

**American College of Radiology
ACR Appropriateness Criteria®**

Clinical Condition: Suspected Small-Bowel Obstruction

Variant 1: Suspected complete or high-grade partial SBO.

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
CT abdomen and pelvis with contrast (routine)	8	Oral contrast should not be used. Positive enteric contrast may prevent detection of diminished bowel wall enhancement in ischemia and obscure abnormal mucosal enhancement in inflammatory and neoplastic conditions. Additional fluid from oral contrast is not well tolerated with bowel obstruction.	High
X-ray abdomen and pelvis	7		Med
CT abdomen and pelvis with contrast (CT enteroclysis)	4	A limited role if high-grade obstruction has been confirmed.	High
X-ray small bowel follow-through	4		Med
X-ray small bowel enteroclysis	4		Med
MRI abdomen and pelvis with or without contrast	4	See statement regarding contrast in text under "Anticipated Exceptions."	None
US abdomen and pelvis	2		None

Variant 2: Suspected intermittent or low-grade SBO.

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
CT abdomen and pelvis with contrast (CT enteroclysis)	8	If other tests are negative.	High
MRI abdomen and pelvis with contrast (MR enteroclysis)	8	MR enterography may have sensitivity and specificity similar to CT enterography and avoids radiation risks. However, the choice of examination depends on institutional preferences and resources. See statement regarding contrast in text under "Anticipated Exceptions."	None
CT abdomen and pelvis with contrast (CT enterography)	7		High
MRI abdomen and pelvis with contrast (MR enterography)	7	See statement regarding contrast in text under "Anticipated Exceptions."	None
X-ray small bowel enteroclysis	7		Med
CT abdomen and pelvis with contrast (routine)	5		High
X-ray small bowel follow-through	5		Med
MRI abdomen and pelvis with or without contrast (routine)	5	See statement regarding contrast in text under "Anticipated Exceptions."	None
X-ray abdomen and pelvis	4		Med
US abdomen and pelvis	2		None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

SUSPECTED SMALL-BOWEL OBSTRUCTION

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Summary of Literature Review

There is no single generally accepted approach to evaluate patients with suspected small-bowel obstruction (SBO). This, in part, reflects not only the differing perspectives of investigators who have written on the topic (surgeons and radiologists) but also the increasing application of sophisticated imaging studies. The diagnostic approach also depends on the clinical presentation (ie, acute high-grade vs. low-grade or intermittent SBO) [1].

Radiography has been the traditional starting point for imaging evaluation of suspected SBO. It must be conceded, however, that studies testing the utility of radiographs have yielded quite disparate results [2-5]. While some investigators report 80%-90% success in diagnosing SBO using radiographs [3], an overall accuracy equal to that of computed tomography (CT) [6], others have achieved rates only in the 30%-70% range [2,5,6]. In some even less encouraging studies, abdomen radiographs have proved to be of little to no help in assessing the site or cause of SBO [7,8], or even to be misleading in 20%-40% of patients [5].

In light of these inconsistent results, it is reasonable to expect that abdomen radiographs will not be definitive in many patients with suspected SBO. In such a setting, gastrointestinal contrast studies (small-bowel follow-through [SBFT], enteroclysis, and barium enema) or cross-sectional imaging studies (CT, ultrasound [US], and magnetic resonance imaging [MRI]) are options.

Contrast Enema

The single-contrast barium enema study with attempted reflux into the distal ileum can exclude colonic obstruction and may occasionally aid in distinguishing SBO from an adynamic ileus [9,10]. It is unreliable, however, for localizing and characterizing the site of SBO

[10,11], as well as for identifying patients who will need surgery [11].

Small-Bowel Follow-Through

Opinion is divided on the usefulness of SBFT studies with orally administered barium. Some investigators have found this study useful for managing suspected SBO in 68%-100% of cases [9,11,12]. Because SBFT suffers from nonuniform small-bowel filling, inability to test distensibility, and limitations posed by intermittent fluoroscopy, some authorities argue that enteroclysis is the appropriate examination in problematic SBO cases [10,13,14].

CT Enteroclysis

Methods of examination that challenge the distensibility of the small bowel, such as standard or CT enteroclysis (CT-E), offer improved sensitivity and specificity over standard barium small-bowel and CT examinations in evaluating suspected intermittent or low-grade SBO [1,5,10,15,16]. Evidence is compelling that enteroclysis is highly reliable in pinpointing sites of low-grade and high-grade obstruction [13,17,18], as well as in distinguishing adhesions from obstructing neoplasms [13]. CT-E is generally favored over conventional enteroclysis because of its ability to avoid problems from overlapping bowel loops. CT-E should be considered as an alternative, especially in patients with a history of malignancy [1]. Enteroclysis has low patient acceptance and depends on the skill of the radiologist performing the examination.

CT Enterography

CT enterography does not require intubation of the small bowel and therefore has greater patient acceptance and is less dependent on the technical skill of the radiologist. However, its clinical usefulness in diagnosing intermittent or low-grade SBO has not yet been convincingly established. CT enterography with neutral-density enteric contrast offers an advantage over CT-E, particularly where detection and characterization of bowel wall abnormalities are important (eg, Crohn's, neoplasms).

Oral Contrast

Evaluation of suspected SBO with oral water-soluble contrast agents is controversial. Some authors point out that this technique is disadvantageous because of the potential for intravascular volume depletion and electrolyte imbalance, plus its suboptimal imaging characteristics compared with studies using barium contrast [10,19]. Others have found both low-osmolar and high-osmolar water-soluble agents to be useful in diagnosis, amelioration, and management of SBO [20-23]. Their stance is bolstered by reports of admittedly rare complications with barium studies, such as conversion from partial to complete obstruction [24]. A randomized controlled study concluded that water-soluble contrast administration was not useful in the management of these patients [25].

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Computed Tomography

Convincing studies have confirmed the usefulness of the standard CT examination in suspected high-grade SBO. Diagnostic accuracy of more than 90% has been reported [2,3,26], with success in distinguishing SBO from ileus [27] and in identifying the cause of obstruction [5,26]. Patients with suspected high-grade obstruction do not require additional oral contrast medium since the fluid in the bowel provides adequate contrast. Low-grade obstruction is a relative “blind spot” for standard CT. One study demonstrated correct diagnosis in fewer than half of such cases [16]. Newer multidetector (MDCT) scanners with multiplanar reconstruction capabilities have been noticeably more effective in evaluating SBO and other abdominal pathology, particularly when coronal reconstructions are added [28].

CT may be useful for detecting complications of bowel obstruction such as ischemia and strangulation [29-33]. CT signs of ischemic complications, when present, are highly specific [34]. When combined with clinical findings, the sensitivity of CT for detecting strangulation can be improved [35].

Ultrasound

Largely because of the success of enteroclysis and CT in diagnosing and characterizing SBO, US has been used rarely for this purpose in the United States; therefore data are scanty. In skilled hands, US has been reported to have a nearly 90% success rate in diagnosing SBO [8,36-38]. In the pediatric age group, US has proven useful in evaluating intussusception [17], midgut volvulus [39], and other causes of SBO [40]. CT proved superior to US in one study [41].

Magnetic Resonance Imaging

Increasing evidence supports MRI’s capability to detect and characterize SBO [42-45]. Because of its higher cost and convincing lack of incremental diagnostic gain compared with CT, MRI should not be used routinely for evaluating suspected high-grade SBO. MR enteroclysis appears to compare favorably with CT enteroclysis in evaluating low-grade obstruction. Children and pregnant patients are a particularly good population to be offered MRI for SBO.

Summary

- Standard CT has emerged as the pre-eminent imaging modality for evaluating SBO and should be considered in the initial evaluation of patients with suspected high-grade SBO.
- The barium enema and small-bowel examination play a less significant role and should not be used as a primary modality in diagnosing acute SBO.
- If intermittent or low-grade SBO is a chief diagnostic concern, either CT or MR enteroclysis [15] is preferred.
- CT and MR enterography are likely superior to routine CT and MRI examinations and enjoy better patient acceptance than enteroclysis. However, there

are no studies comparing enterography with enteroclysis techniques in low-grade SBO.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (ie, <30 mL/min/1.73m²), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73m². For more information, please see the [ACR Manual on Contrast Media](#) [46].

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

Relative Radiation Level Designations	
Relative Radiation Level	Effective Dose Estimate Range
None	0
Minimal	< 0.1 mSv
Low	0.1-1 mSv
Medium	1-10 mSv
High	10-100 mSv

Supporting Document(s)

- [ACR Appropriateness Criteria® Overview](#)
- [Evidence Table](#)

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The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.