

**Acute Pyelonephritis
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. Foxman B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. <i>Am J Med</i> 2002; 113 Suppl 1A:5S-13S.	15	N/A	Review incidence, morbidity, and economic costs of urinary tract infection (UTI).	UTIs are considered the most common bacterial infection, but it is difficult to accurately assess the incidence of UTIs. Catheter-associated UTI is the most common nosocomial infection. The risk of UTI increases with increasing duration of catheterization. The estimated annual cost of community-acquired UTI is significant (approximately \$1.6 billion).	3
2. June CH, Browning MD, Smith LP, et al. Ultrasonography and computed tomography in severe urinary tract infection. <i>Arch Intern Med</i> 1985; 145(5):841-845.	9	35	Prospective study of utility of CT and US in treatment of UTI.	<ol style="list-style-type: none"> 1. Renal CT is a sensitive test for acute upper UTI. 2. US detects focal bacterial nephritis and abscesses but is insensitive to uncomplicated upper UTI. 3. Painless pyelonephritis may be more common in patients with diabetes mellitus. 	3
3. Davidson AJ, Talner LB. Urographic and angiographic abnormalities in adult-onset acute bacterial nephritis. <i>Radiology</i> 1973; 106(2):249-256.	14	5	Description of urographic and angiographic findings in acute focal bacterial nephritis (AFBN).	Three patients treated with antibiotics improved and subsequent urograms revealed prompt excretion of the contrast material. Two patients had nephrectomy.	4
4. Talner LB, Davidson AJ, Lebowitz RL, Dalla Palma L, Goldman SM. Acute pyelonephritis: can we agree on terminology? <i>Radiology</i> 1994; 192(2):297-305.	12	N/A	Clarify terminology and review pathophysiology consensus of Society of Uroradiology.	No results.	4
5. Kawashima A, LeRoy AJ. Radiologic evaluation of patients with renal infections. <i>Infect Dis Clin North Am</i> 2003; 17(2):433-456.	12	N/A	Review current status of imaging in acute renal infection.	CT is most useful. CT urography is increasing performed. MRI and power Doppler are competing with radionuclide studies.	4
6. Kanel KT, Kroboth FJ, Schwentker FN, Lecky JW. The intravenous pyelogram in acute pyelonephritis. <i>Arch Intern Med</i> 1988; 148(10):2144-2148.	10	67	To identify clinical clues that might increase specificity of the intravenous pyelogram in acute pyelonephritis.	8% had abnormality which influenced management. Yield up to 36% if fever not resolved in 72 hours.	3
7. Soulen MC, Fishman EK, Goldman SM, Gatewood OM. Bacterial renal infection: role of CT. <i>Radiology</i> 1989; 171(3):703-707.	13	62	Retrospective review of imaging studies of patients hospitalized for acute renal infections	Abnormality more likely when fever >72 hours. CT better than US for diagnosis both abscess and pyelonephritis.	3
8. Benson M, Li Puma JP, Resnick MI. The role of imaging studies in urinary tract infection. <i>Urol Clin North Am</i> 1986; 13(4):605-625.	12	N/A	Review role of imaging in UTI.	No results.	4

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9. Bova JG, Potter JL, Arevalos E, Hopens T, Goldstein HM, Radwin HM. Renal and perirenal infection: the role of computerized tomography. <i>J Urol</i> 1985; 133(3):375-378.	10	24	Retrospective study to determine CT contribution to diagnosis of renal inflammatory disease.	CT differentiates those requiring surgery from those managed medically.	3
10. Dalla-Palma L, Pozzi-Mucelli F, Pozzi-Mucelli RS. Delayed CT findings in acute renal infection. <i>Clin Radiol</i> 1995; 50(6):364-370.	13	12	Report on delayed CT findings in acute renal infection.	Delayed CT appears to be useful because it improves diagnostic confidence and gives a more exact evaluation of the extent of infection.	4
11. Kawashima A, Sandler CM, Ernst RD, Goldman SM, Raval B, Fishman EK. Renal inflammatory disease: the current role of CT. <i>Crit Rev Diagn Imaging</i> 1997; 38(5):369-415.	12	N/A	Review of the value of CT in renal inflammatory disease.	No results.	4
12. Kawashima A, Sandler CM, Goldman SM. Imaging in acute renal infection. <i>BJU Int</i> 2000; 86 Suppl 1:70-79.	12	N/A	Review of the value of CT in renal inflammatory disease.	No results.	4
13. Kawashima A, Sandler CM, Goldman SM, Raval BK, Fishman EK. CT of renal inflammatory disease. <i>Radiographics</i> 1997; 17(4):851-866; discussion 867-858.	12	N/A	Review of the value of CT in renal inflammatory disease.	No results.	4
14. Wan YL, Lee TY, Bullard MJ, Tsai CC. Acute gas-producing bacterial renal infection: correlation between imaging findings and clinical outcome. <i>Radiology</i> 1996; 198(2):433-438.	13	38	Retrospective study to correlate imaging findings of types I and II emphysematous pyelonephritis (EPN) with clinical course and prognosis.	Two distinct types of EPN can be seen radiologically, and the differentiation is important due to the prognostic difference.	3
15. Zaontz MR, Pahira JJ, Wolfman M, Gargurevich AJ, Zeman RK. Acute focal bacterial nephritis: a systematic approach to diagnosis and treatment. <i>J Urol</i> 1985; 133(5):752-757.	14	9	Description of AFBN on IVP, CT, and US.	Systematic approach to the diagnosis and management of AFBN allows for the most effective use of the noninvasive imaging modalities.	4
16. Piccirillo M, Rigsby CM, Rosenfield AT. Sonography of renal inflammatory disease. <i>Urol Radiol</i> 1987; 9(2):66-78.	12	N/A	Review of US findings in renal inflammatory disease.	No results.	4
17. Kim B, Lim HK, Choi MH, et al. Detection of parenchymal abnormalities in acute pyelonephritis by pulse inversion harmonic imaging with or without microbubble ultrasonographic contrast agent: correlation with computed tomography. <i>J Ultrasound Med</i> 2001; 20(1):5-14.	9	40	Comparison of pulse inversion harmonic imaging (PIHI) with or without contrast agent with US and tissue harmonic imaging to evaluate the ability of PIHI with or without microbubble US contrast agent in depicting renal parenchymal changes in acute pyelonephritis.	Tissue harmonic imaging and PIHI is significantly better than conventional US.	3

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18. Kass EJ, Fink-Bennett D, Cacciarelli AA, Balon H, Pavlock S. The sensitivity of renal scintigraphy and sonography in detecting nonobstructive acute pyelonephritis. <i>J Urol</i> 1992; 148(2 Pt 2):606-608.	9	46	Compare cortical scintigraphy with renal sonography to determine which modality is best to detect patients at risk for renal injury.	Cortical scintigraphy is the preferred imaging technique.	3
19. Bykov S, Chervinsky L, Smolkin V, Halevi R, Garty I. Power Doppler sonography versus Tc-99m DMSA scintigraphy for diagnosing acute pyelonephritis in children: are these two methods comparable? <i>Clin Nucl Med</i> 2003; 28(3):198-203.	9	40 (78 kidneys)	Prospective study to compare power Doppler US to radionuclide scans. To assess the role of renal power Doppler US to identify acute pyelonephritis and to determine whether power Doppler US can replace Tc-99m DMSA renal scintigraphy in the diagnosis of acute pyelonephritis in children.	Power Doppler US: sensitivity 74%, specificity 94%. For power Doppler US, however, there were many false negatives. Therefore, power Doppler is most useful when it is positive but less useful when negative.	3
20. Halevy R, Smolkin V, Bykov S, Chervinsky L, Sakran W, Koren A. Power Doppler ultrasonography in the diagnosis of acute childhood pyelonephritis. <i>Pediatr Nephrol</i> 2004; 19(9):987-991.	9	62	Comparative study to determine if power Doppler US is as sensitive as radionuclide scans in detecting childhood pyelonephritis.	Power Doppler US had sensitivity of 87% and specificity of 92.3%. It does not require radiation; therefore, it may be a practical tool for the diagnosis of acute pyelonephritis in children.	3
21. Sattari A, Kampouridis S, Damry N, et al. CT and 99mTc-DMSA scintigraphy in adult acute pyelonephritis: a comparative study. <i>J Comput Assist Tomogr</i> 2000; 24(4):600-604.	9	36	Prospective study to evaluate the relative value of CT and Tc-99m-DMSA scintigraphy in the diagnosis of acute pyelonephritis in adult patients suspected of having UTI.	CT more accurate.	3
22. Kovanlikaya A, Okkay N, Cakmakci H, Ozdogan O, Degirmenci B, Kavukcu S. Comparison of MRI and renal cortical scintigraphy findings in childhood acute pyelonephritis: preliminary experience. <i>Eur J Radiol</i> 2004; 49(1):76-80.	9	20	Compare MRI and radionuclide scanning in acute pyelonephritis and to determine pyelonephritic foci in the acute phase.	Sensitivity and specificity of MRI was 91% and 89% respectively, which is not statistically different than radionuclide scanning. Post-gadolinium MRI show significant correlation with RCS in the determination of renal pathology. Also, the ability of discriminating acute pyelonephritic foci and renal scar in early stages of disease is the superiority of MRI.	3
23. American College of Radiology. <i>Manual on Contrast Media</i> . Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual.aspx .	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

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.