

**Chronic Elbow Pain  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. Singson RD, Feldman F, Rosenberg ZS. Elbow joint: assessment with double-contrast CT arthrography. <i>Radiology</i> 1986; 160(1):167-173.	14	N/A	Case reports of CT arthrography findings in patients with intra-articular bodies, hyperplastic synovium, fracture fragments and osteophytes.	Examples of positive CT arthrography in various diseases.	3
2. Ho CP. Sports and occupational injuries of the elbow: MR imaging findings. <i>AJR</i> 1995; 164(6):1465-1471.	13	N/A	Essay illustrating MRI findings in chronic overuse and acute traumatic soft-tissue injuries of ligaments, tendons, muscles, and neurovascular structures as well as osteochondral injuries.	Supports use of MRI of soft tissue structures and occult osseous injuries of the elbow joint.	3
3. Quinn SF, Haberman JJ, Fitzgerald SW, Traugher PD, Belkin RI, Murray WT. Evaluation of loose bodies in the elbow with MR imaging. <i>J Magn Reson Imaging</i> 1994; 4(2):169-172.	9	20	Review of 20 patients with clinical suspicion of intra-articular body(s) that had both MRI of the elbow and subsequent arthroscopic surgery. MRI was compared with arthroscopic findings.	Sensitivity for showing loose bodies with MRI was 100%, and the specificity was 67%. MRI was positive in 16 cases; only 14 were found to have loose body at surgery. MRI and arthroscopy were negative for loose body in four cases.	2
4. Sonin AH, Tutton SM, Fitzgerald SW, Peduto AJ. MR imaging of the adult elbow. <i>Radiographics</i> 1996; 16(6):1323-1336.	13	N/A	Review MRI elbow anatomy and illustrates the range of commonly encountered elbow abnormalities including: disruption/tear of ligaments/tendons, osteochondral injury and intra-articular bodies, and synovial-based processes.	Illustrated the utility of MRI in a variety of disorders.	3
5. Fritz RC, Steinbach LS. Magnetic resonance imaging of the musculoskeletal system: Part 3. The elbow. <i>Clin Orthop Relat Res</i> 1996; (324):321-339.	12	N/A	Review article concerning the utility of MRI for assessing the elbow joint.	MRI is most useful in patients who have failed to respond to conservative therapy and additional diagnoses and/or surgery is considered.	4
6. Ouellette H, Kassarian A, Tetreault P, Palmer W. Imaging of the overhead throwing athlete. <i>Semin Musculoskelet Radiol</i> 2005; 9(4):316-333.	12	N/A	Review overhead throwing biomechanics as they relate to diagnostic imaging of throwing athletes.	The elbow is typically injured secondary to excessive valgus forces during throwing. The ulnar collateral ligament (UCL), ulnar nerve, and common flexor tendon origin are all at increased risk of injury. Capitellar osteochondral injuries and loose intra-articular bodies are also frequent.	4
7. Grainger AJ, Elliott JM, Campbell RS, Tirman PF, Steinbach LS, Genant HK. Direct MR arthrography: a review of current use. <i>Clin Radiol</i> 2000; 55(3):163-176.	12	N/A	Review use of MR arthrography throughout the body, including the elbow.	MR arthrography is useful for demonstrating loose osteochondral fragments, loose bodies, and collateral ligament tears.	3
8. Steinbach LS, Palmer WE, Schweitzer ME. Special focus session. MR arthrography. <i>Radiographics</i> 2002; 22(5):1223-1246.	12	N/A	Direct MR arthrography with injection of saline solution or diluted gadolinium can be useful for evaluating certain pathologic conditions in the joints.	MR arthrography is useful for demonstrating ligamentous abnormality and bodies in the elbow joint.	3

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9. Harada M, Takahara M, Sasaki J, Mura N, Ito T, Ogino T. Using sonography for the early detection of elbow injuries among young baseball players. <i>AJR</i> 2006; 187(6):1436-1441.	9	153	A prospective study to determine the usefulness of sonography for detecting elbow injuries among young baseball players.	Sonography showed that 33 subjects had medial epicondylar fragmentation and two had early-stage osteochondritis dissecans of the capitellum. In 25 subjects who agreed to further examination and treatment, radiography confirmed the sonographic findings. Sonography can provide an opportunity to detect and treat elbow injuries before they become more advanced.	3
10. Anderson MW. Imaging of upper extremity stress fractures in the athlete. <i>Clin Sports Med</i> 2006; 25(3):489-504, vii.	12	N/A	Review imaging of upper extremity stress fractures in the athlete.	If initial radiographs are unrevealing, further cross-sectional imaging should be strongly considered. MRI has become the study of choice at most centers.	4
11. Ebrahim FS, Jacobson JA, Lin J, Housner JA, Hayes CW, Resnick D. Intraarticular osteoid osteoma: sonographic findings in three patients with radiographic, CT, and MR imaging correlation. <i>AJR</i> 2001; 177(6):1391-1395.	14	3	Describe the sonographic features of intraarticular osteoid osteoma in patients with radiographic, CT, and MRI correlation.	The sonographic findings of painful cortical irregularity and focal synovitis should raise the possibility of intraarticular osteoid osteoma, prompting the search for characteristic findings on correlative imaging studies.	4
12. Kijowski R, De Smet AA. Magnetic resonance imaging findings in patients with medial epicondylitis. <i>Skeletal Radiol</i> 2005; 34(4):196-202.	13	13 patients 26 controls	A retrospective comparison of the MRI findings of patients with clinically diagnosed medial epicondylitis with the MRI findings of patients of similar age with no clinical evidence of medial epicondylitis.	MRI findings of patients with clinically diagnosed medial epicondylitis included thickening and increased T1 and T2 signal intensity of the common flexor tendon and soft tissue edema around the common flexor tendon. The presence of intermediate to high T2 signal intensity or high T2 signal intensity within the common flexor tendon and the presence of paratendinous soft tissue edema were the most specific findings of medial epicondylitis on MRI.	3
13. Beltran J, Rosenberg ZS. Diagnosis of compressive and entrapment neuropathies of the upper extremity: value of MR imaging. <i>AJR</i> 1994; 163(3):525-531.	12	N/A	Review article on MRI in the evaluation of suspected compressive and entrapment neuropathies about the elbow joint.	Compressive and entrapment neuropathies of the upper extremity can produce a group of clinical syndromes, many of which have features that can be shown with MRI.	3
14. Bredella MA, Tirman PF, Fritz RC, Feller JF, Wischer TK, Genant HK. MR imaging findings of lateral ulnar collateral ligament abnormalities in patients with lateral epicondylitis. <i>AJR</i> 1999; 173(5):1379-1382.	10	35	Use of MRI to determine whether a relationship exists between lateral epicondylitis and abnormalities of the UCL.	Abnormalities of the lateral UCL were seen more often as the degree of lateral epicondylitis became more severe. In the nine patients with severe lateral epicondylitis, all patients had thickening of the lateral UCL and eight had partial/complete tears of that structure. There was surgical correlation in 11 patients.	3

\* See Last Page for Key

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15. Chung CB, Chew FS, Steinbach L. MR imaging of tendon abnormalities of the elbow. <i>Magn Reson Imaging Clin N Am</i> 2004; 12(2):233-245, vi.	12	N/A	Review article on MRI of tendon abnormalities of the elbow.	A detailed understanding of common pathology and patterns of injury can facilitate the ease and accuracy of imaging diagnosis of tendon pathology.	4
16. Coel M, Yamada CY, Ko J. MR imaging of patients with lateral epicondylitis of the elbow (tennis elbow): importance of increased signal of the anconeus muscle. <i>AJR</i> 1993; 161(5):1019-1021.	14	7	Evaluate MRI findings in patients with chronic lateral epicondylitis.	MRI showed increased signal in the anconeus muscle in all seven patients.	4
17. Fritz RC, Steinbach LS, Tirman PF, Martinez S. MR imaging of the elbow. An update. <i>Radiol Clin North Am</i> 1997; 35(1):117-144.	12	N/A	Review article covering the uses of MRI for evaluation of elbow pathology.	MRI is useful for demonstrating tendon, ligament and osseous pathology in the elbow. MRI is most useful in patients who have failed to respond to conservative therapy and additional diagnoses and/or surgery is considered.	4
18. Gaary EA, Potter HG, Altchek DW. Medial elbow pain in the throwing athlete: MR imaging evaluation. <i>AJR</i> 1997; 168(3):795-800.	13	N/A	Pictorial essay illustrating use of MRI for evaluation of partial and complete tears of the UCL.	Examples of MRI findings in UCL injuries as well as other entities such as epicondylitis and osteophyte impingement.	3
19. Ho CP. MR imaging of tendon injuries in the elbow. <i>Magn Reson Imaging Clin N Am</i> 1997; 5(3):529-543.	12	N/A	Review article covering use of MRI for epicondylitis, biceps and triceps tendon injuries.	MRI is useful for differentiating and assessing the various tendon injuries and for guiding further management.	4
20. Mirowitz SA, London SL. Ulnar collateral ligament injury in baseball pitchers: MR imaging evaluation. <i>Radiology</i> 1992; 185(2):573-576.	13	11	MRI study of baseball pitchers with clinical diagnosis of chronic repetitive injury to the UCL.	MRI useful to document presence and severity of injury of the UCL and in distinguishing this entity from other causes of pain.	3
21. Murphy BJ. MR imaging of the elbow. <i>Radiology</i> 1992; 184(2):525-529.	9	27	Correlation of MRI findings with surgical findings in common elbow injuries. A total of 27 patients with elbow pain and five normal volunteers were imaged; surgical correlation was obtained in 11 patients.	Suggest usefulness of MRI for surgical planning.	3
22. Nakanishi K, Masatomi T, Ochi T, et al. MR arthrography of elbow: evaluation of the ulnar collateral ligament of elbow. <i>Skeletal Radiol</i> 1996; 25(7):629-634.	9	10 elbows	Evaluate UCL injury by MRI and MR arthrography (saline).	MRI of UCL injury abnormal but not specific. Unable to distinguish rupture from degeneration. MR arthrography added information in a small number of cases.	3
23. Patten RM. Overuse syndromes and injuries involving the elbow: MR imaging findings. <i>AJR</i> 1995; 164(5):1205-1211.	12	N/A	Review article concerning use of MRI for evaluation of chronic elbow injury.	Illustration of characteristic MRI findings in common traumatic and overuse syndromes.	4

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24. Potter HG, Hannafin JA, Morwessel RM, DiCarlo EF, O'Brien SJ, Altchek DW. Lateral epicondylitis: correlation of MR imaging, surgical, and histopathologic findings. <i>Radiology</i> 1995; 196(1):43-46.	10	33	To determine the utility of MRI for clinical management of patients with chronic lateral epicondylitis; correlation with surgical and pathology findings.	Good agreement between MRI and surgery in the definition of tendon degeneration and degree of tear.	2
25. Potter HG, Weiland AJ, Schatz JA, Paletta GA, Hotchkiss RN. Posterolateral rotatory instability of the elbow: usefulness of MR imaging in diagnosis. <i>Radiology</i> 1997; 204(1):185-189.	10	9 controls 9 patients	To evaluate the efficacy of MRI in the assessment of the normal and abnormal ulnar band of the lateral collateral ligament for diagnosis of posterolateral rotatory instability.	MRI is an effective tool in the preoperative diagnosis of posterolateral rotatory instability. This includes assessment of the ulnar band of the lateral collateral ligament.	2
26. Rosenberg ZS, Beltran J, Cheung YY, Ro SY, Green SM, Lenzo SR. The elbow: MR features of nerve disorders. <i>Radiology</i> 1993; 188(1):235-240.	13	15	Retrospective review of MRI in 15 patients with MRI evidence of nerve disorder.	Suggest role for MRI in the detection of nerve disorders of the elbow. Unable to determine sensitivity or specificity due to study design.	3
27. Schwartz ML, al-Zahrani S, Morwessel RM, Andrews JR. Ulnar collateral ligament injury in the throwing athlete: evaluation with saline-enhanced MR arthrography. <i>Radiology</i> 1995; 197(1):297-299.	9	40	Compare MRI findings with surgical findings to determine whether MR arthrography of the elbow can demonstrate precisely an UCL abnormality in the throwing athlete.	18 (95%) of 19 complete UCL tears and 6 (86%) of 7 partial UCL tears were diagnosed with MR arthrography. Two false-negative findings and no false-positive findings were obtained. MR arthrography useful for detection of incomplete ligament tears.	2
28. Kijowski R, Tuite M, Sanford M. Magnetic resonance imaging of the elbow. Part II: Abnormalities of the ligaments, tendons, and nerves. <i>Skeletal Radiol</i> 2005; 34(1):1-18.	12	N/A	Part II of this comprehensive review on MRI of the elbow discusses the role of MRI in evaluating patients with abnormalities of the ligaments, tendons, and nerves of the elbow.	MRI is useful for detecting tears in the UCL and the lateral collateral ligament, for determining the extent of tendon pathology, for detecting tears of the biceps and triceps and evaluating nerve disorders of the elbow.	4
29. Martinoli C, Bianchi S, Giovagnorio F, Pugliese F. Ultrasound of the elbow. <i>Skeletal Radiol</i> 2001; 30(11):605-614.	12	N/A	To review US evaluation of soft tissues of the elbow.	US identifies ulnar nerve abnormalities and extrinsic lesions. Occult fractures, osteophytes and intra-articular loose bodies can also be imaged. US is able to assess the presence of capsular and synovial processes and to differentiate them from soft tissue tumors in para-articular swelling.	4
30. Martinoli C, Bianchi S, Zamorani MP, Zunzunegui JL, Derchi LE. Ultrasound of the elbow. <i>Eur J Ultrasound</i> 2001; 14(1):21-27.	12	N/A	To describe use of US in the evaluation of the elbow.	US is useful for evaluation of abnormalities affecting tendons, muscles, ligaments and bursae around the elbow joint as well as to delineate the nature of soft-tissue swelling, such as a space-occupying lesion or synovial enlargement. Occult fractures, osteophytes and intraarticular loose bodies can be depicted with this technique.	4

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31. Miller TT, Adler RS. Sonography of tears of the distal biceps tendon. <i>AJR</i> 2000; 175(4):1081-1086.	14	7	To describe the US appearance of tears of the distal biceps brachii tendon.	US can reveal complete and partial tears of the distal biceps tendon, providing an alternative technique to MRI. An advantage of US is the ability to optimize the imaging plane to best display tendon abnormality. Patient's other elbow can be used as a normal control. Limitation of US is dependence on skill and experience of the operator.	4
32. Miller TT, Adler RS, Friedman L. Sonography of injury of the ulnar collateral ligament of the elbow-initial experience. <i>Skeletal Radiol</i> 2004; 33(7):386-391.	14	8	To describe the US appearance of injuries of the UCL of the elbow.	Tears of the UCL are manifested sonographically as non-visualization of the ligament or alteration of the normal morphology.	4
33. Miller TT, Shapiro MA, Schultz E, Kalish PE. Comparison of sonography and MRI for diagnosing epicondylitis. <i>J Clin Ultrasound</i> 2002; 30(4):193-202.	9	11	Prospective study to compare the sensitivity and specificity of US with those of MRI in evaluating epicondylitis.	Sensitivity for detecting epicondylitis ranged from 64% to 82% for US and from 90% to 100% for MRI. Specificity ranged from 67% to 100% for US and from 83% to 100% for MRI. Used as an initial imaging tool, US might be adequate for diagnosing this condition in many patients.	2
34. Sofka CM, Adler RS. Sonography of cubital bursitis. <i>AJR</i> 2004; 183(1):51-53.	14	3	To describe the US appearance of cubital bursitis and to illustrate the use of US guidance for therapeutic injections.	Cubital bursitis can be diagnosed with US. Power Doppler imaging can aid in providing information about active inflammation. Two patients were treated using US guided decompression of the bursa and steroid injection with good clinical results.	4
35. Mulligan SA, Schwartz ML, Broussard MF, Andrews JR. Heterotopic calcification and tears of the ulnar collateral ligament: radiographic and MR imaging findings. <i>AJR</i> 2000; 175(4):1099-1102.	9	42	Compare radiographic and MRI findings to describe the radiographic and MRI appearance of heterotopic calcification in the UCL.	Of the 34 patients who underwent surgery, 26 patients (76%) had either partial or complete tears of the UCL. Heterotopic calcification in the UCL may be associated with partial or complete tears. The MRI detection of heterotopic calcification is less sensitive than that of radiography of the elbow.	3
36. Glajchen N, Schwartz ML, Andrews JR, Gladstone J. Avulsion fracture of the sublime tubercle of the ulna: a newly recognized injury in the throwing athlete. <i>AJR</i> 1998; 170(3):627-628.	14	3	Original report describing avulsion fracture of the sublime tubercle in three patients.	Avulsion fracture of the sublime tubercle is a less common cause of medial elbow pain in throwing athletes and is produced by valgus stress. This problem is best evaluated with a combination of plain radiographs and coronal MR images. Two of the three patients had surgical confirmation.	4

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37. Steinbach LS, Schwartz M. Elbow arthrography. <i>Radiol Clin North Am</i> 1998; 36(4):635-649.	12	N/A	Focuses on technique and capabilities of conventional, CT and MR arthrography.	MR arthrography is useful for demonstrating loose osteochondral fragments, loose bodies, and collateral ligament tears. CT arthrography with air is recommended for loose bodies.	4
38. Skaf AY, Boutin RD, Dantas RW, et al. Bicipitoradial bursitis: MR imaging findings in eight patients and anatomic data from contrast material opacification of bursae followed by routine radiography and MR imaging in cadavers. <i>Radiology</i> 1999; 212(1):111-116.	9	8	Comparative study. Use of radiography and MRI after contrast material opacification of the bursae to demonstrate the anatomy of the bicipitoradial bursa and to report findings in patients with bicipitoradial bursitis.	The anatomy of the bicipitoradial bursa is demonstrated by radiography and MRI. MRI allows accurate diagnosis of bicipitoradial bursitis and its effects on adjacent structures.	3
39. Sofka CM, Potter HG. Imaging of elbow injuries in the child and adult athlete. <i>Radiol Clin North Am</i> 2002; 40(2):251-265.	14	3	Describe the US appearance of cubital bursitis.	Cubital bursitis can be evaluated with US. Power Doppler imaging can aid in providing information about active inflammation.	4
40. Bordalo-Rodrigues M, Rosenberg ZS. MR imaging of entrapment neuropathies at the elbow. <i>Magn Reson Imaging Clin N Am</i> 2004; 12(2):247-263, vi.	12	N/A	Review normal anatomy, clinical features, and MRI assessment of nerve entrapment syndromes at the elbow.	Specific MRI signs in association with clinical findings can supply an accurate diagnosis.	4
41. Vucic S, Cordato DJ, Yiannikas C, Schwartz RS, Shnier RC. Utility of magnetic resonance imaging in diagnosing ulnar neuropathy at the elbow. <i>Clin Neurophysiol</i> 2006; 117(3):590-595.	9	52	A retrospective, nonblinded study by a single observer to: 1. Assess the sensitivity of MRI in diagnosing ulnar neuropathy at the elbow (UNE), especially in cases where neurophysiologic studies were non-localizing; 2. Determine the spectrum of MRI abnormalities in patients presenting with symptoms and signs of UNE; 3. Assess whether MRI findings differ between grades of UNE severity; and 4. To see if MRI findings give an input into the pathological mechanisms of UNE.	The sensitivity of MRI at diagnosing UNE was higher than conventional nerve conduction studies, 90% vs 65%, respectively. In addition, the MRI studies were highly sensitive in patients with non-localizing UNE.	3
42. Beekman R, Van Der Plas JP, Uitdehaag BM, Schellens RL, Visser LH. Clinical, electrodiagnostic, and sonographic studies in ulnar neuropathy at the elbow. <i>Muscle Nerve</i> 2004; 30(2):202-208.	13	102	A prospective study of patients having either purely sensory signs (35%) or sensorimotor signs (65%) of UNE to determine possible correlations between the clinical characteristics, electrophysiological features, and sonographic ulnar-nerve diameter.	Although UNE is clinically heterogeneous, the electrophysiological and sonographic findings are fairly consistent despite the clinical manifestations.	2

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43. Spinner RJ, Goldner RD, Fada RA, Sotereanos DG. Snapping of the triceps tendon over the lateral epicondyle. <i>J Hand Surg [Am]</i> 1999; 24(2):381-385.	14	1	Description of the use of MRI to demonstrate snapping of the triceps over the lateral epicondyle.	Case report of a 65-year-old woman who presented with lateral elbow pain and snapping exacerbated by elbow flexion. The snapping lateral head of the triceps was shown as the etiology on flexion MRI. A differential diagnosis of the disorder is included.	4
44. Spinner RJ, Hayden FR, Jr., Hipps CT, Goldner RD. Imaging the snapping triceps. <i>AJR</i> 1996; 167(6):1550-1551.	13	6 symptomatic and 1 asymptomatic 12 volunteers	Description of use of MRI to aid in delineating the etiology of the snapping elbow and assess the relationships of the medial triceps, ulnar nerve, and medial epicondyle in elbow flexion.	MRI can reveal the anatomic structures that cause two snaps with elbow flexion. When clinically indicated, MRI with the elbow fully flexed should supplement standard elbow MRI.	3
45. Park GY, Kim JM, Lee SM. The ultrasonographic and electrodiagnostic findings of ulnar neuropathy at the elbow. <i>Arch Phys Med Rehabil</i> 2004; 85(6):1000-1005.	9	13	Prospective study to evaluate and compare the morphologic changes of the UNE, using US, between patients with cubital tunnel syndrome and retrocondylar compression syndrome determined with electrodiagnosis.	US detected the morphologic changes and the extent of the UNE.	2
46. Jacobson JA, Jebson PJ, Jeffers AW, Fessell DP, Hayes CW. Ulnar nerve dislocation and snapping triceps syndrome: diagnosis with dynamic sonography--report of three cases. <i>Radiology</i> 2001; 220(3):601-605.	14	3	Review cases of patients who underwent US evaluation of the elbow and subsequent open elbow surgery for symptomatic ulnar nerve dislocation.	Dynamic US of the elbow was used to aid in the accurate diagnosis of and differentiation between ulnar nerve dislocation and snapping of the medial triceps muscle.	4
47. Jbara M, Patnana M, Kazmi F, Beltran J. MR imaging: Arthropathies and infectious conditions of the elbow, wrist, and hand. <i>Radiol Clin North Am</i> 2006; 44(4):625-642, ix.	13	N/A	Reviews seropositive and seronegative inflammatory arthropathies, with emphasis on early detection and surveillance, as well as gout, synovial osteochondromatosis, pigmented villonodular synovitis, tenosynovitis, and de Quervain's tenosynovitis.	Because of overlapping clinical signs and symptoms, MRI plays an important role in delineating the features and staging for a variety of arthropathies and infectious conditions of the elbow, wrist, and hand.	3
48. Lerch K, Borisch N, Paetzel C, Grifka J, Hartung W. Proposal for a sonographic classification of target joints in rheumatoid arthritis. <i>Rheumatol Int</i> 2005; 25(3):215-219.	10	425 patients 1,211 joints	To classify sonographically the joint damage of target joints in patients with rheumatoid arthritis (RA) during a long-term cross-sectional study.	In reference to the elbow joint, overall percentages for intra- and interobserver reliability of US were 90.8% and 88.8%, respectively. US is a valuable tool for assessing and classifying joint alteration in RA. Particularly in early stages of joint affection, US is superior to x-ray in detecting soft tissue changes and minor erosions.	2
49. 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

## 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.