

**Acute Pelvic Pain in the Reproductive Age Group**  
**EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. American Institute of Ultrasound in Medicine. Guidelines for Performance of the Ultrasound Examination of the Female Pelvis.: Clinical Practice Guidelines; 2006: Available from: <a href="http://www.aium.org/publications/clinical/pelvis.pdf">http://www.aium.org/publications/clinical/pelvis.pdf</a> .	15	N/A	Practice guideline for the performance of the US of the female pelvis. Purpose of guideline is to assist physicians performing sonographic studies of the female pelvis.	N/A	3
2. Cacciatore B. Can the status of tubal pregnancy be predicted with transvaginal sonography? A prospective comparison of sonographic, surgical, and serum hCG findings. <i>Radiology</i> 1990; 177(2):481-484.	9	120	Prospective comparison of sonographic, surgical, and serum hCG findings to determine if the status of tubal pregnancy can be predicted with transvaginal sonography.	Tubal pregnancy status can be predicted reliably on the basis of transvaginal sonographic findings.	2
3. Goldstein SR, Snyder JR, Watson C, Danon M. Very early pregnancy detection with endovaginal ultrasound. <i>Obstet Gynecol</i> 1988; 72(2):200-204	10	235	Prospective study to observe imaging of early pregnancy with US.	Imaging of normal pregnancies is possible when: <ul style="list-style-type: none"> <li>• Sac is greater than 0.4 cm;</li> <li>• hCG is greater than 1025 mIU/mL;</li> <li>• Uterus is normal with a homogeneous echo pattern.</li> </ul>	1
4. Nyberg DA, Mack LA, Laing FC, Jeffrey RB. Early pregnancy complications: endovaginal sonographic findings correlated with human chorionic gonadotropin levels. <i>Radiology</i> 1988; 167(3):619-622.	13	84	To correlate endovaginal sonographic findings with human chorionic gonadotropin levels in early pregnancy complications.	Intrauterine gestational sac should be visualized with endovaginal sonography when the hCG level exceeds 1,000 IU/L. Visualization of an extrauterine gestational sac and/or adnexal mass is likely in ectopic pregnancies when hCG level exceeds 1,000 IU/L.	3
5. Levine D. Ectopic Pregnancy. In: Callen PW, ed. <i>Ultrasonography in Obstetrics and Gynecology</i> . 5th ed. Philadelphia, PA: Saunders; 2008:1034.	15	N/A	Book chapter.	N/A	N/A
6. Patel MD, Feldstein VA, Filly RA. The likelihood ratio of sonographic findings for the diagnosis of hemorrhagic ovarian cysts. <i>J Ultrasound Med</i> 2005; 24(5):607-614; quiz 615.	13	252 masses	To quantify the likelihood ratio of sonographic findings for the diagnosis of a hemorrhagic ovarian cyst.	Fibrin strands and a retracting clot are important in the diagnosis of a hemorrhagic ovarian cyst. About 90% of cysts will exhibit at least one of these two features.	1
7. Timor-Tritsch IE, Lerner JP, Monteagudo A, Murphy KE, Heller DS. Transvaginal sonographic markers of tubal inflammatory disease. <i>Ultrasound Obstet Gynecol</i> 1998; 12(1):56-66.	13	77	To identify sonographic markers of inflammatory disease of the pelvis.	Tubo-ovarian complex and the tubo-ovarian abscess can be differentiated with TVS.	3

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8. Molander P, Sjoberg J, Paavonen J, Cacciatore B. Transvaginal power Doppler findings in laparoscopically proven acute pelvic inflammatory disease. <i>Ultrasound Obstet Gynecol</i> 2001; 17(3):233-238.	10	30 study group 20 reference group	<ul style="list-style-type: none"> <li>To assess the usefulness of Doppler transvaginal sonography (TVS) in diagnosing pelvic inflammatory disease (PID).</li> <li>To assess the diagnostic reliability of specific sonographic findings.</li> </ul>	Overall accuracy of Doppler TVS was 93%.	3
9. Shadinger LL, Andreotti RF, Kurian RL. Preoperative sonographic and clinical characteristics as predictors of ovarian torsion. <i>J Ultrasound Med</i> 2008; 27(1):7-13.	13	39	Retrospective review to determine sonographic and clinical characteristics of ovarian torsion.	Ovarian enlargement is the most commonly associated sonographic finding.	3
10. Doria AS, Moineddin R, Kellenberger CJ, et al. US or CT for Diagnosis of Appendicitis in Children and Adults? A Meta-Analysis. <i>Radiology</i> 2006; 241(1):83-94.	11	Children - 26 studies, 9,356 patients Adults - 31 studies, 4,341 patients	Comparative study to evaluate the diagnostic performance of US and CT for the diagnosis of appendicitis in pediatric and adult populations.	CT had higher sensitivity, however radiation associated with CT should be considered for children.	1
11. Williams R, Shaw J. Ultrasound scanning in the diagnosis of acute appendicitis in pregnancy. <i>Emerg Med J</i> 2007; 24(5):359-360.	12	N/A	Review to determine whether US has valuable clinical utility in pregnant women with suspected appendicitis.	A positive scan might be a useful indicator while a negative scan is not.	4
12. Sheafor DH, Hertzberg BS, Freed KS, et al. Nonenhanced helical CT and US in the emergency evaluation of patients with renal colic: prospective comparison. <i>Radiology</i> 2000; 217(3):792-797.	9	45	Prospective comparison of nonenhanced helical CT and US for the depiction of urolithiasis.	CT has a higher sensitivity for the detection of ureteral calculi compared with US. <ul style="list-style-type: none"> <li>US sensitivity = 61%.</li> <li>CT sensitivity = 96%.</li> <li>Statistically significant <math>p=0.02</math>.</li> </ul>	2
13. Ulsan S, Koc Z, Tokmak N. Accuracy of sonography for detecting renal stone: comparison with CT. <i>J Clin Ultrasound</i> 2007; 35(5):256-261.	10	50	To determine accuracy of sonography in the detection of renal stones using noncontrast CT as the gold standard.	Sonography is of limited value for detecting renal stones: Sensitivity 52%-57% for the right kidney and 32%-39% for the left kidney. Accuracy of sonography in detecting a stone in the right kidney was 67% and 77%, respectively; left kidney was 53% and 54%.	3
14. Laing FC, Benson CB, DiSalvo DN, Brown DL, Frates MC, Loughlin KR. Distal ureteral calculi: detection with vaginal US. <i>Radiology</i> 1994; 192(2):545-548.	10	13	To describe use of vaginal US to identify distal ureteral calculi and hydroureter.	Vaginal US should be considered for evaluation of distal ureteral calculi.	4
15. Lazarus E, Mayo-Smith WW, Mainiero MB, Spencer PK. CT in the evaluation of nontraumatic abdominal pain in pregnant women. <i>Radiology</i> 2007; 244(3):784-790.	9 and 10	78	To retrospectively determine accuracy of CT for the diagnosis of appendicitis and compare findings of CT and US.	CT findings established the diagnosis in 35% of examinations with a NPV of 99%; when CT followed negative US findings, CT findings established the diagnosis in 30% of patients.	2

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16. Raman SS, Lu DS, Kadell BM, Vodopich DJ, Sayre J, Cryer H. Accuracy of nonfocused helical CT for the diagnosis of acute appendicitis: a 5-year review. <i>AJR</i> 2002; 178(6):1319-1325.	10	650 552 with adequate follow-up for inclusion in analysis	To evaluate the accuracy of nonfocused helical CT for the diagnosis of acute appendicitis.	Nonfocused helical CT was highly accurate in diagnosing acute appendicitis; sensitivity 96.5%, specificity 98.0%.	1
17. Rao PM, Feltmate CM, Rhea JT, Schulick AH, Novelline RA. Helical computed tomography in differentiating appendicitis and acute gynecologic conditions. <i>Obstet Gynecol</i> 1999; 93(3):417-421.	10	100	Prospective study to determine the accuracy and effect of helical CT in women clinically suspected of having either appendicitis or an acute gynecologic condition.	Helical CT is excellent for differentiating appendicitis from most acute gynecologic conditions. <ul style="list-style-type: none"> <li>• 32 women had appendicitis, 15 had acute gynecologic conditions, 27 had other specific diagnoses, and 26 had nonspecific abdominal pain.</li> <li>• Appendicitis CT; sensitivity 100%, specificity 87%.</li> <li>• Other acute gynecologic conditions CT: sensitivity 87%, 100% specificity.</li> </ul>	2
18. Kaiser AM, Jiang JK, Lake JP, et al. The management of complicated diverticulitis and the role of computed tomography. <i>Am J Gastroenterol</i> 2005; 100(4):910-917.	10	511	Retrospective study to define the role of CT and analyze its impact on the management of acute diverticulitis.	CT evidence of a diverticular abscess correlates with high risk of failure from nonoperative management.	2
19. Kim BS, Hwang IK, Choi YW, et al. Low-dose and standard-dose unenhanced helical computed tomography for the assessment of acute renal colic: prospective comparative study. <i>Acta Radiol</i> 2005; 46(7):756-763.	9	121	Prospective study to compare the efficacy of low-dose and standard-dose CT for the diagnosis of ureteral stones.	Compared with standard scans using 260 mAs, low-dose CT using 50 mAs results in 81% decrease in radiation dose.	2
20. Poletti PA, Platon A, Rutschmann OT, Schmidlin FR, Iselin CE, Becker CD. Low-dose versus standard-dose CT protocol in patients with clinically suspected renal colic. <i>AJR</i> 2007; 188(4):927-933.	9	125	To compare a low-dose CT protocol with standard-dose unenhanced CT in patients with suspected renal colic.	Low-dose CT has sensitivities and specificities close to those of standard-dose CT. In patients with a BMI <30, low-dose CT achieved 96% sensitivity and 100% specificity for the detection of indirect signs of renal colic and a sensitivity of 95% and a specificity of 97% for detecting ureteral calculi. Low-dose CT was 86% sensitive for detecting ureteral calculi <3 mm and 100% sensitive for detecting calculi >3 mm.	2
21. Soulen MC, Fishman EK, Goldman SM, et al. Bacterial renal infection: role of CT. <i>Radiology</i> 1989; 171(3):703-707.	9	62	Retrospective review to determine role of CT in bacterial renal infection.	CT is more sensitive than US for the detection of acute renal inflammatory disease.	3

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22. Loud PA, Katz DS, Bruce DA, et al. Deep venous thrombosis with suspected pulmonary embolism: detection with combined CT venography and pulmonary angiography <i>Radiology</i> 2001; 219(2):498-502.	9	650 308 with US gold standard used in analysis	Study to determine the frequency and location of deep venous thrombosis (DVT) at CT venography after CT pulmonary angiography using US as gold standard.	Combined CT venography and pulmonary angiography can accurately depict the femoropopliteal deep veins. CT sensitivity 97% and specificity 100% for femoropopliteal thrombosis.	1
23. Sam JW, Jacobs JE, Birnbaum BA. Spectrum of CT findings in acute pyogenic pelvic inflammatory disease. <i>Radiographics</i> 2002; 22(6):1327-1334.	12	N/A	Review CT findings in acute pyogenic PID.	CT findings are important for timely diagnosis and treatment of PID.	4
24. Rha SE, Byun JY, Jung SE, et al. CT and MR imaging features of adnexal torsion. <i>Radiographics</i> 2002; 22(2):283-294.	13	N/A	Retrospective studies on diagnosis of adnexal torsion with CT and MR.	CT and MR are useful imaging tools.	3
25. Hiller N, Appelbaum L, Simanovsky N, Lev-Sagi A, Aharoni D, Sella T. CT features of adnexal torsion. <i>AJR</i> 2007; 189(1):124-129.	13	35	Retrospective review of CT scans to define the CT features associated with adnexal torsion and to correlate these features with the clinical, sonographic, surgical, and pathologic findings.	On CT, a well-defined adnexal mass abnormally located in the pelvis with ipsilateral deviation of the uterus in a woman or girl with lower abdominal pain should raise the suspicion of adnexal torsion. Inflammatory signs on CT suggest the presence of necrosis.	3
26. Hurwitz LM, Yoshizumi T, Reiman RE, et al. Radiation dose to the fetus from body MDCT during early gestation. <i>AJR</i> 2006; 186(3):871-876.	13	N/A	To determine radiation dose to the fetus at early gestation when MDCT scanners are used for clinical indications.	0 and 3 months respectively: renal stone protocol, 0.8-1.2 and 0.4-0.7 cGy; appendix protocol, 1.52-1.68 and 2-4 cGy; and pulmonary embolus protocol, 0.024-0.047 and 0.061-0.066 cGy.	2
27. McCollough CH, Schueler BA, Atwell TD, et al. Radiation exposure and pregnancy: when should we be concerned? <i>Radiographics</i> 2007; 27(4):909-917; discussion 917-908.	12	N/A	Review radiation exposure doses from diagnostic imaging exams in pregnancy.	Since fetal risks from diagnostic imaging exams are estimated to be minimal, radiologic and nuclear medicine examinations should not be withheld from pregnant women when clinically indicated.	4
28. Brenner DJ, Hall EJ. Computed tomography--an increasing source of radiation exposure. <i>N Engl J Med</i> 2007; 357(22):2277-2284.	12	N/A	Review the nature of CT, radiation doses delivered by CT exams, rates of CT exam use and its main clinical applications	Compared with radiography, CT involves higher doses of radiation. Rates of CT scanning have rapidly increased since inception and the population exposure to radiation from CT should be considered a potential public health hazard.	4
29. NRC (National Research Council). 2006. <i>Health Risks from Exposure to Low Levels of Ionizing Radiation. BEIR VII Phase 2.</i> : Washington, DC: National Academy Press.	12	N/A	Executive summary that comprehensively reviews the literature on radiation biology and develops risk estimates for cancer and other health effects from low levels of ionizing radiation.	The available biological and biophysical data support a "linear no threshold" (LNT) model that the risk of cancer proceeds in a linear fashion at lower doses without a threshold and that the smallest dose has the potential to cause a small increase risk in humans.	4

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30. Webb JA, Thomsen HS, Morcos SK. The use of iodinated and gadolinium contrast media during pregnancy and lactation. <i>Eur Radiol</i> 2005; 15(6):1234-1240.	15 (Guideline)	N/A	Review literature to create guideline on the use of iodinated and gadolinium-based contrast media in pregnant or lactating women. Limited information is available on this subject.	N/A	4
31. American College of Radiology. <i>Manual on Contrast Media</i> . Available at: <a href="http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual.aspx">http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual.aspx</a> .	15	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	3
32. Birchard KR, Brown MA, Hyslop WB, Firat Z, Semelka RC. MRI of acute abdominal and pelvic pain in pregnant patients. <i>AJR</i> 2005; 184(2):452-458.	10	29	Prospective studies to show the usefulness of MRI in the evaluation of pregnant women with acute abdominal or pelvic pain.	MRI is highly useful.	3
33. Oto A, Ernst RD, Shah R, et al. Right-lower-quadrant pain and suspected appendicitis in pregnant women: evaluation with MR imaging--initial experience. <i>Radiology</i> 2005; 234(2):445-451.	10	23	Retrospective review to determine if there is a role for MRI in evaluation of pregnant women with acute right-lower-quadrant pain in whom acute appendicitis is suspected.	MRI shows promise for evaluation by enabling diagnosis of other possible causes of right-lower-quadrant pain.	3
34. Pedrosa I, Levine D, Eyvazzadeh AD, Siewert B, Ngo L, Rofsky NM. MR imaging evaluation of acute appendicitis in pregnancy. <i>Radiology</i> 2006; 238(3):891-899.	10	51	To retrospectively assess the diagnostic performance of MRI in pregnant patients suspected of having acute appendicitis.	MRI is an excellent modality sensitivity, specificity, prevalence-adjusted positive and NPV, and accuracy for MRI was 100%, 93.6%, 1.4%, 100%, and 94.0%, respectively.	2
35. Roy C, Saussine C, LeBras Y, et al. Assessment of painful ureterohydronephrosis during pregnancy by MR urography. <i>Eur Radiol</i> 1996; 6(3):334-338.	10	17	To assess the RARE (rapid acquisition with relaxation enhancement) MR urography (or RMU) in pregnant women with painful ureterohydronephrosis.	Accuracy of RMU in the detection of urinary tract dilatation and the localization of the level of obstruction was excellent (sensitivity 100%).	3
36. Spencer JA, Chahal R, Kelly A, Taylor K, Eardley I, Lloyd SN. Evaluation of painful hydronephrosis in pregnancy: magnetic resonance urographic patterns in physiological dilatation versus calculous obstruction. <i>J Urol</i> 2004; 171(1):256-260.	13	24	To evaluate MRU appearances in hydronephrosis in pregnancy and compare urographic patterns in physiological and calculous disease.	MRU is a valuable and well tolerated investigation for evaluating painful hydronephrosis in pregnancy.	3
37. Catalano C, Pavone P, Laghi A, et al. Role of MR venography in the evaluation of deep venous thrombosis. <i>Acta Radiol</i> 1997; 38(5):907-912.	10	43	Comparative study to determine role of MR venography in the evaluation of DVT.	MR can provide highly accurate images and is useful in the pelvic region.	3

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38. Spritzer CE, Arata MA, Freed KS. Isolated pelvic deep venous thrombosis: relative frequency as detected with MR imaging. <i>Radiology</i> 2001; 219(2):521-525.	10	769 examinations 167 exams with DVT used in analysis	Retrospective review to determine the relative frequency of DVT as demonstrated with MRI.	20.4% DVT isolated to pelvic veins. Relative frequency detected with MR venography was higher than previously reported with US or venography.	2
39. Ueda H, Togashi K, Kataoka ML, et al. Adnexal masses caused by pelvic inflammatory disease: MR appearance. <i>Magn Reson Med Sci</i> 2002; 1(4):207-215.	13	15	Retrospective analysis of images to describe the morphologic and signal intensity characteristics of inflammatory adnexal masses in MRI.	Pathological process of inflammation is well reflected on MR findings. Inflammatory adnexal masses are associated with specific appearances in MRI.	3
40. Shellock FG, Crues JV. MR procedures: biologic effects, safety, and patient care. <i>Radiology</i> 2004; 232(3):635-652.	12	N/A	Review MR biologic effects, safety, and patient care.	To prevent accidents in the MR environment, it is necessary to revise information on biologic effects and safety according to changes that have occurred in MR technology and with regard to current guidelines for biomedical implants and devices.	4
41. De Wilde JP, Rivers AW, Price DL. A review of the current use of magnetic resonance imaging in pregnancy and safety implications for the fetus. <i>Prog Biophys Mol Biol</i> 2005; 87(2-3):335-353.	12	N/A	Review use of MRI in pregnancy and risks to the fetus. The hazards discussed are biological effects, miscarriage, heating effects and acoustic noise exposure.	Need for further research into effects of MRI. Need for further research into the effects of MRI in pregnancy.	4
42. Kanal E, Barkovich AJ, Bell C, et al. ACR guidance document for safe MR practices: 2007. <i>AJR</i> 2007; 188(6):1447-1474.	15	N/A	ACR guidance document for safe MR practices. Purpose of document is to guide MR facilities in the development of safe MR programs.	N/A	3
43. OMNISCAN® package insert: Nycomed Imaging A.S. Princeton, NJ.	N/A	N/A	Package insert.	N/A	4

## Evidence Table Key

### Study Type Key

*Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.*

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
  - a. Cohort
  - b. Cross-sectional
  - c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews
8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

### Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.