What do Enteral and Parenteral Nutrition Refer To?

Enteral nutrition generally refers to any method of feeding that uses the gastrointestinal (GI) tract to deliver part or all of a person’s caloric requirements. It can include a normal oral diet, the use of liquid supplements or delivery of part or all of the daily requirements by use of a tube (tube feeding). The site of entry of the tube and tube types will be discussed under “enteral access”. Parenteral nutrition refers to the delivery of calories and nutrients into a vein. This could be as simple as carbohydrate calories delivered as simple sugar in an intravenous solution or all of the required nutrients could be delivered including carbohydrate, protein, fat, electrolytes (for example sodium and potassium), vitamins and trace elements (for example copper and zinc). There are many reasons for enteral and parenteral nutrition including GI disorders such as bowel obstruction, short bowel syndrome, Crohn’s disease, and ulcerative colitis; as well as certain cancers or in comatose patients. While enteral nutrition is always preferred when technically possible, some people may have a variety of medical issues that make the safe use of the GI tract difficult. Alternatively, their calorie and nutrient needs may not be met by the current level of functioning of their GI tract. That is when parenteral nutrition may be needed to help an individual remain hydrated and possibly to provide calories and other nutrients to allow for growth and development or maintenance of physical well-being and function.

When Would a Patient Really Require Enteral Nutrition?

When a patient has difficulty eating for whatever reason, and if the GI tract is working, then using this natural means for feeding would be preferable to feeding by intravenous means. Using the GI tract is closer to normal and can help the immune system. An example might be a patient who has had a stroke and now has difficulty swallowing (called dysphagia). The swallowing may normalize over time or in some instances may not return to normal which could put the patient at risk for inadvertently swallowing any solids and liquids consumed into the lungs which could cause a severe pneumonia. During the short term, a patient like this might be fed with a tube entering the nose. For longer use, a tube entering the stomach from outside the abdomen (a gastrostomy) might be appropriate.
What is Meant by and What are Examples of Enteral Access?

Tube feeding is nutrition provided through the GI tract via a tube, catheter, or a surgically made hole into the GI tract. As previously mentioned, it is the preferred method of feeding when patients are unable to eat enough calories on their own. Enteral access devices are feeding tubes placed directly into the GI tract to deliver nutrients as well as additional fluids and often is a method for delivering medications (Figure 1). Nasal or oral tubes may be placed at the bedside or with endoscopy. A nasoenteric tube means that the tube enters the nose and the end of it may be in the stomach, duodenum (first part of the small intestine) or the jejunum (second part of the small intestine). Gastrostomy and jejunostomy tubes are inserted through the skin (percutaneous) through a small incision on the upper abdominal wall. This may be done by a Radiologist with X-ray guidance, by an Endoscopist via endoscopy, or surgically. The table below shows options for enteral access feeding (Table 1). Short-term enteral nutrition is usually defined as use less than 4 weeks; long-term enteral nutrition is defined as use for more than 4 weeks. For more specific information on percutaneous endoscopic gastrostomy, please see the ACG patient resource of the same name.

Figure 1
<table>
<thead>
<tr>
<th>Enteral access device</th>
<th>Length of use</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasogastric tube (NGT; through the nose)</td>
<td>Short-term use</td>
<td>Easy to place, variety of sizes available for patient comfort</td>
<td>Not indicated if bleeding disorder, nasal/facial fractures and certain esophageal disorders</td>
</tr>
<tr>
<td>Orogastric tube (through the mouth)</td>
<td>Short-term use</td>
<td>Lower incidence of sinusitis than NGTs</td>
<td>Not tolerated for long periods of time in alert patients; tube may damage teeth</td>
</tr>
<tr>
<td>Nasoenteric tube (generally thought of as a tube beyond the stomach)</td>
<td>Short-term use</td>
<td>Smaller diameter than NGTs and less patient discomfort; may be used in delayed gastric emptying</td>
<td>May be difficult to position; smaller size tubes may make administration of some medications difficult, and an infusion pump is needed</td>
</tr>
<tr>
<td>Oroenteric tube (postpyloric feeding tube)</td>
<td>Short-term use</td>
<td>Same as orogastric tubes</td>
<td>Same as orogastric tubes</td>
</tr>
<tr>
<td>Gastrostomy tube (can be placed radiologically, endoscopically or surgically)</td>
<td>Short-term use Long-term use</td>
<td>Easily cared for and replaceable; large size tube allow for bolus feeding, and administration of medications</td>
<td>Compared with oral and nasal route, this technique is more invasive</td>
</tr>
<tr>
<td>Jejunostomy tube (can be placed radiologically, endoscopically or surgically)</td>
<td>Long-term use</td>
<td>Decreases the risk of food and fluids passing into the lungs; allows for early postoperative feeding</td>
<td>Technically more difficult to place; smaller size tubes may make administration of some medications more difficult, and an infusion pump is needed</td>
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</table>
What are the Complications of Enteral Nutrition?

Nutrition delivered by enteral tubes can cause the following complications: food entering the lungs, constipation, diarrhea, improper absorption of nutrients, nausea, vomiting, dehydration, electrolyte abnormalities, high blood sugar, vitamin and mineral deficiencies, and decreased liver proteins. Feeding tubes inserted through the nose, such as nasogastric or nasoenteric tubes, can cause irritation of the nose or throat, acute sinus infections, and ulceration of the larynx or esophagus. Feeding tubes inserted through the skin of the abdominal wall, such as gastrosomty or jejunostomy tubes, can become clogged (occluded) or displaced, and wound infections can occur.

Can Enteral Nutrition be Done at Home?

Enteral nutrition may be done at home. Orders that specify protocols for administration and monitoring will be written by a provider or dietitian. Most protocols require the prescriber to indicate the formula for feeding, strength, how quickly to feed, and delivery method. Delivery methods include the following: gravity controlled and pump assisted. Gravity controlled feeding refers to any feeding method that uses manually controlled devices to deliver a feeding which is almost always a gastric feeding. This may include a continuous gravity feeding that is manually controlled with a feeding bag and a roller clamp to help control the rate; and intermittent gravity feeding where 200-300 mL are delivered over 30-60 minutes every 4-6 hours; and, a bolus feeding where a specific volume of feeding is infusing via bag or a syringe rapidly over several minutes, usually at a rate of about 60 mL/minute. Pump assisted feeding utilizes an electric pump device to more precisely control the rate of delivery in patients who are at a higher risk of inadvertently getting formula in their lungs, sensitive to volume, have delayed gastric emptying or are being fed into the small intestine. Choice of the delivery methods for a particular person depends on the type of enteral access device as well as the person’s individual needs. Water flushes should be administered to prevent clogging and ensure adequate hydration. Feeding tubes should be flushed with water before and after medication delivery and before and after every feeding or every 4 hours during continuous feeding. Often a dietitian, nurse or home care company will teach the patient how to prepare, administer, and monitor tube feeds. In addition, a home care company may be available to explain the supply options available and help to arrange for home supplies and equipment.

Who May Benefit from Parenteral Nutrition?

Anyone who cannot/will not eat, or cannot maintain their fluid and/or nutritional status by oral eating or by tube feeding may be appropriate for intravenous nutrition. Again, the preferred route is by using someone’s GI tract, but this is not always possible. The intravenous route is more complicated and expensive to do and is almost always started in the hospital.
What Are the Options for Delivering Parenteral Nutrition?

Parenteral nutrition access options include central venous catheters which may include short term catheters which are tubes that are put in place in the hospital and generally removed prior to discharge and long term options (such as tunneled Hickman catheters) located in the upper chest, peripherally inserted central catheters (PICC) located in the upper arm, and ports implanted under the skin usually in the upper chest wall. (See figures 2 and 3 below). Many catheters are available in multilumen versions to allow for simultaneous infusion of multiple fluids and/or medications. Central venous catheters are commonly used for patients requiring weeks, months or years of therapy. A Hickman catheter is a brand of catheter that is tunneled under the skin and put in place either in a Radiology Department or in an operating room. A Hickman catheter requires dressing care to be performed by the patient, a family member or a Home Care Service. A PICC is commonly used in patients who require therapy for a short duration, usually for several weeks to a few months. A PICC may be placed while in the hospital at the patient’s bedside, in the Radiology Department or rarely at home by a specially trained registered nurse. Depending on the local protocol, a PICC also may require routine flushing with a drug called heparin to prevent clogging and additional site care and also has a higher rate of the catheter moving out of position than a Hickman catheter. Ports are often used for patients requiring months to years of therapy and are commonly used where intermittent infusion therapy is needed such as cancer chemotherapy. Care of a port is needed only when the port is accessed. This is done by cleaning the skin before placing the special needle into the port and monitoring of the port site closely. Ports allow for people to maintain their body image, and there are no external components that may be prone to damage when the port is not in use. Placement of a port usually occurs in an operating room or by a Radiologist with X-ray guidance.
Figure 2: Catheters - Parenteral Nutrition – Temporary

Temporary Vascular Access for Parenteral Nutrition

Internal Jugular Vein
Non-tunneled Central Venous Catheter (multiple lumens)
Subclavian Vein
Tunneled Central Catheter
Cephalic Vein
Basilic Vein
PICC (Peripherally Inserted Central Catheter)
Midline Catheter (PPN only)
Peripheral Intravenous Catheter (PPN only)
Femoral Vein (PPN only)
Figure 3: Catheters - Parenteral Nutrition – Long Term

Long Term Vascular Access for Parenteral Nutrition

- Internal Jugular Vein
- Subclavian Vein
- Subcutaneous Port
- Tunneled Central Venous Catheter
- Cephalic Vein
- Cephalic Venous Access
- Femoral Venous Access
  (or Saphenous Vein may be used)
- PICC (Peripherally Inserted Central Catheter)
- Trans-lumbar/Trans-hepatic Venous Access
- Basilic Vein

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6400 Goldsboro Rd., Suite 450, Bethesda, MD 20817
What Are the Complications of Parenteral Nutrition, and How Can They be Prevented or Decreased?

The most common complications associated with catheter placement include infection, clogging (occlusion), and breakage. A strict infection control protocol is recommended regardless of the type of catheter placed and includes the following: hand washing, aseptic site and hub care (wearing gloves, prepping site with topical antiseptics, etc.), port sterilization before access, close monitoring of catheter site appearance for redness or inflammation. Catheter occlusion, or inability to infuse a solution and/or aspirate a blood sample, may be prevented by flushing the catheter to keep it open. Catheter occlusion may arise from blood, IV fat solutions, or precipitates (abnormal crystal formation in a solution) and may be treated with a declotting agent administered by a Registered Nurse. When a catheter is cracked, leaking, or broken, the catheter must be repaired or replaced as soon as possible. A catheter is clamped between the exit site and the break to prevent entrance of air or leakage of blood.

Thrombosis (blood clot) of a blood vessel around an intravenous catheter is another potential complication with intravenous therapy as well as intravenous nutrition. Many factors play a part in the clotting of a vessel and different institutions may have special protocols for both prevention and treatment.

Can Parenteral Nutrition be Done at Home?

Home parenteral nutrition (HPN) requires a team of clinicians to successfully manage and minimize the associated complications as discussed above. Home parenteral nutrition may be performed for many conditions as a short-term therapy or as a long-term therapy. As the parenteral nutrition formula is being adjusted in preparation for discharge from the hospital, the patient and caregiver will receive education on catheter care, operation of the infusion pump, parenteral nutrition set-up and disconnect procedures, maintenance of intake and output records, review of metabolic complications, and contact numbers for associated problems that may arise. All patients are monitored closely for electrolyte disturbances with routine blood draws to assure stability on HPN formula and clinic visits. If a patient needs readmission to the hospital, the nutrition support team and home nutritional support clinician will often work with the hospital team to provide continuity of care.

Can I Work While on Parenteral Nutrition?

There are many individuals who continue to work and have very full and productive lives while receiving parenteral nutrition. The main determinant will be the degree of disease that caused the underlying GI problem that is left, as well as symptoms the patient is experiencing. Each person needs to be assessed individually as to their wishes and overall medical condition to determine if they are well enough to work.
Other Resources for More Information on Enteral and Parenteral Nutrition

Oley Foundation – The Oley Foundation is a national, independent, non-profit 501 (c) (3) organization that provides information and psycho-social support to consumers of home parenteral (IV) and enteral (tube-fed) nutrition (homePEN), helping them live fuller, richer lives. The Foundation also serves as a resource for consumers’ families, homePEN clinicians and industry representatives, and other interested parties. - www.oley.org

ASPEN – American Society for Parenteral and Enteral Nutrition – ASPEN is a national organization composed of nutrition professionals including physicians, nurses, pharmacists, dietitians and members of industry who are dedicated to improve patient care by advancing the science and practice of clinical nutrition. – www.nutritioncare.org