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Implementation of a Dietitian-Led Enteral Nutrition Support Clinic Results in Quality Improvement, Reduced Readmissions, and Cost Savings

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Abstract

Background: Enteral access device malfunction and breakage results in significant morbidity and healthcare cost. In many healthcare systems, enteral nutrition care is fragmented and inefficient. We describe the development and validation of an enteral nutrition support clinic (NSC) with a focus on prevention of enteral access complications. A care protocol consisting of pre- and postplacement visits and subsequent weekly visits was developed. Competencies were established for dietitians to staff the NSC. *Methods*: A retrospective quality analysis was performed in patients before and after the implementation of an enteral NSC. Enteral access complications, emergency room visits, readmissions, unplanned physician visits, and tube replacements were recorded for 90 days after tube placement. *Results*: Thirty patients were evaluated in the NSC pilot and compared with 22 baseline patients with adequate follow-up. The NSC resulted in an 88.9% reduction in nutrition-related emergency room visits ($P = .016$) and 78.1% reduction in readmissions ($P = .027$). Estimated per-patient cost reductions amounted to $6831. Approximately 30% of patients were seen in the NSC at least once for a clogged tube and 43.3% for tube leakage. Only 1 NSC patient required a procedure for tube reinsertion. *Conclusion*: Implementation of a dietitian-led nutrition support clinic resulted in improved quality, as well as reductions in hospital readmissions, tube-related complications, and healthcare costs. (*Nutr Clin Pract*. 2014;29:649-655)

Keywords

nutritional support; enteral nutrition; patient safety; outpatient clinic; dietitian; cost savings

Background

There is frequently a lack of adequate care and education provided to patients receiving enteral nutrition (EN). This gap is particularly significant when patients are initiated on EN in the acute care setting and receive education and training while hospitalized when they are least able to retain the information.[1] Frequently, patients require multiple hands-on discussions about care of enteral tubes and delivery methods, which can be time-consuming and less effective when delivered in the acute-care setting alone. A lack of comprehension can lead to noncompliance with EN therapy at home. Enteral access device malfunction and breakage accounts for significant morbidity among patients discharged from the hospital after major surgery or illness.[2] Loss or malfunction of enteral access results in diminished patient safety and financial losses to the healthcare systems due to avoidable emergency room visits and hospital admissions.[3] Providers in the emergency setting are frequently poorly equipped to address complications of feeding tubes and may not have suitable repair materials, skin-protectant products, and/or replacement devices available. Providers with expertise in enteral access are typically not readily available in the emergency room. Furthermore, patients receiving home EN require close follow-up with regard to fluid balance, electrolyte abnormalities, and gastrointestinal (GI) side effects. These issues account for additional unanticipated emergency room and provider visits, costs, and dissatisfaction for patients.[4]

Patients with enteral access represent a vulnerable population since they are not well suited to tolerate additional setbacks after what has frequently been a long and arduous hospital stay. EN holds the promise of multiple benefits to various patient populations, including but not limited to patients with cancer undergoing therapy, postoperative patients with GI

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dysfunction or dysphagia, and trauma and stroke patients with decreased oral intake due to neurological causes.[5] To realize the benefits of EN, the enteral access must consistently function to minimize interruption of delivery.[6]

As in most institutions, many providers at the Billings Clinic (Billings, MT) are involved in the care of patients receiving EN. While dietitian and nursing involvement in nutrition support has been substantial in the inpatient setting at the Billings Clinic, an outpatient equivalent of a nutrition support team has been lacking. Patients historically have received care for EN access issues from a variety of surgeons, gastroenterologists, oncologists, primary care providers, emergency care providers, and homecare providers. This fragmented care has been associated with high costs, low patient satisfaction, and occasional loss of enteral access. The numerous challenges of a fragmented care delivery system are described in Figure 1. Without an effective system in place to care for patients receiving EN, practitioners may be reluctant to place feeding tubes in patients who would benefit from EN.[7]

The American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) has published standards of practice for home EN support that identify best practice recommendations with the goal of minimizing these challenges and ensuring appropriate education and care for patients receiving home EN.[8] Most of these recommendations are based on expert consensus and experience. While these standards do exist, they have not been widely adopted.[9] With a shortage of nutrition support physicians nationally, there is a major opportunity for dietitians or nurses with specialized skills to assume the lead role in a nutrition support clinic (NSC) and participate in the routine management of enteral access devices.[10] A clinic-based outpatient NSC led by a dietitian or nurse skilled in the care and maintenance of enteral access tubes represents a novel approach to the dilemma of how best to care for these tubes since urgent outpatient access to the involved surgeon or endoscopist can be difficult.

We hypothesized that early recognition of at-risk enteral access devices and adaptation of prevention and treatment strategies in an NSC would result in lower rates of enteral access loss, reduced need for repeat or revisional enteral access procedures, and decreased hospital readmissions.

Methods

Pilot Clinic Development

The NSC pilot was started at the Billings Clinic to provide comprehensive and consistent outpatient care to patients receiving EN with a focus on prevention of enteral access complications. This was housed within a regional cancer center but served all surgical and oncology EN patients.

Competency Development

Prior to the start of the pilot, procedures to achieve staff credentialing for the NSC were established in consultation with state licensure laws, institutional policies, and A.S.P.E.N. standards.[11] A comprehensive NSC Competency document was developed using the A.S.P.E.N and Academy of Nutrition and Dietetics joint document.[11] Dietitians were evaluated in multiple dimensions of practice by 2 experienced attending surgeons using a combination of observation, verbalized competency, and documentation review. Each competency was scored 1–4, and the scoring formed the basis of both practice and order privileges in the NSC. Competency training also included 1–3 observations of placement procedures for feeding tubes, including nasojejunal, jejunostomy, gastrostomy, and percutaneous endoscopic gastrostomy, to facilitate understanding of the techniques.

Protocol Development

NSC consults were mandated for all surgical and oncology patients undergoing feeding tube placement. The NSC dietitian met with patients 3–7 days prior to planned feeding tube placement to provide education; secure insurance approval for nutrition products, pumps, and other supplies; and make necessary financial assistance referrals. The NSC dietitian saw the patient again on the day of or day after tube placement (either as an inpatient or outpatient, as appropriate) to provide hands-on education. Education included site care, tube care, and delivery of EN and free water. Successful demonstration of all skills by the patient or caregiver was required. Each appointment also included a check by the dietitian to ensure the tube was properly secured and to provide the most appropriate securing device to reduce risk of tube dislodgment. The dietitian continued to follow patients on a weekly basis for the first month and monthly after that when possible. For patients traveling a long distance, phone call follow-up was acceptable as necessary. All patients were seen a minimum of every 3–6 months. Table 1 summarizes the services routinely provided in the NSC.

Care standards were established that permitted the NSC dietitian to order a limited set of interventions, laboratory tests, and tests that were relevant to NSC practice. These orders included tube feed formulas and free water; dietary supplements, including protein, glutamine, probiotics, fiber, vitamins, and minerals; and laboratory tests, including zinc, vitamin D, prealbumin, fecal fats, triglycerides, and blood glucose.

Data Collection and Analysis

Data were collected for 90 days after tube placement. Data recorded for each visit included the purpose of the visit and any EN-related complications noted during the visit. Complications tracked included tube clogging, local site infection, tube discharge, pain at the tube site, bleeding, skin breakdown/necrosis, redness/tenderness, tissue granulation, tube leaking, and tube dislodgement.

Prior to implementation of the NSC pilot—and prior to the addition of a specialist registered dietitian to the outpatient setting—a baseline population review was conducted to

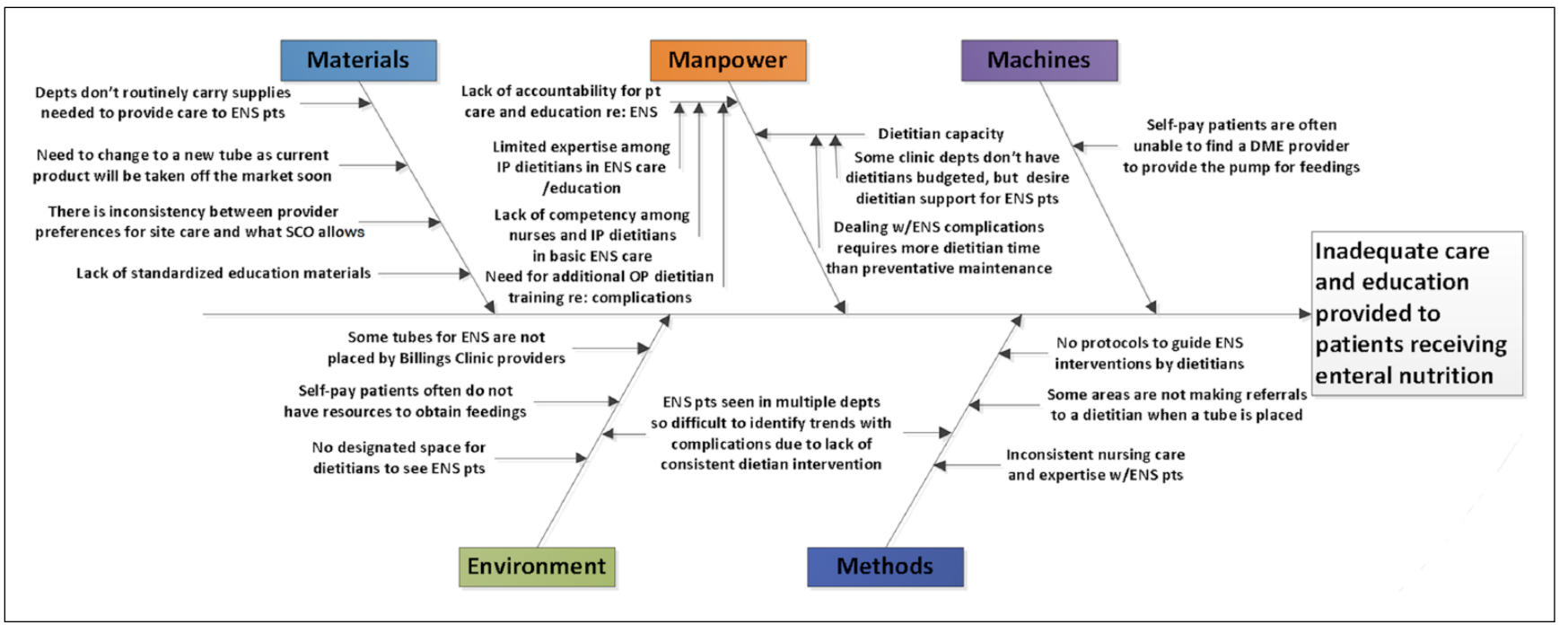

Figure 1. Challenges of enteral nutrition delivery in the old fragmented care delivery system. ENS, enteral nutrition support; DME, durable medical equipment; IP, inpatient; OP, outpatient; pt, patient; SCO, supply chain operations. Developed by K.B., B.H., and K.W.

Table 1. Services Routinely Provided During Nutrition Support Clinic Visits.

NSC Pretube Placement Visit	Posttube Placement NSC Visit	Weekly NSC Visit
• Introduce and demonstrate feeding tube • Obtain authorization for home EN setup • Referral for financial assistance and medication assistance program as appropriate • Nutrition assessment and EN plan development	• Hands-on demonstration of site and tube care. Delivery of first enteral feeding with required return demonstration • Tube secured using device most suitable for patient while providing education on tube securement • Setup and education on home enteral plan and company • Education on unclogging tube	• Tube and site examination to ensure proper care and security • Ensure access to adequate formula and supplies • Follow up with home enteral company as needed • Nutrition monitoring and evaluation of home enteral plan for tolerance and adequacy

EN, enteral nutrition; NSC, nutrition support clinic.

Table 2. Characteristics of Patient Populations Before and After the Nutrition Support Clinic Pilot.

Population Characteristics	Baseline (n = 22)	NSC Pilot (n = 30)	*P* Value
Received chemotherapy	1 (4.5)	1 (3.3)	>.99
Received radiation	0	0	>.99
Received combined chemotherapy and radiation	11 (50.0)	21 (70.0)	.162
No chemotherapy or radiation	7 (31.8)	8 (26.7)	.762
BMI, mean (range)	25.5 (15.0–41.0)	25.7 (14.0–40.0)	>.99
No. of hospital admissions prior to tube placement, mean (range)	1.1 (0–3)	0.7 (0–4)	>.99

Values are presented as number (%) unless otherwise indicated. BMI, body mass index; NSC, nutrition support clinic.

identify and quantify areas for improvement. Baseline patients were identified using *Current Procedural Terminology* (*CPT*) codes for tube placement during a 6-month period in 2011 prior to the availability of dietitian assistance and implementation of the NSC. The same 90-day outcomes data were collected in the first 4 months of the NSC for new patients who received feeding tubes (n = 30). This was a retrospective review of quality data during the time when the intervention occurred and not subject to institutional review board review. Statistical analysis was performed using GraphPad QuickCalcs (GraphPad Software, La Jolla, CA). Categorical data were analyzed using the Fisher exact test. Continuous data were analyzed using the *t* test.

Results

Forty-two patients had enteral access placed in the baseline 6-month period before the NSC pilot. Of those, 20 patients were excluded from follow-up data collection due to reasons including tube placement for decompression (not nutrition), transfer to another facility and provider without further follow-up, or death prior to hospital discharge. This left 22 patients with follow-up data for analysis. Of those 22 patients in the baseline group, none saw a dietitian preoperatively, only 3 ever saw a dietitian postoperatively, and none received weekly follow-up.

A total of 30 patients were seen in the NSC pilot period. The NSC patients were similar to those in the baseline group. Table 2 describes characteristics of the 2 groups.

After implementation of the NSC with standard weekly follow-up visits, identification of enteral access complications rose sharply compared with the pre-NSC baseline (Table 3).

Complications and high-cost interventions, including emergency room visits, hospital admissions, and surgical tube reinsertions, were significantly reduced after implementation of the NSC (Table 4). Costs associated with the NSC were calculated by taking into account supply costs during the pilot plus the portion of the dietitian salary dedicated to the NSC (based on average time spent with pilot patients as a percentage of total hours worked) (Table 5). The dietitian's time was inclusive of a 60-minute preoperative visit, a 60-minute postoperative visit, and nine 30-minute follow-up visits. Annualized projected cost savings associated with reduced complications are reported in Table 5. Since this was implemented as a pilot program, NSC visits were provided at no charge to the patient. However, with appropriate documentation and billing of these visits, there is potential for associated patient care revenue to offset overall program costs.

Table 3. Enteral Access Complications Before and After the Nutrition Support Clinic Pilot.

	No. (%) of Instances			No. (%) of Patients With Complications		
Complications	Baseline (n = 22)	NSC Pilot (n = 30)	*P* Value	Baseline (n = 22)	NSC Pilot (n = 30)	*P* Value
Clogged tube	3 (13.6)	11 (36.7)	.112	3 (13.6)	9 (30.0)	.200
Local infection	**11 (50.0)**	**4 (13.3)**	**.006**	7 (31.8)	4 (13.3)	.169
Tube discharge	4 (18.2)	7 (23.3)	.741	2 (9.1)	5 (16.7)	.685
Pain at site	**12 (54.6)**	**2 (6.7)**	**<.001**	**9 (40.9)**	**2 (6.7)**	**.004**
Bleeding	0	2 (6.7)	.502	0	2 (6.7)	.502
Skin breakdown/necrosis	2 (9.1)	5 (16.7)	.685	2 (9.1)	3 (10.0)	>.99
Redness/tenderness	**22 (100)**	**22 (73.3)**	**.015**	11 (50.0)	14 (46.7)	>.99
Tissue granulation	4 (18.2)	1 (3.3)	.149	3 (13.6)	1 (3.3)	.299
Tube leaking	**5 (22.7)**	**23 (76.7)**	**.002**	**3 (13.6)**	**13 (43.3)**	**.033**
Tube dislodgement	4 (18.2)	1 (3.3)	.149	2 (9.1)	1 (3.3)	.563

NSC, nutrition support clinic. Statistically significant results in boldface.

Table 4. ER Visits, Hospital Admissions, and Surgical Tube Reinsertions per Patient in the Baseline and NSC Pilot Groups.

Tube-Related Occurrences	Baseline (n = 22)	Baseline Mean No. of Events per Patient	NSC Pilot (n = 30)	NSC Pilot Mean No. of Events per Patient	% Change in Occurrences	*P* Value
Unplanned physician visits	7	0.32	8	0.27	–15.6	.762
ER visits	**6**	**0.27**	**1**	**0.03**	**–88.9**	**.016**
Hospital readmissions	**7**	**0.32**	**2**	**0.07**	**–78.1**	**.027**
Tube reinsertion procedures	3	0.14	1	0.03	–78.6	.299

ER, emergency room; NSC, nutrition support clinic. Statistically significant results in boldface.

Table 5. Projected Cost Savings of the NSC.

Tube-Related Occurrences	Mean Cost per Occurrence	Mean Reduction in Occurrences per Patient	Mean Cost Savings per Patient	Estimated Annualized Savings (Assumes 90 Patients/y)
Unplanned physician visits	126.27	–0.05	–6.50	–585.43
ER visits	2493.00	0.24	596.81	53,712.82
Hospital admissions	24,354.18	0.25	6125.45	551,290.07
Tube reinsertion procedures	1124.26	0.10	115.83	10,424.96
Costs of implementing the NSC pilot per year			$291.55 (per patient)	$26,239.50 (institutional)
Total avoidable costs			**$6831.59 (per patient)**	**$614,842.42 (institutional)**

Costs are presented in U.S. dollars. ER, emergency room; NSC, nutrition support clinic.

Discussion

We have demonstrated that a dietitian-led outpatient NSC can be a successful and cost-saving approach to the management of patients receiving home EN. In addition to routine dietary assessment and feeding management, expanded competencies of the NSC included management of enteral access device issues, regular monitoring of enteral access security, and consistent education for patients and caregivers. Implementation of the NSC reduced emergency room visits and hospital readmission. Our data suggest that the need for tube reinsertion and other complications was reduced, but a larger patient population would have been necessary to confirm this observation with statistical significance. By centralizing care of the EN patient at the NSC, hospital and physician practices can realize a significant improvement in efficiency.

The NSC pilot noted increases in certain minor EN complications such as leakage or clogging—likely due to improved

documentation and centralization of care. We hypothesize that more tube complications were captured in the NSC documentation since patients had a clear resource to turn to when problems occurred. Regular assessments allowed for timely identification and correction of education inadequacies, site complications, and intolerance of feeds. Patients in the baseline population had an average of 5 visits with a physician in which there was no documentation of a feeding tube, site condition, or EN tolerance.

In the old system, care was fragmented and many complications likely went undocumented. Presumably, if minor complications were identified early before the situation escalated, tubes could be saved and costly emergency visits and readmissions prevented. While we do not have data regarding the reasons behind all the unscheduled physician visits, the number of unscheduled physician visits remained stable. Some of these visits occurred when patients were seen in the NSC when their problems necessitated physician evaluation. The lead NSC physicians were committed to ensuring prompt access when an NSC patient was in need of evaluation beyond what the dietitian was able to provide. Without the NSC, we can speculate some of these patients requiring physician evaluation would have been referred to the emergency room or admitted to the hospital. Patient satisfaction rates in the NSC were high (a mean of 4.8 on a 5.0 scale), but no baseline comparison data are available.

Our results complement those published by an Australian group that implemented a dietitian-led clinic in patients with head and neck cancer that resulted in a reduction in nutrition-related admissions from 12% to 4.5%.[12] While our intervention focused primarily on centralizing and managing the care of enteral access patients, their group developed an algorithm to assess patients for malnutrition and to intervene on patients who demonstrated a need for supplemental percutaneous endoscopic gastrostomy or nasogastric tube feedings.

The basis of the NSC is protocol-driven care. Dietitian-led, protocol-driven care has been successfully attempted before in other contexts,[13] and numerous examples of protocol-driven care by nonphysicians have been documented in both inpatient and outpatient settings.[14,15] Nutrition support teams in the inpatient setting have been demonstrated to improve outcomes, including lower infection rates, higher survival, higher caloric delivery, better glycemic control, and reduced monetary costs.[16-18] There is also precedence to support the incorporation of specialist enteral access skills into dietetic practice. Dietitian-led teams to place postpyloric tubes have been shown to reduce costs, improve EN delivery and tolerance, and reduce ventilator-associated pneumonia rates.[19,20] It is not surprising that development of an outpatient specialty NSC can achieve similar measurable improvements in outcome.

Limitations of this study include relatively small sample sizes, dissimilarity between the baseline and NSC groups (more patients in the NSC received chemotherapy and radiation), and a single-institution study population. Further health services research in clinical nutrition could help clarify which aspects of an NSC contribute to reductions in emergency visits and readmissions.

In the current healthcare climate in the United States—where we are trying to deliver more care at lower cost—there is a major drive to develop processes that improve quality and reduce readmissions.[21] Inpatient nutrition support services have long been known to be cost-effective.[22] Through development of an NSC with a focus on identifying and preventing enteral access complications, we have demonstrated improved patient outcomes and economic benefits. In the era of healthcare reform, institutions should allow dietitians, nurses, and others to practice "at the top of their license" with appropriate training, support, and supervision to provide enteral access care. In dietetic practice, this effort to achieve the "top of practice" can include initiatives to transition more dietitians to expert or advanced levels of practice. Dietitian visits may be covered by healthcare plans and patient copays, so in the future the NSC could become self-supporting. This strategy will also help fill the gap of missing nutrition support physicians and the fragmented care delivered by surgeons, gastroenterologists, oncologists, and others. State licensure laws and regulations as well as institutional regulations should be reviewed and updated to facilitate these opportunities. This "top of license" practice model allows practitioners, including dietitians and nurses, to use their skills to their maximal potential and will improve access and efficiency of healthcare delivery.[23]

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