American College of Radiology
ACR Appropriateness Criteria®
Postmenopausal Acute Pelvic Pain

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
US pelvis transabdominal	Usually Appropriate	O
US pelvis transvaginal	Usually Appropriate	O
MRI pelvis without and with contrast	May Be Appropriate	O
CT abdomen and pelvis without IV contrast	May Be Appropriate	☢☢☢
MRI pelvis without contrast	May Be Appropriate	O
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

POSTMENOPAUSAL ACUTE PELVIC PAIN

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Summary of Literature Review

Introduction/Background

Acute pelvic pain is a common presenting complaint, both in the emergency room and the outpatient setting [1]. Acute pelvic pain is defined as pain in the lower abdomen or pelvis lasting <3 months. Acute pelvic pain of gynecologic origin is more common in premenopausal women and is addressed in the ACR Appropriateness Criteria® topic on "Acute Pelvic Pain in the Reproductive Age Group" [2]. However, approximately 15% of women presenting with acute pelvic pain are in the perimenopausal or postmenopausal reproductive stage [3].

The literature regarding etiology of acute, rather than chronic, pain in postmenopausal women is somewhat limited. In a single-center study, investigators noted that ovarian cysts account for one-third of the cases of pain attributed to gynecologic origin in perimenopausal and postmenopausal women [3]. This is a slightly less common cause of pain than in the reproductive age group. Uterine fibroids are the are the second most common cause of acute pelvic pain in the peri/postmenopausal group, and a significantly more common cause of pain than in the premenopausal group [3]. Acute pain from fibroids may be secondary to torsion of pedunculated fibroids, prolapse of a submucosal fibroid, or from acute infarction/hemorrhage in a degenerating fibroid. The third most common cause of pelvic pain is pelvic infection, which accounts for 20% of cases [3]. These cases of pelvic inflammatory disease (PID) include tubo-ovarian abscess, oophoritis, salpingitis, endometritis, cervicitis, or peritonitis from gynecologic origin. The majority of these are related to sexual activity; however, recent instrumentation and surgery are common iatrogenic causes. Isolated endometritis can also be seen with cervical stenosis. The fourth most common gynecologic cause of acute pelvic pain is ovarian neoplasm, which is the etiology in 8% of cases [3]. Ovarian torsion, retained intrauterine device, and endometriosis have been reported as causes of acute pain in the postmenopausal period; however, these are considered rare.

In the postmenopausal woman, other causes of pelvic pain are attributable to the urinary, gastrointestinal, and vascular systems [4]. Imaging recommendations vary for these etiologies, and narrowing of the differential will help ensure optimal diagnostic imaging. Please see the corresponding ACR Appropriateness Criteria guidance document, which addresses these diagnoses listed in Appendix 1.

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).

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Discussion of Procedures by Variant

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.

CT Abdomen and Pelvis

CT abdomen and pelvis may be useful in the setting of poorly localized pain, masses, or organomegaly involving both the abdomen and pelvis as well as in assessment of abdominal vasculature and ascites.

CT is useful in the evaluation of patients with a nonspecific clinical presentation or broad differential diagnosis, including gynecologic and nongynecologic etiologies, and may be a first-line imaging modality in this setting. CT with intravenous (IV) contrast had higher sensitivity than ultrasound (US) (89% versus 70%) for urgent diagnoses in a mixed-gender group of adults with abdominopelvic pain [5], and approximately 88% overall accuracy compared with surgical diagnosis in a similar cohort [6]. Although specific data are lacking for the postmenopausal population, CT is also widely used as a second-line imaging modality in patients with an equivocal or nondiagnostic US evaluation, particularly when there is concern for appendicitis [7,8]. The bulk of evidence to support the use of a CT abdomen and pelvis in acute postmenopausal pelvic pain refers to contrast-enhanced imaging.

For gynecologic diagnoses, contrast-enhanced CT may identify ovarian cysts and masses, including solid components, as well as ascites, or lymphadenopathy that may raise suspicion for a malignant diagnosis [9-11]. However, the accuracy of CT for adnexal mass characterization remains limited. CT is distinctly helpful when macroscopic fat or calcifications of teeth or bone fragments are present, to confirm the diagnosis of ovarian teratoma. Regarding ovarian torsion, CT findings have been described but specific diagnostic accuracy has not been reported to our knowledge. CT findings of ovarian torsion include an enlarged, featureless, and hypoenhancing ovary, sometimes with apparent swirling of vascular pedicle and abnormal craniocaudal orientation of ovary or uterine deviation to the affected side [12-16].

Contrast-enhanced CT may be helpful for identification of uterine fibroids that have undergone torsion or necrosis [12,17], with the findings of diminished contrast enhancement of the fibroid(s) (86% sensitivity) and ascites (100% sensitivity) demonstrating the best diagnostic performance in a series of 51 cases [18]. CT is also helpful in evaluation of fibroids when calcified masses cause shadowing and limit visualization of the pelvic contents by US [19].

Contrast-enhanced CT may aid in the early diagnosis of PID with the findings of pelvic fluid, loss of normal fat planes, and/or subtle enhancement of the endocervical canal or fallopian tubes prior to emergence of the dilatation and enlargement that can be identified with US [20,21]. Fulminant PID on CT demonstrates fluid in the endometrial canal, distended and thickened fallopian tubes with wall enhancement, and ovarian enlargement [12,20,22]. CT findings late in the course of PID with formation of a tubo-ovarian abscess includes a complex cystic mass with thick enhancing walls [14,22] and anterior displacement of the mesosalpinx, which helps to distinguish tubo-ovarian abscess from other sources of abscess formation in the pelvis [12,22,23].

MRI Pelvis

MRI is most often utilized as a problem-solving examination if US or CT do not reveal an etiology of pain. Potential benefits of MRI in the acute pelvic pain setting are high spatial resolution and excellent soft-tissue contrast. This allows for more precise localization and origin of pathology identified on US and CT [12,24].

MRI confers up to 96% sensitivity for detection of tubo-ovarian malignancy [25], and readers are referred to the ACR Appropriateness Criteria® topic on "Clinically Suspected Adnexal Mass, No Acute Symptoms" [26]. Regarding ovarian torsion, MRI is reported to be 80% to 85% sensitive [27-29] and imaging features include an enlarged ovary with stromal edema and surrounding fluid, absent or diminished ovarian enhancement, tubal knot or whirlpool sign, mural thickening of the fallopian tube, peripheralized and/or hemorrhagic follicles, and anatomic deviation of adnexa and uterus [12,16,24,28,30].

Contrast-enhanced MRI provides the greatest soft-tissue detail for evaluation of uterine fibroids and is particularly helpful in evaluating for symptomatic complications including hemorrhage, torsion, infarction, and prolapse [22,31-33]. MRI is probably not necessary as a primary imaging modality in uncomplicated cases of PID, but it is useful for anatomic specificity and facilitating treatment planning [12,24,34,35]. MRI is reported to be 95% sensitive and 89% specific for evaluation of hydrosalpinx [36].

The majority of the above reports have focused on the utility of contrast-enhanced MRI, but valuable information can often be derived from noncontrast protocols with emphasis on T2-weighted imaging. Abbreviated MRI

protocols without IV contrast have demonstrated 73% accuracy for diagnosis of acute pelvic pain in a mixed group of men, pregnant women, and nonpregnant women [29].

US Pelvis Transabdominal

US is considered a first-line imaging modality for evaluation of pelvic pain of suspected gynecologic origin [37]. Transabdominal US is most often performed in conjunction with transvaginal US. Transabdominal US has the benefit of a larger field of view that allows visualization of the uterus and adnexa, but also the remainder of the pelvic contents, including free pelvic fluid. Transabdominal US is well tolerated by patients; however, it can be limited by patient body habitus. The evidence presented below for transvaginal US generally assumes a combined approach using both techniques.

US Pelvis Transvaginal

Transvaginal US is considered a first-line imaging modality for evaluation of pelvic pain of suspected gynecologic origin and, although it may be performed independently, is usually performed at the same time as a transabdominal US per the ACR-ACOG-AIUM-SPR-SRU Practice Parameter for the Performance of Ultrasound of the Female Pelvis [37]. Color Doppler is considered a standard component of a pelvic US examination and is usually performed simultaneously, with the addition of spectral Doppler when indicated, particularly in the setting of concern for torsion. The benefits of transvaginal US include the close proximity of the high-frequency probe to the reproductive system with less intervening bowel gas and adipose tissue that can attenuate the US beam and decrease imaging quality. There is little primary prospective evidence to critically evaluate the role of US for the broad presentation of pelvic pain, but it is standard clinical practice [1,4,8,38,39]. Of note, 26.8% of postmenopausal women reported pain while undergoing a transvaginal US, a potential limitation in this patient group [40].

US is particularly useful in the evaluation of adnexal cysts and masses, and is addressed in detail in the in the ACR Appropriateness Criteria® topic on "Clinically Suspected Adnexal Mass, No Acute Symptoms" [26]. Simple ovarian cysts are common in postmenopausal women and may be symptomatic [10,41,42]. Pelvic US can often distinguish between benign and malignant cysts and masses and is reported to have 94% to 100% sensitivity for detection of tubo-ovarian malignancy [43,44]. However, many masses are asymptomatic or present with vague symptoms in the absence of torsion or other complication. Torsion in the postmenopausal cohort is usually secondary to benign ovarian masses [45,46]. Torsion can be diagnosed with US with 70% to 95% sensitivity by identification of a unilaterally enlarged ovary with a twisted vascular pedicle, diminished ovarian venous flow, or complete loss of arterial and venous flow to the ovary [13,47-49].

US is the most common initial imaging study for evaluation of uterine fibroids, though there is little primary prospective evidence to support its use [50,51]. US readily demonstrates the size and location of most fibroids but is probably less sensitive than MRI for assessing complications such as necrosis or hemorrhagic degeneration, extrapolating from the literature on postprocedural assessment after uterine fibroid embolization [32,33,52].

In PID, US has demonstrated a sensitivity of 90% for ovarian involvement and 93% for tubal involvement [53]. US has also been shown to be useful after a nondiagnostic or nonspecific CT examination [54,55].

Summary of Recommendations

- **Variant 1**: US pelvis transabdominal and US pelvis transvaginal are usually appropriate for the initial imaging of postmenopausal acute pelvic pain. US pelvis transabdominal and US pelvis transvaginal are usually performed together and are complementary (ie, more than one procedure is ordered as a set or simultaneously where each procedure provides unique clinical information to effectively manage the patient's care). CT abdomen and pelvis with IV contrast is also usually appropriate for the initial imaging of postmenopausal acute pelvic pain and is an equivalent alternative to the US procedures (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 go to www.acr.org/ac.

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 [56].

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."		

References

1. Allison SO, Lev-Toaff AS. Acute pelvic pain: what we have learned from the ER. Ultrasound Q 2010;26:211-8.

2. Bhosale PR, Javitt MC, Atri M, et al. ACR Appropriateness Criteria® Acute Pelvic Pain in the Reproductive Age Group. Ultrasound Q 2016;32:108-15.
3. Kurt S, Uyar I, Demirtas O, Celikel E, Beyan E, Tasyurt A. Acute pelvic pain: evaluation of 503 cases. Arch Iran Med 2013;16:397-400.
4. Amirbekian S, Hooley RJ. Ultrasound evaluation of pelvic pain. Radiol Clin North Am 2014;52:1215-35.
5. Lameris W, van Randen A, van Es HW, et al. Imaging strategies for detection of urgent conditions in patients with acute abdominal pain: diagnostic accuracy study. BMJ 2009;338:b2431.
6. Perry H, Foley KG, Witherspoon J, et al. Relative accuracy of emergency CT in adults with non-traumatic abdominal pain. Br J Radiol 2016;89:20150416.
7. Martin JF, Mathison DJ, Mullan PC, Otero HJ. Secondary imaging for suspected appendicitis after equivocal ultrasound: time to disposition of MRI compared to CT. Emerg Radiol 2018;25:161-68.
8. Asch E, Shah S, Kang T, Levine D. Use of pelvic computed tomography and sonography in women of reproductive age in the emergency department. J Ultrasound Med 2013;32:1181-7.
9. Patel MD, Ascher SM, Paspulati RM, et al. Managing incidental findings on abdominal and pelvic CT and MRI, part 1: white paper of the ACR Incidental Findings Committee II on adnexal findings. J Am Coll Radiol 2013;10:675-81.
10. Boos J, Brook OR, Fang J, Brook A, Levine D. Ovarian Cancer: Prevalence in Incidental Simple Adnexal Cysts Initially Identified in CT Examinations of the Abdomen and Pelvis. Radiology 2018;286:196-204.
11. Pickhardt PJ, Hanson ME. Incidental adnexal masses detected at low-dose unenhanced CT in asymptomatic women age 50 and older: implications for clinical management and ovarian cancer screening. Radiology 2010;257:144-50.
12. Iraha Y, Okada M, Iraha R, et al. CT and MR Imaging of Gynecologic Emergencies. Radiographics 2017;37:1569-86.
13. Ssi-Yan-Kai G, Rivain AL, Trichot C, et al. What every radiologist should know about adnexal torsion. Emerg Radiol 2018;25:51-59.
14. Rha SE, Byun JY, Jung SE, et al. CT and MR imaging features of adnexal torsion. Radiographics 2002;22:283-94.
15. Dhanda S, Quek ST, Ting MY, et al. CT features in surgically proven cases of ovarian torsion-a pictorial review. Br J Radiol 2017;90:20170052.
16. Duigenan S, Oliva E, Lee SI. Ovarian torsion: diagnostic features on CT and MRI with pathologic correlation. AJR Am J Roentgenol 2012;198:W122-31.
17. Roy C, Bierry G, El Ghali S, Buy X, Rossini A. Acute torsion of uterine leiomyoma: CT features. Abdom Imaging 2005;30:120-3.
18. Ohgiya Y, Seino N, Miyamoto S, et al. CT features for diagnosing acute torsion of uterine subserosal leiomyoma. Jpn J Radiol 2018;36:209-14.
19. Murase E, Siegelman ES, Outwater EK, Perez-Jaffe LA, Tureck RW. Uterine leiomyomas: histopathologic features, MR imaging findings, differential diagnosis, and treatment. Radiographics 1999;19:1179-97.
20. Revzin MV, Mathur M, Dave HB, Macer ML, Spektor M. Pelvic Inflammatory Disease: Multimodality Imaging Approach with Clinical-Pathologic Correlation. Radiographics 2016;36:1579-96.
21. Siddall KA, Rubens DJ. Multidetector CT of the female pelvis. Radiol Clin North Am 2005;43:1097-118, ix.
22. Kalish GM, Patel MD, Gunn ML, Dubinsky TJ. Computed tomographic and magnetic resonance features of gynecologic abnormalities in women presenting with acute or chronic abdominal pain. Ultrasound Q 2007;23:167-75.
23. Wilbur AC, Aizenstein RI, Napp TE. CT findings in tuboovarian abscess. AJR Am J Roentgenol 1992;158:575-9.
24. Kassam Z, Petkovska I, Wang CL, Trinh AM, Kamaya A. Benign Gynecologic Conditions of the Uterus. Magn Reson Imaging Clin N Am 2017;25:577-600.
25. Forstner R, Thomassin-Naggara I, Cunha TM, et al. ESUR recommendations for MR imaging of the sonographically indeterminate adnexal mass: an update. Eur Radiol 2017;27:2248-57.
26. Atri M, Alabousi A, Reinhold C, et al. ACR Appropriateness Criteria® Clinically Suspected Adnexal Mass, No Acute Symptoms. J Am Coll Radiol 2019;16:S77-S93.
27. Beranger-Gibert S, Lagadec M, Boulay-Coletta I, et al. Hepatic and perihepatic involvement of female genital diseases and pregnancy: a review. Abdom Imaging 2015;40:1331-49.
28. Beranger-Gibert S, Sakly H, Ballester M, et al. Diagnostic Value of MR Imaging in the Diagnosis of Adnexal Torsion. Radiology 2016;279:461-70.

29. Singh AK, Desai H, Novelline RA. Emergency MRI of acute pelvic pain: MR protocol with no oral contrast. Emerg Radiol 2009;16:133-41.
30. Lourenco AP, Swenson D, Tubbs RJ, Lazarus E. Ovarian and tubal torsion: imaging findings on US, CT, and MRI. Emerg Radiol 2014;21:179-87.
31. Verma SK, Bergin D, Gonsalves CF, Mitchell DG, Lev-Toaff AS, Parker L. Submucosal fibroids becoming endocavitary following uterine artery embolization: risk assessment by MRI. AJR Am J Roentgenol 2008;190:1220-6.
32. Deshmukh SP, Gonsalves CF, Guglielmo FF, Mitchell DG. Role of MR imaging of uterine leiomyomas before and after embolization. Radiographics 2012;32:E251-81.
33. Kubik-Huch RA, Weston M, Nougaret S, et al. European Society of Urogenital Radiology (ESUR) Guidelines: MR Imaging of Leiomyomas. Eur Radiol 2018;28:3125-37.
34. Czeyda-Pommersheim F, Kalb B, Costello J, et al. MRI in pelvic inflammatory disease: a pictorial review. Abdom Radiol (NY) 2017;42:935-50.
35. Knoepp US, Mazza MB, Chong ST, Wasnik AP. MR Imaging of Pelvic Emergencies in Women. Magn Reson Imaging Clin N Am 2017;25:503-19.
36. Valentini AL, Speca S, Gui B, Soglia G, Micco M, Bonomo L. Adenomyosis: from the sign to the diagnosis. Imaging, diagnostic pitfalls and differential diagnosis: a pictorial review. Radiol Med 2011;116:1267-87.
37. American College of Radiology. ACR–ACOG–AIUM–SPR–SRU Practice Parameter for the Performance of Ultrasound of the Female Pelvis. Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/US-Pelvis.pdf?la=en. Accessed September 30, 2020.
38. Vandermeer FQ, Wong-You-Cheong JJ. Imaging of acute pelvic pain. Clin Obstet Gynecol 2009;52:2-20.
39. Cicchiello LA, Hamper UM, Scoutt LM. Ultrasound evaluation of gynecologic causes of pelvic pain. Obstet Gynecol Clin North Am 2011;38:85-114, viii.
40. Gentry-Maharaj A, Sharma A, Burnell M, et al. Acceptance of transvaginal sonography by postmenopausal women participating in the United Kingdom Collaborative Trial of Ovarian Cancer Screening. Ultrasound Obstet Gynecol 2013;41:73-9.
41. Valentin L, Ameye L, Franchi D, et al. Risk of malignancy in unilocular cysts: a study of 1148 adnexal masses classified as unilocular cysts at transvaginal ultrasound and review of the literature. Ultrasound Obstet Gynecol 2013;41:80-9.
42. Baheti AD, Lewis CE, Hippe DS, O'Malley RB, Wang CL. Adnexal lesions detected on CT in postmenopausal females with non-ovarian malignancy: do simple cysts need follow-up? Abdom Radiol (NY) 2019;44:661-68.
43. Nohuz E, De Simone L, Chene G. Reliability of IOTA score and ADNEX model in the screening of ovarian malignancy in postmenopausal women. J Gynecol Obstet Hum Reprod 2019;48:103-07.
44. Van Calster B, Van Hoorde K, Valentin L, et al. Evaluating the risk of ovarian cancer before surgery using the ADNEX model to differentiate between benign, borderline, early and advanced stage invasive, and secondary metastatic tumours: prospective multicentre diagnostic study. BMJ 2014;349:g5920.
45. Kamaya A, Shin L, Chen B, Desser TS. Emergency gynecologic imaging. Semin Ultrasound CT MR 2008;29:353-68.
46. Eitan R, Galoyan N, Zuckerman B, Shaya M, Shen O, Beller U. The risk of malignancy in post-menopausal women presenting with adnexal torsion. Gynecol Oncol 2007;106:211-4.
47. Lee EJ, Kwon HC, Joo HJ, Suh JH, Fleischer AC. Diagnosis of ovarian torsion with color Doppler sonography: depiction of twisted vascular pedicle. J Ultrasound Med 1998;17:83-9.
48. Nizar K, Deutsch M, Filmer S, Weizman B, Beloosesky R, Weiner Z. Doppler studies of the ovarian venous blood flow in the diagnosis of adnexal torsion. J Clin Ultrasound 2009;37:436-9.
49. Chiou SY, Lev-Toaff AS, Masuda E, Feld RI, Bergin D. Adnexal torsion: new clinical and imaging observations by sonography, computed tomography, and magnetic resonance imaging. J Ultrasound Med 2007;26:1289-301.
50. Donnez J, Dolmans MM. Uterine fibroid management: from the present to the future. Hum Reprod Update 2016;22:665-86.
51. De La Cruz MS, Buchanan EM. Uterine Fibroids: Diagnosis and Treatment. Am Fam Physician 2017;95:100-07.
52. Ghai S, Rajan DK, Benjamin MS, Asch MR, Ghai S. Uterine artery embolization for leiomyomas: pre- and postprocedural evaluation with US. Radiographics 2005;25:1159-72; discussion 73-6.
53. Patten RM, Vincent LM, Wolner-Hanssen P, Thorpe E, Jr. Pelvic inflammatory disease. Endovaginal sonography with laparoscopic correlation. J Ultrasound Med 1990;9:681-9.

54. Patel MD, Dubinsky TJ. Reimaging the female pelvis with ultrasound after CT: general principles. Ultrasound Q 2007;23:177-87.

55. Yitta S, Mausner EV, Kim A, et al. Pelvic ultrasound immediately following MDCT in female patients with abdominal/pelvic pain: is it always necessary? Emerg Radiol 2011;18:371-80.

56. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: https://www.acr.org/-/media/ACR/Files/Appropriateness-Criteria/RadiationDoseAssessmentIntro.pdf. Accessed September 30, 2020.

Appendix 1. Related ACR Appropriateness Criteria topics, which may be, consulted for suspected nongynecologic etiologies of acute pelvic pain.

Primary Suspected Diagnosis	ACR AC Topic
Appendicitis	Right Lower Quadrant Pain-Suspected Appendicitis
Urinary tract infection	Recurrent Lower Urinary Tract Infections in Women
Urinary stone disease	Acute Onset Flank Pain-Suspicion of Stone Disease (Urolithiasis)
Diverticulitis	Left Lower Quadrant Pain-Suspected Diverticulitis
Abdominal mass	Palpable Abdominal Mass-Suspected Neoplasm
Bowel obstruction	Suspected Small-Bowel Obstruction