



General

Guideline Title

ACR Appropriateness Criteria® suspected small-bowel obstruction.

Bibliographic Source(s)

Katz DS, Baker ME, Rosen MP, Lalani T, Carucci LR, Cash BD, Kim DH, Piorkowski RJ, Small WC, Smith MP, Yaghmai V, Yee J, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® suspected small-bowel obstruction. [online publication]. Reston (VA): American College of Radiology (ACR); 2013. 10 p. [71 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Small WC, Rose TA Jr, Rosen MP, Blake MA, Baker ME, Cash BD, Fidler JL, Greene FL, Jones B, Katz DS, Lalani T, Miller FH, Sudakoff GS, Tulchinsky M, Yee J, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® suspected small-bowel obstruction. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 6 p.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Suspected Small-bowel Obstruction

Variant 1: Suspected high-grade SBO, based on clinical evaluation or initial radiography (if performed).

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	9	Oral contrast should not be used if high-grade SBO is known or suspected. Oral contrast will not reach the site of obstruction, wastes time, adds expense, can induce further patient discomfort, will not add to diagnostic accuracy, and can lead to complications, particularly vomiting and aspiration.	☒☒☒☒
CT abdomen and pelvis without contrast	7	Perform this procedure in patients who have known or suspected high-grade SBO when IV contrast is contraindicated.	☒☒☒☒
<p>Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate; 10 Always appropriate</p>			<p>*Relative Radiation</p>

Radiologic Procedure	Rating	Comments	RRL*
with contrast (routine)		patients who have had multiple prior CT examinations. See statement regarding contrast in text below under "Anticipated Exceptions."	
X-ray abdomen and pelvis	5	Perform this procedure if it has not already been performed.	☼☼☼
CT abdomen and pelvis without and with contrast	4		☼☼☼☼
MRI abdomen and pelvis without contrast (routine)	4	MRI is most appropriate for pregnant women, children, and younger adult patients who have had multiple prior CT examinations.	O
X-ray small bowel follow-through	4	This procedure has a limited role if a high-grade obstruction has been confirmed by radiography or CT/MRI. Perform the x-ray with water-soluble contrast material, and use iso- or low-osmolar contrast material if there is a risk of aspiration.	☼☼☼
CT enteroclysis	3	This procedure may not be readily available at most institutions or radiology practices. Generally, it is not indicated in the acute setting.	☼☼☼☼
CT enterography	3	This procedure has a limited role if radiography or routine CT/MR has confirmed a high-grade obstruction. The exact protocol depends on the patient's circumstances and the radiologist's preference. Generally, it is of little use in the acute setting due to lack of tolerance of the volume of fluid ingested if there is an obstruction.	☼☼☼☼
MR enteroclysis	3	This procedure may not be readily available at most institutions or radiology practices.	O
MR enterography	3	This procedure has a limited role if radiography or routine CT/MR has confirmed a high-grade obstruction. The exact protocol depends on the patient's circumstances and the radiologist's preference. Generally, it is not indicated in the acute setting.	O
X-ray small bowel enteroclysis	3	This procedure has a limited role if radiography or CT/MR has confirmed a high-grade obstruction by radiography or CT/MR.	☼☼☼
US abdomen and pelvis	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Suspected intermittent or low-grade SBO.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	8	In contrast to a high-grade obstruction, oral contrast is not necessarily contraindicated and may add functional information.	☼☼☼☼
CT enteroclysis	8	This procedure may not be readily available at most institutions or radiology practices. CT enteroclysis, MR enteroclysis, and x-ray enteroclysis are alternative examinations.	☼☼☼☼
MR enteroclysis	8	This procedure may not be readily available at most institutions or radiology practices. CT enteroclysis, MR enteroclysis, and x-ray enteroclysis are alternative examinations.	O

Radiologic Procedure	Rating	Comments	RRLE
X-ray small bowel follow-through		This procedure may not be readily available at most institutions or radiology practices. CT enteroclysis, MR enteroclysis, and x-ray enteroclysis are alternative examinations.	
CT abdomen and pelvis without contrast	6	Perform this procedure when IV contrast is contraindicated. In contrast to a high-grade obstruction, oral contrast is not necessarily contraindicated and may add functional information.	☼☼☼☼
CT enterography	5	The exact protocol depends on the patient's circumstances and the radiologist's preference. There is no evidence that CT enterography can accurately identify the presence or site of obstruction in this population, other than to characterize known or suspected Crohn disease.	☼☼☼☼
MR enterography	5	The exact protocol depends on the patient's circumstances and the radiologist's preference. This procedure's role in SBO is not established, other than to characterize Crohn disease. MR enterography has no proven efficacy in intermittent or low-grade SBO; it is useful only if the suspected cause is a tumor (including concurrent obscure gastrointestinal bleeding), in which case a multiphase CT enterography may be preferable.	O
X-ray small bowel follow-through	5	This procedure may add functional information. It should be performed with a water-soluble contrast, which can be helpful in predicting whether the patient should go to surgery. Use iso- or low-osmolar contrast material, if there is a risk of aspiration.	☼☼☼
MRI abdomen and pelvis without contrast (routine)	4		O
MRI abdomen and pelvis without and with contrast (routine)	4	See statement regarding contrast in text below under "Anticipated Exceptions."	O
X-ray abdomen and pelvis	4		☼☼☼☼
CT abdomen and pelvis without and with contrast	3		☼☼☼☼☼
US abdomen and pelvis	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Abdominal Radiography

Abdominal radiography has been the traditional starting point for the imaging evaluation of suspected small-bowel obstruction (SBO). However, studies testing the use of abdominal radiographs have yielded disparate results. Although some investigators have reported an 80% to 90% success rate in diagnosing SBO using radiographs, an overall accuracy somewhat approaching that of computed tomography (CT), others have achieved rates only in the 30% to 70% range. In other studies, abdominal radiographs proved to be of little or no help in assessing the site or cause of SBO and were even misleading in 20% to 40% of patients. A relatively recent study, however, found that abdominal radiographs were accurate for detecting acute SBO. This study showed that by using 3 patterns of air-fluid levels senior radiologists achieved more accuracy than less experienced radiologists. It should be stressed, however, that it is impossible to differentiate a SBO from a postoperative ileus in the perioperative period based on a single examination. Serial examinations showing persistent dilated small-bowel loops with air-fluid levels and relative or complete paucity of gas in the colon favor SBO.

Despite the relatively high accuracy of abdominal radiographs in detecting SBO, CT provides much more information, including the site and cause

of the obstruction and complications of SBO. As a result, CT findings generally influence patient management much more than do abdominal radiographs.

In light of these inconsistent results, it is reasonable to expect that abdominal radiographs will not be definitive in many patients with a suspected SBO. It could prolong the evaluation period and add radiation exposure while often not obviating the need for additional examinations, particularly CT. Therefore, in patients with a known or suspected SBO, fluoroscopic-contrast examinations (small-bowel follow-through [SBFT], conventional enteroclysis), and, particularly, cross-sectional imaging examinations (CT, magnetic resonance imaging [MRI], ultrasound [US]), as well as specialized cross-sectional imaging examinations (CT enterography, CT enteroclysis, MR enterography, and MR enteroclysis), may be more appropriate options.

Small-bowel Follow-through

Opinions remain divided on the usefulness of SBFT examinations with an orally administered barium contrast. Some investigators have found this examination useful for managing suspected SBO in 68% to 100% of cases. Because SBFT is limited by nonuniform small-bowel filling, cannot test distensibility, and has limitations posed by intermittent fluoroscopy, some authorities argue that enteroclysis is the more appropriate imaging examination in problematic SBO cases. The SBFT should, therefore, be considered a problem-solving examination following an equivocal CT, particularly with low-grade or intermittent/partial obstruction.

Water-soluble Contrast Agent Use in Small-bowel Follow-through

One of the major issues with SBO is whether to conservatively manage it or to operate, even after CT confirms the diagnosis of SBO and excludes complications of ischemia and a closed loop. This is especially true in the perioperative period, when distinguishing an ileus from an obstruction is often impossible and when, within the first 10 days, a reoperation can lead to multiple inadvertent enterotomies and other potential complications. In these cases, many surgeons use a water-soluble contrast small-bowel series, either orally or via a nasogastric tube, because the results of the examination are highly prognostic of whether a patient will require surgery.

The use of oral water-soluble contrast agents in patients with a SBO is very controversial, particularly its therapeutic role (a subject not in the purview of this Appropriateness Criteria). However, a recent systematic review and meta-analysis of the diagnostic role of water-soluble contrast agents in adhesive SBO (including 14 prospective studies) concluded that if contrast reached the colon within 4 to 24 hours (often within 8 hours), there was 96% sensitivity and 98% specificity in predicting resolution of the SBO. Therefore, it seems reasonable that in the proper clinical setting, in which a SBO is known, and signs, symptoms, laboratory values, and a CT have been used to exclude reasons for immediate operative management, a water-soluble contrast small-bowel study can assist management decisions.

Computed Tomography

Multiple publications have confirmed the use and accuracy of "standard" abdominal and pelvic CT examinations in patients with a suspected high-grade SBO. A diagnostic accuracy of more than 90% has been reported, with high accuracy for distinguishing SBO from an adynamic small-bowel ileus and for identifying the cause of obstruction. Patients with a suspected high-grade obstruction do not require any oral contrast medium because the nonopacified fluid in the bowel provides adequate intrinsic contrast. Additionally, oral contrast use in a known or suspected high-grade SBO does not add to diagnostic accuracy and can delay diagnosis, slightly increase cost, increase patient discomfort, and increase the risk of complications, particularly vomiting and aspiration. However, SBO may be identified in patients who have undergone CT with oral (with or without intravenous [IV]) contrast, when SBO is not specifically suspected. Alternatively, oral contrast may be purposefully given to selected patients when SBO is a consideration but a high-grade obstruction is not the primary clinical diagnosis. A low-grade/intermittent obstruction is less accurately diagnosed using CT. In 1 study, the correct diagnosis was made in less than half of such patients. Multidetector CT scanners with multiplanar reconstruction capabilities have been noticeably more effective for evaluating SBO and other abdominal pathology, particularly when coronal or 3-dimensional (3-D) reconstructions are added. Multiplanar reformations have also been found to increase accuracy and confidence in locating the transition zone in SBO, which can be a useful adjunct if an operative intervention is planned. An IV contrast is preferable for routine CT imaging of a suspected SBO, in part to demonstrate whether the bowel is perfusing normally or is potentially ischemic, and, in a minority of cases, to provide information about the potential etiology, such as Crohn disease and neoplasm. However, in patients who cannot receive IV contrast due to an allergy or renal dysfunction, noncontrast CT appears to have comparable accuracy for diagnosing or excluding SBO.

In addition to CT's high accuracy for detecting a SBO, CT has been shown to be very helpful in guiding management. CT is very useful for assessing SBO complications, namely ischemia and strangulation, as well as conditions that lead directly to both obstruction and ischemia if untreated (i.e., closed-loop SBO). With CT, signs of ischemic complications, when present, are highly specific. Unfortunately, CT is not very sensitive for identifying ischemia; in 1 study, the prospective sensitivity, based on the initial radiology report, was only 14.8%. Even retrospectively, the sensitivity of 2 experienced radiologists was 29.6% and 40.7% (consensus review of a third radiologist was 51.9%). Another study found that using maximal attenuation of a region of interest when assessing bowel-wall enhancement was a reliable method for evaluating intestinal ischemia in

a SBO, and it showed good correlation with the pathology results. When combined with clinical findings, CT's sensitivity for detecting strangulation and associated complications can be improved. Ultimately, CT has been useful in effectively triaging patients into operative versus nonoperative treatment groups. Signs such as intraperitoneal fluid, mesenteric edema, and the absence of small-bowel feces suggest that early surgical intervention should be considered.

Conventional Enteroclysis and CT Enteroclysis

Methods of examination that challenge the distensibility of the small bowel, including conventional (i.e., fluoroscopic) enteroclysis and CT enteroclysis, offer improved sensitivity and specificity over standard barium small-bowel and CT examinations in evaluating suspected intermittent or low-grade SBO. There is solid evidence that enteroclysis is highly reliable in revealing sites of low- and high-grade SBO, as well as for distinguishing adhesions from obstructing neoplasms or other etiologies. CT enteroclysis is generally favored over conventional enteroclysis because it avoids the problem of overlapping small-bowel loops; it also has been shown to demonstrate a larger number of bowel abnormalities and more abnormalities outside the bowel. To our knowledge, however, CT enteroclysis is not widely used in the United States at present. CT enteroclysis should be considered, especially for patients who have a history of malignancy. Enteroclysis has low patient acceptance and depends on the skill of the radiologist performing the examination (the same problem exists for CT enteroclysis). Additionally, in the acute setting, enteroclysis (using any modality) can be difficult to perform, has very limited availability, and is generally not indicated. Also, the radiation dose can be relatively high in enteroclysis, especially if there is difficulty in positioning the tube; however, the dose can be substantially reduced by using pulsed fluoroscopy.

CT Enterography

CT enterography does not require intubation of the small bowel and, therefore, has greater patient acceptance and is less dependent on the radiologist's technical skill. To the Expert Panel's knowledge, however, its clinical usefulness for diagnosing intermittent or low-grade SBO has not been convincingly established. Additionally, patients may lack the tolerance to ingest a relatively large volume of fluid, if the bowel is obstructed. Because there is little evidence that CT enterography can be used reliably to identify intermittent- or low-grade SBO we cannot recommend this examination for these patients unless neoplasm is suspected as a cause (i.e., no prior surgery and no known hernia and/or concomitant obscure gastrointestinal bleeding).

Ultrasound

Because of CT's high accuracy for diagnosing and characterizing SBO and because of the inherent limitation of US in adults in this situation, US has rarely been used for this purpose. Compared with sonography, CT (or MRI) generally provides more information as to the status of the entire gastrointestinal tract, the 3-D anatomy, and the underlying causes and complications of SBO, and it is preferred by surgeons for adult patient management. In skilled hands, US was reported to have a nearly 90% success rate for diagnosing SBO, with a sensitivity of 91% and a specificity of 84%, in a prospective study of 76 patients with suspected SBO who underwent bedside US. In an older study, CT proved superior to US in diagnosing intestinal obstructions. In the pediatric age group, US has proven useful in evaluating intussusception, midgut volvulus, and other causes of SBO.

Magnetic Resonance Imaging

Increasing evidence supports the role of MRI for detecting and characterizing SBO, particularly in patients for whom ionizing radiation exposure should be avoided. Because of its relatively high cost and absent evidence of any incremental diagnostic gain, compared with CT, *in most patients* MRI should not be used routinely to evaluate suspected high-grade SBO. MR enteroclysis appears to compare favorably with CT enteroclysis in evaluating a low-grade obstruction, although neither MR enteroclysis nor CT enteroclysis are in wide use. Children and, particularly, pregnant patients with known or suspected SBO, as well as younger patients with repetitive episodes of obstruction, are the ideal population to undergo MRI. In pregnant patients, only noncontrast sequences are obtained. In nonpregnant individuals, noncontrast sequences, with or without IV gadolinium-enhanced sequences, can be performed. MR enterography may be superior to routine MR examinations and is better accepted by patients than MR enteroclysis. To our knowledge, however, little data are available on comparing MR enterography with other imaging examinations in patients with a suspected SBO.

Summary

- Radiographs have relatively limited use for the imaging confirmation and characterization of a SBO. In patients for whom a strong clinical suspicion is present, consideration should be given to immediate cross-sectional imaging, particularly CT.
- Standard CT, performed with an IV contrast if possible, but generally without oral contrast, is the primary imaging modality for evaluating SBO and should be strongly considered in the initial evaluation of patients with a suspected high-grade SBO. CT also has use in evaluating lower grades of SBO and can be used to identify an obstruction, when obstruction is not the primary clinical consideration.
- Fluoroscopic small-bowel examinations play a much less substantial role and should not be used as a primary imaging modality in diagnosing

an acute SBO.

- If intermittent, recurrent, or low-grade SBO is a primary concern, an enteroclysis is likely the next best test, although it may not be readily available at most institutions or radiology practices.
- In the proper clinical setting, a water-soluble contrast small-bowel series can be helpful in determining whether conservative or operative management is appropriate.
- Children and, particularly, pregnant patients with known or suspected SBO, as well as younger patients with repetitive episodes of obstruction, are the ideal population to undergo MRI. In pregnant patients, only noncontrast sequences are obtained. In nonpregnant individuals, noncontrast sequences with or without IV gadolinium-enhanced sequences can be performed.

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) (i.e., <30 mL/min/1.73 m²), 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/1.73 m². For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- IV, intravenous
- MR, magnetic resonance
- MRI, magnetic resonance imaging
- SBO, small-bowel obstruction
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
0	0 mSv	0 mSv
☼	<0.1 mSv	<0.03 mSv
☼☼	0.1-1 mSv	0.03-0.3 mSv
☼☼☼	1-10 mSv	0.3-3 mSv
☼☼☼☼	10-30 mSv	3-10 mSv
☼☼☼☼☼	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies".

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Suspected small-bowel obstruction

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Critical Care

Emergency Medicine

Gastroenterology

Internal Medicine

Nuclear Medicine

Radiology

Surgery

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for patients with suspected small-bowel obstruction

Target Population

Patients with suspected small-bowel obstruction

Interventions and Practices Considered

1. Computed tomography (CT) abdomen and pelvis
 - With contrast
 - Without contrast
 - Without and with contrast
 - With contrast (CT enteroclysis)
 - With contrast (CT enterography)
2. X-ray
 - Abdomen and pelvis
 - Small-bowel follow-through
 - Small-bowel enteroclysis
3. Magnetic resonance imaging (MRI) abdomen and pelvis
 - With or without contrast (routine)

- Without contrast (routine)
 - Without and with contrast (MR enteroclysis)
 - Without and with contrast (MR enterography)
4. Ultrasound (US) abdomen and pelvis

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

Staff will search in PubMed only for peer reviewed medical literature for routine searches. Any article or guideline may be used by the author in the narrative but those materials may have been identified outside of the routine literature search process.

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 10 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis, and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid, but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence (study quality) for each article included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distribute surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The appropriateness rating scale is an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate"; 4, 5, or 6 are in the category "may be appropriate"; and 7, 8, or 9 are in the category "usually appropriate." Each panel member assigns one rating for each procedure for a clinical scenario. The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating.

If consensus is reached, the median rating is assigned as the panel's final recommendation/rating. Consensus is defined as eighty percent (80%) agreement within a rating category. A maximum of three rounds may be conducted to reach consensus. Consensus among the panel members must be achieved to determine the final rating for each procedure.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is proposed as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

This modified Delphi method enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive influence from fellow panelists in a simple, standardized and economical process. A more detailed explanation of the complete process can be found in additional methodology documents found on the [ACR Web site](#) (see also the "Availability of Companion

Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for evaluation of patients with suspected small-bowel obstruction

Potential Harms

Oral contrast use in a known or suspected high-grade small-bowel obstruction (SBO) does not add to diagnostic accuracy and can delay diagnosis, slightly increase cost, increase patient discomfort, and increase the risk of complications, particularly vomiting and aspiration.

Gadolinium-based Contrast Agents

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) (i.e., <30 mL/min/1.73 m²), and almost never in other patients. 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/1.73 m². For more information please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

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

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. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (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 U.S. Food and Drug Administration (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.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Katz DS, Baker ME, Rosen MP, Lalani T, Carucci LR, Cash BD, Kim DH, Piorowski RJ, Small WC, Smith MP, Yaghmai V, Yee J,

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1996 (revised 2013)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Gastrointestinal Imaging

Composition of Group That Authored the Guideline

Panel Members: Douglas S. Katz, MD (*Principal Author*); Mark E. Baker, MD (*Co-Author*); Max P. Rosen, MD, MPH (*Panel Chair*); Tasneem Lalani, MD (*Panel Vice-chair*); Laura R. Carucci, MD; Brooks D. Cash, MD; David H. Kim, MD; Robert J. Piorkowski, MD; William C. Small, MD, PhD; Martin P. Smith, MD; Vahid Yaghmai, MD, MS; Judy Yee, MD

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Small WC, Rose TA Jr, Rosen MP, Blake MA, Baker ME, Cash BD, Fidler JL, Greene FL, Jones B, Katz DS, Lalani T, Miller FH, Sudakoff GS, Tulchinsky M, Yee J, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® suspected small-bowel obstruction. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 6 p.

Guideline Availability

Electronic copies: Available from the [American College of Radiology \(ACR\) Web site](#) .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#) .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2013 Nov. 2 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria® suspected small-bowel obstruction. Evidence table. Reston (VA): American College of Radiology; 2013. 22 p. Electronic copies: Available from the [ACR Web site](#) .

Patient Resources

None available

NGC Status

This summary was completed by ECRI on March 19, 2001. The information was verified by the guideline developer on March 29, 2001. This summary was updated by ECRI on March 27, 2006. This summary was updated by ECRI Institute on June 2, 2010. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This summary was updated by ECRI Institute on August 23, 2011. This NGC summary was updated by ECRI Institute on February 27, 2014.

Copyright Statement

Instructions for downloading, use, and reproduction of the American College of Radiology (ACR) Appropriateness Criteria® may be found on the [ACR Web site](#) .

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouse[®] (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the [NGC Inclusion Criteria](#).

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.