserved for trainees with sufficient enteroscopy and gastrostomy proficiency and may be more optimally suited for therapeutic endoscopy fellowships. Experience in placement of DPEJs is not currently a requirement for successful GI fellowship completion. The trainee should, however, be familiar with the increased risks associated with this procedure over PEG placement<sup>26</sup> (ie, bowel perforation, bleeding, jejunal volvulus, death) and the overall lower technical success rate, although high technical success rates have been reported with DPEJ performed with single-balloon enteroscopy.<sup>27</sup> The trainee should be aware that in contrast with PEGs, the success of DPEJ placement may be increased by altered surgical anatomy.<sup>24,26</sup> There are no current guidelines to recommend a minimum number of DPEJs to perform prior to achieving competence. However, the consensus of the ASGE Training Committee is that each program needs to determine this threshold number to provide adequate experience to fellows wishing to perform DPEJs on completion

of training, recognizing that some programs may not have available expertise or case volume for this procedure.

### Endoscopic placement of nasoenteric tubes

Nasoenteric tubes (NETs) are widely used for short-term nutritional support, considered to be  $\leq 4$  to 6 weeks. The placement of NETs may be performed unassisted at the bedside or with the use of endoscopy nasoenteric tubes (ENETs) or fluoroscopy. The trainee should be aware of these various options for placement. A wide variety of endoscopic methods has been developed, with no predominant single technique prevailing to date.<sup>28,29</sup> With respect to ENETs, the trainee should be aware of the challenges of retrograde movement of the feeding tube during endoscope withdrawal with the traditional drag and pull method and that, in general, accidental or purposeful dislodgement is common, particularly in the very young, elderly, or disoriented.<sup>30</sup> Attempts to prevent dislodgement include use of an endoscopically placed stiff guide-wire over which the NET will be advanced, securing the NET to the jejunal mucosa with an endoscopic clip, and bridling the NET at the nose.<sup>31</sup> The trainee should be aware that given the concern for retrograde dislodgement, postprocedure confirmation of placement by abdominal radiograph may be necessary. The trainee should be aware that similar risks of aspiration have been found with gastric and post-pyloric gastric feeding.<sup>32,33</sup>

### PEG removal and replacement

Prior to removal of any enteral nutrition device, the trainee must ensure that the indication for which the device was placed has resolved. Furthermore, the trainer must underscore the importance of knowing who initially placed the device (ie, surgery, interventional radiology, or gastroenterology) because there are differences in the internal bumper or securing devices (ie, sutures) among different methods. However, most currently available endoscopic PEG kits are designed for external traction removal; some are removed by simply deflating the internal balloon, and yet others with a fixed, rigid bumper require endoscopic removal. The trainee should be exposed to the amount of physical force (10-14 pounds of external pull pressure) necessary to remove a PEG tube with traction and also how to counsel the patient in anticipation of PEG removal. The trainee should be aware that PEG removal can be performed in an outpatient clinic visit, or, if sedation is necessary, in the endoscopy suite. The interval between PEG placement and safe traction removal has not been determined definitively by study, but many clinicians recommend at least 6 weeks from the date of PEG placement to allow for maturation of the gastrocutaneous fistula. The trainee should know to notify the patient that leakage from the gastrocutaneous fistula can be expected for up to 2 to 4 weeks, after which minimal to no gastric output should be seen through the fistula (persistent fistula may be present for PEG tubes in place for greater than 1 year).

PEG replacement is necessary in cases of unintentional PEG dislodgement or tube dysfunction and deterioration. When notified of an unintentional PEG dislodgement, the trainee must know to inquire about when the PEG was placed. If dislodgement occurs within 14 days of insertion, the track may not be mature and "blind" reinsertion of a tube via the fistula (without endoscopic or radiologic guidance) should not be attempted.<sup>34</sup> The trainee should be aware that the gastrocutaneous track is prone to closure within hours of dislodgement, even in the case of a mature fistulous track, and thus the trainee should be aware of efforts to maintain fistula patency (ie, place a Foley catheter, ask the patient to proceed immediately to the local emergency department) until PEG replacement can be performed. The trainee should be well-versed in the types of replacement tubes available at the institution and have an understanding of other options available. A complete and updated list of all types of enteral feeding devices, including replacement tubes, is contained within the ASGE Technology Committee Review on enteral nutrition devices.<sup>15</sup>

Techniques for tract measurement and safe placement must be carefully taught to the trainee. The need for verification of proper tube position by examination, aspiration of gastric contents, and possibly a radiographic contrast study prior to the initiation of feeding should be part of this training. The trainee should be taught about the possible adverse events of PEG replacement, including fistula disruption, misplacement of the tube into the peritoneal cavity, and hemorrhage.<sup>35</sup>

## POSTPROCEDURE CONSIDERATIONS

### Routine care and follow-up

Following endoscopic enteral feeding access procedures, communication of findings and planning for follow-up care is extremely important. The trainee should be taught by example to feel responsible for follow-up care in patients with PEGs as well as those patients with other types of endoscopic enteral access. Discussions with the patient and/or family and effective communication with the primary caretakers regarding tube care and maintenance is not only important for continuity, but also will likely result in fewer clogged or otherwise dysfunctional feeding tubes and may even limit postprocedure adverse events. The trainee also should coordinate who will be responsible for prescribing enteral formulations. The degree of nutrition training in GI fellowship program is thought to be inadequate, with  $>70\%$  of fellows never having written a prescription for enteral or parenteral nutrition.<sup>36,37</sup> Some manner of formal nutrition education should be part of GI fellowship (ie, didactic lectures, topic-specific conference, inpatient dietary service). Fellows also should be directed to more informal sources of nutrition education.<sup>38</sup> Additionally, the trainee should be

aware that initiation of enteral nutrition should be individualized; however, feeding via the PEG tube can be started safely within 3 to 4 hours of placement.<sup>39,40</sup>

### **Adverse events associated with PEG placement**

The trainee must be fully knowledgeable in the prevention, identification, and treatment of all adverse events related to insertion of PEGs and other enteral feeding devices. Didactic lectures and clinical conference discussions should include these topics in addition to the trainer specifically discussing these issues in the evaluation and management of the patient. Given the relative infrequent nature of adverse events, when they do arise, if feasible, the trainer should use the opportunity to demonstrate the findings and management to a number of trainees, not just the one immediately involved. Prevention of adverse events by proper patient selection, attention to optimal technique, and need for proper follow-up can be reinforced effectively at this time, when the reality of the adverse event is still fresh in trainees' minds.

**Unintentional or premature removal.** The trainee should be aware that PEG tubes inadvertently removed within the first 2 weeks after placement should not be replaced blindly, because the PEG track may not have matured adequately. In these instances, the PEG site should be allowed to heal for a few days, and a different site may be selected for a repeat attempt at placement. The trainee should be aware that such patients should be treated with antibiotics and monitored for signs of peritonitis that could require surgical intervention. Peritonitis is a severe adverse event that may occur in 0%-1.25% of PEG cases and carries a high mortality rate.<sup>34</sup> All trainees must realize that pneumoperitoneum may be present in up to 38% of patients after initial PEG placement and is not a useful diagnostic sign for peritonitis, or alone constitutes grounds for surgical exploration.<sup>41,42</sup>

The trainee should know to address the conditions that allowed accidental removal to occur in order to prevent recurrence. Trainees should be taught to consider the risk of accidental removal in all patients when communicating post-PEG placement orders to the primary team. Close follow-up of high-risk patients is essential to verify that preventative measures have been taken. Accidental removal of a longstanding PEG tubes is not a true emergency unless signs and symptoms of tract disruption and peritonitis occur, but trainees must be cognizant of the potential for rapid fistula closure, often occurring within 4 to 8 hours. Methods to prevent tract closure, including placement of a temporary, thin (Foley) tube or wire into the tract, and use of PEG-tract dilators to reconstitute the tract should be familiar to trainees, who may get the first call from family members, nursing homes, or emergency department staff. The trainee should be well-versed in the types of replacement tubes available at the institution and have an understanding of other options available. A complete and updated list of all types of enteral feeding devices, including

replacement tubes, is contained within the ASGE Technology Committee Review on enteral nutrition devices.<sup>15</sup>

**Peristomal infection.** The trainee should be knowledgeable in the detection of wound infections related to enteral access procedures. Although most infections are minor and respond well to antibiotics, severe soft tissue infections such as necrotizing fasciitis are possible and require rapid recognition and surgical debridement. The trainee must be aware of risk factors for site infection such as obesity, diabetes, steroid treatment, malnutrition, or procedure-related factors such as inadequate length of skin incision, excessive traction on the tube in follow-up care, or failure to use antibiotic prophylaxis.<sup>43</sup>

**Buried bumper syndrome.** Buried bumper syndrome occurs when the internal bumper erodes and migrates into and through the gastric wall and occurs as a consequence of tight apposition of the external bolster of the PEG tube against the abdominal wall. The trainee should recognize the signs of this adverse event as abdominal pain with feeding, signs of resistance to flow, bleeding, peritubular leakage, abscess, or other soft-tissue infection. Trainees should be taught to examine PEG sites closely for a palpable internal bumper beneath the skin, site tenderness or fluctuance, and they should specifically test for fixation of the internal bumper by attempting to slide the PEG in and out of the tract. The diagnosis is confirmed by endoscopy. Trainees should be aware of several existing methods for the management of buried bumper syndrome, including simple external traction removal, the push-pull technique whereby a snare is used to retract the buried bumper into the stomach, and a one-step PEG replacement with bumper removal by using a new pull PEG kit.<sup>44,45</sup>

Trainees should be aware that prevention of buried bumper requires good care and patient instruction. The external bolster should be left 1 to 2 cm from the abdominal wall to prevent excessive tension on the internal bumper. In addition, during routine daily care, the gastrostomy tube should be advanced forward into the wound slightly and rotated to ensure that the bumper does not become buried in the gastric mucosa. The tube should then be pulled back gently such that the external bolster is replaced to its original position (the distance measurement on the tubing should be the same as before).

**Colocutaneous and gastrocolic fistula.** Colocutaneous and gastrocolic fistulas are rare adverse events of PEG placement that result from bowel interposition between the gastric wall and anterior abdominal wall such that the PEG tube is placed directly through the bowel into the stomach. The trainee should understand that these adverse events may be prevented in most cases by avoiding PEG placement where finger pressure and translumination are suboptimal. Use of the "safe tract" technique described previously and exercising caution when attempting PEG placement in patients with prior abdominal surgery also are important. Trainees need to understand the natural history and presentation of these iatrogenic fistulas (many are

asymptomatic), which may present acutely or after several months when PEG tube replacement is required. When the replacement gastrostomy tube is passed through the fistula blindly, it enters the colon rather than tracking to the stomach. Initiation of tube feeds results in diarrhea from colon tube feedings and dehydration. The trainee should be taught that management involves removal of the PEG tube, allowing the fistula to close, and that surgery may be necessary to correct the internal gastrocolic fistula.

**Hemorrhage.** Hemorrhage and/or ulceration may occur as an adverse event of PEG placement in up to 2.5% of patients. Hemorrhage at the time of PEG placement may be the result of direct puncture of a vessel in the gastric wall or from traumatic erosion and often can be treated with manual pressure. Delayed bleeding may be due to ulceration of the internal bumper into the gastric wall because of excessive tension or ulceration of the opposite gastric wall from chronic irritation from the internal bumper or balloon. Treatment may include standard endoscopic treatment of ulcer base stigmata and PEG removal or repositioning. The trainee should be knowledgeable on the assessment and management of bleeding with respect to enteral access placement. Trainees should be counseled on ensuring optimal coagulation parameters prior to the procedure, including addressing anticoagulant medications.

**Peristomal leakage.** Leakage around the PEG site is a relatively common problem within the first few days after placement. The trainee must develop the ability to differentiate insignificant PEG leakage from pus reflecting an underlying abscess, feeding solution spillage due to buried bumper syndrome, stool from a gastrocolic fistula, or excessive gastric fluid or feedings related to gastric outlet obstruction or severe dysmotility. A careful examination of the PEG site is always warranted, and frequently upper endoscopy is helpful to confirm buried bumper syndrome, gastric outlet obstruction, gastric ulceration, or other pathology. The trainee should be aware that treatment may include management of comorbidities, loosening of the external bolster, and local measures aimed at preventing skin breakdown. Additionally, the trainee should be taught that placement of a large PEG tube will not solve the problem and may serve to distend the tract further. The trainee must realize that there are instances in persistent peristomal leakage that the PEG tube will need to be fully removed and a new PEG tube placed at a different site.

**Clogged tubes.** Tube dysfunction because of clogging is one of the most common problems with PEG tubes. Smaller caliber tubes such as NG tubes are more likely to become clogged. Trainees who are often the first call to respond to such problems should be aware of methods to unclog PEGs and instructions to prevent recurrent clogging. Trainees should be taught that the first step in attempting to unclog the tube should be flushing the tube with a 60-mL syringe with warm water. Pancreatic enzymes dissolved in a bicarbonate solution and left to remain in

the tube for a few minutes followed by flushing with water may be effective.<sup>46</sup> Additional methods include using a cytology brush or specialized gastrostomy brush to unclog the tube. The trainee should be instructed never to place resins (ie, cholestyramine), bulking agents (ie, psyllium) or meat tenderizer in the PEG tube. Successful unclogging should be followed promptly by additional teaching to caregivers about proper tube maintenance including routinely flushing 20 mL of water after administration of all medications or tube feeds. Additionally all medications should be delivered in a liquid formulation or dissolved in water or an appropriate liquid.

**PEG tract tumor seeding.** Patients who have oropharyngeal or esophageal cancers that undergo PEG placement are at risk of seeding the PEG tract with tumor when the tubing is pulled through the tract.<sup>47</sup> Trainees should be aware that these risks may be substantial with pull PEGs and that alternative means of gastrostomy placement may need to be considered with the referring provider.<sup>48</sup>

### Adverse events associated with PEG-J, NETs, and DPEJ

The trainee should be aware of the common and uncommon adverse events associated with these additional enteral access procedures. The most frequent adverse events of PEG-J relates to retrograde migration of the tube. The importance of verifying jejunal position before relying on PEG-J or nasojejunal tubes to provide jejunal feedings cannot be overemphasized. Other adverse events include tube obstruction, diarrhea from enteral tube feeds, small bowel intussusception, and perforation. The trainee should recognize that DPEJ procedures have higher rates of adverse events (approximately 4.2% by the largest series) that include bleeding, perforation, peritonitis, cellulitis, or inadvertent organ puncture and are generally similar in etiology and presentation to the analogous PEG adverse event.<sup>26</sup> Given the higher rate of adverse events, trainees should remain vigilant in the evaluation of patients who recently underwent placement of an enteral access device.

## ASSESSMENT OF TRAINING

Formal evaluations of each trainee's endoscopic skills should be obtained, as outlined by the ACGME core competencies. Using these ACGME core competencies as an objective guideline for verbal and written feedback will allow each training program an established method of documentation and credentialing. Trainees must receive appropriate and timely feedback throughout the training experience, including formative and summative evaluations in all areas being evaluated, including patient care, medical knowledge, interpersonal and communication skills, professionalism, practice-based learning, and improvement and system-based practice.

## Patient care

Trainees must be able to provide patient care that is appropriate, effective, and compassionate. This includes taking a history and performing a comprehensive and accurate physical examination to ensure proper patient selection for enteral access placement. The ability to formulate a plan for management and follow-up is critical. Trainees should be able to present the results of each consultation orally and in writing and to defend any recommendations. Expertise in providing informed consent for enteral feeding tube placement is essential.

## Medical knowledge

Trainees must demonstrate a core fund of knowledge in the indications, contraindications, and alternatives to enteral feeding tube placement. Trainees must be able to demonstrate an analytic approach and use appropriate investigations, including the practice of evidence-based medicine to support their decision making with regard to enteral feeding.

## Interpersonal and communication skills

Trainees must be able to demonstrate interpersonal and communication skills that result in effective information exchange with their patients, families, and other health care professionals. This would include, but is not limited to, verbal and written communication as a consultant. Effective communication skills in reviewing the risks, benefits, and alternatives of the various enteral feeding options with patients and their families are essential for the informed consent process. Endoscopic reports should be accurate and timely, describing in detail how the procedure was performed. Trainees must be able to work effectively as members and leaders of the health care team.

## Professionalism

Trainees must understand and be committed to all elements of professionalism, including respect, compassion, and integrity toward patients and their families and toward other health care professionals. Trainees must demonstrate ethical behavior, responsiveness, and sensitivity to a diverse sex, ethnic, socioeconomic, and an aging patient population.

## Practice-based learning and improvement

Trainees must be able to investigate, evaluate, and improve their patient care practices by analyzing and assimilating both scientific evidence as well as their own previous endoscopic experience into their practices. They should be able to critically appraise clinical studies relevant to enteral feeding and be able to use information technology to support their own education. They must be involved in teaching and be able to facilitate the learning of other students and health care professionals in enteral feeding tube placement.

## System-based practice

Trainees must demonstrate an understanding of, awareness of, and responsiveness to the larger context and system of health care delivery. Trainees should practice cost-effective health care when using these invasive techniques, without compromising the quality of care for their patients. Trainees should be able to advocate for timely, quality patient care and know how to partner with other health care providers such as nutritionists, social workers, primary care providers, nurse educators, and others involved in ensuring adequate long-term care of a patient with a newly placed enteral feeding device.

## DISCLOSURES

*The following author disclosed a financial relationship relevant to this publication: Dr Al-Haddad, consultant and advisory role, Boston Scientific. All other authors disclosed no financial relationships relevant to this publication.*

*Abbreviations: DPEJ, direct percutaneous endoscopic jejunostomy; ENET, endoscopy nasoenteric tube; NET, nasoenteric tube; PEG, percutaneous enteral gastrostomy; PEG-J, percutaneous enteral gastrostomy-jejunostomy.*

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