A Survey of Percutaneous Endoscopic Gastrostomy in 202 Japanese Medical Institutions

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Abstract

Background Percutaneous endoscopic gastrostomy (PEG) is widely used for enteral nutrition of patients unable to take food by mouth. In this study, we surveyed usefulness of PEG and determined the approximate rates of complications associated with PEG replacement in Japan.

Methods Questionnaires were sent to 760 hospitals; 202 hospitals returned their questionnaires (27% response rate).

Results 5,291 patients underwent PEG in 2004 among these Japanese hospitals. PEG was mainly performed in general hospitals by physicians and surgeons. Most patients were elderly (mean age: 79.8 ± 33.4 SD years old) with cerebral infarction/hemorrhage and dementia and required nutritional support. Major complications such as death and peritonitis were experienced by 24.7% of hospitals. Approximately 25% of hospitals experienced more than one erroneous insertion of the tube into the extra-gastrointestinal tract. Hospitals that experienced erroneous insertions had higher 30-day mortality rates, whether or not mortality was associated with PEG placement. On the other hand, the erroneous insertion rates as well as 30-day mortality were inversely associated with number of PEG procedures performed during year 2004 at each hospital.

Conclusion These surveillance data imply that a lower patient volume treated with PEG at an institute may be associated with negative outcomes, although a longitudinal study is necessary to confirm this conclusion.

Keywords Quality of life, Enteral nutrition, Patient care, Morbidity and mortality, Home care

Introduction

For patients with a functioning gastrointestinal tract but the inability to take food by mouth, early enteral nutrition reduces morbidity and mortality of several conditions compared with total parenteral nutrition.1–5 Nasogastric tubes are simple enough to insert but are often intolerable for the patients. Moreover, these tubes are difficult to maintain in position and are associated with a significant risk of aspiration.5 Nasojejunal tubes are more tolerable to patients, but they are easily blocked and also difficult keep in position.7 Therefore, gastrostomy or occasionally jejunostomy may be used for patients who cannot take food orally. Although gastrostomy or jejunostomy may be easily performed with open surgery under general anesthesia, the risks of surgery may outweigh the benefits, because most patients with indications for gastrostomy are older, malnourished, and have other morbidities.8

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Percutaneous endoscopic gastrostomy (PEG) as well as percutaneous endoscopic jejunostomy/percutaneous endoscopic duodenostomy are fast, safe, and effective methods for long-term enteral tube feeding as long as no contraindications to enteral feeding exist. Moreover, there may be less reflux and food aspiration with these methods. Therefore, PEG is now the preferred treatment for patients with dysphagia, and its use has been growing in the United States and the United Kingdom.

Although the primary indication for PEG is the inability to take food by mouth, indications vary widely depending on the physician’s policy. Although PEG insertion and tube exchanges are not complicated, they can lead to serious and potentially lethal complications. However, such negative findings seem to be outweighed by the positive results at least in Japan. We surveyed PEG usage in Japan by sending questionnaires to 760 medical institutions and received answers from 202 (27% response rate). The results are summarized in this paper.

Methods

Surveillance
We selected the 760 hospitals where one or more doctors are involved in performing PEG for patients and participate in the PEG doctor’s network in Japan (http://www.peg.ne.jp/news/index.html). We sent questionnaires to these 760 hospitals and received answers to the questionnaires from 202 (27% response rate). A copy of the 83 questions on the questionnaire appears in Appendix I.

Statistical analysis
Factors associated with erroneous insertion of the tube into the extra-gastrointestinal tract were evaluated using either Chi-square test or Student’s t-test. Kruskal-Wallis equality of populations rank tests adjusted for trend tests, as described by Cuzick, were used to determine associations among three and more groups. All statistical analyses were performed using STATA 8.0 (STATA Corporation, College Station, TX).

Results

Characteristics of responding medical institutions
A total of 194 medical facilities performed PEG procedures on 5,291 patients in 2004. A mean of 27.3 ± 26.2 SD PEG procedures (range, 0 to 160) were performed at each of these medical institutions: 10th percentile = 4 patients, 25th percentile = 8 patients, 50th percentile = 20 patients, 75th percentile = 38 patients, and 90th percentile = 58 patients (Fig. 1A). The types of institutions that responded to the questionnaires were general hospitals (73.7%) followed by community hospitals (8.6%), clinic without beds (7.1%), special functioning hospitals (5.6%) and clinic with beds (5.1%). The total number of PEG procedures performed in 2004 was equivalent among general hospitals, special functioning hospitals, and community hospitals, but the number in community...
hospitals was greater than in clinic with beds (Fig. 1B). Hospitals with more than 100 beds were most common in this survey: more than 200 beds: 40.7%; 100–200 beds: 25.6%; 20–99 beds: 22.1%; less than 19 beds: 5.0%; no beds: 6.5%. The number of PEG procedures per institution increased depending on the number of beds (Fig. 1C). The number of hospitals adopting PEG has grown steadily: PEG started more than 10 years ago: 19.8%; 5–10 years ago: 41.7%; 2–5 years ago: 22.9%; 1–2 years ago: 15.6%. In particular, medical institutes that began performing PEG procedures more than 5 years ago treated more patients than hospitals that began performing these procedures less than 5 years ago (Fig. 1D). PEG was typically performed in the endoscopy room (71.9%) and also in the operation room (12.4%) as well as in clinical wards (3.8%), either with conscious sedation (55.8%) or local anesthesia of the pharynx (21.6%), with (52.4%) or without (47.6%) the use of an anticholinergic agent, and using the pull method (69.7%). However, in some medical institutions, the procedure varied.

Approximately 25% of medical institutions performed a throat culture before the procedure. However, most institutions (91.9%) ignored the possible existence of pathogenic microorganisms in patients’ throats and inserted the tube via the oral route. Bumper (75.1%) and balloon (17.6%) procedures were most common during the initial tube insertion, although neither way was fixed in other hospitals. Of the type of catheter to fix to the skin at initial construction, the tube type was preferred (66.8%) followed by the button type (18.7%). Whether or not the gastric wall was fixed to the abdominal wall varied by institution. Most institutions did not use fluoroscopy to

**Methods of performing PEG and status of team support**

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confirm the status of the PEG tube (80.3%). During the exchange of the catheter, bumper (49.8%) and tube methods (26.3%) were most common. The duration between the initial tube insertion and the first exchange of the tube was significantly shorter with the balloon procedure (mean 2.22 ± 1.84 SD months) than with the bumper procedure (mean 5.23 ± 2.22 SD months) (Student’s t-test: \( P < 0.0001 \)). Approximately 25% of institutions performed the first tube exchange under endoscopy, whereas more than 50% performed it manually. Institutes varied in the method in which they confirmed the status of the PEG tube at the first exchange, although an endoscopic procedure was used most frequently: endoscope: 32.5%; fluoroscopy: 19.5%; injecting air through PEG: 6.5%; checking influx of gastric acid: 20.0%. However, at the second exchange, fluoroscopy was used by most institutions (73.2%) to confirm the status of the PEG tube, whereas injecting air through PEG was the next (14.9%) and endoscopy was applied least (11.9%). Most second exchanges took place a mean of 5.23 ± 2.22 SD months after the first exchange. Approximately one-third of patients exchanged the PEG tube at home.

A preoperative conference for all patients who needed PEG was held by 16.5% of medical facilities. More than half (67.8%) of medical institutes had no nutrition support team, whereas more than half (53.1%) had a clinical path designed for patients who were undergoing PEG.

Feasibility of performing PEG and frequency of erroneous insertion of the tube into the extra-gastrointestinal tract

Nearly half of the medical institutes (47%) had some patients in whom it was not feasible to insert the PEG tube. When the analysis was restricted to hospitals that had at least one patient in whom PEG tube insertion was not feasible, the natural logarithm of unfeasible PEG patients divided by the number of PEG procedures performed at each hospital in 2004 decreased by an increment of the number of
PEG procedures performed at each hospital in 2004 (Kruskal-Wallis: \( P < 0.0001 \); trend test: \( P < 0.01 \)) (Fig. 2A). Similarly, when the number of beds or the number of doctors at each institute increased, the ratio of unfeasible PEG procedures tended to decrease (Fig. 2B and Fig. 2C).

During tube exchange, 23.8% of hospitals experienced erroneous insertion of the tube into the extra-gastrointestinal tract. The number of erroneous insertions ranged from one to five. When the analysis was restricted to hospitals that experienced at least one erroneous insertion, the natural logarithm of the number of erroneous insertions of PEG tubes divided by the number of PEG procedures performed at each hospital in 2004 decreased by an increment of the number of PEG procedures performed at each hospital in 2004 (Kruskal-Wallis: \( P < 0.0001 \); trend test: \( P < 0.01 \)) (Fig. 3A). Similarly, when the number of beds or number of doctors at each institute increased, the ratio of erroneous PEG insertions tended to decrease (Fig. 3B and Fig. 3C).

Factors associated with erroneous insertion of tubes into the extra-gastrointestinal tract are shown in Table 1. Institutes with no experience with erroneous insertions tended to use balloon and button procedures rather than bumper and tube procedures at exchange. When the PEG was exchanged under endoscopy, the risk of erroneous insertion decreased. Changing the tube at home did not significantly increase the risk of an erroneous insertion.

\[ \text{Incidence of major and minor complications} \]

Death as an adverse event was experienced by 40.7% of the institutes after adopting PEG; the number of deaths ranged from 0 to 19 with a mean of 0.94 ± 1.78 SD per hospital. Two institutes indicated that death was caused by the PEG procedure in 3 patients. The percentage of patients who died within 1 month and 6 months was 5.0% and 12.6%, respectively, although survival data for 20.1% of patients were not disclosed. Institutes that experienced erroneously inserted tubes into the extra-gastrointestinal tract also tended to have significantly higher risks of death within 1 month, whether or not it was due to a complication that occurred during the
Table 1  Factors associated with erroneous insertion of the tube into the extra-gastrointestinal tract

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>No experience of error n = 47 (%)</th>
<th>More than one experience of error n = 155 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which method do you use for stomach internal fixation at exchange?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balloon</td>
<td>43 (28)</td>
<td>10 (15)</td>
<td>0.037</td>
</tr>
<tr>
<td>Bumper</td>
<td>78 (51)</td>
<td>12 (47)</td>
<td></td>
</tr>
<tr>
<td>Balloon or bumper</td>
<td>33 (21)</td>
<td>24 (38)</td>
<td></td>
</tr>
<tr>
<td>Which method do you use for outside the body shape at exchange?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Button</td>
<td>78 (51)</td>
<td>14 (30)</td>
<td>0.006</td>
</tr>
<tr>
<td>Tube</td>
<td>35 (23)</td>
<td>9 (19)</td>
<td></td>
</tr>
<tr>
<td>Button or tube</td>
<td>41 (27)</td>
<td>24 (51)</td>
<td></td>
</tr>
</tbody>
</table>

Please select the method used at the first exchange

<table>
<thead>
<tr>
<th>Method</th>
<th>No experience of error n = 47 (%)</th>
<th>More than one experience of error n = 155 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange under endoscopic observation</td>
<td>44 (29)</td>
<td>7 (15)</td>
<td>0.045</td>
</tr>
<tr>
<td>Manual exchange</td>
<td>89 (58)</td>
<td>28 (60)</td>
<td></td>
</tr>
<tr>
<td>Either way</td>
<td>20 (13)</td>
<td>12 (26)</td>
<td></td>
</tr>
</tbody>
</table>

What kind of confirmation method did you use at the first exchange?

<table>
<thead>
<tr>
<th>Method</th>
<th>No experience of error n = 47 (%)</th>
<th>More than one experience of error n = 155 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoscope</td>
<td>52 (34)</td>
<td>13 (28)</td>
<td>NS</td>
</tr>
<tr>
<td>Fluoroscopy</td>
<td>28 (18)</td>
<td>11 (23)</td>
<td></td>
</tr>
<tr>
<td>Injecting air through PEG</td>
<td>11 (7)</td>
<td>2 (4)</td>
<td></td>
</tr>
<tr>
<td>Check influx of gastric acid</td>
<td>30 (20)</td>
<td>10 (21)</td>
<td></td>
</tr>
<tr>
<td>Varied by situation</td>
<td>32 (21)</td>
<td>11 (23)</td>
<td></td>
</tr>
</tbody>
</table>

Were patients allowed to change the PEG tube at home?

<table>
<thead>
<tr>
<th>Allowance</th>
<th>No experience of error n = 47 (%)</th>
<th>More than one experience of error n = 155 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>49 (32)</td>
<td>21 (46)</td>
<td>NS</td>
</tr>
<tr>
<td>No</td>
<td>106 (68)</td>
<td>25 (54)</td>
<td></td>
</tr>
</tbody>
</table>

*: Calculated by chi-square test. When the P-value was less than 0.05, the difference was considered statistically significant.

Table 2  Outcomes associated with erroneous insertion of the tube into the extra-gastrointestinal tract

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Total n=202 (%)</th>
<th>No experience of error n = 155 (%)</th>
<th>More than one experience of error n = 47 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you experience any deaths within 1 month after PEG insertion?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>77 (38)</td>
<td>50 (34)</td>
<td>27 (63)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>125 (62)</td>
<td>96 (66)</td>
<td>16 (37)</td>
<td>0.001***</td>
</tr>
<tr>
<td>How many in 2004? (Mean ± SD)</td>
<td>0.94 ± 1.78</td>
<td>0.83 ± 1.86</td>
<td>1.33 ± 1.43</td>
<td>NS**</td>
</tr>
</tbody>
</table>

Did you experience any deaths during tube exchange?

<table>
<thead>
<tr>
<th>Exchange</th>
<th>No experience of error n = 155 (%)</th>
<th>More than one experience of error n = 47 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2 (1)</td>
<td>1 (1)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>202 (99)</td>
<td>154 (99)</td>
<td></td>
</tr>
<tr>
<td>How many in 2004? (Mean ± SD)</td>
<td>0.015 ± 0.157</td>
<td>0.01 ± 0.16</td>
<td>0.02 ± 0.15</td>
</tr>
</tbody>
</table>

Did you experience major complications after PEG insertion?

<table>
<thead>
<tr>
<th>Complication</th>
<th>No experience of error n = 155 (%)</th>
<th>More than one experience of error n = 47 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>46 (25)</td>
<td>32 (23)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>140 (75)</td>
<td>110 (77)</td>
<td></td>
</tr>
</tbody>
</table>

Did you experience any deaths related to a major complication within 1 month after PEG insertion?

<table>
<thead>
<tr>
<th>Complication</th>
<th>No experience of error n = 155 (%)</th>
<th>More than one experience of error n = 47 (%)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>17 (9)</td>
<td>8 (6)</td>
<td>0.003***</td>
</tr>
<tr>
<td>No</td>
<td>173 (91)</td>
<td>137 (94)</td>
<td></td>
</tr>
<tr>
<td>How many in 2004? (Mean ± SD)</td>
<td>0.13 ± 0.45</td>
<td>0.08 ± 0.36</td>
<td>0.28 ± 0.63</td>
</tr>
</tbody>
</table>

*: Calculated by chi-square test; **: Calculated by Student’s t test
The 30-day mortality rate in each institute was inversely associated with the number of PEG procedures performed at each hospital in 2004 (Fig. 4).

Major complications such as death and peritonitis associated with the procedures of PEG insertion or replacement were experienced by 24.7% of hospitals during 2004. Minor complications, including wound infection (25.5%) and diarrhea (20.6%), occurred more frequently than pneumonia (12.3%), vomiting (9.9%), dermatitis (9.0%), granulation (7.0%), constipation (4.5%), and others among all patients treated with PEG in year 2004. The infection rate (number of infections/number of PEG procedures) was not associated with the usage patterns of antibiotics or the type of device used (data not shown).

After discharge from the medical institution where PEG was performed.

After discharge from the medical institute where PEG was performed, only 14.3% of patients went home. Most patients were transferred to other hospitals.

**Issue of insurance**

When asked “In your institute, are costs for gastric catheter exchange covered under special insurance medical care material costs?” 12.6% answered “yes”. When asked “In medical facilities using diagnosis related grouping and institutions using insurance for the elderly, the costs associated with gastric catheter exchange cannot be separately claimed under insurance as a special healthcare material cost. Do you think that it should be paid separately as a special healthcare material cost?” most hospitals (96.9%) answered “yes”. To the question “Do you file an insurance claim when you use enteral nutrition via PEG?” 82.5% answered “yes” and 3.2% answered “yes, but we are limited in the maximum charge for the claim”. To the question “Excluding ‘Elental’, ‘Elental P’, ‘Enterude’, ‘Twinfine’ and other medical nutrients of half digested state, do you think set dietary food for enteral nutrition should be a fee-for-service?” 79.1% of hospitals answered “yes”.

**Opinions of doctors who perform PEG**

When asked “Do you think that PEG is the best way to provide nutritional support?” 33.3% answered “yes, it is the best way”, 57.6% answered “yes, it is a good way”, and the remainder answered “No, it is not the best way”. When asked “PEG enables patients to be themselves, that is experience a ‘recovery of everydayness’, and allows care to be provided at home. Do you agree with this opinion?” 95% of doctors agreed.

**Discussion**

We selected 760 hospitals where one or more doctors are involved in performing PEG for patients and participate in the PEG doctor’s network in Japan. We sent questionnaires to these 760 hospitals and received answers to the questionnaires from 202 (27% response rate). In these 202 institutions, totally 5,291 patients underwent PEG in 2004. Data indicate that PEG was mainly performed in general hospitals by physicians and surgeons on older patients with cerebral infarction/hemorrhage and dementia. Procedures were performed primarily in the endoscopy room under conscious sedation or anesthesia of the pharynx. These trends were similar to those in other countries.22,23

The pull and push method were preferred in 70% and 9% of surveyed institutions, respectively, which may reflect the evidence that percutaneous placement of a pull-type gastrostomy tube was performed with a minimum risk of tract disruption and peritonitis.24–27 In contrast, one study showed that serious complications leading to laparotomy, wound infection, or intraperitoneal abscess developed in 17 patients (13%), in all of whom the introducer (ie, push) technique...
had been used. Bumper and tube methods were preferred for the initial PEG tube insertion. In contrast, bumper and button methods were preferred for the first manual exchange of the PEG tube. Endoscopy and fluoroscopy were used most frequently at the first and second tube exchange, respectively, to confirm the status of the tube placement. However, one study showed that repeated endoscopy might not be routinely required to assess the proper positioning of the internal bumper.

Nearly half of medical institutes had patients who were not good candidates for PEG. Similarly, approximately 25% of institutes reported experiencing erroneous insertion of the tube into the extra-gastrointestinal tract, which can trigger lethal peritonitis. These ratios of unfeasible cases and erroneous insertions as well as 30-day mortality decreased as the annual number of PEG procedures, the number of beds, and the number of physicians who performed the surgery per institution increased, which is a novel and interesting finding. Similarly, neonatal mortality and outcomes of coronary angioplasty are affected by patient volume.

In addition, institutes with no experience of erroneous insertions tended to use balloon and button methods rather than bumper and tube methods during tube exchange. When the PEG was exchanged under endoscopy, the risk of erroneous insertion decreased. However, of interest, changing devices at home did not significantly increase the risk of erroneous insertions. One-third of patients performed PEG tube exchanges at home.

PEG procedure-related mortality and morbidity are reported to be 1%–2% and 3%–12%, respectively. In this survey, two institutions reported three deaths related to the PEG procedure; however, this number may be biased by under-reporting and cannot be directly compared with previous reports. In this survey, 5% of patients died within 1 month; however, survival status was unknown for 20.1% of patients. Thus, the 30-day mortality in this study cannot be compared with that in other reports. Researchers in England reported that 30-day mortality for PEG was 22% during 2002 as opposed 10% 10 years earlier. They speculate that this increase in mortality may be due to a trend towards less strict patient selection in the later years.

Major complications were experienced by 24.7% of hospitals. Minor complications, including wound infection, diarrhea, pneumonia, and others, were experienced in more than half of institutions. Infection rates were not associated with antibiotics usage patterns or type of devices used (data not shown), although antibiotic prophylaxis has been demonstrated to reduce the risk of peristomal wound infection associated with PEG insertion.

In conclusion, PEG procedures are widely used in Japan. Lower rates of unfeasible cases and erroneous insertion as well as 30-day mortality were associated with a higher number of PEG procedures performed at each hospital. These results suggest that a lower patient volume treated with PEG at an institute may be associated with negative outcomes, although a longitudinal study is necessary to confirm these findings.

References

Appendix I

The questionnaire

Q1 Which clinical department performs PEG in your hospital? (Select as many responses as apply)
1. Surgery, 2. Department of Internal Medicine, 3. Department of Endoscopy, 4. Other

Q2 How many years has your institute been performing PEG?
1. 1–2 years, 2. 2–5 years, 3. 5–10 years, 4. more than 10 years

Q3 Which department performs PEG most frequently in your institute?
1. Department of Gastroenterology, 2. Department of Endoscopy, 3. Department of Internal Medicine, 4. Other

Q4 How many times did you perform PEG between January and December in 2004?

Q5 Please divide the number that you provided in Q4 into men and women?

Q6 How many patients underwent PEG in your institute in 2004 by each age group?
1. <10 years, 2. 10–20 years, 3. 20–30 years, 4. 30–40 years, 5. 40–50 years, 6. 50–60 years, 7. 60–70 years, 8. 70–80 years, 9. 80–90 years, 10. 90–100 years, 11. 100–years

Q7 Why did you perform PEG?
1. Nutritional support, 2. Decompression, 3. Other

Q8 Please indicate the primary disease of the patient who underwent PEG.

Q9 What kind of disabilities did the patient have? (Select all responses that apply)
1. Dysphagia due to cerebrovascular or other neural disease, 2. Repeated aspiration pneumonia, 3. Reduced oral intake, 4. Crohn’s disease in which perioral intake of food could worsen inflammation in the gastrointestinal tract, 5. Disease or injury that oral intake impossible, 6. Inability to keep nasogastric tube in place (patient pulled it out), 7. Discomfort due to insertion of a nasogastric tube for long periods, 8. Other

Q10 Was there a case in which it was not feasible to perform PEG? If yes, in how many cases did this occur?
Q11 Did you perform PEG after gastrectomy? If yes, how many?

Q12 Do you perform percutaneous transesophageal gastrotubing (PTEG)?

Q13 When did you perform PTEG?
   1. When PEG could not be performed, 2. We perform PTEG even if PEG is available, 3. We do not perform PTEG

Q14 Do you have a preoperative meeting for risk evaluation/nutritional status evaluation/review of future condition of the patient who will undergo PEG?
   1. For all cases, 2. On a case-by-case basis, 3. No

Q15 Does the NST (Nutrition Support Team) coordinate with doctors who perform PEG insertion?

Q16 Do you use a clinical pass?

Q17 Who is responsible for obtaining informed consent? (Select as many responses as apply)
   1. Chief physician, 2. PEG performer, 3. Other (please specify)

Q18 What do you tell the patient and a family during informed consent? (Select as many responses as apply)
   1. Importance of nutrition support therapy, 2. Benefit compared with peroral intake, 3. Reduction in nursing care,
   4. Improve QOL of the patient, 5. Method of PEG construction, 6. Kind of a catheter and timing of exchange,
   7. Kit/nutrient preparation, 8. Ways of managing the patient, 9. Medical insurance or cost, 10. Other

Q19 In addition to Q18, what else do you go over when you obtain informed consent?

Q20 Where do you perform PEG?
   1. Operating room, 2. Endoscopy room, 3. Ward, 4. Other

Q21 What kind of anesthesia do you usually use while performing PEG?

Q22 Do you use an anti-cholinergic agent as pre-medication before PEG?

Q23 Which methods do you use during the first PEG construction?
   1. Pull method, 2. Push method, 3. Introducer method, 4. Pull method or Introducer method,
   5. Push method or Introducer method

Q24 Do you perform a preoperative throat culture?

Q25 When pathogenic microorganisms such as methicillin-resistant Staphylococcus aureus or Pseudomonas spp. are detected on preoperative throat culture, do you eradicate the organism from the throat?
   1. We perform PEG after confirming that the pathogenic microorganism was eradicated,
   2. We perform PEG combined with eradication treatment without confirming that the pathogenic microorganism was eradicated,
   3. We perform PEG without eradication treatment as a general rule

Q26 When pathogenic microorganisms such as methicillin-resistant Staphylococcus aureus or Pseudomonas spp. are detected on preoperative throat culture, which method or kit do you use?
   1. Introducer method, 2. Special device to prevent wound infection, 3. Ordinal method

Q27 When pathogenic microorganisms such as methicillin-resistant Staphylococcus aureus or Pseudomonas spp. are detected on preoperative throat culture, do you use postoperative prophylactic antibiotics?
   1. Yes, we use antibiotics to which the microorganism is sensitive, 2. Yes, we use antibiotics independent of the sensitivity of the microorganism,
   3. No, we do not use antibiotics

Q28 Which type do you use for stomach internal fixation at the first PEG construction?
   1. Balloon type, 2. Bumper type, 3. Combination of Balloon type and Bumper type

Q29 Which type do you use outside the body at the first PEG construction?
   1. Button type, 2. Tube type, 3. Combination of Button type and Tube type

Q30 At the first PEG construction, do you fix the gastric wall?
   1. Yes, for all cases, 2. Determined on a case-by-case basis, 3. No

Q31 At the first PEG construction, do you perform radioscopy?

Q32 Which type do you use for stomach internal fixation at exchange?
   1. Balloon type, 2. Bumper type, 3. Balloon type or Bumper type

Q33 Which type do you use outside the body at exchange?
   1. Button type, 2. Tube type, 3. Combination of Button type and Tube type

Q34 How long is the period from PEG construction to first tube exchange using either balloon type or bumper type?
   1. Balloon type (months), 2. Bumper type (months)

Q35 Please select the method used at the time of first tube exchange.
Q36 At the time of the first tube exchange, what method do you use to confirm tube placement?
   1. Endoscopy, 2. Radioscopy, 3. Inject air through the PEG, 4. Check influx of gastric acid, 5. Varies by situation
Q37 When do you exchange the tube the third time? After ( ) months
Q38 Please select the method used at the second exchange to confirm tube placement.
   1. Endoscopy, 2. Radioscopy, 3. Inject air through the PEG, 4. Check influx of gastric acid, 5. Varies by situation
Q39 After the second exchange, what method do you use to confirm tube placement?
   1. Endoscopy, 2. Radioscopy, 3. Inject air through the PEG, 4. Check influx of gastric acid, 5. Varies by situation
Q40 Do you allow tube exchange to be done at home?
   1. Yes, 2. No
Q41 Have you experienced an intra-abdominal false insertion?
   1. Yes, 2. No
   If yes, how many times did you experience this?
Q42 Were any deaths triggered by an exchange error?
   1. Yes, 2. No
   If yes, how many times did this occur?
Q43 Do you give the patient's family a PEG diary?
Q44 Do you usually perform a pre-operative blood examination?
Q45 Do you usually order chest X-rays as part of the preoperative examination?
Q46 Do you usually order abdominal X-rays as part of the preoperative examination?
Q47 Do you usually order an abdominal CT as part of the preoperative examination?
Q48 Do you usually perform a throat culture as part of the preoperative examination?
Q49 Do you usually perform a nasal cavity culture test as part of the preoperative examination?
Q50 Do you usually perform mouth care as part of the preoperative treatment? If yes, how many times do you go on 1st?
Q51 Do you usually use an antacid agent as part of the preoperative treatment? If yes, please indicate the name of the medicine.
Q52 Do you usually use antibiotics before and during surgery?
Q53 Do you usually use antibiotics after surgery?
   1. Yes, 2. No
Q54 How many days after insertion of the PEG do you begin enteral feeding?
Q55 Please indicate whether or not you use each of the following nutrients (yes or no).
Q56 Do you use an antacid agent after surgery?
   1. Yes, 2. No
Q57 How many days after PEG placement must the patient wait to take a shower?
Q58 Has any patient died within 1 month postoperatively of PEG placement? If yes, how many?
   1. Yes (number), 2. No
Q59 Has any patient died within 1 month postoperatively due to PEG insertion? If yes, how many?
   1. Yes (number), 2. No
Q60 Did you experience major complications with PEG placement?
   1. Yes, 2. No, 3. Unavailable
   If yes, what kind of complications?
Q61 Did you experience minor complications less than 2 weeks postoperatively after PEG placement? If yes, please indicate which complications occurred.
Q63 How long did patients survive after PEG placement?
1. Less than 1 month, 2. Less than 6 months, 3. More than 7 months

Q64 After surgery, how many patients did your discharge from your hospital? Where were patients discharged?

Q65 In your institute, are costs for gastric catheter exchange covered under special insurance medical care material costs?
1. Yes, 2. No

Q66 In medical facilities using diagnosis related grouping and institutions using insurance for the elderly, the costs associated with gastric catheter exchange cannot be separately claimed under insurance as a special healthcare material cost. Do you think that it should be paid separately as a special healthcare material cost?

Q67 Do you file an insurance claim when you use enteral nutrition via PEG?
1. Yes, 2. No, 3. Yes, but we are limited in the maximum amount of the claim.

Q68 Excluding ‘Elental’, ‘Elental P’, ‘Enterude’ ‘Twinline’ and other medical nutrients of half-digested state, do you think set dietary food for enteral nutrition should be a fee-for-service?
1. Yes, 2. No

Q69 Do you have any specific opinions about health insurance for enteral nutrition? If yes, please indicate.

F1 How old is the person filling out this questionnaire?
1. 20's, 2. 30's, 3. 40's, 4. 50's, 5. 60's, 6. More than 70

F2 At the hospital you belong to, how many doctors perform PEG including you?

F3 At the hospital you belong to, how often is PEG performed annually?

F4 Which clinical department performs PEG in your hospital? (Select as many responses as apply)

F5 Which clinical department manages PEG in your hospital? (Select as many responses as apply)

F6 At your hospital, do you try rehabilitation after PEG and do you keep an early discharge of the patient in mind?

F7 At your hospital, do you have learning group such as “the gastrostomy committee?” What types of professionals participate as members? (Select as many responses as apply)

F8 At your hospital, do you unify the manuals according to a type of the catheter used and the type of problems that can occur?
1. Yes, 2. No, but we will try to unify in the future, 3. No plan to unify for now

F9 Do you think that PEG is the best way to provide nutritional support?
1. Yes, it is the best way, 2. No, but it is a good way, 3. No, I do not think it is the best way to provide nutritional support

F10 PEG enables patients to be themselves, that is experience a ‘recovery of everydayness’, and allows care to be provided at home. Do you agree with this opinion?
1. Yes, very much, 2. Yes, somewhat, 3. No

F11 Do you know an HEQ studying group?
1. Yes, 2. No
We are involved in HEQ studying group already.
1. Yes, 2. No

F12 Please describe your hospital?

F13 How many beds do you have?
1. No beds, 2. Less than 20 beds, 3. 20–99 beds, 4. 100–199 beds, 5. More than 200 beds

F14 Where is your hospital located?