

# Percutaneous endoscopic gastrostomy

## Clinical care of PEG tubes in older adults

Vivienne Roche, MD

Percutaneous endoscopic gastrostomy (PEG) tube feeding is recommended by the American Gastroenterological Association as the preferred device to provide long-term enteral nutrition when oral intake is inadequate. Although PEG placement is a relatively common procedure—more than 200,000 are placed annually—it often presents a clinical dilemma for healthcare workers. This pragmatic discussion focuses on the comprehensive clinical care of PEG tubes from the initial discussion with the patient and the caregiver to place the tube to long-term management issues.

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*If man be sensible and one fine morning, while he is lying in his bed, counts at the tips of his fingers how many things in this life truly will give him enjoyment, invariably he will find food is the first one.*

—Lin Yutang

Percutaneous endoscopic gastrostomy (PEG) has become the most common method of providing enteral nutrition. These tubes allow for the continued feeding of individuals with mouth, jaw, throat, esophageal, stomach, liver, kidney, and pancreatic disorders or neurologic disease that cause the loss of appetite or prevent normal eating,

swallowing, or digestion.

First introduced in 1980 to provide enteral nutrition in children and young adults, PEG placement rates have skyrocketed and now are primarily placed in older patients with chronic or degenerative diseases. More than 216,000 tubes were placed in 2000,<sup>1</sup> up from 15,000 tubes in 1989 with as many as 10% of institutionalized older patients being tube-fed.<sup>2</sup>

The advantages of PEG tubes over other types of long-term enteral and parenteral nutrition include their availability, accessibility, and acceptability. Compared with parenteral nutrition, PEG tubes are inexpensive; they utilize a functioning gut; and they are less likely to become infected than intravenous access. PEG placement may be performed by a radiologist, a gastroenterologist, or a surgeon. It requires only local anesthetic, takes a relatively short time to perform (between 10 and 30 minutes), is covered by Medicare (estimated cost \$3,000), and can be performed at the bedside or in

the endoscopy suite; feeding can begin within hours of the procedure. Practical aspects of PEG tubes that will be considered in this review include indications, decision-making process, complications, and management of these devices.

### Indications

The American Gastroenterological Association (AGA) endorses PEG tube placement for prolonged tube feeding (specifically more than 30 days), and nasogastric feeding when enteral feeding is required for shorter periods. The AGA guidelines<sup>3</sup> allow for PEG tube use when:

- the patient cannot or will not eat
- the gut is functional
- the patient can tolerate the placement of the device.

In practice, PEG tubes are placed for a variety of different clinical conditions, including dysphagia, prolonged illness, anorexia, neurologic/psychiatric disorders, oropharyngeal or esophageal disorders or cancers, or increased nutritional needs that the patient is unable to meet with oral intake. Studies show that neurologic illnesses (eg, dysphagia following stroke, dementia), cancer (obstruction secondary to tumor, post-radiation, post-chemotherapy, or post-resection), and the prevention of aspiration account for the majority of placements.<sup>4-6</sup>

However, the evidence base for PEG tube use is conflicting, particularly in geriatric patients. Two randomized

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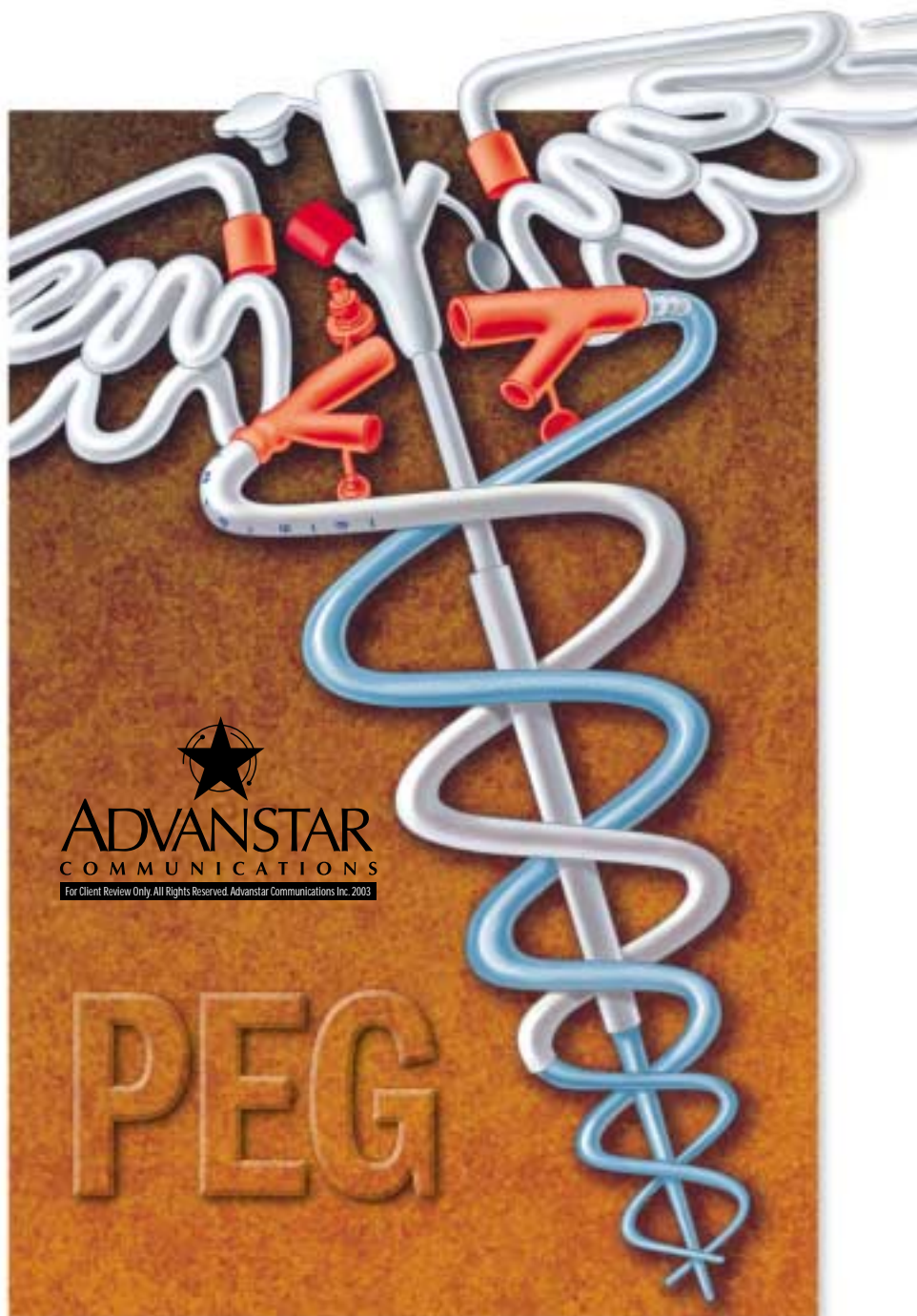
studies of stroke patients with dysphagia (total n=36 patients) who received PEG tube feeds showed improvement in albumin and weight gain at 6 weeks followup.<sup>7,8</sup> More recently, Callahan's prospective observational study of 150 patients age 60 and older who received PEG tubes found no improvement in functional status, nutritional status, or subjective health status at 1-year follow-up; mortality was 50%.<sup>9</sup>

There are no randomized studies on patients with head and neck cancer who received PEG tubes or prospective studies on this subgroup evaluating functional status. In our institution, patients with localized head and neck cancer did well with PEG tubes compared with patients with metastatic head and neck cancer (submitted for publication). A recent review reports no improvement in aspiration pneumonia, mortality, pressure sores, function, or palliation in PEG-fed patients with advanced cognitive impairment.<sup>10</sup>

Prevalence rates of PEG tube placement vary among patients with the same clinical diagnosis (eg, advanced dementia). Non-clinical variables such as geographic location (state-by-state variation, with placement rates lowest in Maine compared with eight other states), access (urban compared with rural location of nursing homes), and race (higher placement rates in non-whites) significantly impact placement rates.<sup>11,12</sup> There are no data examining financial considerations, caregiver convenience, or potential staffing ratio reductions.

### Deciding to place a PEG tube

The challenge in deciding whether to place the tube is not whether the patient can undergo this relatively straightforward procedure, but rather the long-term consequences and implications for the individual. Before recommending PEG tube placement, determine if the patient fits into a subgroup of PEG tube patients with known outcome data, the natural course of the underlying illness



The American Gastroenterological Association endorses percutaneous endoscopic gastrostomy for tube feedings longer than 30 days. In 2000, more than 216,000 tubes were placed, with as many as 10% of institutionalized older adults being tube-fed in the United States.

Illustration for Geriatrics by Jeff Suntala; product supplied by Ross Products Division, Abbott Laboratories.

(progressive/reversible), comorbidities, quality of life, and the patient's overall life expectancy. In other words, consider a PEG tube as you would any intervention with risks and benefits.

Numerous ethical and clinical issues surround PEG tube placement. Studies documenting treatment burden such as aspiration pneumonia after placement, need for physical restraints,

tube dysfunction with prolonged use, the need for some physician intervention every 30 days, and other alternatives, such as hand-feeding and palliative care, are increasingly recognized as considerable counterarguments to the opinion that PEG tubes are benign because they are easily inserted and have low rates of peri-procedure complications. There is no evidence that

**Table 1** Complications associated with PEG tube use

Local	Gastrointestinal	Other
Infection	Diarrhea	Restraints
Bleeding	Vomiting	Pressure sores
Leakage	Constipation	Electrolyte disturbance
Abscess/peritonitis		Aspiration

PEG: percutaneous endoscopic gastrostomy

Source: Prepared for Geriatrics by Vivienne Roche, MD.

supports PEG tube placement in patients with progressive and irreversible illness.

The decision to place a PEG tube should include four considerations:

1. **Oral intake.** Is there documentation that the patient's intake is inadequate—less than 50%? Has weight loss of more than 10% over 6 months been confirmed by chart review? How many calories/day does the patient actually consume? Has the reason for the patient's inadequate oral intake been evaluated? Have reversible causes been treated (eg, depression)? Has the patient had a reasonable trial of supervised feeding? If indicated, have supplements been added to the patient's daily intake and are they administered between meals? How many calories/day does the patient actually consume?

2. **The patient's value system.** Be sure to consider what role food plays within the patient's value system. In most cultures, food plays a vital, unique, pervasive, and fundamental role and symbolizes cultural beliefs and customs. Its impact crosses many boundaries:

- **Social aspects:** It is an integral part of festivities and family/friend gatherings (eg, Thanksgiving, "soul food")

- **Financial/status aspects:** Plenty of food is associated with wealth and privilege; lack of food is associated with illness, death, poverty, and famine or war

- **Religious aspects:** Food plays a prominent role in many religions (eg, Christians believe in the "Bread of Life," Jews celebrate Seder, and Muslims observe Ramadan).

3. **Clinical presentation.** Studies show

that patients do not uniformly benefit from PEG tubes:

- Patients with dysphagia and head and neck cancer patients who have PEG tubes placed show improved albumin and weight gain short-term<sup>6,7</sup>

- Patients with both a history of aspiration and a urinary tract infection had a 48.4% probability of dying 1-week post-procedure<sup>4</sup>

- PEG tube placement does not prevent aspiration; up to 1 in 6 tube-fed patients (16.7%) continue to aspirate after tube placement<sup>9,13</sup>

Food plays a unique, pervasive, and fundamental role, symbolizing cultural beliefs and customs

- PEG tubes in patients with advanced dementia do not prevent aspiration pneumonia, prolong survival, reduce the risk of infection or pressure sores, or improve function.<sup>10,14</sup>

4. **Informed consent.** If the patient is unable to consent, it is important to determine whether the patient previously expressed an opinion about tube feeding. When seeking the family's consent, start by discussing the patient's overall prognosis; an open and forthright discussion often helps family members deal with the moral issues that can surround the decision to place

a tube. Identify why the PEG tube is being placed and the perceived versus the likely outcomes after placement. Some families have unrealistic expectations; they may hope the PEG will reverse an underlying progressive illness, such as dementia, or enable a bed-bound patient to become independent.

- Discuss alternatives such as carefully monitored hand-feeding, but note that there is no difference in survival for PEG tubes versus hand-feeding for demented and nondemented patients.<sup>14</sup>

- Discuss the potential need for restraints. Many families are unaware that patients with PEG tubes may require restraints; 33% of a select cohort of nursing home residents stated that they would prefer tube feeds if they were unable to eat, but 25% then declined when they were informed that restraints are sometimes applied during the feeding process.<sup>15</sup> Peck et al have shown that nursing home residents with PEG tubes are more likely to be restrained than residents without PEG tubes; 71% of persons with advanced dementia are physically restrained.<sup>16</sup>

Contraindications to tube placement include ascites, peritonitis, distal GI obstruction, morbid obesity, and severe reflux disease.

### Complications

The procedure is well tolerated and tubes are successfully positioned 94% of the time.<sup>5</sup> Rates of complications from PEG tube placement vary from 24 to 70%.<sup>5,16</sup> The variance may be explained by differences in what is defined as a complication. Common complications (table 1) can occur soon after placement or at any time. They can be divided into local, GI, or other complications.

**Local complications.** These include redness, bleeding, infection, leakage around the site, and occlusion. Evaluate redness for skin infection, irritation from gastric contents, or excessive tube movement. Whereas leakage rates of 13 to 20% appear in the literature,<sup>10</sup> in my clinical experience, most PEG tubes

do not leak. If the patient has minor gastric content leakage (<5 mL) that is irritating the skin, reduce the irritation with liquid antacids, such as Maalox, applied around the stoma twice a day.

We replace tubes only when they develop problems, such as frequent leakage. Some patients have no problems for years and others need tube replacement every 6 months. Advise pa-

## During feeds, the patient should be sitting up or lying down with the head raised 30 to 45 degrees

tients that weight change (+/- 10 lbs) can alter the tension on the bumper (causing leakage), and the bumper or tube may need adjustment. Occlusion is usually prevented by regular flushing after medications or feeds.

**Gastrointestinal complications.** These include diarrhea, nausea, vomiting, and constipation. Diarrhea, which can affect up to 68% of patients, may be profuse. When a patient develops diarrhea, look for and treat common etiologies. Begin by checking what has changed since the diarrhea started (ie, infusion rate, a change in formula, or a new medication). If the infusion rate has recently increased, the diarrhea may respond to slower continuous feeds that can then be advanced as tolerated.

If bacterial contamination is suspected, review how the feeds are administered. If large amounts of formula are allowed to stand in the feeding bag for more than 12 hours, bacterial contamination is more likely to occur. As always, careful handwashing prevents or minimizes contamination. Feeding bags and tubing should be changed daily. Opened formulas should be refrigerated and warmed to room tem-

perature prior to administration. Hyperosmolar formulas, such as 2CAL, may cause diarrhea that resolves by changing the formula to a lower osmolality formula.

Examine the patient for impaction. Review the medication list for recent additions that may contain sorbitol/magnesium. If antibiotics are being administered, the patient may have acquired *clostridium difficile*, diagnosed by stool culture and toxin assay. If lactose intolerance is suspected, switch to a lactose-free formula, such as Ensure, Gevity, Osmolyte, Promote, or 2CAL. Consider sending a fecal fat test for malabsorption if diarrhea continues.

**Other complications.** These include restraint use, pressure sores, electrolyte disturbance, and aspiration.

Two potentially serious complications of PEG placement, although rare, deserve mention: necrotizing fasciitis and colcutaneous fistulas. Patients present with acute abdominal symptoms and require immediate intervention.

### PEG tube management

Substantial mortality rates, up to 63% at 1 year from the largest cohort of more than 80,000 patients,<sup>4</sup> and persistent poor nutrition after placement (Callahan found 70% had poor nutrition 1 year after PEG placement<sup>9</sup>) pose a serious challenge to the continuing rise in PEG tube placement rates. Although physicians often request an initial nutrition consult before PEG placement, subsequent unsupervised tube feeds may cause serious electrolyte disturbance and malnutrition. It is a reasonable assumption that untreated malnutrition may partially explain some of the substantial mortality rates. Any decision to initiate tube feeds necessitates plans to monitor long-term nutritional status similar to close monitoring of blood pressures after initiating antihypertensive medications and supervising glucose control after initiating diabetic management.

**Initial management.** PEG tubes come in different sizes, ranging from 14# to 30# French, are made of silicone, latex,

or urethane, and are radio-opaque. Large bore tubes (20# and larger) are less likely to occlude. Urinary catheters have been used as PEG tubes but were not designed for this purpose. PEGs have bumpers or balloons to secure placement and come with or without an external skin disk. They can protrude from the stoma by several centimeters, and low-profile devices are now available, such as buttons, which are flush with the skin. These low-profile devices may be appealing cosmetically, but older patients with impaired manual dexterity and/or vision impairment often find them too difficult to connect and disconnect with each feed.

PEGs can be used as soon as bowel sounds return; outpatients can begin PEG tube feeds 6 hours after placement. Many patients who begin tube feeds are already malnourished. Full strength isotonic formulas should be started at low volumes initially (eg, 25 mL/hr via a gravity drip). There is no evidence that half strength feeds are better tolerated. Advance the rate as tolerated (eg, increase the volume by 20 mL every 4 hours until target rates are met). During feeds, the patient should be sitting up or lying down with the head raised 30 to 45 degrees and residuals should be checked four times a day. Residuals less than 200 mL

## Patients require 25 to 30 kcal/kg/d and 30 cc free water/kg/d

are acceptable and tube feeds can be advanced. Stop checking residuals 48 hours after tube feeds have reached target volumes unless there is a change in clinical status (eg, the patient develops nausea or vomiting). Patients should be monitored closely initially as electrolytes, such as potassium, magnesium, calcium, and phosphate, often become depleted with refeeding.

*continued*

## Table 2 Daily PEG tube requirements

- Caloric and/or protein replacement (25 kcal/kg; 1 gm protein/kg)
- Water replacement (free water 30 cc/kg or 1 cc/kcal)

PEG: percutaneous endoscopic gastrostomy

Source: Prepared for Geriatrics by Vivienne Roche, MD.

## Table 3 Suggested steps for long-term PEG tube monitoring

1. Measure weight and assess weight change
2. 24-hour PEG tube regimen: check caloric and free water content
3. Review PEG tube
  - a. Check PEG tube site
  - b. Check what is being administered
  - c. Check content, rate, duration of feeds, flushes
4. Check albumin, electrolytes, BUN, and creatinine

PEG: percutaneous endoscopic gastrostomy

BUN: blood urea nitrogen

Source: Prepared for Geriatrics by Vivienne Roche, MD.

Patients' daily requirements are listed in table 2 and are met using tube feed formulas that vary in fat, protein, and carbohydrate content. Different categories of formulas are available to meet specific needs (eg, lactose-free, intact protein, fiber-containing, high-nutrient density, and disease-specific varieties). When fluid restriction is needed, formulas containing more than 1 kcal/cc have an advantage as the equivalent number of calories can be administered in smaller volumes. Healthcare workers need to familiarize themselves with one brand within each class, based on availability and cost.

Patients require 25 to 30 kcal/kg/d and 30 cc free water/kg/d. Most formulas contain 1 kcal/cc and are usually packaged in 240 cc cans. A reasonable daily regimen for a 50 kg woman with no increased caloric/water requirements would be 6 cans (240 cc/can) per day, based on daily caloric needs of 1,500 kcal/d. This patient requires 1,500 cc water/d. One common error is to give this amount of water in addition to the 6 cans/d. The patient already receives 1,200 cc water/d as tube formulas are approximately 80% water. She only needs an additional 300 cc water/d. Tube

patency is maintained by flushing the tube with water (30 cc) before and after feeds/medications. Any remaining water deficit may be given as divided boluses between feeds. Hypo- or hypernatremia may be avoided by checking the 24-hour water allowance.

Discuss with caregivers and families what can be administered via the tube. Medications, tube feed formula preparations, and free water can be given via the tube. Check with the pharmacist as some medications need to be converted to liquid preparations. Some medications, particularly long-acting preparations, become ineffective when crushed. Inform the caregiver that sweetened drinks, such as cranberry juice, may clog the tube, probably due to increased sediment formation or increased viscosity, and should be avoided. Caregivers should also be advised to avoid the practice of blending entire meals (Thanksgiving, for example) and administering them via the PEG tube.

**Continuous, intermittent, or nighttime feeds.** The woman described above can receive her daily allowance via continuous gravity feeding, or once target volumes have been reached, she may prefer three feeds/d (two cans per feed,

also known as intermittent/bolus feeding). Normally it takes 30 minutes to deliver one can of supplement using a gravity-drip device. Patients who find continuous or intermittent feeds restrictive may prefer nighttime feeds. For these patients, pumps may be helpful so that large volumes can be administered in the minimum amount of time, up to 1,500 mL can be given over a 12-hour period.

**Long-term management.** Without surveillance, PEG tubes have the potential to cause harm, and patients who cannot be monitored regularly are not good PEG tube candidates. Table 3 gives recommendations for monitoring patients until long-term guidelines are established. After refeeding, check electrolytes daily until they have stabilized, and then establish routine monitoring. At each patient encounter, document the patient's weight, note any weight change, review how feeds are delivered, check the amount of supplements given per 24-hour period, estimate the total free water content/24 hours, and check the albumin, electrolytes, and the tube site. Although nutritional markers such as retinol-binding protein, fibronectin, and Somatomedin C and TNF show promise, they are confined to experimental settings. After the device has been placed and electrolytes are stable with refeeding, we recommend assessing the patient at 6 weeks and then every 4 weeks. When the patient is stable on 2 consecutive visits, extend the visits to between 3- and 4-month intervals.

Patients often continue partial oral intake in addition to PEG tube regimens and the dietitian can augment the current oral intake with PEG tube feeds to meet daily nutrition requirements. Cohort studies report 20% of PEG tubes are removed because of adequate oral intake recovery.<sup>9,16</sup> Oral intake can resume as soon as the tube has been removed. In our institution, we recommend no carbonated beverages until the stoma has healed. The stoma starts to close within hours after PEG tube removal and should be com-

plete within 2 days. Rarely the stoma does not close due to granulation tissue, and a suture or silver nitrate may be required.

### Conclusion

As the rates of PEG tube placement increase, continuing education for health-care workers should not be limited to the procedure itself. We can enhance patient care by providing education that enables healthcare providers to 1) recognize cohorts of patients who benefit from the procedure, 2) become familiar with alternative feeding techniques (eg, hand-feeding), 3) correctly manage these devices initially and long-term, and 4) understand the long-term implications of tube feeding for the individual. ☐

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