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Perspectives

Recovery Strategies from the OR to Home

## In This Issue

Intestinal obstructions account for 20% of all acute surgical admissions. Mortality and morbidity are dependent on the early recognition and correct diagnosis of obstruction. If untreated, strangulated obstructions cause death in 100% of patients however, the mortality rate decreases to 8% with prompt surgical intervention. Intestinal obstruction is caused by a variety of pathologic processes including, postoperative adhesions, malignancy, Crohn's disease, and hernias. In her article, Dr. Kent outlines the diagnosis and perioperative treatment of the patient with intestinal obstruction.

Enteral nutrition plays an essential role in the care of adults or children who are unable or unwilling to eat. One potential complication of open enteral nutrition feeding systems is bacterial contamination which is estimated to occur in a significant number of tube feedings. Closed enteral feeding systems offer a number of advantages over open systems, including less bacterial contamination and a safe increase in hang times. In her article, Ms. Lau will provide evidence that closed feeding systems have the potential to improve patient outcomes and safety.



# Treating a Patient with an Intestinal Obstruction

CONTINUING EDUCATION FOR NURSING

*By Vicky P. Kent RN, PhD,CNE*

An intestinal obstruction is anything that occludes, retards, or alters the progression of solids and liquids through the small and large bowel. Patient treatment may range from medical remedies to surgery. A variety of causes and/or conditions could precipitate a bowel obstruction at any point of the life cycle. The patient's age determines the set of factors that contribute to bowel obstruction. Appropriate patient care depends upon accurate diagnosis of the particular obstruction.

The occurrence of bowel obstructions in the United States is on a par with international findings. About 20% of all hospital admissions of patients presenting with acute abdomen result from intestinal obstructions. Bowel obstructions are the source of 12% of all hospital stays in the United States. Originally admitted through the emergency room, 10% to 20% are critical surgical admissions.[1,2,3] Immediate intervention is essential. Eighty percent of these admissions are related to small bowel obstruction.[3,4]

Clinical outcomes of bowel obstruction are contingent on a timely and accurate diagnosis, so mortality and morbidity rates vary. Untreated strangulated obstructions always result in patient death. Surgical treatment within 36 hours reduces the mortality rate to 8%. Beyond 36 hours, mortality rates may rise to 25%.[3] Large bowel obstruction is critical and necessitates early diagnosis and treatment. It is vital to differentiate between obstructions and pseudo-obstructions so that the healthcare provider can administer the appropriate treatment.[5]

Intestinal obstructions are categorized as mechanical or non-mechanical, partial or complete, and acute or insidious. Presenting signs and symptoms provide clues to determining the type of obstruction, classification, site, and the degree of acuity. Indicators of a bowel obstruction include a sensation of fullness, a distended abdomen, queasiness, mild or acute regurgitation, painful stomach contractions, nonexistence of bowel

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*Supported by an educational grant from Dale Medical Products Inc.*

# Closed Enteral Feeding Systems

By Mary Theresa Lau, RN, MS, CNS, CNSN, CRNI

Enteral nutrition has been utilized as a medical therapy for many years. Since ancient times, patients unable to consume adequate nutrients from food were given liquids via glass and wooden tubes. As this was cumbersome and dangerous, the method was not often used until the 18th-19th century.

With the advent of parenteral nutrition in the late 1960's, enteral nutrition fell out of favor. Not until studies in the 1990's-2000's showed improved patient outcomes with enteral nutrition, did it develop to the point we have today.[1] The introduction of closed enteral feeding systems in the late 1990's led to improved safety and enhanced outcomes.

Enteral nutrition is indicated for patients with a functional GI tract who are unable to eat regularly. It is significantly better than parenteral nutrition in that it maintains gut integrity and immune function. Bowel rest during illness causes changes in the integrity of the gut mucosal lining that lead to local and systemic sequelae, such as bacterial translocation through the thinned mucosa. A systematic review of the literature concluded that enteral nutrition for critically ill patients is associated with an important decrease in infectious complications and decrease in cost compared to parenteral nutrition.[2] The authors recommended that enteral nutrition should be the first choice for nourishing the critically ill.

**Table 1. Indications for Enteral Nutrition**

- Dysphagia
- Poor oral intake in a malnourished patient
- Critically ill patients on a ventilator
- Burn patients
- Trauma patients
- Acute severe pancreatitis (fed into the small intestine passed the ligament of Trietz)
- Cancer
- Crohn's disease
- Neurological diseases

## Indications for Enteral Nutrition

Patients who benefit from enteral nutrition have a functional GI tract but cannot be fed orally due to a clinical condition which precludes oral intake. These include adults as well as pediatric patients. ASPEN has developed an excellent flowchart which describes the process for determining the decision making process for instituting specialized nutritional support (Figure 1).

In addition, patients who are at risk for malnutrition or who are already malnourished because they are unable to orally ingest sufficient calories and protein are appropriate for night-time supplemental enteral feedings. Other patient populations who have been shown to benefit from enteral nutrition are (1) those who have impaired neurological function which can cause dysphagia, (2) patients sedated and on a ventilator, (3) burn and trauma patients, (3) and patients with wounds and increased metabolic needs due to critical illness (Table 1).

## Contraindications for Enteral Nutrition

Patients who do not have a functional GI tract (Table 2) should not receive enteral feedings.[1] To determine if the patient can be safely fed enterally; a thorough assessment of their clinical condition must be done. Enteral feeds are contraindicated for patients with pseudo-obstruction, complete bowel obstructions, or high output fistulas, and parenteral nutrition will need to be considered. Upper GI bleeding is also a key contraindication for enteral feeding, although it has been shown safe for patients with lower GI bleeding. Enteral nutrition is also not appropriate for patients who are terminally ill. In these cases careful consideration must be given to the wishes of the patient and their family.

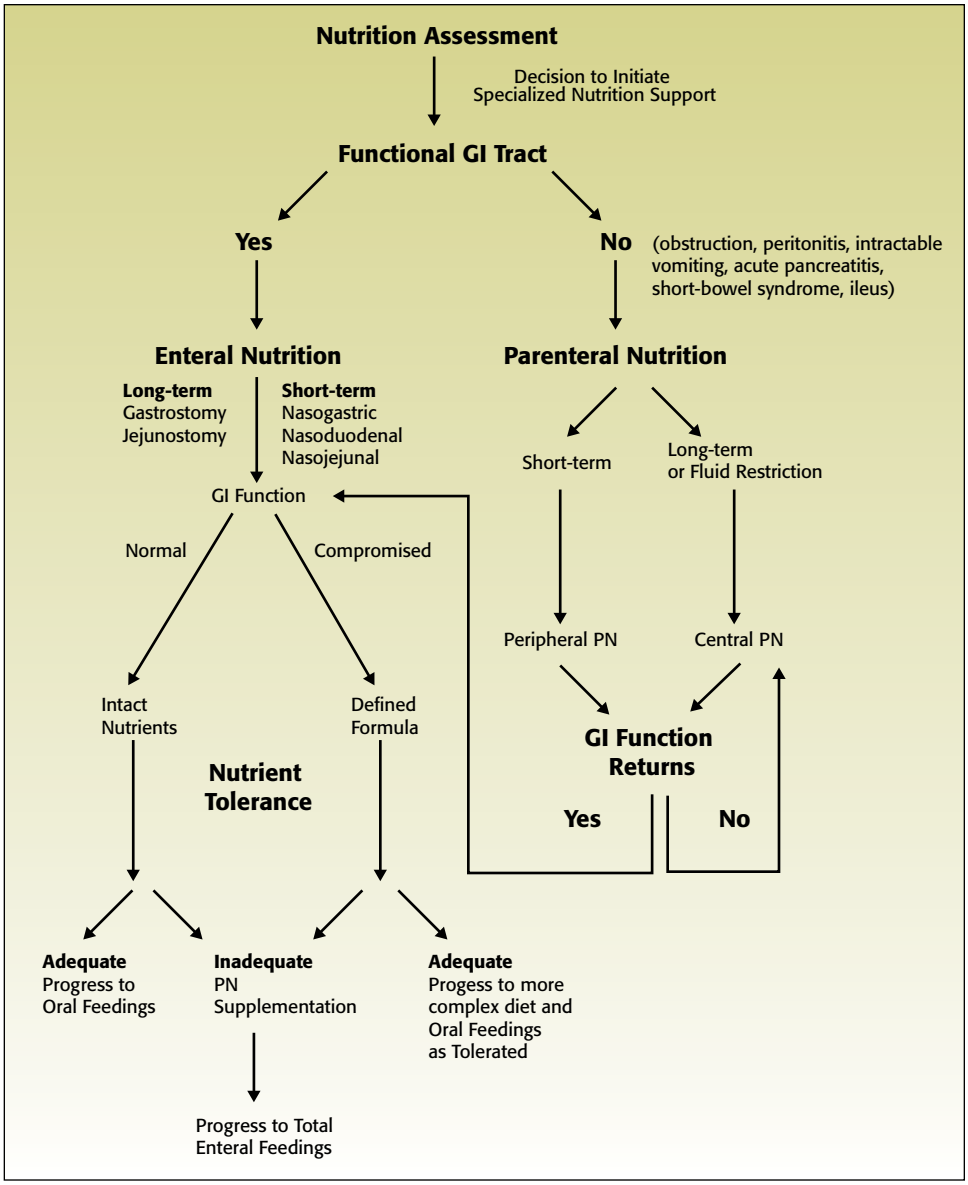
## Choosing the Appropriate Tube

Once it has been determined to feed the patient enterally, the next step is to decide on what tube should be used. For short-term feedings (less than 4 weeks), a temporary small bore feeding tube advanced into the stomach or ideally into the small bowel is the tube of choice. One should use the

**Table 2. Contraindications to Enteral Nutritional Support**

- Non-operative mechanical GI obstruction
- Intractable vomiting and diarrhea refractory to medical management
- Severe short bowel syndrome (less than 100 cm of small bowel remaining)
- Paralytic Ileus
- Distal high output fistulas (too distal to bypass with feeding tube)
- Severe GI bleed
- Severe GI malabsorption (e.g. enteral nutrition failed as evidenced by progressive deterioration in nutritional status)
- Inability to access the GI tract
- Need is expected to for <5 to 7 days for malnourished patients or 7 to 9 days if adequately nourished
- Aggressive intervention not warranted or not desired

Figure 1. **Routes for Delivery of Nutrition in Adults**[1]




smallest tube size possible to ensure patient comfort and decreased risk of complications while allowing an unimpeded flow of feeding formula and medication. An X-ray is considered the gold standard for tube placement verification.

If the patient needs long-term enteral feedings (≥4 weeks), a permanent tube should be utilized (e.g. percutaneous endoscopic gastrostomy [PEG], percutaneous endopscopic jejunostomy [PEJ], surgically placed gastrostomy tube [GT], or jejunostomy tube [JT]). An enteral tube inserted into the stomach can be used for most patients, as they allow for easier feeding administration. Gastrostomy tubes are appropriate and safe for patients who have normal gastric emptying and in those who are at low risk for aspiration, however, the tubes need to be inserted into the small bowel when the patient has a history of gastroparesis, gastric outlet obstructions, pancreatitis, or in those at risk for aspiration. Care must be taken to prevent alterations in skin integrity such as skin irritation and skin breakdown; due to bumpers that are too tight or too loose. Proper site care following the insertion of the feeding tube is very important.

## Potential Complications of Enteral Feedings

Enteral feeding complications can be grouped into 4 categories: (1) procedural mechanical complications, (2) infectious complications, (3) GI complications, and (4) metabolic complications. The overall procedure complication rate is 10%.[1]

Mechanical complications include tube misplacement, aspiration, epistaxis, and respiratory or circulatory compromise. Once the tube is inserted, complications include tube migration, tube occlusion and tube malfunction. (The latter two necessitate tube removal). The most common cause of infectious complications is bacterial transfer from the GI tract into the lungs due to aspiration. This usually leads to aspiration pneumonia. Aspiration can occur during guide wire removal, residual checks, or when administering a feeding with the patient's upper body at less than a 30-to-45-degree angle. Bacterial infections can occur with open enteral feeding systems that have been contaminated by the unwashed hands of healthcare workers.

To decrease risk of aspiration, nurses should elevate the head of the bed at least 30 to 45 degrees, ensuring that the patient's upper body is also at a 30- to 45-degree angle. Feeding should be stopped when providing patient care that requires the head of the bed to be <30 degrees. Caregivers should monitor gastric residuals every 4 hours when enteral feedings are first started; stopping feeding if the gastric residual is >500 ccs and intestinal residuals >100 ccs.[3] Oral care should be given every 4 to 8 hours to decrease microbial growth in the mouth. This step reduces oral colonization and de-

creases the likelihood of infection if the patient has an aspiration. Cleaning the nares every 8 hours and using the smallest size tube possible lessens the risk of sinusitis. Closed enteral feeding systems should be used as they have been shown to decrease touch contamination which can cause diarrhea, bacterial infections and aspiration pneumonia.[3]

Nausea and vomiting can occur in 20% of patients who are enterally fed. This can be caused by delayed gastric emptying in patients with sepsis, after receiving anesthesia, stress, rapid infusion of cold feeding solutions, hypotension, and feeding formulas with a high fat content. Promotility agents have been shown to reduce delayed gastric emptying, as have slow rate advancements of the tube feeding formula (i.e., advancing the rate every 12 hours rather than every 8 hours).

Malabsorption of nutrients can also be problem. Diseases that lead to malabsorption of enteral feedings include Crohn's disease, pancreatic insufficiency, short bowel syndrome, celiac disease, and radiation enteritis. Specialized enteral products are available for use in these patient populations. For example, elemental and semi-elemental formulas contain predigested fat (medium chain triglycerides) and protein (peptides) which are easily absorbed. In addition, malabsorption due to drug-induced diarrhea can occur, and may lead to altered nutritional status and altered skin integrity. Medications containing sorbitol and magnesium can cause diarrhea because these substances have laxative properties. If medication-induced diarrhea is a problem, the nurse should consult with the physician and unit pharmacist with the goal of finding alternative medications.

Metabolic complications related to enteral feedings include fluid and electrolyte imbalances, acid base disturbances, nutritional deficiencies, and hyperglycemia. Fluid and electrolyte imbalances due to refeeding syndrome can occur if careful monitoring and feeding of the severely malnourished patient is not closely watched. This phenomenon [often] presents itself in a previously starved or severely malnourished patient and can be life threatening. Careful initiation of enteral tube feedings must be a priority. Feedings must be started slowly, and fluid and electrolytes should be monitored very closely. Hypophosphatemia and hypokalemia caused by intracellular shifting of electrolytes can lead to arrhythmias, respiratory and circulatory collapse, and ultimately death. Fluid and electrolyte imbalances can also be present in patients with altered renal function and in patients with inadequate fluid intake. This can lead to hypernatremic dehydration due to either high output/gastrointestinal losses or inadequate fluid replacement in the form of free water.

Acid-base imbalances such as hypercapnic metabolic acidosis can occur when tube-fed patients are overfed. It is of particular importance in the ventilated patient with a history of chronic obstructive pulmonary disease (COPD) who retains $CO_2$. These patients should not receive excessive total calories, because this is the primary mechanism behind $CO_2$ retention. On occasion, enteral feeding formulas with a higher fat content are used in ventilated COPD patients who retain $CO_2$. These formulas are used because they have a lower amount of carbohydrate than other formulas, however, a higher fat formula causes delayed gastric emptying and should be avoided in patients at risk for aspiration.

Nutritional deficiencies can occur in patients who exhibit malabsorption or excess GI losses of nutrients due to medications and fistulas. Patients with frequent diarrhea can become zinc deficient. Those who malabsorb fat can become deficient in essential fatty acids and fat soluble vitamins. Overall, most patients who use commercially produced enteral products will not develop nutritional deficiencies, as the formulas contain 100% of the daily recommended intake of nutrients.

Although hyperglycemia is not as prevalent in enterally fed patients as in parenterally fed patients, it can still occur. It is imperative to maintain glycemic control in the critically ill patient, as patient outcomes in this population are improved with tight glycemic control.[4] The use of commercially available enteral formulas with fiber and a higher fat content may slow gastric emptying and reduce hyperglycemia, at least in theory. Another means to decrease the risk of hyperglycemia is to not overfeed the patient (i.e. providing more calories than their estimated need).

Lastly, one potentially fatal risk of enteral feeding is enteral feeding misconnections, a serious patient safety issue. According to a recent consortium position statement issued by the American Society for Parenteral and Enteral Nutrition, after a number of unfortunate enteral misconnections occurred. An enteral misconnection is defined as: "an inadvertent connection between an enteral feeding system and a nonenteral system such as an intravascular line, a peritoneal dialysis catheter, a tracheostomy tube cuff, and medical gas tubing. In each case, serious patient harm, including death, can occur if fluids, medications, or nutritional formulas intended for administration into the gastrointestinal tract are administered via the wrong route (for example into the intravascular system)." [5]

As an example, a 24-year-old pregnant woman at 35 weeks gesta-

tion unfortunately received a closed enteral feeding bag which the nurse had spiked with an IV tubing, as the patient had been on parenteral nutrition on a previous admission. The nurse then connected it into her peripherally inserted central catheter, causing death to the fetus and then the mother, after several hours of excruciating pain.[5] To improve safety, manufacturers have started altering the enteral feeding components, such as the spike set and add-ons (e.g. 5-in-1 connectors and 3-way stopcocks), and most importantly the end of the tubing, so that it cannot be connected to anything other than a feeding tube, especially an IV catheter. Through the efforts of ASPEN, the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO), and the manufacturing industry; major changes in enteral system designs are being implemented. These changes, along with improved education of healthcare providers; will hopefully ensure that no other family will have to endure this tragedy again.

## Open Feeding versus Closed Feeding Systems

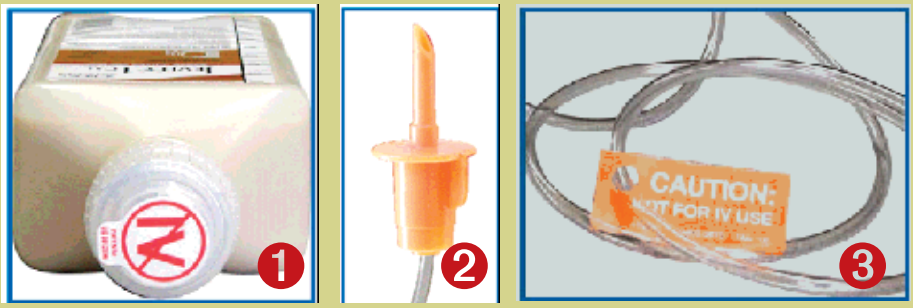
Until the late 1990's, the only way to administer an enteral feeding was with an open system in which the formula was either taken from a can or reconstituted in a blender from a powder into a liquid and then poured into the bag, Typically, the bag was good for 24 hours, yet the nurse was only able to fill the bag with an 8-hour supply at a time to meet the patient's nutritional requirements, thus the nurse had to open the system 3 times each day. The risk of touch contamination was high in this system; the nurse could touch the top of the can or formula as it was being poured into the bag, and the system was checked at least 6 times per day, which exponentially increased the risk of contaminating the bag and the feeding. The bag was also rinsed every 8 hours with water, which often served as the patient's free water allotment for the day. These frequent exposures allowed for the growth of a virtual cesspool of bacteria within the system.

Clinical studies confirm that open feeding systems can be a significant source of septicemias. Pathogens found within open systems which have been implicated in infections include *Acinetobacter baumannii; Enterobacter cloacae; Enterobacter agglomerans*; and *Klebsiella pneumoniae*. These can cause aspiration pneumonia and diarrhea, two of the most common enteral feeding complications. In addition, there is a risk of splash contamination of bloodborne pathogens to the nurse who pours the formula into the bag. Nursing time is also increased significantly with the open system because preparation time is much more labor intensive than with the closed feeding system. Methods to reduce the potential of infectious complications with open enteral systems include: (1) washing hands for 10 seconds prior to handling enteral feeding supplies, (2) cleaning the top of the can, (3) not using expired feeding formulas, (4) avoiding formulas that need to be diluted or mixed, (5) discarding dented and damaged cans, (6) handling the formula as little as possible, (7) never adding new formula to existing formula, (8) hanging only an 8-hour supply at a time, and (9) keeping the formula at room temperature.

Since their introduction, closed enteral feeding systems have become preferred because of the significantly reduced risk of contamination.[6] Closed systems are a patient safety initiative, which leads to improved patient outcomes. Many hospitals follow the Hazard Analysis Critical Control Point guidelines for the preparation and administration of enteral feeding. These have been shown to minimize enteral formula contamination and reduce the risk of touch contamination.[7]

Closed enteral feeding systems come in plastic bottle and bag forms. They are available in 1000 cc, 1500 cc, and 2000 cc sizes. The containers can hang for 24 to 48 hours as per manufacturer guidelines. If the container is empty before the 24 or 48 hour period, a new container is hung with a new spike. Similarly, if the container has formula remaining at the end of the 24 or 48 hour period, then the container is taken down and discarded. Abbott has made safety additions to their enteral feeding system to improve pa-

**Figure 2. Safety Features of the Abbott Nutrition Closed Enteral Delivery System**




1. "No IV" sticker on RTH cap
2. Orange color of spike = enteral
3. "No IV" Caution Tag on distal tubing

*(Permission granted by Abbott Nutrition)*

Figure 3. Dale® ACE Connector™ (Dale Medical Products Inc.)

tient safety and decrease the risk of misconnections. (Figure 2). Newly developed connectors for closed feeding systems (e.g., Dale ®ACE Connector™ Closed System GI Valve, Dale Medical Products, Figure 3) replaces the enteral feeding adapters and 5-in-1 connectors while protecting the healthcare worker from infectious splashback and protects patients from external contamination. The ACE Connector does not require clinician to disconnect to irrigate or administer fluids.

Initially, when a patient starts enteral feedings, there can be some product waste. This can be due to intolerance of the formula so that the feeds must be stopped often or changed to a different type of formula. In these cases, it is recommended to use the 1000 cc container. As a rule, the closed enteral feeding system initially costs more than the open system, however, additional nursing time and costs of iatrogenic infections associated with open systems, can be considerably more costly.

The nurse must wash the hands for at least 10 seconds prior to assembling the closed enteral feeding system, wear disposable gloves and keep the spike of the tubing set sterile. The closed enteral container must be punctured aseptically, and the nurse must attach the new spike set to the container without touching it. The end of the tubing must be kept sterile at all times, especially when it is disconnected for bolus or intermittent feedings. Most sets have a cover that is attached to the end for that very reason (Figure 2). The use of extra connectors (e.g. 5-in-1 connectors or 3-way stop cocks) are not recommended as they can lead to fatal misconnections. The healthcare provider should wear a mask if they have a cold, and do not use expired formulas. Another critical important nursing intervention is the proper labeling of the container with the date, time, formula and the patient name. This step allows the nurse to know when the container must be taken down. If the closed system is left up longer than manufacturer's guidelines; the formula is at increased risk of growth of microorganisms.

At Edward Hines Jr. Veterans Administration Hospital, we adopted the following evidence-based protocol for enteral feedings in 2002 with the support of the Food & Nutrition Service:

Closed feeding systems were recommended to reduce risk of touch contamination of formula. We found the closed system to be effective in reducing costs due to the nursing time and reduced formula waste. At that time there was only 1 enteral product not available in a closed feeding system.

- Wash hands for at least 10 seconds prior to handling any part of the feeding system; wear disposable gloves; the healthcare worker is to wear a mask if they have a cold.
- Our closed enteral formulas are good for 48 hours per manufacturer's guidelines. The nurse labeled the bag or bottle with the date time, formula and patient's name.
- Water flushes are given through a separate gravity bag q 6-8 hours, depending on the patient's fluid needs and hydration status. The flushed bags are good for 24 hours ONLY.
- When disconnected from the feeding tube, the end of the tubing is always covered with a protective cap.
- Every time a new container is hung, it gets a new spike.
- When the 48 hours is up, the entire unit is discarded.
- If using an open system, use ready-to-feed formulas only. Discard dented, damaged and expired cans. Cover unused formula and store in the refrigerator at least 4° C and use within 24 hours.
- Use tap water for water flushes if water safety has been verified, otherwise use sterile water for immunocompromised or critically ill patients.
- Replace the enteral feeding set every 24 hours.
- Clean irrigation syringes after each use with soap and water.

Since 2005, Hines has strictly used only closed enteral feeding systems. The system is never entered except when it is spiked, no medications are added to the formula, and the formula is never diluted.

## Conclusions

In conclusion, enteral feeding is the best way to feed the adult or pediatric patient with a functional GI tract who is unable to consume adequate calories and protein orally. It is preferred to parenteral nutrition. The first step is to decide on the proper tube which is determined by the total duration of enteral therapy and the patient's medications. The best formula for the patient is dependent on the patient's current fluid status and disease states. These factors are critical when selecting the best enteral product for each patient. The nurse needs to alert

to the potential for complications of enteral feeding and know how to prevent them. Closed enteral feeding systems are superior to open systems and can be utilized along the continuum of care, from the intensive care unit to the medical/surgical floor and ultimately to the home care setting. The benefits of closed enteral feeding systems far outweigh those of open enteral feeding systems; thus, closed systems are becoming the standard of care in most institutions. Nurses and registered dietitians are the best healthcare professionals to manage and monitor the safe administration of enteral nutrition.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***Treating a Patient with an Intestinal Obstruction Continued from page 1***


sounds or high pitched and resounding noise, and diarrhea or constipation.

Mechanical bowel difficulties occur when there is an occlusion of the lumen either internal or external to the bowel. The mechanical obstruction physically blocks the movement of material through the intestines. Above the mechanical obstruction, the bowel fills with consumed liquids and solids, digestive secretions and gas. As the proximal bowel expands, the distal bowel folds in on itself. The bowel no longer functions normally as it extends and grows obstructed. Tissue to which blood no longer flows becomes necrotic. This condition can result in bacterial infection, toxins in the tissue or bloodstream, lack of enough fluids, and electrolyte abnormalities.

Potential mechanical bowel obstructions can result from adhesions pressing on the bowel, hernias, gallstones or other foreign bodies, volvulus, intussusception, malignant tumors, or Crohn's disease. If an obstruction is not mechanical, it might be caused by something that decreases the motility of the intestines. Potential sources of non-mechanical bowel obstructions include neurogenic or muscular disturbances that interfere with peristalsis, a decrease in blood flow to the intestine, surgery, infections, medications that block the action of acetylcholine and thus dry out the mucous membrane, opioids and other medications that slow peristalsis, and potassium-consuming diuretics that disturb bowel motility. Mechanical obstructions tend to appear in the small bowel and are caused by disturbances such as parasites, hernias, inflammatory bowel disease (e.g. Crohn's disease), intussusception, or surgical and non-surgical adhesions.[3,4] Less frequent are large bowel mechanical obstructions which are often fatal and usually associated with cancerous lesions.[4,6] In addition to malignant tumors, obstructions may also be caused by diverticulitis, volvulus, and constipation. Patient pain and/or discomfort are similar in both small and large bowel disorders, although the severity and intensity of distress varies.

There are differences between the signs and symptoms of large and small bowel obstructions. With a small bowel obstruction, the patient may complain of cramps or colicky discomfort. The pain is intermittent, and usually in the mid-to-upper abdomen. In a partial obstruction, food consumption exacerbates the pain and digestion marks a decrease in pain. Distress without pain may indicate a paralytic ileus. A reduction in discomfort often corresponds to the patient changing position or vomiting. If an increase of peristaltic activity occurs simultaneous to a reversed direction of intestinal contents, nausea and/or vomiting will result. A high bowel obstruction may cause a projectile with bile odor or no odor. A distended abdomen, a bloated sensation, and altered bowel sounds may indicate a small bowel obstruction. Bowel sounds that are high pitched or indicate a hyperactive bowel, or a total absence of sound are characteristic of a paralytic ileus.

Patients with large bowel obstructions may experience persistent lower abdominal cramping that is usually not as intense as pain associated with small bowel obstruction. Severe pain may result from strangulation or bowel perforation. A complete or partial obstruction will determine the degree of constipation and/or diarrhea. An initial absence of nausea and vomiting may develop into an emesis with a fecal odor. Abdominal swelling is more noticeable in the large bowel

obstruction.

Fever, dehydration, low blood pressure, lethargy and oliguria, abdomen tenderness with palpation, and guarding of the affected areas all may indicate small or large bowel obstructions. In addition, patients may have fluid and electrolyte imbalance and possibly metabolic acidosis or alkalosis as a result of vomiting and malabsorption of gastric contents.[7,8]

## Initial Assessment

It is vital to thoroughly evaluate the patient's psychological, physiological, and safety requirements. It is imperative that nurses incorporate support, understanding, and patient education as part of nursing care. In order for the patient to receive the most appropriate treatment, it is necessary to get a complete patient history, conduct a thorough nursing assessment, and pay attention to all signs and symptoms as a preemptive measure for patient care. The healthcare provider's accurate, comprehensive, and thorough assessment is essential to successful treatment of the patient with a bowel obstruction.

For patients presenting with abdominal pain, nausea, and vomiting, nursing care must include a comprehensive and thorough patient history including frequency and occurrence of bowel movements, past surgeries, abdominal damage, hernias, constipation, gall stones, tumors, abdominal or peritoneal radiation therapy, eating disorders, indigestion, peptic ulcer disease, and current and past drug treatment. One should also assess category, position and time interval of pain, methods of pain relief, and occurrence and description of the consistency, color, and odor of vomitus.

A complete physical examination is necessary. Patient assessment includes inspection, auscultation, percussion, and palpation of the abdomen. For a patient presenting with abdominal pain, palpation is always performed last.

Inspection consists of registering baseline vital signs, measuring abdominal girth, and looking for abdominal swelling and peristalsis. One should also take notice of the patient's entire appearance and deportment during the examination.

Auscultation requires listening to bowel sounds in all 4 quadrants of the abdomen. Take note of the frequency, pitch, and length of sounds. Normal bowel sounds consist of 5 to 34 soft clicks per minute. Sounds are heard at least once every 5 to 15 seconds. They vary in duration from one to a few seconds each and may be high-pitched, resembling gurgling. Absence of sound may indicate a bowel obstruction or a paralytic ileus. High-pitched or jingling sounds (borborygmi) may relate to a hyperactive bowel with increased peristalsis and can be linked with diarrhea. These may be heard above an obstruction while hypoactive sounds are heard distal to or below the obstruction. A thorough auscultation includes listening for hyperactive and hypoactive bowel sounds.[8] Percussion may yield tympanic or resounding sounds that correspond to either a mechanical or non-mechanical obstruction. Palpation of the area of the pain's location can facilitate detection of masses, bulges, lumps, and edema.

## Diagnostic tests

In addition to a complete history and physical examination, laboratory tests can reveal additional information that aids in the diagnosis. Lab values, such as complete blood count (CBC), creatinine, serum amylase, and blood urea nitrogen (BUN) help the health provider understand the extent of underlying problems associated with the obstruction.

The category and location of the obstruction, as well as its placement, acuity, and size will determine medical treatment. For malignant obstructions, the patient's condition and prognosis are key variables in the choice of treatment. Radiological assessments provide specific information about site, pattern and acuity of the obstruction. Plain abdominal, flat and upright views give base line data. Ultrasound, CT, and MRI improve the accuracy of the imaging, but the increasing expense of these tests affect the testing choice.[1] Endoscopy with barium can point to the exact location and verify an obstruction's existence. Barium is used prudently or not at all in cases of a possible perforation. Enema with colonoscopy facilitates the measurement and diagnosis of large bowel mass. The oral barium with gastroscopy is used to assess an upper gastrointestinal mass.

## Treatment

Once a medical diagnosis of obstruction is made, treatment ranges from conservative medical management to surgical intervention. Partial small bowel adhesions or obstructions may be resolved medically without surgical intervention. Treatment options include managing pain, inserting a nasogastric (NG) tube to allow decompression and emptying of the gastrointestinal contents and to relieve distention and controlling nausea with antiemetics. NG tubes, IV fluids, and electrolytes may suffice as treatment, and the variety and amounts of fluids ordered depend on the results of lab tests as well as the overall condition of the patient.

The choice of surgical intervention corresponds to the nature and location of the obstruction. After a complete diagnosis, prompt treatment prevents perforation or strangulation. In cases of vascular insufficiency, per-

foration or strangulation, surgical intervention is necessary.

Small bowel surgery may be a resection with end-to-end anastomosis, with a risk of recurrent adhesions post-surgery. The use of a laparoscopic procedure instead of open abdominal intervention greatly decreases the occurrence of adhesions.[3]

Malignant tumors are the typical reason for large bowel surgery. A diverticulum or perforation may result in a resection with anastomosis. A right hemicolectomy may be appropriate if there is a tumor in the cecum and ascending colon. An extended right hemicolectomy may be advisable for the transverse colon. A left hemicolectomy with colostomy may be the desirable choice for the descending colon. In all cases, it is wise for health providers to inform patients of the possibility of a colostomy.

## Post operative Care

The general principles of postoperative care are the same for all patients.[7,9] After surgery, patient monitoring should include changes in vital signs, oxygenation, circulation, hydration, fluid and electrolyte balance, incisional site and level of pain. The proactive health provider assesses vital signs, temperature pulse and respirations and blood pressure, lung sounds, pulse oximetry to assess oxygenation, intake and output measurement, urine smell and opacity, bowel function, bowel sound assessment, observation of nausea and/or vomiting, patient's temperature to determine infection, incision examination, wound drainage, skin separation at the point of incision, level of pain and response to medications, and correlation of patient anxiety to patient communication and or behavior.

It is vital to pay attention to patient comfort. Pain control following surgery is usually achieved with a patient controlled anesthesia (PCA) pump.[9] Using the PCA pump allows the patient to have control over the timing and amount of medication needed for relief. Nonpharmaceutical techniques available to the patient include deep breathing and relaxation measures. An alternative method of pain control is splinting the abdomen with an abdominal binder or pillows to support the incision. Splinting the incision, providing support with an abdominal binder, reduces pull and tension on the incision thereby decreasing pain (Figure 1). Simply raising the head of the bed 45 degrees will help the patient breathe and rest better. When pain is controlled, the patient will be more likely to move. Using adjuvant pain control methods like an abdominal binder to support the incisional area may be beneficial for the patient who is afraid of moving, deep breathing and ambulating. Patients should change positions every 2 hours and ambulate as soon the surgeon recommends. Early ambulation enhances circulation, facilitates gastrointestinal and urinary functioning, and increases vital capacity and respiratory functioning.[9]

Antibiotics help lessen the threat of infection in patients undergoing surgery. Broad spectrum antibiotics prevent the possibility of infection. Medications such as cefotetan or cefuroxime may be prescribed. Metronidazole in combination with the above antibiotics protect against anaerobic bacteria and protozoa. The drug action and patient condition will determine the route of administration. Postoperative medications are administered intravenously. The class of antibiotic relies on the microorganism's receptivity.[3]

Figure 1. Dale® Abdominal Binder with easy grip strip (Dale Medical Products Inc.)

Following abdominal surgery the patient is likely to have an indwelling Foley catheter, an NG tube and intravenous tubes in place. Explanation of the reasons for tube placement and the sequence of procedures lessens the patient's anxiety. Regardless of the type of tube or use, it is critical to assess the amount, color and consistency of all drainage.

An indwelling Foley catheter is inserted immediately before surgery and secured to the patient's leg by a leg band. Securing the Foley catheter prevents traction pain (pulling on the urethra), possible infection, and movement of the catheter into the neck of the bladder, decreasing the possibility of tissue damage. Be sure though to check the leg band to ensure it does not constrict circulation. The catheter is discontinued within the first few days after surgery when the patient's activity levels increase. Until the catheter is removed, it is crucial to assess the amount, color and consistency of the urine. Urine output of at least 30 ccs per hour indicates adequate hydration. Kidney function, tissue perfusion, prevention of hypovolemic shock, and adequate maintenance of blood pressure all rely on sufficient hydration. Careful measurement of fluid and electrolyte balance is essential.

An NG tube connected to low suction is inserted to prevent an accumulation of gastric secretions and gastric dilatation after surgery. Careful account of the amount, color and consistency of drainage is a critical component of nursing care. Since extend-

ed use of NG suctioning can lead to a decrease in hydrochloric acid, sodium, potassium and water, it is important to assess changes in serum electrolytes and acid-base balance. The NG tube must be monitored for patency. If the tube is obstructed, it must be repositioned to facilitate drainage. If tube repositioning is not sufficient, physician's orders are needed to flush the tube with 20 to 30 ccs of normal saline as needed.[10]

A patient with an NG tube is NPO (i.e. nothing by mouth) and therefore requires assistance with good oral hygiene. A water-soluble lubricant keeps the lips and mucous membranes moist and prevents drying and cracking. When bowel sounds return, the NG tube is discontinued. The patient resumes oral intake of fluids and solids as tolerated. Intravenous solutions are used to maintain hydration, supply electrolytes and administer antibiotics until the patient is able to handle oral feedings.

Surgical wounds interfere with the body's natural barrier to infection. Wounds must be monitored for signs of infection. It is expected that all wounds will drain. The amount, color, and consistency of the wound drainage that alerts the nurse to potential problems. Most surgical wounds are covered with sterile dressings that are removed within a few days after surgery. For those patients allergic to latex or whose incisions require large bulky dressings, cloth or net abdominal binders can be used to secure dressings. While the dressing is intact, it should be monitored for amount and color of drainage. Once the dressing is removed, the incision site must be assessed for signs and symptoms of infection. These include increased inflammation around the site, swelling or edema, pain, and increased or unusual drainage with a foul odor. An increase in the patient's temperature may also indicate infection.

Patients allergic to latex or whose incisions require large bulky dressings, cloth or net abdominal binders can be used to secure dressings.

If the patient returns from surgery with a colostomy, the nurse must assess the color and hydration of the stoma every shift. The stoma should be moist and pink in color. A dusky blue stoma is a sign of vascular insufficiency while a brown-to-black color is indicative of necrosis. Both conditions require immediate medical evaluation. In addition to assessment and care of the stoma, the appliance must fit correctly, protect the skin, and contain drainage as well as odor. The patient requires both instructions in how to care for the stoma and also needs a referral to an enterostomal nurse.

A patient with a colostomy may experience self esteem issues and have trouble with body image. Supportive care, encouragement to express feelings about the colostomy, and a referral to a colostomy support group are essential to providing appropriate postoperative nursing care.

### Other Issues

The patient who presents with a bowel obstruction may be nutritionally compromised. Poor nutritional status impedes healing and complicates the recovery process.[11] It is critical to include a nutritional work up as part of nursing care. Initially, the patient will require intravenous fluids to maintain fluid and electrolyte balance before and during surgery. Postoperatively, as soon as the surgeon approves, the patient should be progressed to oral liquids. The patient receives 30 mL an hour the first postoperative day, then 60 mL the second day, increasing to full free liquids by the third postoperative day. By the fourth day, the patient should be able to tolerate a light diet. Typically, the first oral fluid a patient consumes is water, which has no nutritional value. Since there are no data to suggest that patients cannot tolerate small amounts of milk or other oral dietary supplements, nurses need to advocate the use of supplements rather than water.[11] Ensuring adequate nutrition will prevent delayed wound healing, a problem commonly associated with malnutrition.

Surgical adhesions are the most frequent cause of small bowel obstructions. The use of laparoscopic procedures decreases the incidence of small bowel obstruction related to adhesions.[12] Furthermore, patients who have laparoscopic surgery resume a normal diet, and are able to return to activities of daily living sooner, and experience shorter hospital stays than those patients who undergo open abdominal surgery.[12,13] These facts have implications for the patient as well as the healthcare system at large. Nurses can advocate for the best use of health care resources to aid in patient recovery and prevent complications associated with more invasive procedures.

Shortly before discharge, the patient should be advised to engage in the level of activity appropriate for his or her condition. In addition, the patient should receive instructions as to how and when to take the prescribed medications, and encouragement to stay hydrated and to choose food that promotes good nutrition. The patient

can be educated to recognize signs and symptoms of recurrent problems, so that he or she will know when to seek help from a healthcare provider.

## Conclusion

It can be a challenge to diagnose a bowel obstruction. The keys to successful management are to identify signs and symptoms that may present very subtly at first, followed by a commitment to help the patient before the condition becomes aggravated. Whatever the treatment, nurse participation in treatment and postoperative care is vital. Staying current with new findings and methods is the best course. An ability to recognize the patient's physiological, psychological, and safety needs combined with a willingness to communicate with the patient and other health care providers will yield the best results. Systematically monitoring vital signs aids in the recognition of abnormal functioning. A proactive approach to explaining tubes and procedures will lessen patient anxiety and improve the patient's chances of successful adaptation to treatment. Psychological comfort, reassurance, and education of both the patient and family members are standard for effective patient care. Encouraging the patient to take a scrupulous approach to his or her own care, medical plan, and symptoms will be invaluable to both patient and caregiver.

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2. Discuss the impact of malnutrition on wound healing and recovery in the patient following surgical intervention for bowel obstruction.
3. Describe potential complications of closed enteral feeding systems and enteral feedings in general.
4. Identify patient safety and infection control benefits of closed enteral feeding systems.

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1. **When a patient presents with an acute abdomen, in which order does the nurse assess the patient?**
   a. Palpation, inspection, auscultation, percussion
   b. Inspection, percussion, palpation, auscultation
   c. Auscultation, inspection, palpation, percussion
   d. Inspection, auscultation, percussion, palpation

2. **Which of the following is an example of a non-mechanical bowel obstruction?**
   a. Intussusception
   b. Adhesions
   c. Neurologic deficit
   d. Volvulus

3. **The nurse assess the nasogastric and determines it is not draining properly. Which action should the nurse take first?**
   a. Reposition the tube to facilitate drainage.
   b. Contact the physician to obtain an order to irrigate the tube.
   b. Irrigate the tube with 30 ccs of normal saline.
   c. Elevate the head of the bed 45 degrees.

4. **When planning care for a patient recovering from an open abdominal bowel resection that was done to treat a small bowel obstruction, relief of pain is one of the primary goals. Which non-pharmaceutical techniques can the patient use to relieve pain?**
   a. Use a PCA pump with placebo.
   b. Splint the abdomen using an abdominal binder or pillows.
   c. Lie perfectly still to ensure there is no tension on the incision.
   d. Ambulate immediately upon returning to the unit.

5. **The nurse is preparing a patient for laparoscopic surgery. The patient has a small bowel obstruction secondary to adhesions. The patient asks the nurse if the laparoscopic procedure is really the best surgery for his problem. How does the nurse respond?**
   a. I'm not sure, I'll get the surgeon to explain it to you again.
   b. There is really no difference between this procedure and an open abdominal surgery. It's the surgeon's choice.
   c. It is the procedure that the insurance company requires the surgeon's to use.
   d. The procedure is effective, and you will recover more quickly and are likely to have fewer problems after surgery.

6. **After surgery the nurse records intake and output as a way to monitor hydration. The nurse notes that the patient's urinary output ranges between 30 to 50 ccs per hour. What action should the nurse take?**
   a. Notify the physician immediately.
   b. Increase the patient's intravenous fluids.
   c. Continue standard care. It is within normal range.
   d. Give the patient ice chips and small amounts of clear liquids.

7. **The patient has surgery for a large bowel obstruction in the descending colon. What should the nurse expect when the patient returns from surgery?**
   a. In addition to routine post-operative dressings, the patient will have an NG tube, an indwelling foley catheter, intravenous lines, and a colostomy.
   b. The patient will have an indwelling Foley catheter, abdominal dressings and an NG tube.
   c. The patient will have abdominal dressings and a colostomy.
   d. The patient will have a NG tube, abdominal dressings and oxygen.

8. **The nurse assesses a patient who is 72 hours postoperative for left hemi-colectomy with a colostomy. Which findings indicate the stoma is healthy?**
   a. It is slightly red with scant mucoid-like drainage.
   b. It is moist and pink in color.
   c. It is dusky blue and slightly moist
   d. It is dark red to brown in color.

9. **Which of the following outcomes are found to occur with enterally fed patients?**
   a. Maintenance of gut integrity
   b. Improved immune function
   c. Decreased risk of infection
   d. All of the above

10. **The following is/are indications for enteral nutrition:**
    a. Dysphagia
    b. Bowel obstruction
    c. High output fistulas
    d. A and B

11. **The following is/are contraindications for enteral nutrition:**
    a. Burn patients
    b. Diarrhea
    c. Gastric outlet obstructions
    d. A and C

12. **Of the following, which is/are possible complication(s) of enteral nutrition:**
    a. Aspiration pneumonia
    b. Dehydration
    c. Malabsorption
    d. All of the above

13. **Closed enteral feeding systems is/are:**
    a. More cost effective
    b. Safer for the patient and the nurse
    c. Result in less infectious complications
    d. All of the above

**What is the highest degree you have earned (circle one) ?** 1. Diploma 2. Associate 3. Bachelor's 4. Master's 5. Doctorate

**Indicate to what degree you met the objectives for this program:** 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.

| | Strongly Disagree | | | | | Strongly Agree |
|---|---|---|---|---|---|---|
| 1. Identify at least three nursing interventions for patients following surgical intervention for bowel obstructions | 1 | 2 | 3 | 4 | 5 | 6 |
| 2. Discuss the impact of malnutrition on wound healing and recovery in the patient following surgical intervention for bowel obstruction. | 1 | 2 | 3 | 4 | 5 | 6 |
| 3. Describe potential complications of closed enteral feeding systems and enteral feedings in general. | 1 | 2 | 3 | 4 | 5 | 6 |
| 4. Identify patient safety and infection control benefits of closed enteral feeding systems. | 1 | 2 | 3 | 4 | 5 | 6 |

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| 2 | ☐ | ☐ | ☐ | ☐ | 10 | ☐ | ☐ | ☐ | ☐ |
| 3 | ☐ | ☐ | ☐ | ☐ | 11 | ☐ | ☐ | ☐ | ☐ |
| 4 | ☐ | ☐ | ☐ | ☐ | 12 | ☐ | ☐ | ☐ | ☐ |
| 5 | ☐ | ☐ | ☐ | ☐ | 13 | ☐ | ☐ | ☐ | ☐ |
| 6 | ☐ | ☐ | ☐ | ☐ | 14 | ☐ | ☐ | ☐ | ☐ |
| 7 | ☐ | ☐ | ☐ | ☐ | 15 | ☐ | ☐ | ☐ | ☐ |
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