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# EMERGENCY MEDICINE EVALUATION AND MANAGEMENT OF SMALL BOWEL OBSTRUCTION: EVIDENCE-BASED RECOMMENDATIONS

Brit Long, MD,* Jennifer Robertson, MD, MS,† and Alex Koyfman, MD‡

*Department of Emergency Medicine, Brooke Army Medical Center, Fort Sam Houston, Texas, †Department of Emergency Medicine, Emory University, Atlanta, Georgia, and ‡Department of Emergency Medicine, The University of Texas Southwestern Medical Center, Dallas, Texas
*Reprint Address:* Brit Long, MD, Department of Emergency Medicine, Brooke Army Medical Center, 3841 Roger Brooke Dr., Fort Sam Houston, TX 78234

☐ **Abstract—Background: Small bowel obstruction (SBO) is a commonly diagnosed disease in the emergency department (ED). Recent literature has evaluated the ED investigation and management of SBO. Objective: This review evaluates the ED investigation and management of adult SBO based on the current literature. Discussion: SBO is most commonly due to occlusion of the small intestine, resulting in fluid and gas accumulation. This may progress to mucosal ischemia, necrosis, and perforation. A variety of etiologies are present, but in adults, adhesions are the most common cause. Several classification systems are present. However, the most important distinction is complete vs. partial and complicated vs. simple obstruction, as complete complicated SBO more commonly requires surgical intervention. History and physical examination can vary, but the most reliable findings include prior abdominal surgery, history of constipation, abdominal distension, and abnormal bowel sounds. Signs of strangulation include fever, hypotension, diffuse abdominal pain, peritonitis, and several others. Diagnosis typically requires imaging, and though plain radiographs are often ordered, they cannot exclude the diagnosis. Computed tomography and ultrasound are reliable diagnostic methods. Management includes intravenous fluid resuscitation, analgesia, and determining need for operative vs. nonoperative therapy. Nasogastric tube is useful for patients with significant distension and vomiting by removing contents proximal to the site of obstruction. Surgery is needed for strangulation and those that fail nonoperative therapy. Surgical service evaluation and admission are recommended. Conclusion: SBO is a common reason for admission from the ED. Knowledge of recent literature can optimize diagnosis and management. Published by Elsevier Inc.**

☐ **Keywords—small bowel obstruction; imaging; nasogastric; management; disposition**

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## INTRODUCTION

Cases of small bowel obstruction (SBO) have been documented throughout history, with descriptions dating back to the ancient Egyptians (1,2). SBO accounts for 2–4% of emergency department (ED) visits for abdominal pain, and the condition accounts for as many as 16% of surgical admissions and more than 300,000 operations annually in the United States (3–12). Although some obstructions may occur in the large intestine, close to 80% of mechanical obstructions occur in the small intestine (6–8). Unfortunately, patients may experience a high complication rate, and up to 30% of patients with SBO may experience strangulation (11–13). Elderly patients are particularly at high risk for obstruction and its complications. In fact, up to 12–25% of elderly patients presenting with abdominal pain are ultimately

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diagnosed with obstruction. In addition, whereas the overall SBO mortality rate is <3%, elderly patients with SBO have mortality rates of 7–14% (14–16).

SBO is due to occlusion of the small intestine. Luminal occlusion results in fluid accumulation and gas production from bacterial overgrowth proximal to the site of obstruction (17–19). As the disease progresses, intraluminal pressure increases, and the bowel further dilatates. Ultimately, this pressure can cause mucosal ischemia, necrosis, and perforation (18). Healthy bowel may tolerate a greater amount of gradual dilatation; however, if dilatation occurs rapidly or if the bowel is not healthy at baseline, ischemia can occur rapidly (4,17–19). Obstructions at greatest risk for perforation include closed-loop obstructions and strangulated obstructions. "Strangulated obstruction" refers to an obstruction in which ischemia is occurring, which can lead to organ death (4–6,9). This is opposed to the term "incarcerated hernia," which simply refers to those with extruded loops of intestine unable to return to their normal anatomical position.

### *Etiology*

Over $2 billion in inpatient costs annually in the United States are due to SBO, and thus, determining the etiology is important (1–4). There are various causes, though adhesive disease after abdominal surgery is the most common etiology. Postoperative adhesions account for 75–80% of all cases of SBO (2,6,7,13,19). Adhesions can occur in one-third of patients postoperatively, resulting in over one million in-hospital days (3,4,13,14). Other causes of SBO include congenital (e.g., midgut volvulus, ileal atresia), disorder of the bowel wall (e.g., intussusception, stricture, tumor), extrinsic (e.g., compression from mass, volvulus), and intraluminal disorders (e.g., meconium ileus, gallstones, foreign body, bezoar) (3–7,14). After adhesions, other etiologies include hernia (most common cause of SBO in undeveloped countries), foreign body, radiation, endometriosis, and infection (a common cause in undeveloped countries, such as tuberculosis). If a patient has never undergone intraabdominal surgery, hernia with small bowel incarceration is the most common cause of bowel obstruction (3,4,18,19). Older patients with suspected SBO but no prior abdominal surgery and the absence of a hernia on examination should be evaluated for malignancy (4,16,19).

## CLASSIFICATION OF SBO

There are several classification systems for SBO, including complete vs. partial, high grade vs. low grade, simple vs. closed loop, high vs. low, mechanical vs. ileus, and chronic vs. acute (3–6,18,19). Traditionally, complete obstruction is present when no passage of fluid or gas past the site of obstruction is possible. Patients with some passage of enteric contents are classified as having a partial obstruction. Compared with complete obstruction, partial SBO is associated with less severe distension. High-grade SBO occurs with significant distension, abdominal pain, and no passage of flatus, whereas low-grade SBO is similar to a partial SBO with less severe symptoms. Simple SBO is defined by occlusion of the bowel at a single point, whereas closed-loop SBO occurs when both afferent and efferent parts of a bowel loop are occluded. This form is associated with ischemia and strangulation with necrosis. A high SBO is defined as obstruction proximal to the jejunum, associated with bilious nasogastric (NG) output, and a low SBO is located in the distal ileum, associated with greater distension and feculent NG output. Mechanical SBO occurs with a pathologic lesion or material occluding bowel lumen, whereas ileus is a functional obstruction with lack of propulsive motor activity. Finally, chronic SBO is comprised of several low-grade obstructions that typically resolve without operative treatment. Acute SBO is the abrupt onset of symptoms with no prior history of SBO, which more likely requires operative therapy (3–6,18,19).

However, these classification systems are imprecise and not often clinically useful. A more effective system is to classify SBO as nonoperative vs. operative. SBOs that are strangulated based on history, examination, or imaging, patients with peritonitis/hemodynamic instability with SBO, and those that fail to improve with nonoperative therapy comprise operative SBOs. Nonoperative SBOs are those that are not strangulated and resolve without operative therapy (4–6).

## METHODS

The authors searched PubMed and Google Scholar for articles using a combination of the keyword and Medical Subject Heading "small bowel obstruction," "evaluation," "imaging," "emergency," "management," "surgery." The literature search was restricted to studies published in English. Authors included randomized controlled trials, cohort studies, case control studies, narrative reviews, systematic reviews, and meta-analyses. Authors decided which studies to include for the review by consensus. A total of 94 articles were selected for inclusion in this review.

## DISCUSSION

### *History and Physical Examination*

The diagnosis of SBO is not always straightforward, as many patients have variable symptoms at onset, and

some cases may initially be misdiagnosed (4,6,20). The classic signs and symptoms include abdominal distension, abdominal pain, and nausea with vomiting, but not all patients demonstrate these classic signs and symptoms (5,20). However, along with appropriate imaging, focused history and physical examination can provide valuable information in the evaluation of patients with suspected SBO.

In terms of history, patients may describe nausea and vomiting, paroxysms of abdominal pain every 4–5 min, abdominal distension, hyperactive bowel sounds, and inability to keep food and fluids down. Symptoms may then progress to continuous pain, hypoactive bowel sounds, and worsening vomiting due to bowel fatigue (3,4). However, these signs and symptoms are not specific for diagnosis, and patients with SBO may continue to pass stool and flatus (21,22). The presence of nausea, history of similar complaints, guarding, the severity and duration of pain, and the patient's gender do not affect the likelihood of disease presence (5,22). A prior abdominal surgery possesses a positive likelihood ratio (+LR) of 3.86 and negative likelihood ratio (−LR) of 0.19, and a history of constipation possesses a +LR of 8.8 and −LR of 0.59 (5,20,22). Specific historical elements that should be discerned include previous bowel obstructions and their management, abdominal operations, radiation, and other abdominal disorders (e.g., inflammatory bowel disease, neoplasm) (4–6). Other risk factors that can be helpful to elicit include a laparotomy within the last 5 years, prior gynecologic surgeries, a history of emergency surgery, prior penetrating abdominal trauma, and a history of omental resection (23).

The physical examination should begin with evaluating for systemic toxicity necessitating resuscitation, followed by abdominal examination and evaluation for the presence of a hernia contributing to obstruction (4–6,23,24). In cases where there is concern for systemic toxicity, an incarcerated hernia, or bowel ischemia, an immediate surgical consultation is warranted (24). Peritonitis, localized tenderness, hypotension, or tachycardia suggest strangulation and bowel ischemia (4–6,24). Fever, leukocytosis, and metabolic acidosis are also concerning for systemic toxicity and bowel ischemia (6). Persistent pain that continues to worsen or pain out of proportion to examination is suggestive of ischemia or closed-loop obstruction (3,4,6). However, history and examination alone do not predict strangulation well, and further testing may be warranted (25,26). Evaluation and management of these possible complications of SBO will be discussed in a subsequent section.

Examination findings vary, but many patients with SBO demonstrate mild, generalized tenderness alleviated by vomiting. Abnormal bowel sounds and abdominal distension are the best predictors of SBO (5,20). Abnormal bowel sounds demonstrate a +LR of 6.33 and −LR 0.27, whereas abdominal distension possesses the highest +LR, 16.8, with a −LR of 0.34 (5). Visible peristalsis, rigidity, and reduced bowel sounds are examination findings that are specific but not sensitive. Similarly, relief of pain with vomiting and increased pain with eating are symptoms that are specific but not sensitive (5,22). Other physical examination findings may include an abdominal mass, reduced abdominal wall movements, and generalized tenderness, but they demonstrate poor sensitivities (22).

### *Diagnostic Modalities*

Although the history and physical examination can guide the clinician toward a diagnosis of SBO, they are not sufficiently sensitive or specific for the diagnosis of SBO and its potential complications, such as strangulation or ischemia (5,26). Thus, imaging has become essential for diagnosis of SBO. Various diagnostic modalities are available, including plain radiograph, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound (US) (Table 1) (6).

### *Plain Radiography*

Supine and upright plain radiographs are often the initial imaging tests for evaluation of SBO (23,27). Plain radiographs may have a role in the initial diagnostic evaluation due to their widespread availability, low cost, and ability to follow disease progression serially (6,27). However, the sensitivity of plain films is 66–85% (28,29). In addition, over 20% of abdominal radiographs in patients with SBO are nonspecific or normal (28–30).

**Table 1. Eastern Association for the Surgery of Trauma Practice Management Guideline for Diagnosing SBO (6)**

| Recommendation | Level |
|---|---|
| 1. CT of the abdomen/pelvis should be considered for all patients with SBO. | 1 |
| 2. Water-soluble contrast should be considered in all patients who fail to improve after 48 hours of nonoperative management. | 2 |
| 3. Multidetector CT and multiplanar reconstruction should be used if available. | 3 |
| 4. MRI and ultrasound are possible alternative imaging modalities. | 3 |
| 5. CT should be considered to assist with diagnosis of small bowel volvulus. | 3 |

SBO = small bowel obstruction; CT = computed tomography; MRI = magnetic resonance imaging.

Several findings on radiograph suggest SBO. A normal small bowel-gas pattern is defined as the absence of small bowel gas or the presence of small amounts of gas within up to four nondistended loops of small bowel (<2.5 cm). The gas pattern for SBO on plain film demonstrates dilatated gas- or fluid-filled loops of small bowel in the setting of a gasless or nondistended colon (30,31). However, a patient with SBO may demonstrate more subtle findings on x-ray study, and a plain film can simply show air fluid levels with a normal or slightly distended colon (Figure 1) (28–32). Another abdominal x-ray study feature concerning for SBO includes the string of pearls sign, seen in predominantly fluid-filled loops of small bowel as small amounts of intraluminal gas collecting along the superior wall separated by the valvulae conniventes (33) The string of pearls sign is typically seen on erect or decubitus abdominal radiographs (33).

The severity of SBO can be underestimated on abdominal radiography if the dilatated bowel loops are predominantly fluid filled (27–31). In addition, perforation may be diagnosed with upright radiography, but this is not 100% sensitive for diagnosis of intestinal perforation. If strong suspicion for SBO is present, other testing is recommended, as a negative radiograph cannot exclude the diagnosis (3–6,23,24).

*Computed Tomography*

CT is often the imaging modality of choice and is currently considered the standard of care for imaging SBO (6,27,34). It is rapidly available and has better diagnostic accuracy than plain films. Per Eastern Association for the Surgery of Trauma (EAST) guidelines, Level I evidence recommends the use of CT scanning for SBO, especially multidetector CT with multiplanar reconstructions, as it can provide incremental, clinically relevant information not seen on plain films that may lead to changes in management (6,24). CT with intravenous (i.v.) contrast can reliably diagnose SBO and bowel perfusion (24,35). Compared with plain films, CT better determines the site and cause of the obstruction (27,36,37). In high-risk patients, multiphasic CT including unenhanced arterial, venous, and delayed phases may be performed to detect bowel ischemia in some high-risk patients (34). Adding an unenhanced CT to CT with i.v. contrast may also add to the accuracy of diagnosing bowel ischemia in SBO (38). Oral contrast is typically not necessary, and in high-grade SBO, oral contrast may delay diagnosis, increase cost, and result in patient discomfort and possibly even complications such as aspiration (35). In patients with contraindications to i.v. contrast, noncontrasted CT imaging may provide nearly the same accuracy if the SBO is mechanical in nature (39). However, in patients with partial adhesive SBO, water-soluble-contrast medium (WSCM) possesses both diagnostic and therapeutic purposes and can be utilized for nonoperative therapy (6,40,41).

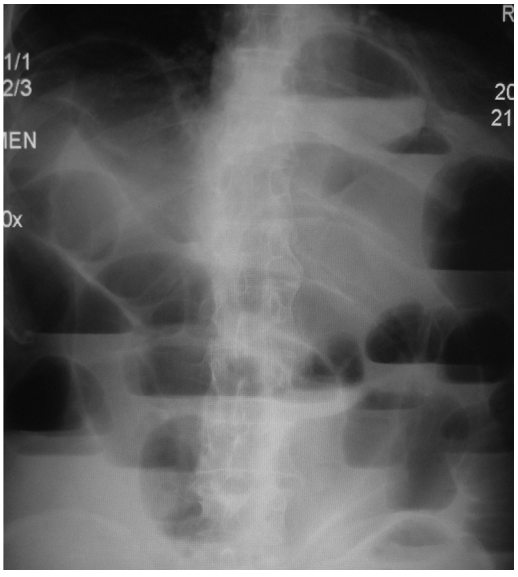


**Figure 1. Upright x-ray study demonstrating a small bowel obstruction with multiple air fluid levels. From https://commons.wikimedia.org/wiki/File:Upright_X-ray_demonstrating_small_bowel_obstruction.jpg.**

CT possesses a +LR of 3.6 and −LR of 0.18 for SBO diagnosis, but this +LR is likely low when compared with current CT technology. Different types of equipment, scanner technology, and contrast affect the test characteristics, and advanced CT scanners possess high sensitivity (5). Several studies evaluating CT imaging have demonstrated overall sensitivities approaching over 96% and specificities up to 100%, especially in scanners with thin slices and fast scanning times (27,36,42,43). The diagnosis of SBO on CT is commonly made when there is an incongruence between the diameter of small bowel loops with a transition zone above which the loops are dilatated and below where they appear collapsed (44). Identifying this transition point on CT is important to evaluate the etiology of the obstruction, as the site and cause provide valuable information on whether operative therapy is needed (3,6). Detection of the transition point by 64-slice multiple-detector CT has been found to demonstrate a 93% sensitivity, 67% specificity, 98% positive predictive value, and 92% accuracy for SBO (45).

Although CT displays high accuracy in diagnosing SBO, in isolation it is less reliable in identifying complications such as perforations, ischemia, and need for an operation (46,47). In a chart review of 60 patients with SBO who had initial CT scans and subsequent operations, perforations were correctly identified on CT

in only 50% of patients, and only 20% of patients were correctly identified as having ischemia (46). In a study of 44 patients with SBO who had CT scans and eventually underwent surgery, the sensitivity of CT for ischemia was only 84%, whereas the specificity was much higher at 96% (48). Decreased segmental bowel-wall enhancement was found to be the most accurate sign of ischemia, with a sensitivity of 78% and specificity of 96% (48). Another study found reduced wall enhancement to be the best predictor of ischemia, with a sensitivity of 56% and specificity of 94% (25).

If ischemia is present, urgent surgery is necessary (6,23). It is less clear, however, if other high-risk features on CT imaging are predictive of the need for an operation. In isolation, CT is less reliable in determining the need for surgery. High-risk features such as a transition point, small bowel feces, and a high-grade obstruction are not necessarily predictive of a need for surgery, even among patients with similar underlying attributes (5,47). A combination of clinical and radiographic findings can be more useful in predicting the need for surgery, and several studies have attempted to evaluate various factors in combination (49–51). In a review of 100 patients with confirmed SBO who received either operative or nonoperative therapy, multiple historical, laboratory, and radiographic findings were suggestive of a need for operation (49). These included a history of malignancy; vomiting; elevated lactic acid (2.7 $\pm$ 1.6 mmol/L); and on CT, free intraperitoneal fluid, mesenteric edema, and no small bowel feces sign. In addition, the combination of vomiting, no "small bowel feces sign," free intraperitoneal fluid, and mesenteric edema had a sensitivity of 96% and positive predictive value of 90% (odds ratio [OR] 16.4, 95% confidence interval [CI] 3.6–75.4) for requiring operative exploration (49). A study in 2014 demonstrated that 92% of patients with SBO required surgery if they had more than three of the following risk factors: persistent abdominal pain or distention, both persistent abdominal pain and distention, fever at 48 h, and CT-determined high-grade obstruction (50). Overall, CT is excellent at diagnosing SBO, but clinicians may need to use a combination of factors when determining complications and need for surgical intervention.

*Ultrasound*

Although CT is considered a first-line test, it is expensive and exposes patients to high doses of radiation (27,52). US, both comprehensive and bedside, has been investigated as an option for diagnosing SBO. The benefits of US are that it allows for rapid diagnosis and serial assessments without radiation exposure (52). However, it is operator dependent, so in situations where the operator is less skilled or the diagnosis is in question, then further testing may be necessary (53).

Although definitions differ slightly, SBO is typically diagnosed on US when the lumen of fluid-filled small bowel loops is dilatated, typically from $\geq$ 2.5 to 3 cm. However, the definition of dilatation varies and ranges from 1.5–3 cm (Figure 2) (52). Additional findings include lengthening of the affected segment to >10 cm and augmentation of peristalsis. Peristalsis on US is demonstrated by whirling movements of the bowel contents (53). The potential cause and obstruction level of the SBO may be determined by examining the area of transition from dilatated to normal bowel. The level of obstruction can be found by examining the location of the bowel loops and pattern of the valvulae conniventes (53). Finally, bowel infarction/ischemia is suggested with free fluid between the dilatated small bowel loops, the absence of peristalsis, and wall thickening (>3 mm) in a fluid-filled distended bowel (53).

Although studies vary, comprehensive and bedside US are sensitive and specific for diagnosing SBO (27,29,52,54). Sensitivities range from 83% to 97.7%, and specificities range from 84% to 100% (27,29,52,54). Studies have also shown high positive predictive value for US, ranging from 93–100% (29,54). Bedside US is associated with +LR of 9.55 (95% CI 2.16–42.21) and −LR 0.04 (95% CI 0.1–0.13), whereas comprehensive US is associated with +LR of 14.1 (95% CI 3.57–55.66) and −LR 0.13 (95% CI 0.08–0.20) (5). The EAST guidelines state that US is an alternative to CT for making the diagnosis of SBO (6). However, this is a level 3 recommendation in the guidelines. This means there are some data available to support its use, but adequate scientific evidence is lacking (6).

There are indeed limitations to US. One significant limitation is that air may obstruct underlying findings in those with distended bowel (5,23). It also may fail to detect superficial abnormalities or diagnose complications, and the modality is operator dependent (55,56). CT is better able to determine the level and

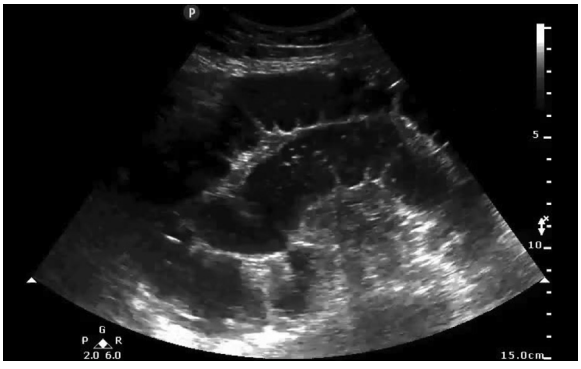


**Figure 2. Ultrasound with findings consistent with dilatation of small intestine and obstruction. From https://commons.wikimedia.org/wiki/File:UOTW_20_-_Ultrasound_of_the_Week_3.jpg.**

etiology of the obstruction (27). Thus, negative findings on US may require further imaging, especially in those patients where there is a high clinical suspicion for SBO (57). However, the benefits of US are that it has no radiation risk, can be quickly performed, and allows for serial examinations (6,52). Thus, it still may be considered an alternative to CT when CT is not available, there are contraindications to CT, or if serial examinations are needed.

*Magnetic Resonance Imaging*

Although mostly used in diagnosing and monitoring Crohn's disease, MRI is an imaging modality that can evaluate for SBO (58). Advantages of MRI over CT include lack of ionizing radiation, improved soft tissue contrast, the ability to provide dynamic information regarding bowel distention and motility, and relatively safe i.v. contrast agents (59,60). MRI possesses high sensitivity and specificity for diagnosis. Half-Fourier acquisition single-shot turbo spin-echo MRI has been shown to have sensitivity approximating 95% and specificity reaching 100% (61–63). MRI is also able to demonstrate vessels and quantitate blood flow and is being investigated as the modality of choice to detect acute ischemia due to SBO (64–66).

MRI possesses limitations, including limited availability, long scan times, high cost, variability in examination equality, and lower spatial and temporal resolution as compared with CT (6,59). In addition, patients are recommended to be fasting at least 4–6 h prior to the scan (58,67). Thus, due to logistical reasons, the EAST guidelines provide a level 3 recommendation (supported by available data but lacking adequate scientific evidence) for MRI imaging of acute SBO (6). At this time, except for pregnant women and children, CT should be utilized when a high-grade SBO is suspected (35,59,60).

For MRI to diagnose SBO, optimal distention of the small bowel loops is critical, because collapsed bowel loops may hide lesions or mimic disease. This is because inadequately distended segments may mistakenly suggest abnormally thickened bowel wall (68). To obtain small-bowel distention, two main techniques are used: 1) Magnetic resonance (MR) enteroclysis with infusion of the contrast through a nasoenteric tube and 2) MR enterography with oral administration of contrast material (68–70). Several different contrast agents may be used, according to their signal intensity on T1- and T2-weighted images (59).

The overall preference for enteroclysis vs. enterography for detecting small bowel diseases other than Crohn's disease is not well documented (58). MR enteroclysis is typically better at enhancing bowel loop distention, as well as detecting mucosal abnormalities, compared with enterography (60,69). It may also reveal subtle transition points or an obstruction in the small bowel that can escape detection with enterography (60,69). However, patients and radiologists tend to prefer enterography over enteroclysis due to fewer logistical problems, ease of use, and comfort (59,69,70). If MR is considered for evaluation, discussion with a radiologist is recommended.

*Management*

The initial goal of evaluating a patient with SBO is to immediately identify hemodynamic instability, the presence of strangulation or bowel ischemia, and the need for urgent operative intervention. These decisions should be made concurrently with resuscitation (3,4,6,24,71). Patients with SBO should be provided i.v. resuscitation, symptomatic control with antiemetics and analgesics, and bowel rest (3,4,6,24). Intravenous fluid resuscitation with electrolyte replacement is needed due to dehydration and hypovolemia (72,73). The patient should be made nil per os (6,24,71).

Therapy can be divided into nonoperative vs. operative interventions. The EAST guidelines for general operative management are shown in Table 2 (6). Conservative therapy and symptomatic management are typically recommended for patients without peritonitis or strangulation, with success rates ranging from 43–73% (23,74–76). Patients typically display improvement within 48 h. In partial SBO, strangulation occurs in a small percentage of cases managed conservatively (3,4,6,9). However, studies suggest conservative therapy is associated with risk of recurrent obstruction, and the risk of recurrence also worsens with each episode of SBO, with SBO related to adhesive disease recurring in 19–53% of cases (23,77,78).

**Table 2. Eastern Association for the Surgery of Trauma Practice Management Guideline for Managing SBO (6)**

| Recommendation | Level |
|---|---|
| 1. Patients with generalized peritonitis or other evidence of clinical deterioration (fever, leukocytosis, tachycardia, acidosis, continuous pain) should undergo timely surgical exploration. | 1 |
| 2. Patients with no evidence of clinical deterioration can safely undergo nonoperative management initially. | 1 |
| 3. CT findings consistent with bowel ischemia require a low threshold for operative intervention. | 2 |
| 4. Laparoscopic treatment of SBO is a viable option compared with laparotomy in selected cases. | 2 |
| 5. Water-soluble contrast should be considered for patients with partial SBO that has not resolved in 48 h. | 2 |

SBO = small bowel obstruction; CT = computed tomography; MRI = magnetic resonance imaging.

NG tube decompression can assist with symptom management, especially in those with distension, pain, severe nausea, and vomiting through decompression of contents proximal to the site of obstruction. Unfortunately, literature evaluating NG tube placement in the setting of SBO is poor. One recent retrospective chart review suggests NG tube placement does not decrease the risk of bowel ischemia or need for surgery (79). Another retrospective study suggests that conservative therapy without NG tube placement is not associated with failure of therapy, and patients treated with NG tube insertion may have a longer time to SBO resolution, longer length of stay, and higher complication rates (79,80). However, these studies are retrospective and are not randomized or prospective. These studies are also subject to selection bias, and study authors gave no explanation for which patients were selected for management without NG tube, and no description of nausea or vomiting was provided. Further randomized data evaluating the timing of NG tube placement and whether NG tube placement improves recovery from SBO are needed. NG tube placement to decompress the small bowel proximal to the obstruction site is recommended in patients with severe symptoms (i.e., consistent nausea and vomiting), severe distension or pain, or altered mental status (6,23). If an NG tube is inserted, nebulized lidocaine may assist placement and reduce the pain of insertion (81).

Patients with partial adhesive SBO without strangulation are good candidates for WSCM for both diagnostic and therapeutic purposes (6,40,41). WSCM is administered orally or most commonly by NG tube in doses of 100 mL in 50 mL of water, both immediately at admission or, if conservative therapy fails, after 48 h (40,41). After administration, WSCM appearing in the colon within 24 h on x-ray study predicts resolution without surgical intervention (40,41). Literature suggests WSCM is safe and can reduce the need for surgery, SBO time to resolution, and hospital stay (23,40,41). Nonoperative techniques can be utilized for 3 days, but if the patient demonstrates no improvement or no passage of WSCM into the colon, operative therapy is needed (3,4,24–26).

Strangulation is primarily dependent on the severity and type of obstruction, as well as patient age and comorbidities (11,21,25). Partial SBO is associated with strangulation in <10% of cases; however, patients with high-grade or complete obstructions display strangulation in 25–45% of cases (75,77,82,83). Delayed surgery in the setting of strangulation increases mortality (6,11,21,23,71). Patients with signs of strangulation or generalized peritonitis, evidence of clinical deterioration (continuous or worsening pain, fever, hypotension, tachycardia, metabolic acidosis), or concern for ischemia based on imaging should undergo surgical exploration

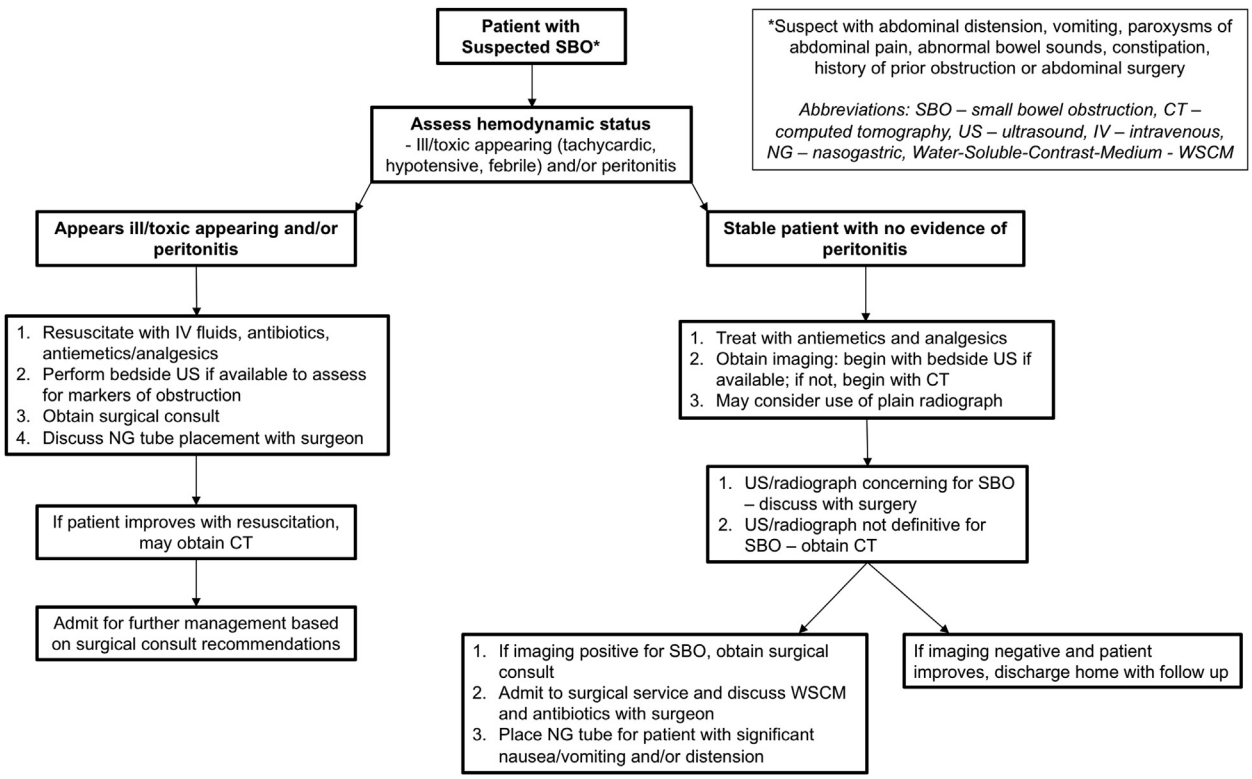


**Figure 3. Algorithm for evaluation and management of patients with small bowel obstruction.**

(Level 1 recommendation per EAST guidelines) (6). Operative therapy is also recommended for those who fail conservative therapy (6,23). Though complete obstruction has a higher failure rate with conservative therapy, those without the previously mentioned findings can safely undergo nonoperative conservative therapy initially for both partial and complete SBO, with surgical consultation (6,23,71). High-grade and complete SBO may resolve with fluid rehydration and symptomatic treatment in 35–50% of cases (71,84). However, up to 30% of those with complete SBO require bowel resection due to intestinal necrosis (71,84). Those with impacted material such as bezoar, food, gallstones, and other foreign bodies will require intervention for removal (6,23,71).

There are no strong recommendations from EAST or other publications for routine use of antibiotics in patients with SBO (6). Authors of this article provide coverage for Gram-negative and anaerobic bacteria as part of broad-spectrum antibiotic coverage. Antibiotics are strongly recommended if the patient displays evidence of strangulation requiring surgery or evidence of perforation, sepsis, or hypoperfusion, along with emergent surgical consult (6,23,71). Broad-spectrum antibiotic coverage is needed due to potential perforation and bacterial translocation.

As many patients resolve with nonoperative therapy, patients diagnosed with SBO are often admitted to a medical service; however, admission to a medical service is associated with increased morbidity and mortality (74,85–89). Patients should be evaluated and admitted by a surgical service, as this is associated with lower mortality rates, shorter lengths of stay, and lower costs compared with admission to a medical service (6,74,85–89). Increased mortality on a medical service is likely due to delayed surgery, as studies suggest a delay to surgery by approximately 2 days (89–94).

A proposed algorithm for the evaluation and management of patients with suspected SBO is shown in Figure 3.

## CONCLUSIONS

SBO is a common reason for admission from the ED, most commonly due to occlusion of the small intestine, resulting in fluid and gas accumulation. Many etiologies are present, but adhesions are the most common cause in adult patients. Several classification systems are present, though the most important is complete vs. partial and complicated vs. simple obstruction, as complete complicated SBO more commonly requires surgical intervention. The most reliable history and examination findings include prior abdominal surgery, history of constipation, abdominal distension, and abnormal bowel sounds. Physicians should closely evaluate for evidence of strangulation, including fever, hypotension, diffuse abdominal pain, and peritonitis. Imaging is necessary in the ED. CT and US are reliable means of diagnosis, but plain radiographs cannot exclude diagnosis. Management includes i.v. fluid resuscitation, analgesia, and determining need for operative vs. nonoperative therapy. Nasogastric tube placement is useful for patients with significant abdominal distension, pain, and vomiting. Surgery is needed for strangulation and those who fail nonoperative therapy. Admission to a surgical service is recommended.

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## ARTICLE SUMMARY

**1. Why is this topic important?**

Small bowel obstruction (SBO) is a common condition requiring admission from the emergency department (ED). Recent literature has investigated the ED investigation and management of SBO.

**2. What does this review attempt to show?**

The review provides a focused overview of the evaluation and management of SBO in the ED, based on the current literature.

**3. What are the key findings?**

SBO results from external or internal compression of the small intestines, causing an accumulation of fluid and gas proximal to the point of obstruction, which may progress to ischemia and perforation. Adhesions are the most common cause of SBO. The most reliable history and examination findings include prior abdominal surgery, constipation, abdominal distension, and abnormal bowel sounds. Strangulation may present with fever, hypotension, diffuse abdominal pain, and peritonitis. Imaging can assist in diagnosis. Plain radiographs cannot exclude the diagnosis. Computed tomography and ultrasound are reliable means of assessment. Management includes intravenous fluid resuscitation, analgesia, and determining need for operative vs. nonoperative therapy. Nasogastric tube placement is recommended in patients with significant distension and vomiting for decompression. Surgery is needed for strangulation and those who fail nonoperative therapy. Admission to a surgical service is recommended.

**4. How is patient care impacted?**

SBO is a common abdominal disease diagnosed in the ED, and knowledge of recent literature may optimize evaluation and management.