Review Article | Communication in Palliative Medicine and Palliative Care

The appropriate use of gastrostomy tubes in palliative surgery

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Abstract: Palliative surgery is defined as an operation or procedure performed with the primary intention of relieving symptoms or improving quality of life. Gastrostomy tubes are often employed with palliative intent but, like many palliative interventions, there is insufficient data to facilitate surgical decision-making. This can be challenging for healthcare professionals as caring for palliative patients often encompasses end of life care, severe life-altering symptoms, and poor prognosis. Thus, we have gathered available data for the appropriate use of gastrostomy tube in palliative surgery and propose our mini-review as a primer to aid in medical and surgical decision-making. We first provide the background for palliative surgery and the definition, brief history and techniques pertinent to palliative gastrostomy tube (PGT). Then we review the data relevant to two common indications—head/neck cancer and malignant bowel obstruction—for PGT. As our deliverable, we present an effective paradigm for delivering the data to patients and families utilizing known palliative communication and decision-making frameworks such as the Palliative Triangle, Best Case/Worst Case and Defining Value. Moreover, we highlight the necessity of conducting more palliative care research that involves palliative outcome measures in addition to traditional metrics such as overall survival. We end our discussion by emphasizing the importance of multidisciplinary team, individualized decision-making, and relationship-based care for palliative patients.

Keywords: Palliative surgery; palliative gastrostomy tube (PGT); the Palliative Triangle; Best Case/Worst Case; Defining Value

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Introduction

Palliative surgery is an operation or procedure performed with the primary intention of relieving symptoms or improving quality of life (QOL). Thus, whenever surgery is deemed palliative, the intent and individualized care are paramount. If the intent is to relieve symptoms such as nausea or vomiting, then the outcome ought to be evaluated by the success of symptom relief weighed against treatment toxicity in addition to overall survival. Often, physician-based outcomes (e.g., mortality, length of stay, complications, cost) are the sole primary endpoints of clinical and translational research, while patient-based

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outcomes (e.g., symptom resolution, QOL, time at home, functional status) are de-emphasized. Given that they are not mutually exclusive, adequate representation of both physician-based and patient-based outcomes are required in palliative research, as the very intent of palliative surgery is to relieve patient-reported symptoms and improve their QOL. An individualized approach must involve not only patient-based research, but also clear communication, listening, and shared decision-making with the patient and family to respect their values throughout palliative discussions (1,2).

Gastrostomy tubes provide artificial enteral nutrition and/or decompression to relieve gastrointestinal obstructive symptoms (3). The first gastrostomy operations were performed in the mid-1800s to provide artificial nutrition and to relieve esophageal stricture. Then Stamm gastrostomy technique was invented in 1894 and still is widely used as an open or laparoscopic approach. Percutaneous endoscopic gastrostomy (PEG) was developed in 1979 and is performed under endoscopic guidance (4). The pull technique is the most common method—an endoscope is passed through the mouth into the stomach for insufflation, then a needle is inserted through abdominal wall along with the guidewire that is brought out through the mouth. Then the gastrostomy tube is guided down the wire from the mouth to the stomach then pulled through the abdominal wall (5). Less commonly, gastrostomy tube can also be pushed down from the mouth to the stomach via a guidewire (push technique) or can be directly inserted through the abdominal wall via gastropexy and fluoroscopic guidance in a technique called radiologically-inserted gastrostomy (RIG) (6,7).

Different groups have investigated the appropriate use of palliative gastrostomy tube (PGT) and emphasized the need for high-quality data and central consensus (5,8-10). Given the low-level evidence, decision-making can pose challenges for clinicians since patients are often faced with end-of-life care, life-altering symptoms, and poor prognosis. In this mini-review, we provide a primer for the appropriate use of gastrostomy tube in palliative surgery. First, we define PGT and discuss the outcomes data of the two common indications—head/neck cancer and malignant bowel obstruction (MBO). We end with palliative care frameworks to guide clinicians in their decision-making, including the Palliative Triangle, Best Case/Worst Case and Defining Value.

Definition

We define PGT as follows: a gastrostomy tube—surgical or percutaneous—offered to patients with compromised per oral (PO) intake or gastrointestinal obstructive symptoms, for the purpose of relieving symptoms and improving QOL. Our discussion of PGT will include feeding gastrostomy for artificial nutrition and venting gastrostomy for decompression.

Data

While PEG tube insertion has good outcomes with 98% success rate, complication rate has been reported as 10–40%. Most complications are minor which include pain, erythema, wound infection, bumper-erosion, and tube displacement not requiring surgery. Major complications, accounting for 1–3%, include tube malplacement, bowel perforation, peritonitis, fistula, aspiration, gastrointestinal (GI) bleeding, and tube displacement requiring surgery (3,5,11,12). Although mortality rate is 20–24% at 30-day and 50–63% at 1-year (5,12), the metric is skewed given poor baseline status of patients.

Below, we review the outcomes data of PGT for head/neck cancer and MBO.

Head/neck cancer

While palliative care for head/neck cancer patients is especially appropriate given the high morbidity (13), the clear indication of palliative intent is generally unavailable in current data regarding the use of gastrostomy tube (14-19). It is important to distinguish the use of gastrostomy tube in curative and palliative head/neck cancer patients. As previously defined, the primary goal of PGT in head/neck cancer ought to be symptom improvement and improved QOL, whereas the primary goal of gastrostomy tube in curative head/neck cancer is sustenance through treatment. The lack of clear indication of palliative intent in head/neck cancer literature can be challenging for healthcare professionals during decision-making. Thus, it is important to deduce principles from current literature and appropriately apply to palliative settings, while acknowledging that not all data are translatable and conducting PGT research in head/neck cancer is paramount. Such approach can be helpful since palliative

patients suffer similar complications (e.g., dysphagia, malnutrition, aspiration) as nonpalliative patients and may have already undergone curative treatment before starting palliative care or palliative surgical debulking and palliative chemoradiation. Below, we discuss principles regarding the use of gastrostomy tube from current head/neck cancer literature that can be applied to palliative settings.

Current data shows that PEG is increasingly placed in patients with head/neck cancers given their nutritional hurdles attributable to malignancy and life-limiting symptoms such as mucositis, dysphagia, and compromised QOL. The analysis of Surveillance, Epidemiology, and End Results (SEER)-Medicare data collected from 31,627 patients found that 35.1% of patients who underwent treatment for head/neck cancer had a PEG placed before or after treatment started (14). In palliative patients, PEG is commonly used when their life expectancy is several weeks to months, caloric intake is less than 60% via oral intake, or symptoms such as dysphagia, gastric obstruction or dysmotility develop as a result of the disease or palliative chemoradiation side effects. Gastric obstruction or dysmotility may prompt the use of percutaneous gastrojejunostomy tube. For short-term access up to 6 weeks, nasogastric tube (NGT) or nasojejunal tube can be considered (20).

A systematic review of 26 studies compared the outcomes of enteral nutrition through NGT *vs.* PEG. The results showed their comparable nutritional status, frequency of radiation interruptions, overall survival, and QOL. However, NGT was associated with more dislodgements, higher perception of inconvenience, and predisposition to aspiration pneumonia (16). While conclusions are difficult given insufficient prospective studies, PEG may confer more palliative advantage given similar nutritional profile but higher convenience and lower probability of pulmonary infection.

Data suggest that an optimal timing of PGT placement can depend on its relation to surgical timeline. In a single-site study of 50 patients with primary carcinomas of the head/neck, intraoperative PEG after tumor resection and postoperative PEG had fewer complications than preoperative placement (11% *vs.* 57%; 17% *vs.* 57%, respectively). While most were minor complications (e.g., leakage around PEG tube, granulation tissue), a patient who underwent preoperative PEG developed an intra-abdominal abscess requiring a laparotomy. Thus, the study recommended an intraoperative PEG given the reduced need for anesthesia, association with lower complication rate, and mitigation of a rare but serious risk of tumor seeding at the PEG site (21). In order to prevent tumor seeding, some reports have suggested radiologic placement of gastrostomy tube instead of traditional push or pull-technique, thereby avoiding direct contact with tumors (7). A newer retrospective study corroborated this finding by showing that the concurrent placement of a PEG tube on the day of ablative surgery was associated with lower complication rates and shorter length of stay. On the other hand, patients who received PEG tubes later in the hospital day were more likely to have malnutrition and renal failure at baseline and were associated with higher rates of aspiration pneumonia and sepsis (19). Given that palliative patients may also suffer malnutrition, dysphagia, and immunocompromised state, earlier placement of PEG for feeding could be beneficial.

Two studies described patient factors associated with the timing of PEG placement with respect to chemoradiation treatment. A retrospective study involving 8,306 patients with locoregionally advanced head/neck cancer revealed a higher prevalence of prophylactic PEG placement—before radiation treatment—among those with laryngeal and oropharyngeal cancers compared to other malignancies in the region. Other factors associated with prophylactic PEG included regional instead of local cancer, no surgical treatment, and patients who were unmarried, divorced or widowed (15). While this study provides helpful data, it is important not to introduce bias into our care based on patients' demographics but rather be more attentive and aware to provide additional social support to facilitate maximal benefit from PEG. Another study sought to predict which factors are associated with reactive—after chemoradiation treatment—requirement of a PEG tube. A review of 297 patients treated with chemoradiation therapy for oropharyngeal squamous cell carcinoma found that body mass index (BMI) less than 25 kg/m^2, tumor grade of 3 or higher, and cumulative cisplatin dose above 200 mg/m^2 and accelerated irradiation fractionation were associated with a need for PEG placement due to dehydration or significant weight loss (17). Despite the lack of robust evidence for the timing of PEG placement, both studies suggest prophylactic placement is more common and this data may be applied to palliative patients with specific risk factors who may benefit from early nutrition via PEG.

These findings suggest that in palliative patients who undergo palliative resection for head/neck cancers, concurrent or intraoperative PGT placement can be a preferred strategy. For those undergoing palliative chemoradiation, it may

be helpful to refer to data suggesting the correlation of preemptive PEG insertion with a decrease in short-term critical weight loss (>10% weight loss) and significantly enhanced short-term QOL (18). If the patient forgoes prophylactic PEG placement, then risk factors for reactive PEG placement should be reviewed as noted above (17). Still, there is a limited body of research investigating the benefits of PGT placement in the context of palliative outcomes such as patient satisfaction, nutritional and functional status, and QOL. While this may be attributed to the curative nature of head/neck cancer management, more comparative studies involving palliative outcome measures are necessary to establish evidence-based recommendations.

MBOs

MBO is a common complication of advanced-stage malignancy, frequently seen in gastrointestinal or gynecological cancers. The etiology is mechanical or functional—mechanical due to intraluminal mass, intramural or serosal extension, or extrinsic compression, and functional due to tumor invasion of the enteric plexus or drug-induced hypomotility. As MBO worsens, repeated distension and peristalsis cause inflamed bowel that hampers recovery (6). Thus, patients suffer intractable nausea, vomiting, bloating, and inability to take PO, all of which dramatically affect QOL along with decreased nutritional and functional status (22). For most patients with MBO, surgery is contraindicated. In addition to ascites, peritoneal carcinomatosis (PC), and multi-site obstructions, most patients have poor functional status and hostile intra-abdominal anatomy (22). Thus, current practice includes medical management with pain control, corticosteroids, antiemetics, and palliative venting gastrostomy (PVG) for symptom relief (9). Unfortunately, decision-making is difficult due to inadequate high-quality evidence to guide clinicians. Furthermore, only two systematic reviews exist that evaluate PVG in MBO, highlighting the need for further research (6,22). Below, we present available guidelines and data on PVG in MBO.

The Multinational Association for Supportive Care in Cancer (MASCC) published a guideline on MBO management in 2022 based on 397 publications selected from 17,656 total studies. The guideline states PGT may benefit gastric decompression in MBO given some evidence for the feasibility of the insertion, high reduction of nausea or vomiting, and rare major complications. Ascites is not an absolute contraindication as paracentesis may help mitigate infection risks (9). Another guideline was established by Chicago Consensus Working Group in 2020, specifically for peritoneal surface malignancies. Similarly, the guideline suggested some improvement in obstructive symptoms and QOL and some evidence for the association between earlier placement and symptom relief. Overall, the recommendation was to consider PGT placement for GI secretion management and potential resumption of PO intake if medical therapies fail to achieve symptom improvement (10).

The first systematic review included 25 studies with 1,194 patients and showed a successful insertion rate of 91%, obstructive symptom relief of 92%, and median survival after PVG between 35 and 147 days. The major and minor complication rates were 1.9% and 19.8%, respectively. The median procedure time was 17 minutes, though only 2 studies reported the outcome. Overall, the review recommended PVG as a safe and effective decompressive management of MBO with rare major complications and favorable outcomes (6). Another systematic review included 23 studies with a total of 1,657 patients and concluded that PVG provided patients with longer time at home and improved QOL and symptom relief from nausea and vomiting (22). Both systematic reviews revealed safety and efficacy of PGT for improvement in symptom relief and QOL.

Some studies investigated the efficacy of PGT in MBO complicated by ascites and PC. A retrospective study of 96 patients with advanced malignancy showed successful PVG placement rate of 92.7% and obstructive symptom relief of 91% in a cohort of patients, half of whom had ascites and 36% of whom underwent drainage prior to PVG placement. Infectious complications occurred exclusively in patients with ascites. About 8% of patients were re-admitted for obstructive symptoms despite functioning PVG (23). For PC, a retrospective study observed 750 patients, of whom 7.9% underwent PVG, and found an association between PVG placement and higher rates of discharge to hospice and lower rates of discharge to home, though without a difference in 30-day readmission rates (24). While the study found an association, it is difficult to translate as palliative outcomes such as QOL, symptom relief, and patient satisfaction were not included. Consistent with the MASCC and Chicago Consensus guidelines, these studies showed PGT may be offered with paracentesis for MBO patients with ascites to mitigate infection risks while its use in PC is inconclusive.

Unfortunately, the optimal timing of PVG is not well-

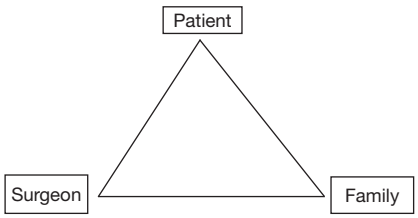

Figure 1 An ideal Palliative Triangle in which mutual interactions among patient, family, and surgeon guide individualized decision for palliative surgery. From Miner *et al.* (29).

established. A retrospective study of 439 patients with MBO showed that the length of interval between MBO diagnosis to PVG placement did not influence overall survival. Given the safety and efficacy of PVG, the study concluded that earlier placement soon after MBO diagnosis may confer earlier symptom relief and longer time at home (25). However, the study also did not include palliative outcomes with respect to the timing of PVG.

One study did explore the degree of symptom relief from PVG. A retrospective study of 75 patients showed that PVG decreased the mean frequency of vomiting from 2.2 to 0.4 and the probability of nausea occurrence from 80% to 40% (26). This study supports the efficacy of PEG as a decompressive measure for MBO patients' symptom relief. More studies focusing on palliative outcomes (e.g., symptom relief, improved QOL) rather than solely on survival, should be performed for more robust, palliative data.

In addition to decompression, PGT can also function as a feeding tube while patients receive chemotherapy. Often, clinicians may not favor performing any procedures, including PGT, in patients who are receiving chemotherapy, given concerns for immunosuppression and subsequent complications. However, head/neck cancer literature suggests safety in placing PGT as a feeding tube given low complication and mortality rate and minimal effect on functional status (27). In fact, PGT can supplement chemotherapy by maintaining nutrition and improving QOL, enabling proper healing of the diseased regions, and providing fuels for daily activities. While chemotherapy may exert primary palliative effects, PGT can serve as a safe and effective adjunct to effective palliation as a "therapeutic" procedure. Thus, when deemed appropriate by the multidisciplinary team, it is important to consider PGT as a feeding tube (e.g., via jejunal extension) after a forthright discussion with patients and families regarding risks and benefits of the procedure. It may be helpful to cite 90–99% successful PEG insertion rate in MBO population with 0–24% risk of major complications (i.e., major bleeding, peritonitis, revision) (5), though further studies are needed that investigate the outcomes of dual approaches of feeding and decompressive use of PGT.

Deliverable

An important last step in palliative surgery is the effective delivery of the available data. This step highlights the essence of palliative surgery as it culminates the proper definition of palliative intent and available data into shared decision-making based on clear communication. Below, we propose a practical three-question framework to facilitate decision-making between clinicians, patients, and families.

What is the indication?

The first question is perhaps the simplest: what is the patient's indication for PGT and what does the data suggest regarding the outcomes? We have listed a summary of the indications and data:

- Head/neck cancer—need high-quality, palliative-specific data; early PEG may help for patients with life expectancy of several weeks to months, caloric intake less than 60% via oral intake, or symptoms such as dysphagia or gastric obstruction/dysmotility; for duration less than 6 weeks, NGT may suffice.
- MBOs—need high-quality data; early placement for medically refractory, inoperable MBO with intractable obstructive symptoms is generally safe and may provide earlier symptom relief and improved QOL via longer time at home; for ascites, paracentesis and PGT can help.

What is the intent?

After determining the indication, the next step is to establish the intent of PGT. First, clinicians must understand the definition of palliative intent in the context of symptom relief and improved QOL based on functional independence, days spent at home, freedom from pain after surgery, and long-term symptom burden, rather than mortality data alone (28). Second, clinicians should explore patient's and family's values to clarify their expectations and hopes. Below, we suggest two peer-reviewed palliative communication frameworks:

The Palliative Triangle (*Figure 1*) is a paradigm that

depicts a dynamic relationship between the patient, family, and surgeon throughout the palliative treatment. The keywords are dynamic and throughout: dynamic refers to a flexible, two-way communication based on trust and throughout emphasizes the longitudinal nature of the relationship. Eventually, the goal is to address each patient's values and available emotional and social support, while weighing alternative therapies. The Palliative Triangle originated from a prospective study that showed a close interaction and overall satisfaction of patients and families despite less than ideal improvement symptoms and QOL (29). This framework was further validated in another prospective study that showed favorable symptom relief associated with palliative operations after the surgeons were trained with the Palliative Triangle, highlighting the importance of clear communication (30).

The Best Case/Worst Case (*Figure 2*) is a practical communication tool that conveys a realistic clinical scenario (31,32). For instance, consider a clinician obtaining consent for PGT. If the clinician only mentions the 98% successful insertion rate, 10–40% complication rate, and 20–24% mortality rate at 30-day, then valuable palliative outcomes such as functional status, symptom relief, and QOL will not be conveyed. In addition, patient's willingness to undergo procedures is highly individualized. Best Case/Worst Case facilitates communication using specific examples, such as time at home and reduced symptoms. A prospective study evaluated this tool by training surgeons with Best Case/Worst Case and demonstrating improved score in shared decision-making and a shift of communication from an isolated problem to a contextualized discussion of patient preferences (31). In the context of PGT, both the Palliative Triangle and Best Case/Worst Case will help clinicians attend to patient's perspectives, communicate clearly, and identify relevant values to determine the intent.

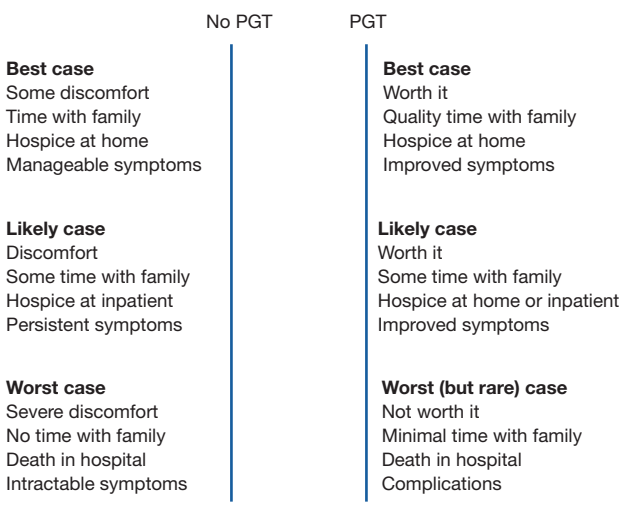

Figure 2 The Best Case/Worst Case visual aid. Adapted from Taylor *et al.* (31). PGT, palliative gastrostomy tube.

What is the informed decision?

The last step is to make an informed decision with patient and family. Here, patient selection is a key factor in maximizing palliative effect while minimizing negative outcomes (33). Below we share three frameworks to aid optimal patient selection for PGT.

Cohen *et al.* (33) introduced a helpful formula to derive the value of palliative intervention for each patient (*Figure 3*). In the context of PGT, the appropriate use would involve maximal symptom relief, QOL improvement, and anticipated duration of palliation and minimal procedural complication. Symptom relief would include relief from nausea/vomiting and improved QOL could include improved functional status. Various scoring tools (34) such as the McGill Quality of Life Questionnaire (MQOL), Quality of Life at End of Life (QUAL-E), and Quality of Dying and Death Questionnaire (QODD) are available to help determine these metrics.

Another simple tool is called "Was it Worth it?". A retrospective study (35) of a prospective palliative surgery database at a tertiary academic hospital showed that patients who answered "Not worth it" to a palliative operation they had undergone were more likely to be over 65 years of

$$\uparrow \text{Value} = \frac{\uparrow \text{Benefit (Relief of symptoms, Improved quality of life)}}{\downarrow \text{Cost (Treatment toxicity, Duration of treatment, Resource utilization)}} \times \text{Anticipated duration of palliation}$$

Figure 3 Value of palliative surgery can be represented as benefit divided by cost multiplied by anticipated duration of palliation. From Cohen *et al.* (33).

age, lack family support, and have needed re-intervention. Thus, these factors can help facilitate additional social support when selecting for patients whose value would be maximized with PGT.

Lastly, it is paramount to involve a multi-disciplinary team consisting of surgeons, oncologists, gastroenterologists, interventional radiologists, palliative care team, social work, and nurse specialists. While more data is needed to compare the effect of hospital settings on PGT outcomes, much research on PGT has been performed at tertiary care centers (3,23,27). Given the complexity of the decision-making process and support staff needed, tertiary referral center is often required as a place for palliative patients to receive care (3). Unmet psychosocial needs often arise, thus early, multi-disciplinary consultations of social work and palliative care are indicated (9,27). If support services are unavailable, primary care providers should consider facilitating early palliative care consultation to begin the decision-making process.

Conclusions

In this review, we provided a practical primer for clinicians when deciding on the appropriate use of PGT. We emphasized the importance of defining PGT as a procedure with a goal of symptom relief and improved QOL. We reviewed available outcomes data regarding head/neck cancer and MBO. We concluded with a simple 3-question deliverable to achieve an effective palliative care discussion with patients and families augmented with peer-reviewed palliative care tools.

Throughout the review, we also emphasized the importance of steering palliative research away from physician-based outcomes as sole primary endpoints. Rather, the central message must focus on patient-based or palliative outcomes, in conjunction with conventional outcomes (e.g., mortality, survival, length of stay) to ensure that palliative intent research is evaluated by palliative outcome measures. We proposed Defining Value and Was It Worth It (33,35) as helpful starting points and have emphasized the importance of multidisciplinary team dynamics.

It is important to note that palliative patient populations are heterogenous and decision-making is different for each patient (35). We encourage each clinician to treat each encounter as unique and put patient and family at the center of the discussion, gently and patiently evaluating their individual values, hopes, and purpose, in a road to making a shared decision on the appropriate use of PGT.

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Footnote

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References

1. Shin J, Miner TJ. Palliative Surgery: When To and When Not To? In: Faintuch J, Faintuch S. editors. Recent Strategies in High Risk Surgery. Cham: Springer; 2024.
2. Miner TJ. Communication as a core skill of palliative surgical care. Anesthesiol Clin 2012;30:47-58.
3. Porter RJ, McKinlay AW, Metcalfe EL. Endoscopically placed venting gastrostomy can be a safe and effective palliative intervention in benign and malignant gastrointestinal obstruction. Frontline Gastroenterol 2021;13:309-15.
4. Minard G. The history of surgically placed feeding tubes. Nutr Clin Pract 2006;21:626-33.
5. Roche KF, Bower KL, Collier B, et al. When Should

the Appropriateness of PEG be Questioned? Curr Gastroenterol Rep 2023;25:13-9.
6. Thampy S, Najran P, Mullan D, et al. Safety and Efficacy of Venting Gastrostomy in Malignant Bowel Obstruction: A Systematic Review. J Palliat Care 2020;35:93-102.
7. Vincenzi F, De Caro G, Gaiani F, et al. Risk of tumor implantation in percutaneous endoscopic gastrostomy in the upper aerodigestive tumors. Acta Biomed 2018;89:117-21.
8. Mobily M, Patel JA. Palliative percutaneous endoscopic gastrostomy placement for gastrointestinal cancer: Roles, goals, and complications. World J Gastrointest Endosc 2015;7:364-9.
9. Madariaga A, Lau J, Ghoshal A, et al. MASCC multidisciplinary evidence-based recommendations for the management of malignant bowel obstruction in advanced cancer. Support Care Cancer 2022;30:4711-28.
10. The Chicago Consensus on peritoneal surface malignancies: Palliative care considerations. Cancer 2020;126:2571-6.
11. Laasch HU, Wilbraham L, Bullen K, et al. Gastrostomy insertion: comparing the options--PEG, RIG or PIG? Clin Radiol 2003;58:398-405.
12. McMahon MM, Hurley DL, Kamath PS, et al. Medical and ethical aspects of long-term enteral tube feeding. Mayo Clin Proc 2005;80:1461-76.
13. Cocks H, Ah-See K, Capel M, et al. Palliative and supportive care in head and neck cancer: United Kingdom National Multidisciplinary Guidelines. J Laryngol Otol 2016;130:S198-207.
14. Locher JL, Bonner JA, Carroll WR, et al. Gastrostomy tube placement and use in patients with head and neck cancer. Head Neck 2012;34:422-8.
15. Locher JL, Bonner JA, Carroll WR, et al. Patterns of prophylactic gastrostomy tube placement in head and neck cancer patients: a consideration of the significance of social support and practice variation. Laryngoscope 2013;123:1918-25.
16. Bossola M, Antocicco M, Pepe G. Tube feeding in patients with head and neck cancer undergoing chemoradiotherapy: A systematic review. JPEN J Parenter Enteral Nutr 2022;46:1258-69.
17. Strom T, Trotti AM, Kish J, et al. Risk factors for percutaneous endoscopic gastrostomy tube placement during chemoradiotherapy for oropharyngeal cancer. JAMA Otolaryngol Head Neck Surg 2013;139:1242-6.
18. Mellors K, Ye X, Van Den Brande J, et al. Comparison of prophylactic percutaneous endoscopic gastrostomy with reactive enteral nutrition in patients with head and neck cancer undergoing radiotherapy or chemoradiotherapy: A systematic review. Clin Nutr ESPEN 2021;46:87-98.
19. Din-Lovinescu C, Barinsky GL, Povolotskiy R, et al. Percutaneous Endoscopic Gastrostomy Tube Timing in Head and Neck Cancer Surgery. Laryngoscope 2023;133:109-15.
20. Cotogni P, Stragliotto S, Ossola M, et al. The Role of Nutritional Support for Cancer Patients in Palliative Care. Nutrients 2021;13:306.
21. Raynor EM, Williams MF, Martindale RG, et al. Timing of percutaneous endoscopic gastrostomy tube placement in head and neck cancer patients. Otolaryngol Head Neck Surg 1999;120:479-82.
22. Patterson M, Greenley S, Ma Y, et al. Inoperable malignant bowel obstruction: palliative interventions outcomes - mixed-methods systematic review. BMJ Support Palliat Care 2024;13:e515-27.
23. Issaka RB, Shapiro DM, Parikh ND, et al. Palliative venting percutaneous endoscopic gastrostomy tube is safe and effective in patients with malignant obstruction. Surg Endosc 2014;28:1668-73.
24. Yu J, Sullivan BG, Nguyen NT, et al. Readmission and Disposition in Patients With Malignant Bowel Obstructions Following Gastrostomy Tube. Am Surg 2023;89:5915-20.
25. Pinard KA, Goring TN, Egan BC, et al. Drainage Percutaneous Endoscopic Gastrostomy for Malignant Bowel Obstruction in Gastrointestinal Cancers: Prognosis and Implications for Timing of Palliative Intervention. J Palliat Med 2017;20:774-8.
26. Dittrich A, Schubert B, Kramer M, et al. Benefits and risks of a percutaneous endoscopic gastrostomy (PEG) for decompression in patients with malignant gastrointestinal obstruction. Support Care Cancer 2017;25:2849-56.
27. Gauvin G, Do-Nguyen CC, Lou J, et al. Gastrostomy Tube for Nutrition and Malignant Bowel Obstruction in Patients With Cancer. J Natl Compr Canc Netw 2021;19:48-56.
28. Lilley EJ, Cooper Z, Schwarze ML, et al. Palliative Care in Surgery: Defining the Research Priorities. Ann Surg 2018;267:66-72.
29. Miner TJ, Jaques DP, Shriver CD. A prospective evaluation of patients undergoing surgery for the palliation of an advanced malignancy. Ann Surg Oncol 2002;9:696-703.
30. Miner TJ, Cohen J, Charpentier K, et al. The palliative triangle: improved patient selection and outcomes

associated with palliative operations. Arch Surg 2011;146:517-22.
31. Taylor LJ, Nabozny MJ, Steffens NM, et al. A Framework to Improve Surgeon Communication in High-Stakes Surgical Decisions: Best Case/Worst Case. JAMA Surg 2017;152:531-8.
32. Schwarze ML, Kehler JM, Campbell TC. Navigating high risk procedures with more than just a street map. J Palliat Med 2013;16:1169-71.
33. Cohen JT, Miner TJ. Patient selection in palliative surgery: Defining value. J Surg Oncol 2019;120:35-44.
34. Albers G, Echteld MA, de Vet HC, et al. Evaluation of quality-of-life measures for use in palliative care: a systematic review. Palliat Med 2010;24:17-37.
35. Cohen JT, Beard RE, Cioffi WG, et al. Was It Worth It? Critical Evaluation of a Novel Outcomes Measure in Oncologic Palliative Surgery. J Am Coll Surg 2023;236:1156-62.

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