American College of Radiology
ACR Appropriateness Criteria®
Anorectal Disease

Variant: 1 Suspected perianal disease. Abscess or fistula. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI pelvis without and with IV contrast	Usually Appropriate	O
CT pelvis with IV contrast	Usually Appropriate	☢☢☢
US endoanal	May Be Appropriate	O
MRI pelvis without IV contrast	May Be Appropriate	O
CT pelvis without IV contrast	May Be Appropriate	☢☢☢
Radiography pelvis	Usually Not Appropriate	☢☢
Fluoroscopy contrast enema	Usually Not Appropriate	☢☢☢
Fluoroscopy fistulography anus	Usually Not Appropriate	☢☢☢
CT pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

Variant: 2 Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI pelvis without and with IV contrast	Usually Appropriate	O
CT pelvis with IV contrast	Usually Appropriate	☢☢☢
US pelvis transrectal	May Be Appropriate	O
Fluoroscopy contrast enema	May Be Appropriate	☢☢☢
Fluoroscopy cystography	May Be Appropriate	☢☢☢
Fluoroscopy vaginography	May Be Appropriate	☢☢☢
MRI pelvis without IV contrast	May Be Appropriate	O
Radiography pelvis	Usually Not Appropriate	☢☢
CT pelvis without IV contrast	Usually Not Appropriate	☢☢☢
CT pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

Variant: 3 Suspected proctitis or pouchitis. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MR enterography	Usually Appropriate	O
MRI pelvis without and with IV contrast	Usually Appropriate	O
CT pelvis with IV contrast	Usually Appropriate	☢☢☢
CT enterography	Usually Appropriate	☢☢☢☢
Fluoroscopy contrast enema	May Be Appropriate	☢☢☢
MRI pelvis without IV contrast	May Be Appropriate	O
US pelvis	Usually Not Appropriate	O
Radiography pelvis	Usually Not Appropriate	☢☢
CT pelvis without IV contrast	Usually Not Appropriate	☢☢☢
CT pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢
WBC scan abdomen and pelvis	Usually Not Appropriate	☢☢☢☢

Variant: 4 Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI pelvis without and with IV contrast	Usually Appropriate	O
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
CT pelvis with IV contrast	Usually Appropriate	☢☢☢
Fluoroscopy contrast enema	May Be Appropriate	☢☢☢
MRI pelvis without IV contrast	May Be Appropriate	O
CT abdomen and pelvis without IV contrast	May Be Appropriate	☢☢☢
CT pelvis without IV contrast	May Be Appropriate	☢☢☢
US pelvis transrectal	Usually Not Appropriate	O
Radiography abdomen and pelvis	Usually Not Appropriate	☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢
CT pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

Panel Members

Angela D. Levy, MD[1]; Peter S. Liu, MD[b]; David H. Kim, MD[c]; Kathryn J. Fowler, MD[d]; Adil E. Bharucha, MBBS, MD[e]; Kevin J. Chang, MD[f]; Elizabeth Cilenti, MD[g]; Kenneth L. Gage, MD, PhD[h]; Evelyn M. Garcia, MD[i]; Avinash R. Kambadakone, MD[j]; Elena K. Korngold, MD[k]; Daniele Marin, MD[l]; Courtney Moreno, MD[m]; Jason A. Pietryga, MD[n]; Cynthia S. Santillan, MD[o]; Stefanie Weinstein, MD[p]; Steven D. Wexner, MD, PhD[q]; Laura R. Carucci, MD.[r]

Summary of Literature Review

Introduction/Background

Inflammatory and infectious disorders of the anorectum are commonly encountered in clinical practice, but their exact incidence is unknown. They encompass a variety of anorectal disorders in a diverse population of patients who may present to the emergency department, urgent care clinic, primary care physician, or subspecialty physician such as a gastroenterologist or colorectal surgeon. Patients with inflammatory and infectious disorders of the anorectum may come in need of medical attention with acute symptoms such as pain, tenesmus, discharge, bleeding, and/or findings of sepsis. Other patients may have chronic symptoms, or their complaints may relate to a prior surgical procedure or underlying disease. Depending upon the condition and presentation, a variety of imaging modalities may be used for the initial evaluation of an anorectal complaint.

Imaging may also be helpful for planning the management of rectovaginal fistulas that are the consequence of obstetric trauma from childbirth, iatrogenic anorectal or rectovaginal fistulas that are caused by radiation or surgical complications, and fistulas that result from other forms of trauma.

The initial imaging in 4 anorectal disease categories is covered in this document: suspected

perianal disease (perianal fistula and abscess); suspected rectal fistula (rectovescicular or rectovaginal); suspected proctitis or pouchitis; and suspected complication after proctectomy, coloproctectomy, or colectomy with pouch or other anastomosis.

Special Imaging Considerations

Anorectal Fistulae and Malignancy

Though the focus of this topic is on inflammatory and infectious disorders of the anorectum, it is important to recognize that inflammatory disease of the anorectum may be a complication of malignancy or associated with malignancy. For example, approximately 11% of colovesical and colovaginal fistulae are caused by malignancy [1]. Recently, carcinoma has been reported in association with anal fistulae in Crohn disease (CD), and carcinomas may rarely arise in chronic fistula in the anorectum [2,3]. Consequently, the concern for malignancy should be raised when the imaging findings of a soft mass, mass-like thickening of the wall of the anorectum, or malignant-appearing lymphadenopathy are present during evaluation of the anorectum for suspected benign inflammatory disease.

Initial Imaging Definition

Initial imaging is defined as imaging at the beginning of the care episode for the medical condition defined by the variant. More than one procedure can be considered usually appropriate in the initial imaging evaluation when:

- There are procedures that are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care)

OR

- There are complementary procedures (ie, more than one procedure is ordered as a set or simultaneously in which each procedure provides unique clinical information to effectively manage the patient's care).

Discussion of Procedures by Variant

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.

Anorectal abscesses result from infection of the intersphincteric anal glands. Obstruction of the draining duct may produce an intersphincteric abscess or the infection may rupture through the external sphincter to form an abscess in the ischiorectal or ischioanal spaces. Cephalad extension results in a high intramuscular or perirectal abscess, or a supralevator abscess if it extends above the levator muscles. Posterior extension may result in a horseshoe abscess in the intersphincteric plane or ischiorectal fossa [4]. Patients with anorectal abscess may present with pain that is typically throbbing, visible redness and swelling of the anus, and/or sepsis. On physical examination, there is often tenderness to palpation and an area of fluctuance. In some cases, the abscess may be occult on physical examination.

The majority of anal fistulae (fistula-in-ano) arise from a preexisting abscess and as such are believed to represent a spectrum of the same disease. Clinically, patients with fistula-in-ano present with drainage of blood, pus, or fecal material from an external opening in the perianal region, intermittent pain, and perianal itching. The majority of patients with fistula-in-ano are male (2:1) and have a mean age at presentation of 40 years [5]. Other diseases that may cause anal fistula include CD, radiation proctitis, foreign body, prior anal surgery, infections (such as human immunodeficiency virus [HIV], tuberculosis, actinomycosis), and malignancy [6]. Perianal fistulae are a very common component of CD, occurring in 13% to 27% of these patients [7,8]. Perianal fistulae may be the initial manifestation of CD in up to 81% of patients who develop perianal disease, and in a small number of patients, it is the only manifestation of their disease [9]. Complex and multifocal fistulae are more common in CD.

Imaging is used in suspected cases of anorectal abscess and/or fistula to confirm the diagnosis, assist in surgical planning, predict surgical outcome, assess for recurrent or residual disease, and monitor medical therapy in patients with CD [10].

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.
A. CT Pelvis

The appropriate CT protocol for imaging a patient with an anorectal complaint depends upon the presentation and differential diagnosis. Intravenous (IV) contrast is preferred to a noncontrast examination to help visualize and characterize fluid collections, abscesses, and fistulous tracts. Water-soluble rectal contrast is generally not necessary to diagnose a rectal abscess and may be challenging to administer depending on symptom severity. However, rectal contrast may help delineate perforation or leak in a patient with a history of trauma or recent surgery. Water-soluble rectal contrast is preferred over barium to avoid the possibility of barium spilling into the peritoneal cavity or spaces of the extraperitoneal pelvis. Water-soluble rectal contrast is also preferred in a patient who could potentially be undergoing surgery.

CT is commonly used in the acute setting to evaluate for anorectal abscess. The inherent lack of contrast resolution of CT limits the differentiation of subtle attenuation changes to differentiate small abscesses and fistulae from the anal sphincter complex and the soft tissue of the pelvic floor. To our knowledge, there is no recent literature evaluating the accuracy of modern CT technology for the detection of anorectal abscesses and there are no studies comparing IV contrast-enhanced scans to scans obtained without IV contrast. CT with and without IV contrast would only be useful when there is benefit from dual-phase imaging (eg, gastrointestinal bleeding). However, IV contrast is important to delineate rim-enhancement of fluid collections to aid in the diagnosis of abscess. The reported sensitivity of CT for anorectal abscess is 77% [11]. Comparing CT with endoanal ultrasound (US) and surgical findings, only 24% of perianal fistulae were correctly classified on CT, as compared with 82% by endoanal US in a small series of 25 patients reported by Schratter-Sehn et al [12].

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.
B. Fluoroscopy Contrast Enema

Fluoroscopic contrast enema is not useful in this clinical scenario because it cannot assess the

presence or absence of an abscess or fistula tract. There is no relevant literature regarding the use of contrast enema in the evaluation of perianal disease.

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.
C. Fluoroscopy Fistulography

Fluoroscopic fistulography is performed by cannulating the external opening of a fistula with a small-gauge catheter, such as an IV catheter, pediatric feeding tube, or lacrimal cannula. Scout radiographs are obtained prior to careful injection of water-soluble contrast material into the fistula tract while obtaining spot radiographs [13]. Care should be taken not to inadvertently obscure a distal fistula with the enema or catheter tip or the balloon of a catheter. Fistulography may also be performed with CT by injecting a dilute water-soluble contrast material into an external opening of a fistula; however, there is limited published experience with this technique [14,15].

Fluoroscopic fistulography is rarely performed for perianal disease and has been replaced by modern cross-sectional imaging in this setting. Data on the accuracy of fluoroscopic fistulography are available from small series reported in older medical literature. Weisman et al [13] reported the highest sensitivity (89%) for identification of the primary tract in a retrospective review of 27 patients. In contrast, Kuijpers and Schulpen [16] found fistulography was accurate in only 16% of patients in a retrospective review of 25 patients [16]. The limitations of fistulography include lack of filling of the entire tract or extensions of the tract because inflammatory debris in the tract may prevent contrast filling. In these cases, the internal opening may not be defined. Furthermore, the anal sphincter complex and levator ani are not visualized fluoroscopically; as such, the relationship of the fistula to these structures cannot be defined.

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.
D. MRI Pelvis

MRI of the anorectal region can be performed on a 3T or 1.5T magnet. A 3T magnet improves signal-to-noise ratio and spatial resolution. To our knowledge, there are no published studies comparing the accuracy of detection of anorectal disease on 3T compared with 1.5T. The anorectum can be imaged with an endoanal coil or multichannel external phased array body coil. Though an endoanal coil has been shown to improve detection of the internal opening of fistulae, the phased array body coil provides better visualization of the extent of fistulae and those located in the supralevator space and ischiorectal fossa [17]. When using a phased array body coil, the field of view should be tailored to the anatomy imaged and the patient's body habitus. For example, in the evaluation of perianal fistula, the field of view should be small enough to clearly visualize the anal sphincter complex. The planes of imaging should be orthogonal to the area of interest. Gadolinium-based IV contrast material administration is preferred for detection of fistula because active inflammation in fistulous tracts will enhance avidly with contrast and abscesses will show rim-like enhancement [18]. The addition of diffusion-weighted sequences increases the conspicuity of fistulae over T2-weighted fast spin-echo (FSE) sequences (100% sensitivity) and discriminates between inflammatory mass and abscess (100% sensitivity and 90% specificity) [19].

Pelvic MRI with a multichannel phased array body coil has become the standard for imaging

perianal fistula, especially those associated with CD, because they are more frequently complex with clinically occult tracts. Imaging with a body coil is better tolerated and is not limited by the field of view compared with MRI with an endoanal coil. The surgical concordance with fistula detection has been shown to be better with a body coil (96%) compared with an endoanal coil (68%) [20].

In multiple studies, MRI has been shown to have high sensitivity and specificity for the evaluation of perianal fistula. The meta-analysis by Zbar and Armitage [21] showed MRI had a sensitivity ranging from 81% to 100% and specificity from 67% to 100%, with accuracy for identification of the internal opening of 74% to 97%, and delineation of horseshoe fistula of 97% to 100% [21]. Sahni et al [22] showed that, for diagnosis of the primary fistula in CD patients, MRI had an accuracy of 64% to 100%. Comparing MRI to examination under anesthesia with or without endoanal US, the sensitivity and specificity for discriminating complex from simple perianal fistula was 97% and 96%, 92% and 85% for MRI, and 75% and 64% for endoanal US.

Though fistula can be readily identified on MRI without IV contrast as hyperintense tracts on FSE T2-weighted sequences and short-tau inversion recovery sequences, the use of IV contrast facilitates visualization because tracts with active inflammation will avidly enhance and small associated abscesses will show ring enhancement around a central fluid collection. IV contrast enables the differentiation of inactive tracts containing granulation tissue, which diffusely enhance from active tracts that have ring or rim-like enhancement [18].

Lo Re et al [23] retrospectively evaluated MRI in 31 patients with CD suspected of having perianal fistula and a surgical examination under anesthesia showing that short-tau inversion recovery sequences were equivalent to IV contrast-enhanced fat-suppressed T1-weighted sequences in detection and classification of anal fistula with sensitivity of 96%, specificity of 75%, positive predictive value (PPV) of 93%, and negative predictive value (NPV) of 86% for both sequences [23]. However, their study did not evaluate tract activity. In another retrospective study of 17 patients that underwent MRI prior to surgery, the contribution of MRI sequences to fistula classification was evaluated. All 3 readers showed statistically significant concordance between fistula classification and surgery with IV contrast-enhanced fat-suppressed T1-weighted sequences. The highest concordance for all 3 readers was reached with the combination of T2-weighted sequences and IV contrast-enhanced fat-suppressed T1-weighted sequences [24].

Finally, Dohan et al [19] evaluated the addition of diffusion imaging in a retrospective study of 24 patients with perianal fistula that went to surgery. The sensitivity for anal fistula detection for fat-suppressed FSE T2-weighted sequences was 91.2% and for diffusion imaging was 100%, with statistically significant greater fistula conspicuity on diffusion imaging than fat-suppressed FSE T2-weighted sequences.

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.
E. Radiography Pelvis

Radiography is not useful in this clinical scenario because it cannot assess the presence or absence

of an abscess or fistula tract. There is no relevant literature to support the use of radiography in the evaluation of perianal fistula.

Variant 1: Suspected perianal disease. Abscess or fistula. Initial imaging.
F. US Endoanal

Endoanal US is performed with a 360° US probe that has a frequency range between 2.5 and 16 MHz [25]. Patients are imaged in the left lateral decubitus position or lithotomy position. Endoanal US provides excellent visualization of the distal rectum and anal canal as well as the anal sphincter complex. Display of the anorectal anatomy in the coronal plane is facilitated by obtaining 3-D acquisitions and reconstructions [25,26]. Fistula tracts are hypoechoic or mixed echogenicity bands, and abscess are anechoic or hypoechoic fluid collections. Practical considerations, such as patient discomfort, limit the use of endoanal ultrasound for the initial evaluation of suspected perianal fistula or abscess.

In a recent study of 122 patients by Sun et al [27], the reported sensitivity, specificity, and accuracy for the diagnosis of perianal fistula compared with surgery was 92%, 100%, and 93%, respectively. This study reported an accuracy of identification of the internal opening of the fistula of 95%. In an earlier study of 104 patients by Buchanan et al [28], comparing endoanal US with MRI, endoanal US correctly classified 81% of perianal fistulae compared with 90% by MRI. Their accuracy for detection of the internal opening was 91% by endoanal US and 97% by MRI. Endoanal US is limited by the field of view and depth of penetration. Accuracy for identification of extrasphincteric and suprasphincteric tracts (50% and 67%, respectively) is lower compared with transsphincteric and intersphincteric tracts (93% and 88%, respectively) [27]. Other limitations include obscuration of the tract or secondary extensions by gas in the tract or gas in an associated abscess. In patients with recurrent disease, it may be impossible to distinguish tracts with active inflammation from those with fibrosis and granulation tissue, which is often a clinical question in patients with CD.

Hydrogen peroxide may be injected into the external opening of the fistula during endoanal US to enhance visualization of fistula tracts [29]. A tract filled with hydrogen peroxide is brightly hyperechoic on endoanal US, improving its visualization and connection to abscess cavities as well as differentiating it from scar tissue [25].

In a group of 19 patients, Buchanan et al [26] showed that hydrogen peroxide–enhanced 3-D endoanal US improved conspicuity of perianal fistula tracts but did not statistically improve the identification of primary tracts (71% versus 81%), secondary tracts (63% versus 68%), or internal openings (86% versus 90%) compared with 3-D endoanal US without hydrogen peroxide [26]. When West et al [30] compared endoanal US using hydrogen peroxide with MRI using an endoanal coil, endoanal US correctly classified the primary tract in 81% compared with 90% in MRI; secondary tracts, 67% versus 57%; and was able to visualize the internal opening equally, 86% versus 86%. In the most recent study of 124 patients by Brillantino et al [31] comparing 3-D endoanal US with and without hydrogen peroxide to MRI with surgical correlation, no higher accuracy was found for detection of the internal opening with endoanal US compared with MRI. In fact, in cases of complex fistulae, MRI shows higher accuracy in the evaluation of secondary extensions than endoanal US shows.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.

Rectovaginal and rectovesicular fistulae are uncommon. The most common cause of a rectovaginal fistula is obstetric or vaginal trauma (88% of cases) [32], followed by CD, which accounts for approximately 9% of cases [33]. Other causes include radiation; pelvic infections (diverticulitis, tuberculosis, lymphogranuloma venereum, human papilloma virus, HIV, cytomegalovirus, and schistosomiasis); malignancies of the anorectum, perineum, and gynecologic organs; and iatrogenic injury and postoperative complications. Upon initial imaging, the organ of origin may be unknown. Rectovaginal fistulae are subclassified as high or low fistulae. High fistula, referred to as rectovaginal fistula, are communications to the rectum, proximal to the anal sphincter. These often involve the posterior vaginal fornix. Low fistula are anovaginal, which are communications from the anal sphincter complex to the lower half of the vagina [34]. Women with rectovaginal or anovaginal fistulae present with stool, gas, or odorous mucopurulent discharge from the vagina. These symptoms may be confused for incontinence. Other symptoms include dyspareunia, perineal pain, and recurrent vaginal infections.

Rectovesicular fistulae are characterized by the clinical presentation of pneumaturia or fecaluria, which are pathognomonic [1]. Recurrent urinary tract infection may also be a presenting manifestation. Diverticulitis, CD, colorectal or pelvic malignancies, radiation, iatrogenic injury, and postoperative complications are the most common causes.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
A. CT Pelvis

The appropriate CT protocol for imaging a patient with an anorectal complaint depends upon the presentation and differential diagnosis. IV contrast is preferred to a noncontrast examination to help visualize and characterize fluid collections, abscesses, and fistulous tracts. CT without contrast is not useful in this clinical scenario. CT with and without IV contrast would only be useful when there is benefit from dual-phase imaging, but is not typically performed in this scenario. Water-soluble rectal contrast is generally not necessary to diagnose a rectal abscess and may be challenging to administer, depending on symptom severity. However, rectal contrast may help delineate perforation or leak in a patient with a history of trauma or recent surgery. Water-soluble rectal contrast is preferred over barium to avoid the possibility of barium spilling into the peritoneal cavity or spaces of the extraperitoneal pelvis. Water-soluble rectal contrast is also preferred in a patient who could potentially be undergoing surgery.

CT provides important information in the diagnosis of the underlying etiology of the fistula, as well as detecting the course and locations of fistulae. To our knowledge, there are no data in the literature regarding the use of IV contrast in the detection of rectovaginal or rectovesicular fistula. Water-soluble contrast should be placed in the bowel or bladder to try to opacify fistulous tracts, depending upon the clinically suspected location of the tract. The bladder can be opacified retrograde (CT cystogram) or antegrade with delayed imaging after IV contrast administration. Kuhlman et al [35] reported an accuracy of 60% for the CT detection of enterovaginal or vesicovaginal fistula by the identification of contrast material in the vagina from the bowel or bladder. In a study of 37 patients with colovaginal and colovesicular fistulae, CT had a diagnostic sensitivity of 76.5% for fistula detection and 94.1% for defining the etiology of the fistula [1].

However, this study does not report how the diagnosis of fistula was made and what type of contrast material was used.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
B. Fluoroscopy Contrast Enema

Fluoroscopic contrast enemas performed for the diagnosis of perforation or leak, rectovaginal or rectovesicular fistula, pouchitis, or proctitis can be performed with water-soluble contrast or barium. Though this procedure is reported to have low sensitivity and specificity as detailed in the following paragraph, it may be useful for observing subtle fistulas. In general, water-soluble contrast is preferred if a leak or perforation are suspected to avoid barium spillage into the peritoneal cavity or extraperitoneal pelvis. Using barium may also interfere with a subsequent CT scan because of the streak artifact that it causes on CT. Care should be taken not to inadvertently obscure a distal fistula with the enema or catheter tip or the balloon of a catheter.

The performance of contrast enema for the detection of rectovaginal fistulas is reported in small series from older published literature. In 13 enemas performed by Giordano et al [36], the overall sensitivity was 7.7% for all fistula and 9% for those that involved the colon only. In a previous series of sigmoid vaginal fistulae, contrast enema detected the fistulae in 34% of cases [37]. For fistula to the urinary tract, Amendola et al compared contrast enema and cystography, which showed 50% and 30% of fistula, respectively, in 28 patients with surgically proven colovesicular fistula [38].

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
C. Fluoroscopy Cystography

The data on diagnosis of rectovesicular fistula by cystography is limited to small series in older medical literature. In series of 30 patients with enterovesicular fistula, Hsieh et al [39] reported 90% were detected by cystography and 75% by contrast enema.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
D. Fluoroscopy Vaginography

Fluoroscopic vaginography is performed after obtaining anterolateral and lateral scout radiographs or spot films. A large-gauge Foley catheter, such as a 26-guage with a 30-mL balloon, is placed in the vaginal lumen. The balloon is inflated to prevent the spillage of contrast material out of the vagina. Water-soluble contrast is injected under fluoroscopic guidance, and spot radiographs are obtained in the anteroposterior, right and left, oblique, and lateral views. Water-soluble contrast is preferred over barium because the endometrial cavity may fill in normal patients, and contrast may thus spill into the peritoneal cavity. Vaginography may also be performed with CT [40]. An unenhanced scan is obtained prior to vaginal opacification. The vagina is opacified in the same manner as in fluoroscopy; however, the water-soluble contrast is diluted with sterile water or normal saline (1/10, V/V) [40]. A second CT is obtained after vaginal filling. It may be acquired with or without IV contrast, depending upon the clinical indication.

Giordano et al [36] reported a sensitivity of 79% and PPV of 100% for fluoroscopic vaginography for identification of fistulous tracts in 27 patients with suspected fistulae. Earlier series in a smaller

number of patients reported sensitivities of 100% [41,42]. Limitations of vaginography include occlusion of low fistula by the Foley catheter balloon and completely filling complex fistulous tracts that may have several branches. The high sensitivity and PPV supports the use of this procedure in certain clinical scenarios.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
E. MRI Pelvis

Rectovaginal and anovaginal fistula may be visualized on MRI performed with a phased array body coil, but to our knowledge, there are no published studies reporting the accuracy of fistula detection. As such, the advantages of scanning with or without IV contrast have not been studied. Based on our knowledge of anorectal fistula, there is a clear advantage to using IV contrast to visualize collapsed tracts that do not contain fluid and would be difficult to see on T2-weighted sequences. MRI pelvis without IV contrast may be helpful in certain clinical situations but is not as good as one performed with IV contrast. Stoker et al [43] compared endoluminal coil MRI with and without IV contrast to endoluminal US, reporting a PPV for detection of fistula tracts of 92% and 100%, respectively.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
F. Radiography Pelvis

Radiography is not useful in this clinical scenario because it cannot assess the presence or absence of an abscess or fistula tract.

Variant 2: Suspected rectal fistula. Rectovesicular or rectovaginal. Initial imaging.
G. US Pelvis Transrectal

Yee et al [44] reported that endoluminal US detected only 28% of rectovaginal fistula in 25 patients prior to surgical repair. However, more recent reports show improved detection; consequently, this procedure can be useful in certain clinical situations for fistula detection. In 28 patients, Yin et al [45] had a PPV of 100% for the identification of the anorectal opening of the fistula and 93% for the identification of the vaginal opening, and an overall PPV of the fistula of 90%. The limitation of endoluminal US is identification of complex fistulas with secondary branches, visualization of occluded branches, and visualization of fistula that extend beyond the field of view.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.

Proctitis, inflammation of the rectum, is a common manifestation of inflammatory bowel disease (ulcerative colitis and CD). Other causes include infections (gonorrhea, chlamydia, herpes simplex virus, HIV/acquired immunodeficiency syndrome), radiation, and ischemia. Patients present with rectal pain, discomfort, tenesmus, purulent discharge, abdominal pain, and urgency. In most patients, imaging is not required. However, if a more complex disease is clinically suspected, imaging may be indicated to define the extent of disease and/or complications.

An ileal pouch anal anastomosis (IPAA), also known as a J-pouch, is the most common surgical approach for creating a continent reservoir following total proctocolectomy. This is typically performed in a two-stage procedure in patients with ulcerative colitis or familial adenomatous polyposis. Pouchitis is a common complication of IPAA, occurring in approximately 20% of patients

within 1 year of surgery and 50% of patients within 10 years of surgery [46]. Pouchitis may be caused by primary infection or an immune response to an altered microbiome in the pouch lumen or mucosa. Patients may present with increased stool frequency and fluidity, tenesmus, incontinence, pain, malaise, fever, or bleeding. The symptoms of pouchitis overlap with other postoperative complications, such as dehiscence and abscess, as well as occult CD such as in patients that have presumed ulcerative colitis with undiagnosed CD or subsequently developed CD [47]. Imaging is an important complementary technique to endoscopy with biopsy to accurately diagnose and manage inflammation in the pouch.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
A. CT Enterography

CT enterography techniques provide better visualization of the small bowel compared with routine CT. To optimize small-bowel distention and visualization of the mucosa, patients ingest a large volume (1,000 to 2,000 cc) of neutral contrast material (such as low w/v barium solutions, water, polyethylene glycol, or methylcellulose suspensions) prior to the examination. IV contrast enhances the small-bowel wall such that it is well seen adjacent to the neutral intraluminal contrast. Single- or dual-phase (arterial and portal venous, respectively) acquisitions may be obtained.

Using CT findings of inflammation (wall thickening, mucosal hyperenhancement, mural stratification, peripouch stranding, peripouch hyperemia, and peripouch abscess, fistula, or sinus tract), Liszewski et al [48] showed that IV contrast-enhanced CT enterography had a 90% sensitivity, 67% specificity, 90% PPV, 67% NPV, and 85% accuracy for diagnosis of pouchitis when more than 2 signs of inflammation were present.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
B. CT Pelvis

The appropriate CT protocol for imaging a patient with an anorectal complaint depends upon the presentation and differential diagnosis. IV contrast is preferred to a noncontrast examination to help visualize and characterize fluid collections, abscesses, and fistulous tracts. CT without contrast is not useful in this clinical scenario. CT with and without IV contrast would only be useful when there is benefit from dual-phase imaging, but it is not typically performed in this scenario. Water-soluble rectal contrast is generally not necessary to diagnose a rectal abscess and may be challenging to administer, depending on symptom severity. However, rectal contrast may help delineate perforation or leak in a patient with a history of trauma or recent surgery. Water-soluble rectal contrast is preferred over barium to avoid the possibility of barium spilling into the peritoneal cavity or spaces of the extraperitoneal pelvis. Water-soluble rectal contrast is also preferred in patients who could potentially be undergoing surgery.

CT is often the initial examination for patients with clinical findings of proctitis or pouchitis because of its ability to evaluate inflammatory thickening of the rectal or pouch wall, associated abscess, possible fistula, or anastomotic leak in an IPAA. IV contrast-enhanced CT is preferred over a noncontrast CT because the presence of IV contrast will allow detection of abnormal enhancement of the bowel wall as well as the presence of rim-enhancement that would suggest abscess in any associated fluid collection. To our knowledge, there are no studies in the literature using modern

CT technology that evaluate the accuracy of routine pelvic CT with or without IV contrast for the diagnosis of proctitis or pouchitis.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
C. FDG-PET/CT Skull Base to Mid-Thigh

Fluorine-18-2-fluoro-2-deoxy-D-glucose (FDG)-PET/CT has been reported to be a useful tool in assessing the degree of inflammatory activity in patients with ulcerative colitis and CD [49,50]. Shyn et al [51] compared FDG-PET/CT enterography to conventional CT enterography in evaluating patients with CD. In this study, FDG-PET/CT enterography showed sites of active inflammation in 3 of 13 cases (23.1%) that were not seen on CT enterography, though these areas were not in the rectum or a surgical pouch. To our knowledge, there is no relevant recent literature regarding the use of FDG-PET/CT in the evaluation of suspected proctitis or pouchitis.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
D. Fluoroscopy Contrast Enema

Fluoroscopic contrast enemas performed for the diagnosis of perforation or leak, rectovaginal or rectovesicular fistula, pouchitis, or proctitis can be performed with water-soluble contrast or barium. In general, water-soluble contrast is preferred if a leak or perforation is suspected in order to avoid barium spillage into the peritoneal cavity or extraperitoneal pelvis. Using barium may also interfere with a subsequent CT scan because of the streak artifact that it causes on CT.

A retrospective review by Brown et al [52] published in 1990 compared CT to fluoroscopic examination of patients with IPAA. Some of the fluoroscopic examinations were performed antegrade through the distal limb of the loop ileostomy, whereas others were performed retrograde. In these 18 patients, 10 had infectious symptoms and 8 did not. CT more clearly delineated the site and extent of abscess in 9 patients with infectious symptoms compared with the fluoroscopic studies [52]. However, this study did not evaluate the sensitivity or specificity of each examination, neither did it directly address pouchitis. To our knowledge, there is no recent literature evaluating fluoroscopic contrast enema for the diagnosis of proctitis or pouchitis.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
E. MR Enterography

Pouchitis can also be evaluated as part of MR enterography. MR enterography is commonly performed with biphasic oral contrast agents that produce low signal intensity on T1-weighted sequences and high signal intensity on T2-weighted sequences because they allow excellent characterization of bowel wall enhancement on IV contrast-enhanced T1-weigheted sequences. These agents include low weight/volume barium solutions, water, polyethylene glycol, and methylcellulose. Patients ingest a large volume of the oral contrast prior to the examination. Administering an antispasmodic drug such as glucagon is useful for reducing motion artifact caused by bowel peristalsis. Both FSE T2-weighted and steady-state free precession T2-weighted sequences are generally performed to compensate for limitations of each in addition to dynamic IV contrast-enhanced sequences.

In 28 patients who underwent colectomy with IPAA, Sahi et al [53] compared MR enterography, pouch endoscopy, and biopsy. They found that the presence of 4 or more MR enterography features of inflammation had the best correlation with endoscopic findings (86% sensitivity, 79% specificity, 80% PPV, 85% NPV, and 82% accuracy).

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
F. MRI Pelvis

MRI of the anorectal region can be performed on a 3T or 1.5T magnet. A 3T magnet improves signal-to-noise ratio and spatial resolution. To our knowledge, there are no published studies comparing the accuracy of detection of anorectal disease on 3T compared with 1.5T. The anorectum can be imaged with an endoanal coil or multichannel external phased array body coil. Though an endoanal coil has been shown to improve detection of the internal opening of fistulae, the phased array body coil provides better visualization of the extent of fistulae and those located in the supralevator space and ischiorectal fossa [17]. When using a phased array body coil, the field of view should be tailored to the anatomy imaged and the patient's body habitus. For example, in the evaluation of perianal fistula, the field of view should be small enough to clearly visualize the anal sphincter complex. The planes of imaging should be orthogonal to the area of interest. Gadolinium-based IV contrast material administration is preferred for detection of fistula because active inflammation in fistulous tracts will enhance avidly with contrast and abscesses will show rim-like enhancement [18]. The addition of diffusion-weighted sequences increases the conspicuity of fistulae over T2-weighted FSE sequences (100% sensitive) and discriminates between inflammatory mass and abscess (100% sensitivity and 90% specificity) [19].

MRI is an excellent imaging modality for the evaluation of inflammatory disease of the rectum or IPAA. Using IV contrast material enhances the ability to diagnose inflammation, adding the findings of mucosal hyperenhancement to other findings such as wall thickening, submucosal edema seen on T2-weighted sequences, and mucosal ulceration. Additional findings, such as perirectal and perianal fistula and abscess, can also be seen. In a study of 58 patients with CD who had MRI and colonoscopy, several MRI features correlated with endoscopic diagnosis of proctitis, including wall thickness, submucosal fat, increased perimural signal intensity on T2-weighted sequences, increased perimural enhancement, creeping fat, and mesorectal lymph node size [54]. In another study of 9 patients, MRI had sensitivity and specificity of 100% for pouchitis as validated by pathology, using the criteria of increased wall thickness and enhancement [55].

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
G. Radiography Pelvis

Radiography is not useful in this clinical scenario because it cannot assess inflammation of the rectum or ileoanal pouch. There is no relevant literature to support the use of radiography in the evaluation of suspected proctitis or pouchitis.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
H. US Pelvis

Various US techniques (transabdominal, transperineal, transvaginal, and endorectal) can be used to assess the rectum or IPAA. In one study using endorectal US to evaluate radiation proctitis as

compared with colonoscopy, endorectal US had sensitivity of 86.4%, specificity of 66.7%, PPV of 76.0%, NPV of 80.0%, and overall accuracy of 77.5% in differentiating mild from severe radiation proctitis by using blurred rectal wall stratification and wall vascularity [56]. There is no relevant recent literature regarding the use of US in the evaluation of suspected pouchitis.

Variant 3: Suspected proctitis or pouchitis. Initial imaging.
I. WBC Scan Abdomen and Pelvis

In 1990, Thoeni et al [57] published a retrospective study of 55 patients who underwent total colectomy and IPAA. They compared CT, indium-11 (In-111) scintigraphy, and fluoroscopic pouchography for the detection of pouchitis, abscess, and fistula. For pouchitis, the sensitivity of CT, In-111 scintigraphy, and pouchography was 71%, 80%, and 53%, respectively. To our knowledge, there is no recent literature evaluating and comparing scintigraphy for the diagnosis of proctitis or pouchitis.

There is no relevant recent literature regarding the use of Tc-99m white blood cell (WBC) scan in the evaluation of suspected proctitis or pouchitis.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.

Complications of proctectomy with coloanal or colorectal anastomosis and coloproctectomy with IPAA in the early postoperative period are not uncommon, particularly in patients with low rectal anastomoses and IPAAs. They include infection and abscesses related to the surgery, anastomotic dehiscence/leak, small-bowel obstruction, and ischemia. In a multicenter prospective trial of 234 patients undergoing low anterior resection for rectal cancer with a colorectal anastomosis, 11.5% of patients had an early symptomatic anastomotic leak during the hospital admission for the surgery, whereas 7.7% had a symptomatic anastomotic leak that developed after discharge between postoperative days 11 and 70 [58]. Late complications included anastomotic stricture, small-bowel obstruction, anastomotic leakage with abscess, fistulae, and recurrence of the patient's primary disease, or pouch prolapse in the case of IPAA. A meta-analysis of complications after total proctocolectomy with IPAA performed by Hueting et al [59] showed a pooled incidence of 9.5% for pelvic sepsis, 5.5% for pouch-related anal or vaginal fistula, 9.2% for strictures, and 13.1% for small-bowel obstruction. The initial imaging modality for patients with a suspected postoperative complication may vary based upon the suspected complication. CT is often the first imaging modality used for patients who return following surgery with acute pain, sepsis, or signs of bowel obstruction.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.
A. CT Abdomen and Pelvis

CT abdomen and pelvis may be preferred over CT pelvis alone, depending upon the clinical scenario or specific type of operation performed. To our knowledge, there are no studies comparing noncontrast CT to IV contrast-enhanced CT for the detection of postoperative complications. However, IV contrast does improve the detection of abscesses and is important for the evaluation of the integrity of the bowel wall when ischemia or anastomotic dehiscence is

suspected. CT with and without contrast would only be indicated when there is benefit from dual-phase imaging. When anastomotic leak is suspected, rectally administered contrast material is important to demonstrate extraluminal extravasation of contrast to confirm the leak, adding an additional finding to other findings of leak: perianastomotic gas, fluid collection, and staple line integrity. Hyman et al [60] reported that CT was superior to fluoroscopic contrast enema at detecting leaks, with a PPV of 89.5% for CT and 40% for contrast enema in 33 patients who developed leaks. Kaur et al [61] showed a 91% sensitivity, 100% specificity, 100% PPV, and 95% NPV for CT in detecting postoperative anastomotic leaks in a retrospective study 170 patients who had undergone a low anterior resection, emphasizing the importance of rectal contrast material to improve confidence in diagnosis.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.
B. CT Pelvis

CT pelvis may be preferred over CT abdomen and pelvis in specific clinical scenarios when the pelvis alone is the area of clinical concern. To our knowledge there are no studies comparing noncontrast CT with IV contrast-enhanced CT for the detection of postoperative complications. However, IV contrast does improve the detection of abscesses and is important for the evaluation of the integrity of the bowel wall when ischemia or anastomotic dehiscence is suspected. CT with and without IV contrast would only be useful when there is benefit from dual-phase imaging. When anastomotic leak is suspected, rectally administered contrast material is important to demonstrate extraluminal extravasation of contrast to confirm the leak, adding an additional finding to other findings of leak: perianastomotic gas, fluid collection, and staple line integrity. Hyman et al [60] reported that CT was superior to fluoroscopic contrast enema at detecting leaks, with a PPV of 89.5% for CT and 40% for contrast enema in 33 patients who developed leaks. Kaur et al [61] showed a 91% sensitivity, 100% specificity, 100% PPV, and 95% NPV for CT in detecting postoperative anastomotic leaks in a retrospective study of 170 patients who had undergone a low anterior resection, emphasizing the importance of rectal contrast material to improve confidence in diagnosis.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.
C. Fluoroscopy Contrast Enema

Fluoroscopic contrast enemas performed for the diagnosis of perforation or leak, rectovaginal or rectovesicular fistula, pouchitis, or proctitis can be performed with water-soluble contrast or barium. In general, water-soluble contrast is preferred if a leak or perforation are suspected in order to avoid barium spillage into the peritoneal cavity or extraperitoneal pelvis. Using barium may also interfere with a subsequent CT scan because of the streak artifact that it causes on CT.

Fluoroscopic water-soluble contrast enema is routinely used to evaluate clinically suspected leaks, anastomotic stenoses, fistulas, and sinus tracts. It may be complementary to CT or performed in conjunction with CT. In the study by Tang et al [62], water-soluble contrast enema was performed in 33 of the 66 patients evaluated for pouch disorders and compared with a composite clinical diagnosis. The sensitivity and specificity for the diagnosis of small-bowel and inlet strictures was 80% and 95.7%, and pouch outlet strictures was 0% and 93.5%, respectively. They also found the

sensitivity and specificity for the diagnosis of fistula was 33.3% and 96.3%, sinus tract 50% and 100%, pouch leak 50% and 96.8%, respectively [62]. In some institutions, routine water-soluble contrast enema is performed prior to ileostomy takedown. In a study of 42 patients who underwent total proctocolectomy with IPAA, Dolinsky et al [63] showed that 14% of patients had clinically significant occult strictures detected by water-soluble contrast enema prior to ileostomy takedown. On the other hand, others report that routine use of fluoroscopic water-soluble contrast enema in patients with low pelvic anastomoses (ultralow colorectal, coloanal, and IPAA) does not impact ileostomy takedown compared with digital rectal examination and colonoscopy or sigmoidoscopy. In the study by Karsten et al [64], 38 patients were evaluated with fluoroscopic water-soluble contrast enema, which was 100% sensitive and 69% specific for detection of significant pathology, but that pathology was equally detected on digital rectal examination and endoscopic examinations such that fluoroscopic water-soluble contrast enema could be used selectively on patients with abnormal clinical findings.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.
D. MRI Pelvis

MRI of the anorectal region can be performed on a 3T or 1.5T magnet. A 3T magnet improves the signal-to-noise ratio and spatial resolution. To our knowledge, there are no published studies comparing the accuracy of detection of anorectal disease on 3T compared with 1.5T. The anorectum can be imaged with an endoanal coil or multichannel external phased array body coil. Though an endoanal coil has been shown to improve detection of the internal opening of fistulae, the phased array body coil provides better visualization of the extent of fistulae and those located in the supralevator space and ischiorectal fossa [17]. When using a phased array body coil, the field of view should be tailored to the anatomy imaged and the patient's body habitus. For example, in the evaluation of perianal fistula, the field of view should be small enough to clearly visualize the anal sphincter complex. The planes of imaging should be orthogonal to the area of interest. Gadolinium-based IV contrast material administration is preferred for detection of fistula because active inflammation in fistulous tracts will enhance avidly with contrast, and abscesses will show rim-like enhancement [18]. The addition of diffusion-weighted sequences increases the conspicuity of fistulae over T2-weighted FSE sequences (100% sensitive) and discriminates between inflammatory mass and abscess (100% sensitivity and 90% specificity) [19].

The superior contrast resolution of MRI compared with CT makes it an ideal modality for the evaluation of clinically suspected anastomotic or IPAA-related fistulas or sinus tracts. In a study of 44 patients with ulcerative colitis and IPAA with pelvic symptoms, MRI with and without IV gadolinium contrast material detected 23 of 26 fistula for a sensitivity of 88%, specificity of 100%, PPV of 100%, and NPV of 85% [65]. The authors reported that high diagnostic confidence was obtained with the IV gadolinium-enhanced sequence compared with the T2-weighted fat-saturated sequence. MRI was obtained in 23 of the 66 postoperative patients reported by Tang et al [62]. MRI had a sensitivity and specificity for the diagnosis of small-bowel and inlet strictures of 33.3% and 100%, pouch outlet strictures of 0% and 92%, fistula of 57.1% and 88.9%, sinus of 0% and 70.8%, and pouch leak of 0% and 91.7%, respectively.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.

E. Radiography Abdomen and Pelvis

Radiographs may be helpful in evaluating postoperative patients when there is a suspected bowel obstruction by confirming or excluding small-bowel obstruction. Radiographs may also show free air if there is a suspected postoperative perforation or ectopic air, or bubbly lucencies in the case of abscess, fistula, or sinus tracts that contain air. However, radiographs will frequently be inconclusive and additional imaging will be needed for those patients with abnormal radiographs; additional imaging is often necessary to confirm the suspected diagnosis and to add more specificity to the findings. To our knowledge, there is no recent literature on the use of radiographs in the evaluation of suspected complications after proctectomy with coloanal or colorectal anastomosis and coloproctectomy with IPAA.

Variant 4: Suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. Initial imaging.
F. US Pelvis Transrectal

There is no relevant recent literature regarding the use of US in the evaluation of suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis.

Summary of Recommendations

- **Variant 1:** MRI pelvis without and with IV contrast or CT pelvis with IV contrast is usually appropriate as the initial imaging for suspected perianal disease with abscess or fistula. These procedures are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care).
- **Variant 2:** MRI pelvis without and with IV contrast or CT pelvis with IV contrast is usually appropriate as the initial imaging of rectovesicular or rectovaginal rectal fistula. These procedures are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care).
- **Variant 3:** MR enterography or MRI pelvis without and with IV contrast or CT pelvis with IV contrast or CT enterography is usually appropriate as the initial imaging of suspected proctitis or pouchitis. These procedures are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care).
- **Variant 4:** MRI pelvis without and with IV contrast or CT abdomen and pelvis with IV contrast or CT pelvis with IV contrast is usually appropriate as the initial imaging of a suspected complication postproctectomy or coloproctectomy or colectomy with pouch or other anastomosis. These procedures are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care).

Supporting Documents

The evidence table, literature search, and appendix for this topic are available at https://acsearch.acr.org/list. The appendix includes the strength of evidence assessment and the final rating round tabulations for each recommendation.

For additional information on the Appropriateness Criteria methodology and other supporting

documents, please go to the ACR website at https://www.acr.org/Clinical-Resources/Clinical-Tools-and-Reference/Appropriateness-Criteria.

Appropriateness Category Names and Definitions

Appropriateness Category Name	Appropriateness Rating	Appropriateness Category Definition
Usually Appropriate	7, 8, or 9	The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.
May Be Appropriate	4, 5, or 6	The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal.
May Be Appropriate (Disagreement)	5	The individual ratings are too dispersed from the panel median. The different label provides transparency regarding the panel's recommendation. "May be appropriate" is the rating category and a rating of 5 is assigned.
Usually Not Appropriate	1, 2, or 3	The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.

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. Patients in the pediatric age group are at inherently higher risk from exposure, because of both 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 with those specified for adults (see Table below). Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document

[66].

Relative Radiation Level Designations		
Relative Radiation Level*	**Adult Effective Dose Estimate Range**	**Pediatric Effective Dose Estimate Range**
O	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 (eg, region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

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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