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
US pelvis transabdominal	Usually Appropriate	O
US pelvis transvaginal	Usually Appropriate	O
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
MRI pelvis without and with IV contrast	May Be Appropriate	O
MRI pelvis without IV contrast	May Be Appropriate	O
CT abdomen and pelvis without IV contrast	May Be Appropriate	☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

Panel Members

Tara L. Henrichsen, MD, MD[1]; Katherine E. Maturen, MD, MS[b]; Jessica B. Robbins, MD[c]; Esma A. Akin, MD[d]; Susan M. Ascher, MD[e]; Olga R. Brook, MD[f]; Mark Dassel, MD[g]; Lucas Friedman, MD[h]; Lee A. Learman, MD, PhD[i]; Michael N. Patlas, MD[j]; Elizabeth A. Sadowski, MD[k]; Carl Saphier, MD[l]; Ashish P. Wasnik, MD[m]; Phyllis Glanc, MD.[n]

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 wherein each procedure provides unique clinical information to effectively manage the patient's care).

Discussion of Procedures by Variant

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.
A. 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].

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.
B. 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].

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.
C. 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.

Variant 1: Postmenopausal acute pelvic pain. Initial imaging.
D. 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, 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 [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.. 26(4):211-8, 2010 Dec.
2. Brook OR, Dadour JR, Robbins JB, et al. ACR Appropriateness Criteria® Acute Pelvic Pain in the Reproductive Age Group: 2023 Update. J Am Coll Radiol 2024;21:S3-S20.
3. Kurt S, Uyar I, Demirtas O, Celikel E, Beyan E, Tasyurt A. Acute pelvic pain: evaluation of 503 cases. Arch Iran Med. 16(7):397-400, 2013 Jul.
4. Amirbekian S, Hooley RJ. Ultrasound evaluation of pelvic pain. [Review]. Radiol Clin North Am. 52(6):1215-35, 2014 Nov.
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. British Journal of Radiology. 89(1059):20150416, 2016.
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. Emergency

Radiology. 25(2):161-168, 2018 Apr.EMERG. RADIOL.. 25(2):161-168, 2018 Apr.

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. Journal of Ultrasound in Medicine. 32(7):1181-7, 2013 Jul.

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.. 10(9):675-81, 2013 Sep.

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. 286(1):196-204, 2018 01.

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. [Review]. Radiographics. 37(5):1569-1586, 2017 Sep-Oct.

13. Ssi-Yan-Kai G, Rivain AL, Trichot C, et al. What every radiologist should know about adnexal torsion. [Review]. EMERG. RADIOL.. 25(1):51-59, 2018 Feb.

14. Rha SE, Byun JY, Jung SE, et al. CT and MR imaging features of adnexal torsion. Radiographics. 2002;22(2):283-294.

15. Dhanda S, Quek ST, Ting MY, et al. CT features in surgically proven cases of ovarian torsion-a pictorial review. British Journal of Radiology. 90(1078):20170052, 2017 Oct.Br J Radiol. 90(1078):20170052, 2017 Oct.

16. Duigenan S, Oliva E, Lee SI. Ovarian torsion: diagnostic features on CT and MRI with pathologic correlation. AJR Am J Roentgenol. 2012;198(2):W122-131.

17. Roy C, Bierry G, El Ghali S, Buy X, Rossini A. Acute torsion of uterine leiomyoma: CT features. Abdom Imaging. 30(1):120-3, 2005 Jan-Feb.

18. Ohgiya Y, Seino N, Miyamoto S, et al. CT features for diagnosing acute torsion of uterine subserosal leiomyoma. Jpn J Radiol. 36(3):209-214, 2018 Mar.

19. Murase E, Siegelman ES, Outwater EK, Perez-Jaffe LA, Tureck RW. Uterine leiomyomas: histopathologic features, MR imaging findings, differential diagnosis, and treatment. Radiographics. 19(5):1179-97, 1999 Sep-Oct.

20. Revzin MV, Mathur M, Dave HB, Macer ML, Spektor M. Pelvic Inflammatory Disease: Multimodality Imaging Approach with Clinical-Pathologic Correlation. [Review]. Radiographics. 36(5):1579-96, 2016 Sep-Oct.

21. Siddall KA, Rubens DJ. Multidetector CT of the female pelvis. [Review] [65 refs]. Radiol Clin North Am. 43(6):1097-118, ix, 2005 Nov.

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. [Review] [52 refs]. ULTRASOUND Q.. 23(3):167-75, 2007 Sep.

23. Wilbur AC, Aizenstein RI, Napp TE. CT findings in tuboovarian abscess. AJR Am J Roentgenol. 158(3):575-9, 1992 Mar.

24. Kassam Z, Petkovska I, Wang CL, Trinh AM, Kamaya A. Benign Gynecologic Conditions of the Uterus. [Review]. Magn Reson Imaging Clin N Am. 25(3):577-600, 2017 Aug.

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. 27(6):2248-2257, 2017 Jun.

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. [Review]. Abdom Imaging. 40(5):1331-49, 2015 Jun.

28. Beranger-Gibert S, Sakly H, Ballester M, et al. Diagnostic Value of MR Imaging in the Diagnosis of Adnexal Torsion. Radiology. 279(2):461-70, 2016 May.

29. Singh AK, Desai H, Novelline RA. Emergency MRI of acute pelvic pain: MR protocol with no oral contrast. Emerg Radiol. 2009 Mar;16(2):133-41.

30. Lourenco AP, Swenson D, Tubbs RJ, Lazarus E. Ovarian and tubal torsion: imaging findings on US, CT, and MRI. [Review]. EMERG. RADIOL.. 21(2):179-87, 2014 Apr.

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. 190(5):1220-6, 2008 May.

32. Deshmukh SP, Gonsalves CF, Guglielmo FF, Mitchell DG. Role of MR imaging of uterine leiomyomas before and after embolization. [Review]. Radiographics. 32(6):E251-81, 2012 Oct.

33. Kubik-Huch RA, Weston M, Nougaret S, et al. European Society of Urogenital Radiology (ESUR) Guidelines: MR Imaging of Leiomyomas. Eur Radiol. 28(8):3125-3137, 2018 Aug.

34. Czeyda-Pommersheim F, Kalb B, Costello J, et al. MRI in pelvic inflammatory disease: a pictorial review. [Review]. Abdom Radiol. 42(3):935-950, 2017 03.

35. Knoepp US, Mazza MB, Chong ST, Wasnik AP. MR Imaging of Pelvic Emergencies in Women. [Review]. Magn Reson Imaging Clin N Am. 25(3):503-519, 2017 Aug.

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. [Review][Erratum appears in Radiol Med. 2011 Dec;116(8):1314 Note: Soglia, B G [corrected to Soglia, G]]. Radiol Med (Torino). 116(8):1267-87, 2011 Dec.

37. American College of Radiology. ACR-ACOG-AIUM-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. April 2, 2019

38. Vandermeer FQ, Wong-You-Cheong JJ. Imaging of acute pelvic pain. [Review] [30 refs][Reprint in Top Magn Reson Imaging. 2010 Jul;21(4):201-11; PMID: 22082769]. Clin Obstet Gynecol. 52(1):2-20, 2009 Mar.

39. Cicchiello LA, Hamper UM, Scoutt LM. Ultrasound evaluation of gynecologic causes of pelvic pain. Obstet Gynecol Clin North Am. 2011;38(1):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. 41(1):73-9, 2013 Jan.

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. [Review]. Ultrasound Obstet Gynecol. 41(1):80-9, 2013 Jan.

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. 44(2):661-668, 2019 02.

43. Nohuz E, De Simone L, Chene G. Reliability of IOTA score and ADNEX model in the screening of ovarian malignancy in postmenopausal women. Journal of Gynecology Obstetrics and Human Reproduction. 48(2):103-107, 2019 Feb.

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. 349:g5920, 2014 Oct 15.

45. Kamaya A, Shin L, Chen B, Desser TS. Emergency gynecologic imaging. [Review] [68 refs][Erratum appears in Semin Ultrasound CT MR. 2008 Dec;29(6):491]. Semin Ultrasound CT MR. 29(5):353-68, 2008 Oct.

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. 106(1):211-4, 2007 Jul.

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. 17(2):83-9, 1998 Feb.

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. 37(8):436-9, 2009 Oct.

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(10):1289-1301.

50. Donnez J, Dolmans MM. Uterine fibroid management: from the present to the future. [Review]. Human Reproduction Update. 22(6):665-686, 2016 11.Hum Reprod Update. 22(6):665-686, 2016 11.

51. De La Cruz MS, Buchanan EM. Uterine Fibroids: Diagnosis and Treatment. [Review]. Am Fam Physician. 95(2):100-107, 2017 Jan 15.

52. Ghai S, Rajan DK, Benjamin MS, Asch MR, Ghai S, Uterine artery embolization for leiomyomas: pre- and postprocedural evaluation with US. [Review] [60 refs]. Radiographics. 25(5):1159-72; discussion 1173-6, 2005 Sep-Oct.

53. Patten RM, Vincent LM, Wolner-Hanssen P, Thorpe E Jr. Pelvic inflammatory disease. Endovaginal sonography with laparoscopic correlation. J Ultrasound Med. 9(12):681-9, 1990 Dec.

54. Patel MD, Dubinsky TJ. Reimaging the female pelvis with ultrasound after CT: general principles. Ultrasound Q. 2007;23(3):177-187.

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(5):371-380.

56. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: https://edge.sitecorecloud.io/americancoldf5f-acrorgf92a-productioncb02-3650/media/ACR/Files/Clinical/Appropriateness-Criteria/ACR-Appropriateness-Criteria-Radiation-Dose-Assessment-Introduction.pdf.

Disclaimer

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.

[a]Mayo Clinic, Rochester, Minnesota. [b]Panel Chair, University of Michigan, Ann Arbor, Michigan. [c]Panel Vice-Chair, University of Wisconsin, Madison, Wisconsin. [d]George Washington University Hospital, Washington, District of Columbia; Commission on Nuclear Medicine and Molecular Imaging. [e]Georgetown University Hospital, Washington, District of Columbia. [f]Beth Israel Deaconess Medical Center, Boston, Massachusetts. [g]Cleveland Clinic, Cleveland, Ohio; American College of Obstetricians and Gynecologists. [h]University of California Riverside, Riverside, California; American College of Emergency Physicians. [i]Virginia Tech Carilion School of Medicine, Roanoke, Virginia; American College of Obstetricians and Gynecologists. [j]McMaster University, Hamilton, Ontario, Canada. [k]University of Wisconsin, Madison, Wisconsin. [l]Women's Ultrasound, LLC, Englewood, New Jersey; American College of Obstetricians and Gynecologists. [m]University of Michigan, Ann Arbor, Michigan. [n]Specialty Chair, University of Toronto and Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada.