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A dedicated feeding tube clinic reduces emergency department utilization for gastrostomy tube complications

Amber M. Moyer[1] · Danielle Abbitt[1] · Kevin Choy[1] · Teresa S. Jones[1] · Theresa L. Morin[1] · Krzystof J. Wikiel[1] · Carlton C. Barnett[1] · John T. Moore[1] · Thomas N. Robinson[1] · Edward L. Jones[1]

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Abstract

Introduction Enteral access is required for a variety of reasons from neuromuscular disorders to dysphagia. Gastrostomy tubes (GTs) can be placed endoscopically, surgically, or radiographically and complications include infection, bleeding, leakage and unintentional removal. Routine post-procedural follow-up is limited by inconsistent guidelines and management by different specialty teams. We established a dedicated GT clinic to provide continuity of care and prophylactic GT exchange. We hypothesized that patients followed in the GT clinic would have reduced Emergency Department (ED) utilization.

Methods A retrospective review of patients who underwent GT placement from January 2010 to January 2020 was conducted. Baseline demographics, indications for GT placement, number and reason for ED visits and utilization of a multidisciplinary GT clinic were studied.

Results A total of 97 patients were included. The most common indication for placement was dysphagia (88, 91%) and the most common primary diagnosis was head and neck malignancy (51, 51%). The GT clinic is a multidisciplinary clinic staffed by surgeons and residents, dieticians, and wound care specialists and cared for 16 patients in this study. Three patients (19%) in the GT clinic group required ED visits compared to 44 (54%) in the standard of care (SOC) group ($p < 0.05$). There was an average of 0.9 ED visits per patient (range 0–7) in the GT clinic group vs 1.6 ED visits per patient (range 0–20) in the SOC group ($p = 0.34$). Feeding tubes were prophylactically exchanged an average of 7 times per patient in the GT clinic group vs 3 times per patient in the SOC group ($p < 0.05$).

Conclusion A multidisciplinary clinic dedicated to GT care limits ED visits for associated complications by more than 50%. Follow-up in a dedicated clinic with prophylactic tube exchange decreases ED visits and should be considered at facilities that care for patients with GTs.

Keywords Gastrostomy · Complications · Multidisciplinary · Emergency department utilization

Over 216,000 gastrostomy tubes (GTs) are placed annually in the United States encompassing 24 different patient conditions and utilizing products from 12 different major manufacturers [1]. Moreover, these tubes can be placed endoscopically, surgically, or radiographically by several different specialties [2, 3]. Enteral access is required for a variety of reasons including neurological disease, critical illness, cancer and gastric decompression. Gastrostomy tubes are most commonly placed endoscopically via the "pull" technique, "push" technique, or the introducer method [3]. Complications include tube dislodgement (0–5.3%), bleeding (up to 2.5%), buried bumper syndrome (1.5–8.8%), peristomal leakage (1–2%) and local wound infection (4–30%) [4, 5]. Management of long-term complications such as peristomal leakage, moisture, and hypergranulation tissue are also key to GT care [6].

Despite the widespread use of GTs, routine follow-up with the proceduralist is rare. Feeding tubes can be placed bedside in an Intensive Care Unit (ICU) along with a tracheostomy or scheduled in radiology suites, endoscopy suites, or the operating room. There is also an array of specialists

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✉ Amber M. Moyer
amber.moyer@cuanschutz.edu

[1] Department of Surgery, University of Colorado School of Medicine & Rocky Mountain Regional Veterans Affairs Medical Center, Aurora, 12631 E 17th Ave, C302, Aurora, CO 80045, USA

who place these tubes, including Surgeons, Interventional Radiologists, Gastroenterologists, and Family Practice Physicians. This diversity creates confusion for the patient and family members as to who they should follow-up with for GT issues and unfortunately results in patients seeking care in the Emergency Department (ED). The burden of GT complications on the ED has been studied in the pediatric population showing a high rate of ED visits in the first 30 days after hospital discharge, with nearly 8.6% requiring an ED visit after GT placement [7]. Furthermore, GTs are often placed in the elderly or neurologically impaired with a late (after four weeks) accidental dislodgement rate of 12.8%, leading to costly ED management averaging $1200 per visit [5].

To address this issue, we developed a clinic dedicated to patients with GTs. We sought to provide patient and caregiver education and support, prophylactic GT exchange, and continuity of care for all GT patients within the Eastern Colorado VA Health System regardless of who placed the tube. We hypothesized that patients followed in GT clinic would have significantly reduced ED utilization for GT complications.

Methods

This study was approved by the Colorado Multi-Institutional Review Board (COMIRB) #19-2365. We utilized the VA Corporate Data Warehouse to identify patients who had a CPT code related to GT placement (Table 1). Any patient with an associated CPT code who was seen at the Rocky Mountain Regional/Denver VA Medical Center between January 2010 and January 2020 was included.

The GT clinic was established in June 2016 and patients who underwent feeding tube placement by the General Surgery (GS), Gastroenterology (GI), and Interventional Radiology (IR) services were automatically enrolled after the clinic was established. In addition, patients with a current feeding tube could be referred to the clinic by any service at any time. A total of 105 patients underwent feeding tube placement or were managed for their feeding tubes and 18 patients were enrolled in the GT clinic during the study period. Patients with gastro-jejunostomy or jejunostomy tubes were excluded from this study. Ninety-seven patients were included in this study with 16 (16%) in the GT clinic cohort. Ten patients were seen before and after the development of the GT clinic and were included in the standard of care cohort until their first visit in GT clinic, after which they were considered as part of the GT clinic cohort.

Baseline demographics, patient characteristics, indications for GT placement, placement team and number along with reason for ED visits were reviewed. The GT clinic group was compared to the prior SOC group with Fisher's exact test (proportions) or student's t-test (means). P-values < 0.05 were considered statistically significant. All statistical analyses were performed with GraphPad Prism software.

Results

A total of 105 patients were identified during the study period and 97 included. Ninety-three (96%) were male with an average age of 64.5 (range 27–90) and an average BMI of 23.5 (range 14.5–35.0). The most common indication for placement was dysphagia (88 patients, 91%) and the most common primary diagnosis was head and neck malignancy (51 patients, 51%). More GTs were placed by IR (56 patients, 58%) than GS (24 patients, 25%) and GI (16 patients, 16%). Balloon GTs were more common (58 patients, 60%) and the most common size placed was an 18 Fr (53 patients, 55%). Most GTs were used for bolus feeds (92 patients, 95%). Gastrostomy tubes remained in place for an average of 31.8 months (range 0–293) or 46.0 months (range 0–258) if patients expired with the GT in place (Table 2).

The GT clinic began in June 2016 and cared for 16 patients. All of the patients enrolled in GT clinic were male with an average age of 64.8 (range 36–81) and an average BMI of 23.0 (range 16.3–31.9). All GTs were placed for dysphagia (16) and most were related to a primary diagnosis of head and neck malignancy (6 patients, 38%). Like the overall cohort, the majority of GTs were placed by IR (8 patients, 50%). When comparing the GT clinic group and the SOC group, there was no statistically significant difference in age, BMI, sex, diagnosis of diabetes, diagnosis of alcohol use disorder, tracheostomy status, or caregiver dependence. The

Table 1 CPT codes related to gastrostomy tube (GT) initial placement or GT replacement/reposition used for patient selection

CPT Code	Code description
43,246	Esophagogastroduodenoscopy, flexible, transoral; with directed placement of percutaneous gastrostomy tube
49,440	Insertion of gastrostomy tube, percutaneous, under fluoroscopic guidance including contrast injection(s), image documentation and report
43,762	Replacement of gastrostomy tube, with no revision
43,763	Replacement of gastrostomy tube, with revision

Table 2 Comparison of patient demographics and gastrostomy tube (GT) metrics between the GT clinic group and the standard of care (SOC) group. Asterisk (*) denotes $p < 0.05$

		GT Clinic $N = 16$	SOC $N = 81$	p-value
Sex				> 0.99
	Male	16 (100%)	77 (95%)	
	Female	0 (0%)	4 (5%)	
Age		63.13	64.75	0.56
BMI		23.02	23.56	0.69
GT indication				0.58
	Dysphagia	16 (100%)	72 (89%)	
	Leak/disaster diversion	0 (0%)	1 (1%)	
	ICU nutrition	0 (0%)	7 (9%)	
	Access	0 (0%)	1 (1%)	
Primary diagnosis				0.02*
	Head and neck malignancy	6 (38%)	45 (56%)	
	Neuromuscular disorder	4 (25%)	8 (10%)	
	Gastrointestinal malignancy	2 (13%)	6 (7%)	
	Failure to thrive	0 (0%)	15 (19%)	
	Other	4 (25%)	7 (9%)	
Tracheostomy status				0.36
	Tracheostomy	6 (38%)	20 (25%)	
	No tracheostomy	10 (63%)	61 (75%)	
Diabetes status				> 0.99
	Diabetes mellitus	3 (19%)	14 (17%)	
	No diabetes mellitus	13 (81%)	67 (83%)	
Alcohol use disorder				> 0.99
	Alcohol use disorder	8 (50%)	43 (53%)	
	No alcohol use disorder	8 (50%)	38 (47%)	
Caregiver status				0.27
	Caregiver	8 (50%)	28 (35%)	
	No caregiver	8 (50%)	53 (65%)	
Placement team				0.75
	General surgery	5 (31%)	19 (24%)	
	Interventional radiology	8 (50%)	48 (59%)	
	Gastroenterology	3 (19%)	13 (16%)	
	Other	0 (0%)	1(1%)	
Type of tube				0.41
	Non-balloon GT	8 (50%)	31 (38%)	
	Balloon GT	8 (50%)	50 (62%)	
Tube use				0.59
	Bolus feeds	16 (100%)	76 (94%)	
	Continuous feeds	0 (0%)	49 (5%)	
	Decompression	0 (0%)	1 (1%)	
Hypergranulation tissue				0.00*
	Present	5 (31%)	61 (75%)	
	Not present	8 (50%)	12 (15%)	
	Unknown	3 (19%)	8 (10%)	
Tube duration (months)				
	Duration of tube	83.4	17.5	0.00*
	Duration of tube deceased	57.0	43.5	0.61

average duration of tube dependence in months was higher in the GT clinic group compared to the SOC group (83.4 vs 17.5 months, $p < 0.05$). There was also no statistically significant difference in placement team, tube type, size of tube, and feeding method between the two groups (Table 2).

Gastrostomy tubes were prophylactically exchanged an average of 7 times per patient in the GT clinic group vs 3 times per patient in the SOC group ($p < 0.05$). Three patients (19%) in the GT clinic group required ED visits for GT complications compared to 44 (54%) in the SOC group ($p < 0.05$). There was an average of 0.9 ED visits per patient (range 0–7) in the GT clinic group vs 1.6 ED visits per patient (range 0–20) in the SOC group ($p = 0.34$). Table 3 summarizes the difference in GT exchange and ED utilization between the two groups.

The most common ED presentation was GT displacement (50 visits, 34%) followed by tube malfunction (19 visits, 13%) and leakage (19 visits, 13%). When comparing the GT clinic group and the SOC group, there was no statistically significant difference in ED chief complaint: tube displacement, broken tube, tube malfunction, infection, bleeding, leaking, and pain. Figure 1 summarizes ED presentation between the two groups. Overall, most tubes were replaced by IR (16 replacements, 43%), followed by GI (8 replacements, 22%) and GS (6 replacements, 16%). There was no statistically significant difference in replacement team.

Table 3 Comparison of number of tube exchanges and Emergency Department (ED) utilization between the gastrostomy tube (GT) clinic group and the standard of care (SOC) group

	GT Clinic $N=16$	SOC $N=81$	p-value
Tube exchanges (per patient)	7.38	2.77	0.00*
ED visit required (%)	19	54	0.01*
Number of ED visits (per patient)	0.88	1.62	0.34

Asterisk (*) denotes $p < 0.05$

Discussion

A dedicated, multidisciplinary GT clinic decreased ED visits for GT complications by 35% (54 vs 19%, $p < 0.05$). In addition, when compared to the prior SOC, patients managed in the GT clinic had no visits for broken tubes (0 vs 10%, $p = 0.29$), infected tubes (0 vs 11%, $p = 0.19$), or leaking tubes (0 vs 15%, $p = 0.19$) and maintained GT access for a longer period of time (83.4 vs 17.5 months, $p < 0.05$).

The impact of GT complications on our healthcare system is substantial. Rosenberger et al. described a total lifetime accidental percutaneous endoscopic gastrostomy (PEG) tube dislodgement rate of 12.8%, most occurring after discharge from rehabilitation or nursing facilities. The majority of these dislodgements required an ED visit, a level 3 surgical consultation, a replacement gastrostomy tube and a radiographic confirmation of tube positioning, resulting in charges averaging $1200 per dislodgement [5]. Jacobson et al. found a way to significantly decrease costs by avoiding confirmatory X-rays after bedside GT replacement following dislodgement if the tract appeared mature without trauma [8].

A patient's general medical condition and nutritional status are the greatest risk factors for adverse events related to tube feeding [9]. Attempts at preventing GT complications have centered around clinical care guidelines, i.e., the European Society for Clinical Nutrition and Metabolism guideline on home enteral nutrition [10]. Interestingly, a study by Hvas et al. found that a multidisciplinary nutrition support team that assists with patient selection for gastrostomy

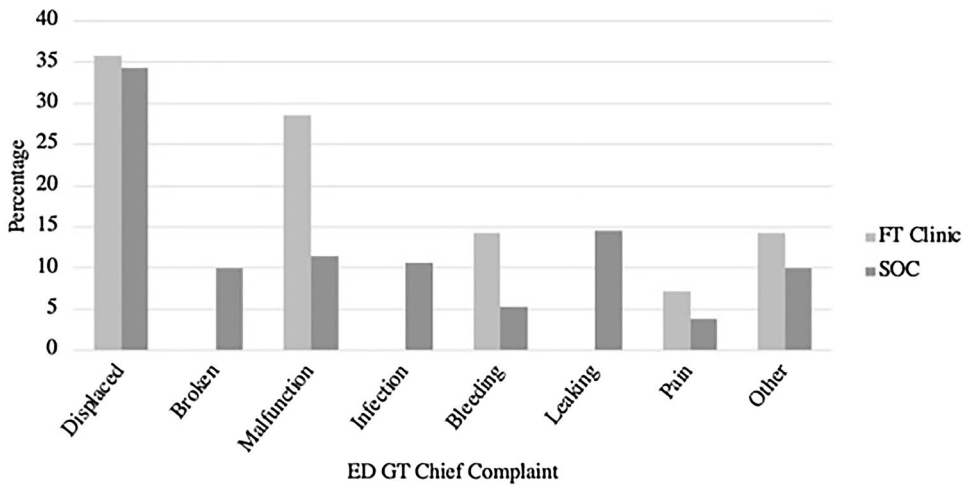

Fig. 1 Emergency department gastrostomy tube (GT) chief complaint for GT clinic group and standard of care (SOC) group

Table 4 Manufacturer guidelines for available gastrostomy tube (GT) devices

Tube type		Common tubes	Duration
Naso-gastric Naso-jejunal		Corflo® (AVANOS)	4–6 weeks
Balloon gastrostomy	Standard length	MIC® Gastrostomy (AVANOS); Balloon G-Tube (AMT); Bard™ Tri-funnel Gastrostomy (Bard); EndoVive™ Gastrostomy (Boston Scientific)	4–6 months
	Low-profile	MIC-Key® Low-profile (AVANOS); MiniONE™ Balloon Button (AMT)	
Balloon jejunostomy		MIC® Jejunostomy (AVANOS)	6–8 months
Non-balloon gastrostomy	Standard length	Ponsky® PEG (Bard); Capsule Monarch® G-Tube (AMT); Capsule Dome G-Tube (AMT); EndoVive™ PEG (Boston Scientific)	8–12 months
	Low-profile	MiniONE™ non-balloon (AMT), AMT Button (AMT), Bard™ Button (Bard); EndoVive™ Low Profile Button (Boston Scientific)	
Balloon & Non-balloon gastro-jejunostomy	Standard length	MIC® Gastrojejunostomy (AVANOS); EndoVive™ Through the PEG (Boston Scientific)	8–12 months
	Low-profile	MIC-Key® Low-profile (AVANOS)	

placement decreases 30-day mortality following gastrostomy insertion [11].

The GT clinic described in this study was developed to provide longitudinal care for patients with GTs. This clinic is a multidisciplinary clinic staffed by surgical residents and faculty, as well as dieticians and wound care specialists. The surgical team performs a focused physical exam and addresses concerns and complications related to the GT and prophylactically exchanges the tube based upon manufacturer guidelines (Table 3). Clinic visits are supplemented by registered dieticians at every visit and wound care when needed. This comprehensive management of the GT and regular review of the medications and feeds patients are receiving via the tube maximizes nutrition and resultant healing of the tube site and overall health. This clinic has also facilitated transition to the federally mandated ENFIT ® tube connection system (Table 4). Lastly, we provide a replacement tube should their current GT become displaced prior to the next visit. Patients receive VA-specific care and troubleshooting guidelines (in accordance with manufacturer guidelines) and 24/7 contact information to limit unnecessary ED visits.

Our study is the first to detail a dedicated GT clinic and demonstrate a correlation between its use and decreased ED utilization for GT complications. Although multifactorial, we postulate that these results are likely due to patient and caregiver comfort with GT use, care, and troubleshooting, ease of access to clinic support, and regular physical exams with GT exchanges to limit wound complications and malfunction from normal tube wear and tear.

Limitations of our study include its retrospective design at a single Veteran's Affairs institution. The patient population of this study has a strong male preponderance and while reflective of the veteran population at this site, may not be reflective of the general GT population. Furthermore, we did not analyze data on chronic medical comorbidities or adequacy of nutrition which may also limit the generalizability of these findings. As a single-institution study, our results may reflect local practices that may not parallel the national standard of care. For example, most GTs evaluated in this study were placed by IR and the majority of GT replacements were performed by IR, which may not be applicable to different institutions. Lastly, there was a significant difference in the length of tube dependence between the GT clinic group and the SOC group (83.4 months vs. 17.5 months, $p < 0.001$). This could reflect selection bias as the patients who survived longer would be more likely to participate in GT clinic. This may reflect increased comfort and familiarity with the feeding tube and a trend was seen toward increased longevity in those patients who died with the tube in place (57.0 months vs. 43.5 months, $p = 0.61$) but a larger study is needed to fully elucidate the reasons behind these differences.

Overall, a dedicated, multidisciplinary GT clinic focusing on comprehensive, longitudinal care by surgeons, dieticians, and wound care specialists reduces ED visits for GT complications by more than 50%. The high rate of GT complications in combination with a lack of standardized care guidelines after GT placement and the involvement of multiple specialties results in patients with GTs relying on the ED for complication management, which is a costly burden on our healthcare system. Follow-up in a dedicated clinic, along with prophylactic tube replacement can limit this burden and should be considered at all facilities that care for patients with GTs.

Disclosures Drs. Amber Moyer, Danielle Abbitt, Kevin Choy, Teresa Jones, Krzystof Wikiel, Carlton Barnett, John Moore, and Thomas Robinson have no conflicts of interest or financial ties to disclose. Theresa Morin has no conflict of interest or financial ties to disclose. Dr. Edward Jones receives consulting fees from Boston Scientific.

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