

SAFE PRACTICES *in Patient Care*

Helping to promote a culture of safety

Enteral nutrition is the preferred way of feeding patients who cannot maintain sufficient oral intake but have a functioning gastrointestinal tract. Enteral feeding has been used for several decades for hospitalized patients, but for the last 20 years home enteral nutrition (HEN) has been expanding in home care. The number of patients on HEN is now higher than patients on home parenteral nutrition. HEN is considered as being safer, more physiologic, and more cost effective than parenteral nutrition; however potential complications can negate these advantages. In her article Ms. Linda Lord outlines what is involved in the safe and effective delivery of HEN including techniques of tube feeding delivery, how to avoid complications, and how to incorporate it into the family's schedule of activities.

When caring for HEN consumers, clinicians primarily focus on minimizing adverse medical and nutrition-related outcomes. In contrast, HEN consumers' foremost concerns usually involve psychosocial challenges, which affect their quality of life. In their article, Dr. Cheryl Thompson and HEN consumer Luke Vohsing, provide the HEN consumer's perspective, with the goal of helping clinicians not lose sight of how they can help HEN consumers minimize disruption to their lives.

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Safe enteral tube feedings and hydration in home care

by Linda M. Lord, NP, MS, CNS

When patients are unable to maintain adequate nutrient and hydration status by oral diet alone, nutrition support may be initiated as either a supportive or a life-saving measure. Enteral tube feeding is frequently touted as being safer, more physiologic, and more cost effective than parenteral nutrition, but it has potential complications that can negate these advantages. To safely discharge a patient receiving enteral tube feedings, a series of steps should be taken: verifying appropriateness of therapy, identifying overall nutrition goals, educating the patient, arranging continuing followup. For optimal functioning, patients should be familiar with the enteral access device. Ideally, significant others are included in this process, learning techniques of tube feeding, how to avoid or respond to complications, and how to incorporate the feeding into the household's schedule.

Indications and goals for home enteral tube feedings

Home enteral tube feedings are indicated when a patient has a functional gastrointestinal (GI) tract but cannot or should not meet nutrient requirements by oral feeding alone. This may be due to impaired swallowing, gastroparesis, nausea, emesis, inadequate oral intake, inadequate absorption of nutrients, or insufficient

mental status. Goals for nutrition support should be established that may include achievement of an ideal weight, maintenance or repletion of nutrition or fluid status, prevention of nutrient deficiencies, or short-term nutrition support through rigorous medical therapies such as chemotherapy or radiation treatment.

Enteral access devices

Nasally inserted feeding tubes are for short-term use, about 6 weeks; otherwise they can cause skin erosion, ulcers, otitis media, rhinitis, or sinusitis. Nasal feeding tubes for adults are small-bore (8-12 F) and made of soft materials such as polyurethane or silicone. They are generally long enough to reach the stomach or small bowel. Larger-bore, stiffer nasogastric tubes of 14-18 F are manufactured for decompression and drainage of the stomach.

If tube feedings are indicated for more than 6 weeks, enteral access devices that are inserted directly through the abdominal wall into the GI tract should be considered. These include gastrostomy (G) and jejunostomy (J) tubes.

G-tubes are preferable as the feeding formula can generally be administered as quickly as a meal is normally consumed, 3-4 times during the day. Between feedings the tube is capped. The most common types are percutaneous endoscopic gastro-



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Life with home enteral nutrition: *a view from the inside*

by Cheryl W. Thompson PhD, RD, CNSD, and Luke Vohsing

When caring for home enteral nutrition (HEN) consumers, clinicians primarily focus on minimizing adverse medical and nutrition-related outcomes. In contrast, HEN consumers' foremost concerns usually involve psychosocial challenges, which affect their quality of life. Although each person's experience is unique, consumers encounter many similar HEN-related challenges. Consumers who perceived themselves as coping successfully with HEN have offered insights into how they are able to adapt, cope, and ultimately thrive with this therapy.

Common challenges

HEN provides the nutrients essential to sustain life; however, the sensory, social, cultural, and religious pleasures and traditions associated with eating typically remain unmet.¹ Reliance upon HEN produces a ripple effect that can profoundly affect self-esteem, family dynamics, personal and professional roles, social relationships, and employment. Although each individual's experience is unique, common challenges arise as a person adjusts to life with HEN (refer to Table 1).

Helping themselves: Insights from resilient individuals

One author (Thompson) of this article, in her doctoral research, sought to understand how HEN consumers learned to cope successfully with their therapy and to determine how healthcare providers could foster the process.^{2,3} In her qualitative study, 12 adults who perceived themselves as coping successfully with HEN described how they achieved a state of thriving by using an attitude of personal responsibility to accept new life conditions, seek and accept

support, take charge of their own well-being, maximize their independence and normality, and focus on the positive. The author anticipated that the participants would provide many examples of how clinicians helped them to deal with HEN yet, for the most part, their collective story was a quest for answers by independently seeking information and resorting to trial and error. Nevertheless, they provided some practical recommendations for clinicians, often by recalling what would have been helpful—for example, the majority of participants cited the need for additional education. Feeling unprepared to assume the

responsibility of their HEN regimen and to deal with potential complications was a considerable source of frustration, anger, confusion, and anxiety for these individuals and their families.

The participants also described adapting to new and ongoing HEN-related disruptions as a dynamic process. This finding was consistent with recent research that defies the traditional view of chronic illness as a predictable, linear trajectory of stages from diagnosis to acceptance and, finally, adaptation.^{14,15} The process of coping with HEN included four nonlinear and dynamic phases: negative emotions, independence, normalization, and thriving. Negative emotions are a natural response when initiating HEN. Rather than ruminate over those emotions, resilient consumers tried not to dwell on them, or they used feelings of anger and frustration as catalysts for constructive actions. Participants' advice to clinicians included that it helps to listen intently, validate their feelings, and collaborate to resolve the underlying issue.

The use of a wide variety of coping strategies was another key factor in the participants' ability to thrive with HEN. Most notably, they practiced problem-focused and constructive emotion-focused coping strategies. Problem-focused coping strategies are actions intended to resolve a stressful situation such as learning a new skill, seeking information, trying a new medication or enteral product, using social support, or practicing problem-solving techniques.¹⁶ These skills were invaluable to overcome problems that consumers or their clinicians had the ability to control or improve. However, HEN consumers encounter many problems arising from their underlying disease or reliance upon HEN that may never be improved or resolved. Emotion-focused coping strategies can at least temporarily reduce the emotional stress of irreversible conditions by changing how a person thinks or feels about the situation.¹⁶ Strategies used by these resilient consumers included finding meaning or benefit from the experience, viewing the situation in a more positive light, distracting themselves with another activity, making light of the situation, comparing

Table 1. Common challenges identified by HEN consumers^{2,13}

- Inability to eat, or restricted intake
- Difficulty accepting dependence, physical limitations, and lack of control
- Negative or altered body image
- Altered marital and other relationships, changes in family dynamics, interference with sexual functioning
- Social embarrassment and isolation, difficulty finding a support system
- Inflexible initial HEN regimen, lifestyle disrupted by infusion schedule
- Negative emotions such as depression, anxiety, fear of the unknown, grief, low self-esteem, pity, anger, denial, and "Why me?" attitude
- Inadequate HEN education and follow-up
- Technical problems with equipment, especially when beginning HEN
- Perceived lack of knowledge by healthcare providers, and inconsistent information regarding HEN

themselves to someone less fortunate, and expressing their emotions by talking with a friend or counselor and writing in a journal. In addition, vigilantly monitoring their progress toward self-imposed goals challenged some consumers to improve and enabled them to track gradual changes that might otherwise go unnoticed.

Based on these participants' experiences, it was evident that both problem- and emotion-focused strategies are essential to coping successfully with HEN. Twenty-nine of the strategies that these consumers used to cope successfully with HEN have been compiled into a self-help manual. This free resource, *Coping Well with Home Enteral Nutrition*, is available for downloading at <http://www.copingwell.com>.

How clinicians can foster coping

Although the study participants were largely self-taught, clinicians can help to teach many of the concepts. The following strategies, gleaned from interviews with HEN consumers and nutrition-support clinicians, will help HEN consumers to cope and to improve their self-management skills.

Support

Support from family, friends, organizations, or a spiritual source enhances coping.

1. Tell HEN consumers about support groups such as the Oley Foundation. Many studies have confirmed that social support facilitates coping.^{6,17} Potential benefits from support groups include receiving practical information, being inspired by others who have overcome similar challenges, realizing that one is not alone, and sharing a similar experience. It is important to recognize that the type of support desired will vary, and a person's educational and emotional needs will change over time. If they desire, more experienced consumers can volunteer to share their knowledge with others. A national group that provides education and outreach to home parenteral and enteral nutrition consumers, their families, and clinicians is the Oley Foundation.

Resources, including the newsletter *Lifeline*, are available at <http://www.oley.org> or by calling 800-776-OLEY (6539). Referring consumers to disease-specific support groups can also be helpful. As a participant stated: . . . the people that cannot cope, or will not cope, they need to be talked to by a person that goes through the same thing as they have gone through. . . . that person doesn't need to talk to a doctor because the doctor only knows from not experience but what other people have told him or what he thinks. "They need to talk to somebody who tube feeds themselves." Another HEN consumer said, "It has been very helpful for me to just see other people who are going through the same problems as me. When you are tube fed, you often believe that you are the only person on the face of the Earth that is going through this; that is why it is helpful to see others going through the same thing. One of the blessings and curses of relying on HEN is that when these people are out in public it is often hard for others to tell that they are HEN-reliant. It is a blessing because I don't want everyone to know that I have a tube in my stomach, yet it is a curse because I can never tell who the other people are that are going through the same things as me."

2. Encourage HEN consumers to seek and accept support. At times, HEN consumers may be reluctant to ask for the assistance they need, often because they do not want to burden others.



KANGAROO JOEY™ Pump (Covidien, Mansfield, MA)

Clinicians can help by conveying that it is the consumer's responsibility to assure that his/her need for support is recognized and to be willing to accept help. One participant advised other consumers, "As appropriate, don't be afraid or embarrassed to hand over responsibilities of your life to others. . . . It's not your fault you're limited; ask for help when needed." Another HEN consumer stated, "It is often hard to ask for help because you lose your sense of independence when you have to ask for help all the time, yet there are times that you will need help no matter what you do."

3. Be sensitive to their spiritual needs. Individuals who experience a health crisis often turn to a spiritual source of strength or strengthen their religious affiliation.^{18, 19}

Mobility

Mobility is associated with feelings of freedom and independence, increases a person's ability to resume normal activities, and can enhance quality of life.

1. Choose equipment that maximizes mobility and independence. HEN consumers who are not bedridden may benefit from ambulatory pumps. In recent years, technological improvements have decreased pumps' size and weight while extending battery life and ease of programming. Changing to a light-weight ambulatory pump can maximize HEN consumers' mobility. One example of this new technology is the KANGAROO JOEY™ Pump (Covidien), an ambulatory feeding and flushing pump. It has a fully portable design with a backpack or fanny pack that allows convenient, discrete use. Another portable pump that is available is the EnteraLite® Infinity® Enteral Feeding Pump (Zevex Inc.), that can help consumers stay more active. One HEN consumer recalled, "I was getting very frustrated because it was like sitting and I was stuck. . . . That has really helped as far as traveling, being able to have the portable pump." Another consumer conveyed, "I have taken my pump all

the way to Australia and back and it worked great! These new pumps allow people to live their lives and work the problem of HEN into their lives, not the other way around.”

2. Minimize infusion time to the extent possible. Periodically review the HEN regimen, as it may be possible to decrease the infusion time; for example, over time the gastrointestinal tract may gradually adapt to a more rapid infusion rate. As another option, a more concentrated formula may be used to decrease the number of feedings per day, assuming that the consumer receives adequate fluid orally or uses water boluses. A HEN consumer described the feeling this way: “Eight hours that I’m free . . . off the pump. . . . When you are stuck to a pump it feels like you are in jail; you can’t do anything except sit and wait for it to be over. When the pump gets taken off I feel like I am set free, I can now live my life and am free to do whatever I want.”

Information

Information is power, and without it consumers can feel helpless to resolve even the simplest HEN-related problems.

1. Inform completely. Clinicians know the importance of providing comprehensive HEN education using clear and concise verbal and written instructions. However, it requires diligence to recognize when a consumer has not fully understood the information. Be cognizant of impediments to instruction such as altered mental or emotional state, vision or hearing impairments, or a language barrier.²⁰ Other possible barriers include providing an overwhelming amount of information, giving advice that is inconsistent or irrelevant at the time, and failing to address the consumer’s real concerns.²¹ In addition, consumers may be more likely to have questions later after experiencing HEN on their own. Plan for followup sessions; otherwise you might hear this complaint: “The first time that I had to make my bag myself

I had so much information that I didn’t even know where to begin. I felt like no matter what I did it was going to be wrong.”

2. Prepare consumers for potential complications. Provide information about complications before they occur to minimize negative emotional responses and to facilitate proactive and appropriate preventive actions. If printed resources are not readily available, utilize the free Oley Foundation complication charts (<http://www.oley.org/charts.html>). When recalling the first time his tube fell out, one man said, “They don’t tell you that when you go home . . . that this is something that’s gonna go on. I mean, I was a little surprised the first few times things went wrong.”

Self-management

Self-management decreases reliance upon others and should be encouraged to the extent that each consumer is capable.

1. Teach self-management and problem-solving skills. Demonstrate each task using small, sequential steps. Explain the rationale, and assure sufficient hands-on practice to develop competence. Provide positive and specific feedback. One consumer stated, “[The] motivation was to unburden my wife; the other was to demonstrate to me that I could be independent.” Another consumer who started HEN as a child recalled, “When I first got my G-tube, the way that the doctors explained it to me was very helpful. They had a doll in which they had placed a G-tube in its stomach and they had one that was not yet used. They let me play with both of them, just to see what they were like, what they felt like, how they worked, and what I could expect.”
2. Once basic skills are learned, practice problem-solving and trouble-shooting scenarios. One HEN consumer explained, “No, feeding tubes are not always trouble-free. Sometimes you have to work with them and take alternative pathways, but they are manageable. . . . A few hazards along

the way are just part of the process.” Another consumer advised, “Don’t be afraid to try new techniques when problem-solving because you never know, your new technique might work better than anything else.”

Coping

Coping strategies should be taught to HEN consumers because most people repeatedly use the same methods of dealing with adversity whether or not they are successful.

1. Foster constructive emotion-focused coping strategies. Advise consumers that changing the way they think or feel about a situation can at least provide temporary relief for problems beyond their control. Another participant described this as “trying to minimize the effect it had on me . . . rolling with the punches.”
2. Help consumers to set realistic goals and plan necessary actions. Suggest writing in a journal, which has been a helpful tool for home parenteral nutrition patients with depression.²² A participant in the study mentioned how his surgeon had told him “to keep a journal and write down when you’re having a good day. You realize there’s more good times than you might sometimes realize, even if it’s only once or twice a week.”

Collaborative decisions

Collaborative decisions can enhance compliance and maximize quality of life because they include input from those who are most affected by HEN-related decisions.

1. Facilitate collaborative decision-making. Consumers will vary in the extent to which they want to participate in decision-making, which can also evolve over time. Collaborate in decision-making as much as the consumer is able and desires to participate. A female consumer explained, “Our society is just medically, is very paternalistic, and it is very seductive when you are sick to want someone else to figure it all out for you.”
2. Educate consumers on the pros and

cons of all options; they are often reluctant to participate in decision-making because they are inadequately informed. Set mutually agreeable goals, and be sure that all parties buy in to them. The entire family and social network can feel the impact of HEN. Try to include all key people in decision-making. “Being a child when I first lost my small bowel, it was always important for me to at least help in the decision-making process,” said one consumer. “My doctor’s philosophy which I live by is ‘Yes, you have this condition, but live your life and we will work these problems in around it.’ I cannot think of a better philosophy to have when dealing with HEN.”

Mental health

Mental health is essential for well-being; therefore, problems must be recognized and effectively managed to cope successfully with any chronic health condition.

1. Identify and treat mental-health problems. To cope effectively, mental-health issues such as depression must be resolved or treated. Be alert to signs of depression, as the stigma of mental illness causes many individuals to hesitate in seeking the help they need.
2. Do not rely on consumers to self-diagnose mental-health issues. Increase your efforts to screen and diagnose depression, which frequently occurs when initiating HEN and with underlying conditions such as a stroke or cancer.
3. Validate consumers’ feelings. HEN consumers should be aware that experiencing negative emotions is a common reaction to chronic illness and the initiation of HEN. Foster open communication and discuss treatment options or make a referral as appropriate. One participant offered this advice to other consumers: “Don’t be afraid to talk with your doctor. And don’t be afraid to go into counseling to learn how to deal with it.”
4. Understand that people are self-conscious about changes to their body image. It is a natural desire to want to feel accepted by others and not to

feel different. Many HEN consumers prefer a low-profile gastrostomy tube that is flush with the skin. One man recalled, “You walk along with kind of a crazy feeling for the first six months, wondering, ‘Well, what will people think of me with this tube in my stomach?’”

Minimal disruption

Minimal disruption to daily activities helps consumers to adjust more easily to reliance upon HEN.

1. Simplify the regimen. Help to minimize the extent to which HEN consumers’ lives revolve around their therapy. One man gave the following advice: “Do not become a slave to the tube.” Another consumer stated it this way, “You are not the tube; you are a person with a tube.”
2. Allow for flexibility within medical and nutrition guidelines. Consumers need to be actively involved in deciding their HEN regimen; otherwise, they are likely to experiment with changes, often without input from a clinician. One woman described changing her own HEN regimen this way: “As time goes on, you become more flexible, and you learn to overcome. . . . You realize that regimentation that they sent you home with is not written in stone.” Allow as much flexibility as is medically feasible to help minimize life disruption. Establish boundaries of safe practice and clearly explain the consequences of leaving the safety zone.

Empowerment

Empowerment stimulates a sense of responsibility and confidence in one’s ability to succeed.

1. Help HEN consumers realize that they are ultimately in charge. One man said, “You have to be in charge yourself.” Later he clarified it: “If I have the opportunity to direct what I’m doing and how I am doing it, I want to maximize that as much as I can, and thank goodness that I can.” Each HEN consumer is ultimately responsible for his or her thoughts and actions. Thoughts and actions have

consequences—even if it is deciding to do nothing. The objective is to choose constructive behaviors repeatedly.

2. Information is power. Empower HEN consumers by enhancing their knowledge. One participant suggested that clinicians should “empower the patient to be able to make some decisions for themselves.” If you do not know an answer, offer to help resolve the issue together.

Conclusion

Despite the best of intentions, the current home-care services offered to HEN consumers may be inadequate, which further perpetuates the vulnerability of these individuals. Clinicians must focus on their responsibility to ensure safe and effective delivery of HEN yet not lose sight of how they can help to minimize the extent to which HEN disrupts consumers’ lives. Clinicians must expand the lens with which they view HEN therapy to include the consumer’s perspective, because the effects of HEN go beyond its medical consequences. Reliance upon HEN has been correlated with decrements in quality of life, which for some individuals could be improved by simple modifications to their care regimen and by fostering the use of effective coping strategies. HEN consumers must assume the responsibility of choosing behaviors that promote health and well-being. In addition, clinicians can help to lessen the burden by fostering independence and quality of life, because all HEN consumers deserve the opportunity to maximize their own well-being.

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Luke Vohsing is an exceptional 18-year-old who lost all but 10 inches of his small bowel after a car accident when he was in third grade. Eager to educate his peers, Luke went before his class when he returned to school and explained his surgery, what short bowel syndrome is and all about home IV and tube feedings. After years of interrupted sleep, Luke invented a device to prevent his feeding line from occluding during the night. In the seventh grade, Luke entered this device in a prestigious science fair and won the Governor's Award in the Field of Biotechnology. Luke graduated from high school in June of 2006, and will be attending Mount Carmel School of Nursing to work on his BSN. He hopes to become a pediatric nurse.

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tomy (PEG), balloon, and skin-level. PEG tubes are inserted endoscopically, protrude through a gastric stoma, and contain an internal plastic bumper that prevents them from migrating out of the stomach. Balloon G-tubes can be inserted endoscopically, under radiographic guidance, or when replacing a tube in a mature gastrostomy tract. They also protrude through a gastric stoma, and they have an internal balloon filled with water (through an external port) to prevent dislodgment. Both PEG and balloon G-tubes have a movable external plastic bumper to prevent the tube from migrating too far inward. Skin-level G-tubes are replacements, generally inserted in a mature gastrostomy tract 3 months or more after the original G-tube placement. Skin-level tubes offer cosmetic advantages as they are small, lightweight, and flush with the skin. Each has an anterior cap that closes it; when the cap is opened, an extension tube can be attached for infusing formula, delivering medication, or administering water flushes. A water-filled balloon or plastic bumper holds the tube in place internally.

J-tubes are used when gastric access is not possible or a patient has significant risk for aspirating the formula, such as with gastroparesis, impaired glottic closure, gastric outlet obstruction, severe gastroesophageal reflux disease, upper gastrointestinal tumors or surgeries, or unsuitable mental status. J-tubes are inserted directly into the jejunum or passed through an existing G-tube (J-tube extension) with the tip going through the pyloric valve into the small intestine. Transgastric tubes are inserted through a gastric stoma and contain separate G-tube and J-tube lumens. The J-port is usually for tube feedings and the G-port is for medications or gastric decompression and drainage.

Feeding schedules and delivery systems

Tube feedings can either supplement the diet when there is inadequate oral intake or provide the sole source of nutrition.

When used as a supplement, they should be administered either after a meal or as a nocturnal infusion to minimize suppression of the patient's appetite. Tube feedings can be delivered via syringes, gravity bags, or pump infusions.

The syringe method typically uses a 60-mL catheter-tip syringe attached to the enteral access device. The formula is instilled directly into the tube under plunger pressure, or the plunger may be removed so that the barrel of the syringe funnels formula drawn by gravity. This method is the quickest and is suitable for gastric-tube feedings only.

Another method for gastric-tube feedings is utilizing a gravity bag hung from an IV pole. Formula is poured into the bag, and the rate of administration is controlled with a roller clamp. The bag is rinsed with water between feedings, and a new bag is used every day.

Pumps are for either gastric or small-bowel feeding, delivering a slow drip that can be gradually transitioned from continuous infusion to providing the total volume over 12–16 hours daily. Sometimes pumps are used for nocturnal infusions when patients eat too little during the day. For malabsorption cases, nocturnal infusions may be added to small, frequent oral daytime feedings.

Whatever the choice of delivery system, feeding formulas must be handled with clean technique¹ (Table 1).

Fluid administration

Even though adult tube-feeding formulas are 69% to 86% water, this is typically not sufficient to meet total fluid needs.

Table 1: Handling of Enteral Delivery Systems

- Thorough hand-washing with soap and water
- Use of a new delivery bag daily
- Careful mixing (if needed) and transfer of the formula to the enteral delivery system
- Water flushes of the enteral delivery system after feeding and medication administration
- Adherence to formula manufacturers' recommended hang times

Additional water intake is usually necessary to replace normal urine and insensible fluid losses. Other fluid to be replaced is lost through bowel ostomies, fistulas, drainage bags, diarrhea, emesis, excessive oral secretions, and diaphoresis.

Fluid needs tend to increase with body weight and to decrease with aging. There are several methods of meeting fluid needs (Table 2).

For individuals who are $\geq 125\%$ of their ideal body weight, an obesity-adjusted weight should be used in these equations; obesity-adjusted body weight equals $\frac{1}{4}$ of the difference between the actual and ideal body weights, which is added onto the ideal body weight.

After total fluid needs are established, the fluid volume in the feeding formula can be determined. The water content of enteral formulas is sometimes reported in grams, so it is useful to know that a milliliter of water is equivalent to a gram of the same. The more concentrated a formula, the less water it contains.

Additional fluid needs can be met with water flushes. These are usually administered after feedings, after medication is given, or every 4 hours during continuous-feeding infusions. Extra water may be added to the regimen for many of the same reasons a patient on an oral diet may require extra fluids. Some indications for providing extra water via a feeding tube are thirst, hot weather, febrile states, and diarrhea. Salt may be added to the feeding formula or water flushes to replace sodium and chloride losses; table salt provides 2.3 gm or 100 mEq sodium chloride per teaspoon.

For home patients requiring a pump for feeding delivery, an automatic water

For home patients requiring a pump for feeding delivery, an automatic water flush system has been designed to decrease clogged feeding tubes and provide additional water.

flush system has been designed to decrease clogged feeding tubes and provide additional hydration.² In addition to feeding formula delivery, the pumps can provide up to hourly water flushes, which often assist in meeting a patient's daily fluid requirements. Several clinical trials of the automatic flush pump have shown less tube clogging as compared to manual flushing.³⁻⁵ When the patient is fluid-restricted, the automatic water flush feature can either be turned off or select pumps flush volume and interval can be programmed to accommodate the condition. If the feature is turned off, a manual water flush (30 mL per shift) performed to maintain tube patency should be performed. The three automatic flush pumps currently on the market are the KANGAROO ePump™ and KANGAROO JOEY™ (Covidien, Mansfield, MA), and the FLEXIFLO QUANTUM™ Pump (Ross Lab, Columbus, OH).

Medication administration

The oral route for administering medication is preferred; however, enteral feeding devices can be used when a patient is unwilling or unable to swallow safely. Proper procedure is detailed in the National Consensus Recommendations for Administering Medications Through an Enteral Feeding Tube, available free on the Internet.⁶ Some things to keep in mind:

- Administer liquid medication (diluted according to the guidelines) whenever possible.

- Crushed immediate-release tablets, the crushed contents of hard immediate-release capsules, and further-softened soft immediate-release capsules can be administered through a feeding tube if one follows the procedure given in the guidelines.
- Enteric-coated tablets, sustained-release tablets, or the contents of opened sustained-release capsules must not be administered—even when crushed—through feeding tubes.
- To avoid incompatibilities between medications and between tube-feeding formula and medications, administer individual medications separately; do not add them to the formula.
- Flush the feeding tube after each medication administration. Tube-feeding formula can significantly impair the absorption of certain medications (e.g., phenytoin, carbamazepine, quinolones), so tube-feeding might have to be suspended for 1–2 hours before and after medication administration.

Medication administered through a Y-site adapter can migrate backwards into the enteral feeding line and promote coagulation of certain formulas; therefore, disconnect the enteral formula line, or clamp or pinch the tubing directly above the Y-site adapter before administering medications.

Gastrointestinal problems

Any of the following GI symptoms—nausea, emesis, diarrhea, fecal impaction, obstipation or abdominal discomfort, distention, cramping or pain—can indicate intolerance to enteral feeding formulas; however, if a home-feeding patient has been tolerating a feeding formula and suddenly begins having GI symptoms, the symptoms likely arise from a cause unrelated to the formula composition and administration schedule. Potential formula contamination and other non-nutrition-related etiologies for the GI symptoms should be investigated. Persistent nausea and emesis, feelings of fullness or increas-

Table 2: Fluid Calculations

- Provide 35 mL/kg, decreased to 30 mL/kg in the elderly
- Provide 100 mL/kg for the first 10 kg, 50 mL/kg for the next 10 kg, and 20 mL/kg (≥ 50 years old) or 15 mL/kg (> 50 years old) for the remaining weight
- Provide 1 mL fluid per calorie requirement

ing abdominal distention, discomfort, or cramping or pain warrant holding the formula infusion and doing a further physical assessment.

Patients should be positioned upright, no less than thirty degrees, and remain so for at least 30 minutes after a feeding to minimize the risk for regurgitation and aspiration of the feeding formula. Poor gastric emptying can be treated by prolonging the infusion time, using a promotility agent such as liquid metoclopramide or, if warranted, gaining access to the small bowel for feedings.

Diarrhea has been defined as > 3 liquid stools for at least 2 consecutive days or, if being measured, > 500 mL every 8 hours.^{7,8} Although tube-feeding patients may experience an occasional liquid stool, true diarrhea can also occur. Common causes in the home setting include medications, certain medical and surgical conditions, enteric pathogens, and too-rapid infusion of a small-bowel feeding. Initial management is to provide adequate fluids to either restore or maintain hydration and electrolyte balance. If a patient is receiving small-bowel feedings, ensure that an enteral feeding pump is used. The diarrhea may be reduced by lowering the feeding infusion rate and extending the time that formula is administered. Once an infectious etiology has been ruled out or treated, an antidiarrheal agent may be used. Patients should be assessed for any perianal skin breakdown and treated appropriately with a moisture barrier, zinc oxide ointment, or skin-protectant adherent paste.

If a patient experiences constipation or similar ills, the patient's bowel pattern should be followed closely and include notation of the last bowel movement along with stool frequency, size, color and consistency. This should be compared with the patient's usual bowel pattern. To prevent impaction, a formula containing fiber should be used if possible, and adequate water flushes should be given to meet fluid needs. Fecal impaction may manifest as decreased frequency of bowel movements, straining with defecation, hard or elongated stools, or seepage of liquid stool around the impaction. Patients may also experi-



KANGAROO ePump™ (Covidien, Mansfield, MA)

ence abdominal distention and discomfort. Liquid stool softeners and laxatives may be used as a treatment. In our practice we have found empirically that 120 mL of prune juice administered daily can be effective; a water flush should also be administered before and after to clear the tube. If these treatments are not effective, suppositories or enemas may be required.

Dumping syndrome

Patients receiving small-bowel feedings must be monitored for the signs and symptoms of dumping syndrome.⁹ This can occur when the formula's osmotic load exceeds the small bowel's capacity for absorption. Dumping syndrome can manifest as diarrhea, abdominal cramping, bloating, lightheadedness, dizziness, diaphoresis, shakiness, anxiety, heart palpitations, fainting, or fatigue. It can be treated by slowing the formula infusion rate, switching to a formula that has a lower osmolality, or diluting the formula.

Aspiration

Aspiration is the entry of oral secretions, food, or refluxed stomach contents from the oropharynx into the larynx below the true vocal cords. Signs and symptoms include a combination of sudden coughing, shortness of breath, restlessness, frothy sputum, tachycardia, tachypnea, wheezing, rhonchi and rales, a decreased level of consciousness, and/or subsequent fever. Clinically significant aspiration is marked by sudden hypoxia or eventual aspiration pneumonia. Aspiration of stomach contents should be highly suspected if these events occur after an episode of vomit-

ing. If the patient exhibits a combination of these signs and symptoms, a physician should be called. A chest x-ray may be ordered to determine if there is a new lung infiltrate. Aspiration pneumonia has been reported to occur in only 1% to 5% of enterally fed patients, but it is one of the more serious risks of enteral nutrition therapy.¹⁰

Physical assessment

Heart rate and blood pressure measurements are useful to help assess fluid status until a patient is stabilized on an appropriate fluid intake regimen. The patient should be comfortably at rest for a minimum of 5 minutes before vital-sign measurements are done, because the values could be affected by exertion or stress. Tachycardia and hypotension may indicate dehydration.

A nutrition-focused physical assessment and review of systems focuses on the skin, hair, head, eyes, mouth, nails, musculature, and neurological system. B-vitamin deficiencies can cause dark circles around the eyes; nasolabial seborrhea; pellegra; fissures at the corners of the eyelids or mouth; conjunctival inflammation; corneal vascularization; a reddened, magenta, inflamed, or fissured tongue; and atrophy of the taste buds. Vitamin C deficiency can cause gingivitis, loose teeth, petechiae, and ecchymosis. Bitot's spots (triangular, shiny gray spots on the conjunctiva) and follicular hyperkeratosis (goose bumps that don't rub away) have been noted with vitamin A deficiency.

Essential fatty acid deficiency can develop with fat malabsorption and shows up as alopecia, dry scaly skin, desquamating dermatitis, and rubious hands with dry, brittle nails.

Muscle wasting, which can be pronounced in temporal or clavicular areas, muscle weakness, and transverse ridging of the nails can be due to protein and/or calorie malnutrition. Alopecia can result from protein deficiency. Vitamin C or thiamine deficiency can cause muscle tenderness or pain. A thiamine deficiency can also lead to hyporeflexia and wrist or foot drop. Peripheral neuropathies may be caused by a vitamin B₁₂ or thiamine deficiency. Ataxia

or loss of vibratory and position sense has been associated with a vitamin B₁₂ deficiency. Pallor can be indicative of anemia caused by iron, folate, or vitamin B₁₂ deficiency.

Mineral imbalances can cause physical signs and symptoms. Tetany and carpopedal spasms can be caused by calcium or magnesium deficiency. Cardiac arrhythmias can result from hypokalemia, hypomagnesemia, or hypophosphatemia. Low magnesium levels can cause personality changes such as apathy, depression, or even delirium. Low phosphorus levels can lead to muscle weakness and eventual respiratory arrest. Zinc deficiency can manifest as alopecia, diarrhea, and rashes. In addition to anemia, iron deficiency can also cause spooning of the nails.

Fluid retention can result in edema, jugular distention, and shortness of breath. Fluid retention can be caused by fluid overload or a protein deficiency. Poor tissue turgor, dry mucus membranes, dizziness, lightheadedness, thirst, and decreased or darker-colored urine are signs and symptoms of dehydration.

Maintaining enteral access devices

Position

Once an enteral access device is placed and properly positioned, it should be monitored for any movement. Many devices are marked with regularly spaced lines; note the marking where the tube exits from the nares or stoma. If necessary, mark the tube with indelible ink or adhesive tape, or measure the visible tube length. The external movable bumper on a G-tube should be positioned to provide appropriate tension with the internal bumper or balloon: approximately ¼-inch leeway between the external bumper and the skin. Abdominal girth changes may require the external bumper to be repositioned; this should be done only by an experienced clinician. If the external bumper becomes too tight, as with weight gain or abdominal distention, skin breakdown and pressure necrosis may occur. If the external bumper becomes too loose, leakage may occur. Formula leakage or pain during G-tube feedings may be due to the internal bumper migrating into the

Feeding tubes should be flushed with water after each feeding and medication administration, in between medications, and every four hours during a continuous infusion.

stomal tract, causing “buried bumper syndrome;” the physician should be notified promptly. If the G tube is allowed to migrate too far inward, the internal balloon or bumper could potentially block the pylorus, leading to vomiting and regurgitation.

Secureness

Enteral feeding devices should be secured properly to prevent dislodgment. Nasoenteric tubes are usually taped to the nose so that there is no pressure on the nares, then looped with a little slack towards the cheek and secured under a thin, transparent, adhesive dressing. A nasal bridle may be placed in patients at risk for or already having problems with tube dislodgment.¹¹ This is usually a small-bore tube or umbilical tape that has been looped around the nasal septum and joined outside the nares. The feeding tube is secured to the bridle with suture material.

G-tubes are usually secured with an external bumper, J-tubes with sutures or tape. For J-tubes there is also a vertical tube attachment device (Hollister Inc. Libertyville, IL) that contains a synthetic skin wafer and serrated strap. The J-tube is positioned through a hole in the wafer; the serrated strap is wrapped around it; and the opposite side of the wafer adheres to the skin. G- and J-tubes may also be covered with a dressing or an abdominal binder.

Patency

Feeding tubes should be flushed with water after each feeding and medication

administration, in between medications, and every four hours during a continuous infusion. Water is the best flushing fluid, with neutral pH and no additives to discolor or affect the tube material. It can be instilled directly from a syringe into the tube. Do not flush tubes with cranberry juice or carbonated sodas; they tend to be acidic, causing the protein in feeding formulas to curdle and clog the tube.^{12,13}

Acidic agents can also cause early fatigue to tube materials. Gastric secretions are acidic; therefore feeding tubes should be flushed with water before and after checking for gastric residuals.¹⁴ Dark juices and carbonated beverages can also cause tube discoloration.

Feeding formula that contains fiber should be shaken vigorously prior to administration, as the fiber may have settled.

Integrity

Enteral feeding tubes should be checked periodically for tube fatigue and should be replaced per manufacturers’ instructions—usually monthly. G- and skin-level tubes with balloons are generally changed every 3 to 6 months; this is accomplished by deflating the water balloon via the balloon port, removing the tube, inserting a new tube, and instilling fresh water into the balloon. PEG tubes or skin-level G-tubes with internal bumpers can usually stay in place longer, about 1 year or more. PEG tubes are removed by an experienced clinician utilizing a traction technique that causes the internal bumper to deconform as it exits the stomal tract. Skin-level G-tubes with internal bumpers are removed by stretching them taut with a metal obturator. Red rubber urological catheters are commonly used for J-tubes and, because of their soft composition, they tend to split where the catheter connects to the feeding bag or syringe. Such J-tubes should be changed at least every 3 months. Lacking internal fixation devices such as balloons or bumpers, they can be slipped out and a new one inserted fairly easily.

Peritubular skin care

For nasal tubes, any adhesive material should be removed and replaced every other day and the nares inspected for any skin breakdown. If necessary, the tube should

be repositioned. Ideally, the skin surrounding G- and J-tube exit sites should be intact and drainage-free with a healed stomal tract that forms a close-fitting seal around the tube. Normal exit site findings may include slight erythema of the skin or minimal drainage that can be managed with gentle cleaning or a thin gauze dressing. General care of abdominal feeding tubes includes gentle external cleansing with liquid soap, followed by a water rinse and pat dry. Agents such as hydrogen peroxide can be used to remove crusts, but contact with the peritubular skin should be avoided as it is irritating, can impede wound healing, and can lead to skin breakdown.

Potential complications

Inflammation and infection

Nasoenteric feeding tubes can obstruct sinus drainage or harbor pathogens that may cause oropharyngeal colonization, both of which can result in rhinitis or sinusitis. Signs and symptoms include nasal drainage; pain or pressure around the nose, eyes, or cheeks; and headaches. If a patient with a nasoenteric tube complains of an earache or ear drainage, his ears should be inspected for otitis media. Nasal tubes have been associated with a higher incidence of middle-ear irritation and infection.

Peritubular leakage

Excessive peritubular leakage of abdominal feeding tubes is a symptom of an underlying problem. It can be due to inward migration of the internal balloon or bumper, increased pressure in the GI tract, or an enlarged stomal tract. The amount and type of drainage should be noted and the physician contacted to determine the underlying problem. It is of utmost importance to protect the skin if leakage is present, as skin maceration can quickly lead to excoriation, bleeding, and deep erosion around the stomal site. Topical zinc oxide petrolatum-based ointments or skin protectant pastes with an absorbent dressing may be used. An enterostomal therapist or wound specialist should be involved, if available.

Hypergranulation tissue

Hypergranulation tissue is excess epithelialized tissue that sometimes protrudes

Tube-feeding formulas that contain fiber, are calorically dense, or are allowed to remain stagnant in feeding tubes are more likely to clog tubes.

from the stomal tract of abdominal feeding tubes. It is caused by trapped moisture and pivoting of the tube. Treatment involves applying a thin layer of topical steroid cream or ointment with a cotton-tipped applicator directly to the tissue, causing it to gradually shrink. Mometasone furoate 0.1% daily or triamcinolone acetone 0.1% 3–4 times daily may be used. Another way to eradicate hypergranulation tissue is to treat it with a silver nitrate applicator.

Abdominal infection

After initial insertion of abdominal tubes, mild cellulitis and serous or serosanguinous drainage can be part of the natural healing process. Purulent drainage around a G-tube site is not necessarily a sign of infection, as normal gastric secretions can be clear or cloudy and green, tan, off-white, or brown.¹⁵ However, increasing erythema, swelling, tenderness, and induration are signs of infection and should be reported to the physician, as systemic antibiotic treatment is usually necessary.

Candidiasis

To prevent candidiasis, the skin should be kept clean and dry. Reddened scattered papules or solid plaques are signs of a fungal infection. A topical antifungal agent, in either powder or ointment, is used.

Tube clogging

Most clogs are due to feeding formula or medications. G-tubes clog less readily than nasoenteric and J-tubes because they have a wider internal diameter and are shorter. Tube-feeding formulas that contain fiber, are calorically dense, or are allowed to remain stagnant in feeding tubes

are more likely to clog tubes. Clogs can also be caused by improperly crushed medications; viscous syrups and bulk-forming agents; or medications allowed to mix with other medications or the feeding formula, producing a precipitate. Medication clogs are much more difficult to clear than feeding-formula clogs.

Dissolving a tube clog is best done as soon as possible.¹⁶ Water can be the initial irrigant; carbonated beverages and meat tenderizers show no superiority over water.¹⁷ The following technique can be used:¹⁸

1. Attach a 30–60 mL syringe to the end of the feeding tube and withdraw as much fluid as possible. Discard the fluid.
2. Fill the syringe with 5 mL of fresh warm water and attach it to the end of the feeding tube. Instill the water under manual pressure for 1 minute, using a back-and-forth motion with the plunger to loosen the clog.
3. Clamp the feeding tube for 5–15 minutes.
4. Use the syringe to try to aspirate fluid. Discard any fluid obtained and then attempt to flush the tube with fresh warm water.
5. If the tube remains clogged, repeat this procedure, using a pancrease and sodium bicarbonate solution¹⁹ (1 crushed Viokase tablet, or 1 teaspoon Viokase powder mixed with 1 crushed nonenteric-coated sodium bicarbonate tablet, or 1/8 teaspoon baking soda dissolved in 5 mL warm water).

Tube dislodgment

Patients who are discharged home with a nasoenteric feeding tube in place should be instructed to stop feedings and to call the physician if they suspect that the tube has moved out of position. The tube tip may be malpositioned due to vomiting or slippage of an inadequately-secured or tugged-on tube. Patients should be made aware that if they begin to vomit and feel the tube in the back of the throat, they should pull the tube completely out through the nose.

Patients who are discharged home with a newly inserted PEG tube must be

closely monitored to prevent inadvertent dislodgment. It takes a few weeks for fusion to take place between the stomach and peritoneum. A dislodged PEG tube can become a medical emergency, as stomach contents are likely to leak into the peritoneum.

When J-tubes and balloon G-tubes are used, the internal stomach or intestinal lining is sutured to the peritoneum, and early dislodgment is not an emergency. G-tubes may be dislodged if the balloon loses volume or ruptures. J-tubes can be dislodged easily as there is no internal balloon or bumper holding them in place. If either type of tube migrates out of its stomal tract, it should be reinserted immediately and secured in position. Without a tube to keep it open, the stoma will begin to contract, and within a few hours it may be difficult to insert a new tube.

Standards of Practice

The American Society for Enteral and Parenteral Nutrition has developed standards of practice for specialized nutrition support for home-care patients.²⁰ Additional information on the interdisciplinary approach; policy and procedure development; nutrition assessment; patient monitoring; patient and family education; feeding formula selection, preparation, and storage; transitional feedings; and definitions of terms are found in these standards.

Conclusion

Enteral tube feedings can provide the nutrients and fluid needed to maintain life for those who have a functioning GI tract but for various reasons cannot have their needs met by oral diet alone. These patients should be initially assessed for appropriateness of therapy, making sure that all other means of promoting oral nutrition have been exhausted. An enteral access device is required for the delivery of tube feedings, and patients must be educated on how to care for these devices and to prevent or treat complications.

Enteral tube feedings impinge on the patient's and household's schedule and social events. It is helpful for the healthcare team to assist in developing a tube-feeding

schedule that will work in the home setting, to set mutual nutrition goals, and to assess the attainment of these goals and set new goals as needed. Outside agencies and support groups that specialize in the nutrition support of patients are invaluable resources for the home tube-fed patient.

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Upon completion of this offering the learner will be able to:

- List the indications for home nutrition support therapy
- Describe the potential complications of enteral tube feedings
- Describe the strategies that HEN consumers can use to adapt and cope more successfully
- Identify ways that clinicians can foster coping in HEN consumers

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1. Which of the following is an indication for enteral tube feedings?
 - a. gastroparesis with a functioning small bowel
 - b. loss of appetite
 - c. chewing difficulties
 - d. midgut enterocutaneous fistula
2. Which of the following would not be a goal of nutrition support therapy?
 - a. repletion of plasma proteins
 - b. prevention of dehydration
 - c. resolution of abdominal distention
 - d. weight maintenance during radiation therapy to the throat
3. Which of the following is true of nasally inserted feeding tubes?
 - a. they are used for gastric feedings only.
 - b. they are small-bore, 8–12 F in diameter.
 - c. they are manufactured to be left in place for up to 6 months.
 - d. they clog less often than gastrostomy tubes.
4. Which of the following are true for gastrostomy tubes?
 - a. A gastric outlet obstruction can occur if the internal plastic bumper or water filled balloon is allowed to migrate over the pylorus.
 - b. Enteral feeding pumps are necessary for tube feeding delivery.
 - c. They are permanent enteral access devices that can not be removed.
 - d. They are intended for short term tube feedings.
5. Which of the following are true for jejunostomy feeding tubes?
 - a. Dumping syndrome can occur if tube feedings are administered too quickly.
 - b. they contain an internal plastic bumper or water filled balloon that prevents them from migrating outward.
 - c. they require a gravity drip enteral delivery system.
 - d. they are appropriate for patients with an intestinal ileus and bowel distention.
6. Water requirements
 - a. are not dependent on the patient's clinical condition
 - b. can be met by the fluid provided in enteral feeding formulas
 - c. should equate urine output volumes
 - d. are based on weight and age
7. Medication administration
 - a. in tube feeding formulas is safe and practical
 - b. is made simpler by combining the medications that are given through the feeding tube
 - c. can cause clogging if it is administered through a Y-site adapter and the enteral feeding line is not clamped off or disconnected
 - d. through feeding tubes should be avoided
8. The following are some actions to be taken for the tube fed patient who has diarrhea except:
 - a. Notify the physician as soon as the patient reports a liquid stool.
 - b. Provide adequate fluids and electrolytes.
 - c. Note any recent medication changes.
 - d. Assess for perianal skin breakdown.
9. Peripheral neuropathies can be caused by:
 - a. protein or calorie malnutrition
 - b. folate or vitamin C deficiency
 - c. essential fatty acid deficiency
 - d. vitamin B₁₂ or thiamine deficiency
10. The best irrigant to flush a feeding tube with is:
 - a. water
 - b. cranberry juice
 - c. a carbonated beverage
 - d. cola syrup
11. Which of the following is not a common HEN-related challenge?
 - a. social isolation and embarrassment
 - b. altered body image and low self-esteem
 - c. untimely delivery of supplies from the home-care provider
 - d. contamination of the enteral formula
12. Resilient HEN consumers who participated in the author's doctoral research described using which of the following coping strategies?
 - a. refuse to accept new life conditions
 - b. seek and accept support
 - c. rely on their clinician's knowledge
 - d. blame others for problems
13. How can clinicians help HEN consumers to cope more effectively with therapy-related challenges?
 - a. Ease their burden by making decisions for them.
 - b. Choose the single best home-infusion regimen while in the hospital.
 - c. Refer consumers to the Oley Foundation.
 - d. Refrain from advising them of potential therapy-related problems.
14. Which of the following is not a potential benefit of a support group?
 - a. receiving low-cost supplies
 - b. receiving practical information
 - c. sharing a common experience
 - d. being inspired by others

What is the highest degree you have earned (circle one) ?					1. Diploma 2. Associate 3. Bachelor's					Mark your answers with an X in the box identifying the correct answer(s).					
Indicate to what degree did this program meet the objectives: Using 1 = strongly disagree to 6 = strongly agree rating scale, please circle the number that best reflects the extent of your agreement to each statement.					4. Master's 5. Doctorate										
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For immediate results, take this test online at www.saxetesting.com										10 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>					
or Mail to: Saxe Communications, PO Box 1282, Burlington, VT 05402 Fax: 802.872.7558										11 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>					
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