

SUPPLEMENTARY MATERIAL

S1. Research questions (RQ)

Making a diagnosis of spondyloarthritis

RQ1- What is the diagnostic value of individual imaging modalities above clinical examination/criteria for axial SpA?

RQ2- What is the diagnostic value of individual imaging modalities above clinical examination/criteria for peripheral SpA (including peripheral psoriatic arthritis)?

Monitoring disease activity and structural damage in spondyloarthritis

RQ3- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor disease activity in axial SpA?

RQ4- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor structural changes in axial SpA?

RQ5- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor disease activity in peripheral SpA(including peripheral psoriatic arthritis)?

RQ6- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor structural changes in peripheral SpA(including peripheral psoriatic arthritis)?

Predicting outcome (severity) and treatment response

RQ7- What is the ability, and added value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict outcome (severity) in axial SpA?

RQ8- What is the ability and value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict treatment response in axial SpA?

RQ9- What is the ability, and added value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict outcome (severity) in peripheral SpA?

RQ10- What is the diagnostic value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict treatment response in peripheral SpA?

Making a diagnosis of spinal fracture or osteoporosis in spondyloarthritis

RQ11- What is the diagnostic value of individual imaging modalities above other imaging modalities for spinal fractures in SpA?

RQ12- What is the ability of individual imaging modalities to diagnose and monitor osteoporosis in SpA?

S2. Details of search strategy performed using MEDLINE via Pubmed (1948 to January 2013) and EMBASE via Ovid (1980 to January 2013).

RQ1-10

Search strategy, MEDLINE via Pubmed

1. "spondylarthropathies"[MeSH Terms]
2. spondylart*[Text Word]
3. (Reactiv*[TI] AND Arthriti*[TI])
4. (Psoria*[TI] AND Arthriti*[TI])
5. (ankyl*[TI] AND Spondyl*[TI])
6. (((inflam*[TiAB] AND (peripher*[TIAB] OR tendon*[TIAB] or tendinop*[TIAB] OR limb*[TIAB]) AND pain [TIAB])))
7. spondylo*[TiAB]
8. (((inflam*[TiAB] AND (back[TIAB] OR spin*[TIAB]) AND pain [TIAB])))
9. or/1-8
10. "Tomography"[Mesh]
11. "Magnetic Resonance Imaging"[Mesh]
12. "Ultrasonography"[Mesh]
13. "Tomography, X-Ray Computed"[Mesh]
14. "Positron-Emission Tomography and Computed Tomography"[Mesh]
15. "Positron-Emission Tomography"[Mesh]
16. "Tomography, Emission-Computed, Single-Photon"[Mesh]
17. ("magnetic"[All Fields] AND "resonance"[All Fields] AND "imaging"[All Fields])
18. "mri"[All Fields]
19. ultrasono*[TIAB]
20. echograph*[TIAB]
21. "CT scan*"[TIAB]
22. tomograph*[TIAB]
23. scintigraph*[TIAB]
24. (PET[Title/Abstract]) AND tomog*[Title/Abstract]
25. (SPECT[Title/Abstract]) AND photon[Title/Abstract]
26. or/10-25
27. 9 and 26
28. (animals[mh] NOT human[mh])
29. 27 not 28
30. (("case report*" [TI]) OR (case reports[Publication Type]))
31. 29 not 30
32. english[Language]
33. 31 and 32

Search strategy, EMBASE via Ovid

1. (magnetic and resonance and imaging).mp.
2. magnetic resonance imaging.mp.
3. mri.mp.
4. Ultrasonography.mp. or exp echography/
5. magnetic resonance imaging.mp. or exp nuclear magnetic resonance imaging/
6. "ultrasono*".ti,ab.
7. Tomography, X-Ray Computed.mp. or exp computer assisted tomography/
8. "CT scan*".ti,ab.
9. "echograph*".ti,ab.
10. "tomograph*".ti,ab.
11. "scintigraph*".ti,ab.
12. Positron Emission Tomography.mp. or exp positron emission tomography/
13. (PET and tomog*).ti,ab.
14. Tomography, Emission-Computed, Single-Photon.mp. or exp single photon emission computer tomography/
15. (SPECT and photon).ti,ab.
16. or/1-15
17. exp ankylosing spondylitis/
18. exp psoriatic arthritis/
19. exp reactive arthritis/
20. exp spondyloarthropathy/
21. (inflam* and (peripher* or tendon* or tendinop* or limb*) and pain).ti,ab.
22. "spondylo*".ti,ab.
23. (inflam* and (back or spin*) and pain).ti,ab.
24. or/17-23
25. 16 and 24
26. limit 25 to (conference abstract or conference paper or "conference review" or letter or conference proceeding)
27. 25 not 26
28. limit 27 to (animals or animal studies)
29. limit 28 to human
30. 28 not 29
31. 27 not 30
32. "case report*".m_titl.
33. case study.m_titl.
34. case report/
35. or/28-30
36. 31 not 35
37. limit 36 to english language

RQ11

Search strategy, MEDLINE via Pubmed

1. "spondylarthropathies"[MeSH Terms]
2. spondylart*[Text Word]
3. (Reactiv*[TI] AND Arthriti*[TI])
4. (Psoria*[TI] AND Arthriti*[TI])
5. (ankyl*[TI] AND Spondyl*[TI])
6. (((inflam*[TiAB] AND (peripher*[TIAB] OR tendon*[TIAB] or tendinop*[TIAB] OR limb*[TIAB]) AND pain [TIAB]))))
7. spondylo*[TiAB]
8. (((inflam*[TiAB] AND (back[TIAB] OR spin*[TIAB]) AND pain [TIAB])))
9. or/1-8
10. "Tomography"[Mesh]
11. "Magnetic Resonance Imaging"[Mesh]
12. "Ultrasonography"[Mesh]
13. "Tomography, X-Ray Computed"[Mesh]
14. "Positron-Emission Tomography and Computed Tomography"[Mesh]
15. "Positron-Emission Tomography"[Mesh]
16. "Tomography, Emission-Computed, Single-Photon"[Mesh]
17. ("magnetic"[All Fields] AND "resonance"[All Fields] AND "imaging"[All Fields])
18. "mri"[All Fields]
19. ultrasono*[TIAB]
20. echograph*[TIAB]
21. "CT scan*"[TIAB]
22. tomograph*[TIAB]
23. scintigraph*[TIAB]
24. (PET[Title/Abstract]) AND tomog*[Title/Abstract]
25. (SPECT[Title/Abstract]) AND photon[Title/Abstract]
26. x*ray*
27. "Radiography"[Mesh]
28. or/10-27
29. "Fractures, Bone"[Mesh]
30. "Fractures, Spontaneous"[Mesh]
31. "Osteoporotic Fractures"[Mesh]
32. "Spinal Fractures"[Mesh])
33. fractur*
34. or/29-33
35. 9 and 28 and 34
36. (animals[mh] NOT human[mh])
37. 35 not 36
38. (("case report*" [TI]) OR (case reports[Publication Type]))
39. 37 not 38
40. english[Language]
41. 39 and 40

Search strategy, EMBASE via Ovid

1. (magnetic and resonance and imaging).mp.
2. magnetic resonance imaging.mp.
3. mri.mp.
4. Ultrasonography.mp. or exp echography/
5. magnetic resonance imaging.mp. or exp nuclear magnetic resonance imaging/
6. "ultrasono*".ti,ab.
7. Tomography, X-Ray Computed.mp. or exp computer assisted tomography/
8. "CT scan*".ti,ab.
9. "echograph*".ti,ab.
10. "tomograph*".ti,ab.
11. "scintigraph*".ti,ab.
12. Positron Emission Tomography.mp. or exp positron emission tomography/
13. (PET and tomog*).ti,ab.
14. Tomography, Emission-Computed, Single-Photon.mp. or exp single photon emission computer tomography/
15. (SPECT and photon).ti,ab.
16. exp radiography/
17. x*ray*.mp.
18. exp X ray/
19. or/1-18
20. exp fracture/
21. fractur*.mp.
22. or/20-21
23. exp ankylosing spondylitis/
24. exp psoriatic arthritis/
25. exp reactive arthritis/
26. exp spondyloarthropathy/
27. (inflam* and (peripher* or tendon* or tendinop* or limb*) and pain).ti,ab.
28. "spondylo*".ti,ab.
29. (inflam* and (back or spin*) and pain).ti,ab.
30. or/23-29
31. 19 and 22 and 30
32. limit 31 to (conference abstract or conference paper or "conference review" or letter or conference proceeding)
33. 31 not 32
34. limit 33 to (animals or animal studies)
35. limit 34 to human
36. 34 not 35
37. 33 not 36
38. "case report*".m_titl.
39. case study.m_titl.
40. case report/
41. or/38-40
42. 37 not 41
43. limit 42 to english language

RQ12

Search strategy, MEDLINE via Pubmed

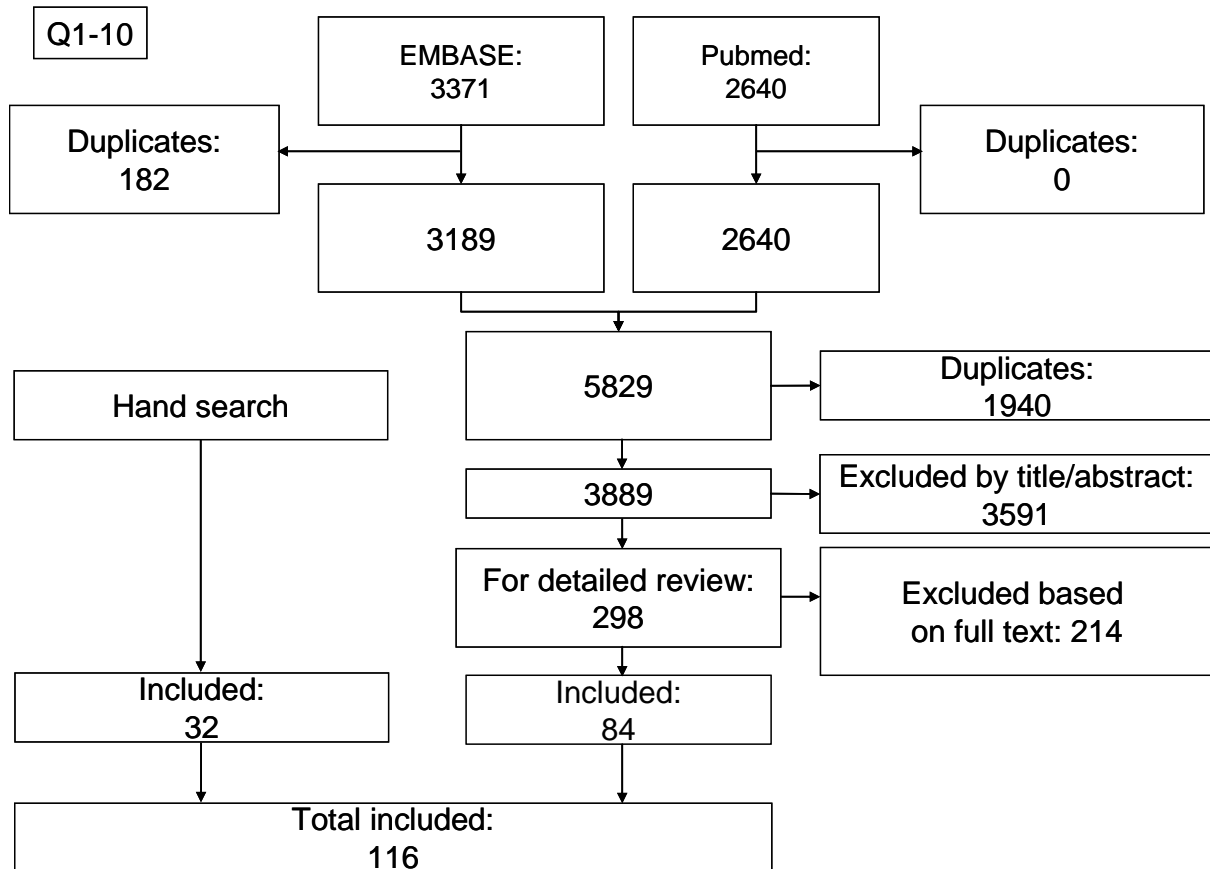
1. "spondylarthropathies"[MeSH Terms]
2. spondylart*[Text Word]
3. (Reactiv*[TI] AND Arthriti*[TI])
4. (Psoria*[TI] AND Arthriti*[TI])
5. (ankyl*[TI] AND Spondyl*[TI])
6. (((inflam*[TiAB] AND (peripher*[TIAB] OR tendon*[TIAB] or tendinop*[TIAB] OR limb*[TIAB]) AND pain [TIAB]))))
7. spondylo*[TiAB]
8. (((inflam*[TiAB] AND (back[TIAB] OR spin*[TIAB]) AND pain [TIAB])))
9. or/1-8
10. "Tomography"[Mesh]
11. "Magnetic Resonance Imaging"[Mesh]
12. "Ultrasonography"[Mesh]
13. "Tomography, X-Ray Computed"[Mesh]
14. "Positron-Emission Tomography and Computed Tomography"[Mesh]
15. "Positron-Emission Tomography"[Mesh]
16. "Tomography, Emission-Computed, Single-Photon"[Mesh]
17. ("magnetic"[All Fields] AND "resonance"[All Fields] AND "imaging"[All Fields])
18. "mri"[All Fields]
19. ultrasono*[TIAB]
20. echograph*[TIAB]
21. "CT scan*"[TIAB]
22. tomograph*[TIAB]
23. scintigraph*[TIAB]
24. (PET[Title/Abstract] AND tomog*[Title/Abstract])
25. (SPECT[Title/Abstract] AND photon[Title/Abstract])
26. x*ray*
27. "Radiography"[Mesh]
28. "Absorptiometry, Photon"[Mesh]
29. DEXA
30. (bone*[TIAB]) AND densit*[TIAB]
31. "Bone Density"[Mesh]
32. or/10-31
33. osteoporo*
34. "Osteoporosis"[Mesh]
35. "Bone Density"[Mesh]
36. ((bone*[TIAB]) AND (loss*[TIAB] OR densit*[TIAB] OR mass*[TIAB]))
37. or/33-36
38. 9 and 32 and 37
39. (animals[mh] NOT human[mh])
40. 38 not 39
41. (("case report*" [TI]) OR (case reports[Publication Type]))
42. 40 not 41
43. english[Language]
44. 42 and 43

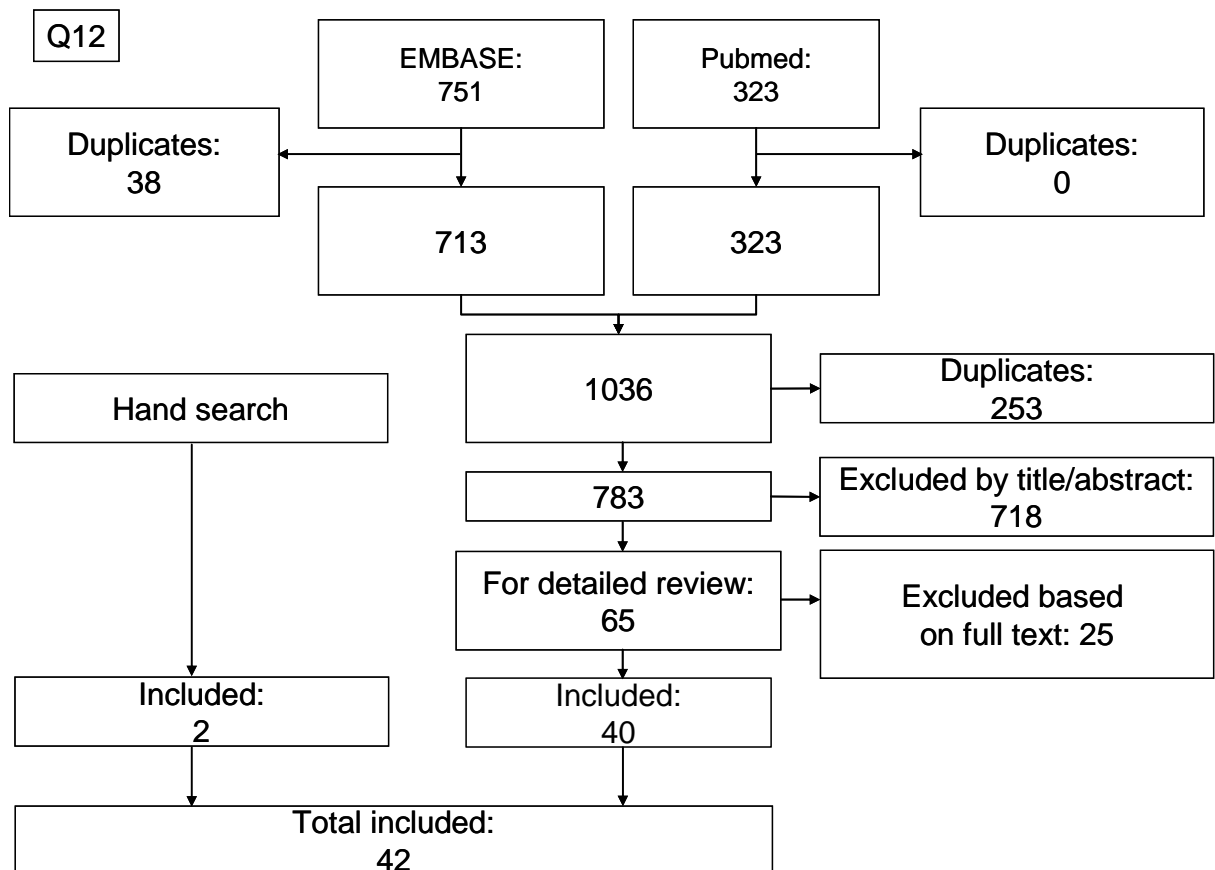
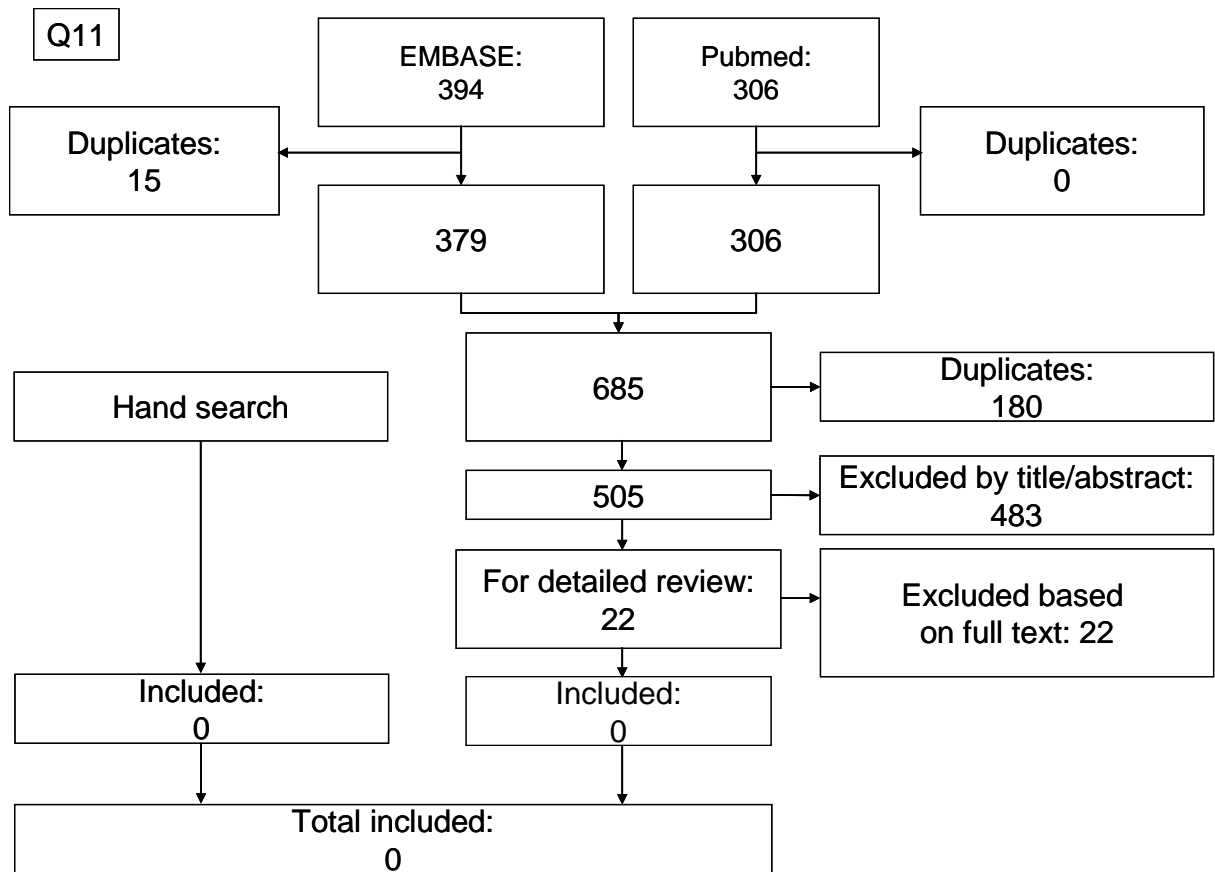
Search strategy, EMBASE via Ovid

1. (magnetic and resonance and imaging).mp.
2. magnetic resonance imaging.mp.
3. mri.mp.
4. Ultrasonography.mp. or exp echography/
5. magnetic resonance imaging.mp. or exp nuclear magnetic resonance imaging/
6. "ultrasono*".ti,ab.
7. Tomography, X-Ray Computed.mp. or exp computer assisted tomography/
8. "CT scan*".ti,ab.
9. "echograph*".ti,ab.
10. "tomograph*".ti,ab.
11. "scintigraph*".ti,ab.
12. Positron Emission Tomography.mp. or exp positron emission tomography/
13. (PET and tomog*).ti,ab.
14. Tomography, Emission-Computed, Single-Photon.mp. or exp single photon emission computer tomography/
15. (SPECT and photon).ti,ab.
16. exp radiography/
17. x*ray*.mp.
18. exp X ray/
19. DEXA.mp. or exp dual energy X ray absorptiometry/
20. exp absorptiometry/ or exp photon absorptiometry/
21. (bone* and (loss* or densit* or mass*)).ti,ab.
22. Bone Density.mp. or exp bone density/
23. or/1-22
24. (bone* and (loss* or densit* or mass*)).ti,ab.
25. Bone Density.mp. or exp bone density/
26. exp osteoporosis/ or Osteoporosis.mp.
27. osteoporo*.mp
28. or/24-27
29. exp ankylosing spondylitis/
30. exp psoriatic arthritis/
31. exp reactive arthritis/
32. exp spondyloarthropathy/
33. (inflam* and (peripher* or tendon* or tendinop* or limb*) and pain).ti,ab.
34. "spondylo*".ti,ab.
35. (inflam* and (back or spin*) and pain).ti,ab.
36. or/29-35
37. 23 and 28 and 36
38. limit 37 to (conference abstract or conference paper or "conference review" or letter or conference proceeding)
39. 37 not 38
40. limit 39 to (animals or animal studies)
41. limit 40 to human
42. 40 not 41
43. 39 not 42
44. "case report*".m_titl.
45. case study.m_titl.
46. case report/

- 47. or/44-46
- 48. 43 not 47
- 49. limit 48 to english language

S3. Flowcharts showing the three separate literature searches of 7550 articles, from which 298 articles were selected for detailed review; 157 articles were included in the final analysis.





S4. Number of included articles per research question

	Number of included articles
RQ1- What is the diagnostic value of individual imaging modalities above clinical examination/criteria for axial SpA?	25
RQ2- What is the diagnostic value of individual imaging modalities above clinical examination/criteria for peripheral SpA (including peripheral psoriatic arthritis)?	9
RQ3- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor disease activity in axial SpA?	34
RQ4- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor structural changes in axial SpA?	23
RQ5- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor disease activity in peripheral SpA(including peripheral psoriatic arthritis)?	15
RQ6- What is the ability, and added value above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) of individual imaging modalities to monitor structural changes in peripheral SpA(including peripheral psoriatic arthritis)?	8
RQ7- What is the ability, and added value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict outcome (severity) in axial SpA?	17
RQ8- What is the ability and value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict treatment response in axial SpA?	3
RQ9 - What is the ability, and added value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict outcome (severity) in peripheral SpA?	3
RQ10- What is the diagnostic value of individual imaging modalities above other measures (e.g. clinical examination, PROs, CRP, other imaging modalities) to predict treatment response in peripheral SpA?	0
RQ11 - What is the diagnostic value of individual imaging modalities above other imaging modalities for spinal fractures in SpA?	0
RQ12 - What is the ability of individual imaging modalities to diagnose and monitor osteoporosis in SpA?	42

S5. Reference list of included articles per recommendation

Recommendation 1: Diagnosing axial SpA

A. In general, conventional radiography of the SI joints is recommended as the first imaging method to diagnose sacroiliitis as part of axial SpA. In certain cases, such as young patients and those with short symptom duration, MRI of the SI joints is an alternative first imaging method.

B. If the diagnosis of axial SpA cannot be established based on clinical features and conventional radiography, and axial SpA is still suspected, MRI of the SI joints is recommended. On MRI, both active inflammatory lesions (primarily bone marrow edema) and structural lesions (such as bone erosion, new bone formation, sclerosis and fat infiltration) should be considered. MRI of the spine is not generally recommended to diagnose axial SpA.

C. Imaging modalities other than conventional radiography and MRI are not generally recommended in the diagnosis of axial SpA*.

***CT may provide additional information on structural damage if conventional radiography is negative and MRI cannot be performed. Scintigraphy and US are not recommended for diagnosis of sacroiliitis as part of axial SpA.**

1. Bennett AN, McGonagle D, O'Connor P, et al. Severity of baseline magnetic resonance imaging-evident sacroiliitis and HLA-B27 status in early inflammatory back pain predict radiographically evident ankylosing spondylitis at eight years. *Arthritis Rheum* 2008;58:3413-8.
2. Bennett AN, Rehman A, Hensor EM, et al. Evaluation of the diagnostic utility of spinal magnetic resonance imaging in axial spondylarthritis. *Arthritis Rheum* 2009;60:1331-41.
3. Bennett AN, Rehman A, Hensor EM, et al. The fatty Romanus lesion: a non-inflammatory spinal MRI lesion specific for axial spondyloarthritis. *Ann Rheum Dis* 2010;69:891-4.
4. Blum U, Buitrago-Tellez C, Mundinger A, et al. Magnetic resonance imaging (MRI) for detection of active sacroiliitis--a prospective study comparing conventional radiography, scintigraphy, and contrast enhanced MRI. *J Rheumatol* 1996;23:2107-15.
5. Chase WF, Houk RW, Winn RE, et al. The clinical usefulness of radionuclide scintigraphy in suspected sacro-iliitis: a prospective study. *Br J Rheumatol* 1983;22:67-72.
6. Devauchelle-Pensec V, D'Agostino MA, Marion J, et al. Computed tomography scanning facilitates the diagnosis of sacroiliitis in patients with suspected spondylarthritis: results of a prospective multicenter French cohort study. *Arthritis Rheum* 2012;64:1412-9.
7. Geijer M, Göthlin GG, Göthlin JH. The clinical utility of computed tomography compared to conventional radiography in diagnosing sacroiliitis. A retrospective study on 910 patients and literature review. *J Rheumatol* 2007;34:1561-5.
8. Goie The HS, Steven MM, van der Linden SM, et al. Evaluation of diagnostic criteria for ankylosing spondylitis: a comparison of the Rome, New York and modified New York criteria in patients with a positive clinical history screening test for ankylosing spondylitis. *Br J Rheumatol* 1985;24:242-9.

9. Heuft-Dorenbosch L, Landewé R, Weijers R, et al. Combining information obtained from magnetic resonance imaging and conventional radiographs to detect sacroiliitis in patients with recent onset inflammatory back pain. *Ann Rheum Dis* 2006;65:804-8.
10. Inanc N, Atagündüz P, Sen F, et al. The investigation of sacroiliitis with different imaging techniques in spondyloarthropathies. *Rheumatol Int* 2005;25:591-4.
11. Kim NR, Choi JY, Hong SH, et al. "MR corner sign": value for predicting presence of ankylosing spondylitis. *AJR Am J Roentgenol* 2008;191:124-8.
12. Klauser A, Halpern EJ, Frauscher F, et al. Inflammatory low back pain: high negative predictive value of contrast-enhanced color Doppler ultrasound in the detection of inflamed sacroiliac joints. *Arthritis Rheum* 2005;53:440-4.
13. Klauser AS, De Zordo T, Bellmann-Weiler R, et al. Feasibility of second-generation ultrasound contrast media in the detection of active sacroiliitis. *Arthritis Rheum* 2009;61:909-16.
14. Marzo-Ortega H, McGonagle D, O'Connor P, et al. Baseline and 1-year magnetic resonance imaging of the sacroiliac joint and lumbar spine in very early inflammatory back pain. Relationship between symptoms, HLA-B27 and disease extent and persistence. *Ann Rheum Dis* 2009;68:1721-7.
15. Mohammadi A, Ghasemi-rad M, Aghdashi M, et al. Evaluation of disease activity in ankylosing spondylitis; diagnostic value of color Doppler ultrasonography. *Skeletal Radiol* 2013;42:219-24.
16. Oostveen J, Prevo R, den Boer J, et al. Early detection of sacroiliitis on magnetic resonance imaging and subsequent development of sacroiliitis on plain radiography. A prospective, longitudinal study. *J Rheumatol* 1999;26:1953-8.
17. Song IH, Brandt H, Rudwaleit M, et al. Limited diagnostic value of unilateral sacroiliitis in scintigraphy in assessing axial spondyloarthritis. *J Rheumatol* 2010;37:1200-2.
18. van Tubergen A, Heuft-Dorenbosch L, Schulpen G, et al. Radiographic assessment of sacroiliitis by radiologists and rheumatologists: does training improve quality? *Ann Rheum Dis* 2003;62:519-25.
19. Weber U, Hodler J, Kubik RA, et al. Sensitivity and specificity of spinal inflammatory lesions assessed by whole-body magnetic resonance imaging in patients with ankylosing spondylitis or recent-onset inflammatory back pain. *Arthritis Rheum* 2009;61:900-8.
20. Weber U, Lambert RG, Østergaard M, et al. The diagnostic utility of magnetic resonance imaging in spondylarthritis: an international multicenter evaluation of one hundred eighty-seven subjects. *Arthritis Rheum* 2010;62:3048-58.
21. Weber U, Lambert RG, Pedersen SJ, et al. Assessment of structural lesions in sacroiliac joints enhances diagnostic utility of magnetic resonance imaging in early spondylarthritis. *Arthritis Care Res (Hoboken)* 2010;62:1763-71.

22. Weber U, Pedersen SJ, Zubler V, et al. What constitutes the characteristic fat lesion on MRI of the sacroiliac joints in early spondyloarthritis? *Arthritis Rheum* 2012;64 Suppl 10:1024
23. Weber U, Zubler V, Pedersen SJ, et al. Development and validation of a magnetic resonance imaging reference criterion for defining a positive sacroiliac joint magnetic resonance imaging finding in spondyloarthritis. *Arthritis Care Res Hoboken* 2013;65:977-85.
24. Weber U, Zubler V, Zhao Z, et al. Does spinal MRI add incremental diagnostic value to MRI of the sacroiliac joints alone in patients with non-radiographic axial spondyloarthritis? *Ann Rheum Dis* 2014 Jan 22. [Epub ahead of print]
25. Wick MC, Weiss RJ, Jaschke W, et al. Erosions are the most relevant magnetic resonance imaging features in quantification of sacroiliac joints in ankylosing spondylitis. *J Rheumatol* 2010;37:622-7.

Recommendation 2: Diagnosing peripheral SpA

When peripheral SpA is suspected, US or MRI may be used to detect peripheral enthesitis, which may support the diagnosis of SpA. Furthermore, US or MRI might be used to detect peripheral arthritis, tenosynovitis and bursitis.

1. Aydin SZ, Ash ZR, Tinazzi I, et al. The link between enthesitis and arthritis in psoriatic arthritis: a switch to a vascular phenotype at insertions may play a role in arthritis development. *Ann Rheum Dis* 2013;72:992-5.
2. D'Agostino MA, Said-Nahal R, Hacquard-Bouder C, et al. Assessment of peripheral enthesitis in the spondylarthropathies by ultrasonography combined with power Doppler: a cross-sectional study. *Arthritis Rheum* 2003;48:523-33.
3. D'Agostino MA, Aegerter P, Bechara K, et al. How to diagnose spondyloarthritis early? Accuracy of peripheral enthesitis detection by power Doppler ultrasonography. *Ann Rheum Dis* 2011;70:1433-40.
4. de Miguel E, Cobo T, Muñoz-Fernández S, et al. Validity of enthesitis ultrasound assessment in spondyloarthropathy. *Ann Rheum Dis* 2009;68:169-74.
5. de Miguel E, Muñoz-Fernández S, Castillo C, et al. Diagnostic accuracy of enthesitis ultrasound in the diagnosis of early spondyloarthritis. *Ann Rheum Dis* 2011;70:434-9.
6. Farouk HM, Mostafa AA, Youssef SS, et al. Value of enthesal ultrasonography and serum cartilage oligomeric matrix protein in the preclinical diagnosis of psoriatic arthritis. *Clin Med Insights Arthritis Musculoskelet Disord* 2010 29;3:7-14.
7. Feydy A, Lavie-Brion MC, Gossec L, et al. Comparative study of MRI and power Doppler ultrasonography of the heel in patients with spondyloarthritis with and without heel pain and in controls. *Ann Rheum Dis* 2012;71:498-503.
8. Ibrahim G, Groves C, Chandramohan M, et al. Clinical and ultrasound examination of the Leeds enthesitis index in psoriatic arthritis and rheumatoid arthritis. *ISRN Rheumatol* 2011;:731917.

9. Marchesoni A, De Lucia O, Rotunno L, et al. Enthesal power Doppler ultrasonography: a comparison of psoriatic arthritis and fibromyalgia. *J Rheumatol* 2012;89:29-31.

Recommendation 3: Monitoring disease activity in axial SpA

MRI of the SI-joints and/or the spine may be used to assess and monitor disease activity in axial SpA, providing additional information on top of clinical and biochemical assessments. The decision on when to repeat MRI depends on the clinical circumstances. In general, STIR sequences are sufficient to detect inflammation and the use of contrast medium is not needed.

1. Althoff CE, Feist E, Burova E, et al. Magnetic resonance imaging of active sacroiliitis: do we really need gadolinium? *Eur J Radiol* 2009;71:232-6.
2. Baraliakos X, Hermann KG, Landewé R, et al. Assessment of acute spinal inflammation in patients with ankylosing spondylitis by magnetic resonance imaging: a comparison between contrast enhanced T1 and short tau inversion recovery (STIR) sequences. *Ann Rheum Dis* 2005;64:1141-4.
3. Baraliakos X, Davis J, Tsuji W, et al. Magnetic resonance imaging examinations of the spine in patients with ankylosing spondylitis before and after therapy with the tumor necrosis factor alpha receptor fusion protein etanercept. *Arthritis Rheum* 2005;52:1216-23.
4. Blachier M, Coutanceau B, Dougados M, et al. Does the site of magnetic resonance imaging abnormalities match the site of recent-onset inflammatory back pain? The DESIR cohort. *Ann Rheum Dis* 2013;72:979-85.
5. Bonel HM, Boller C, Saar B, et al. Short-term changes in magnetic resonance imaging and disease activity in response to infliximab. *Ann Rheum Dis* 2010;69:120-5.
6. Braun J, Baraliakos X, Golder W, et al. Magnetic resonance imaging examinations of the spine in patients with ankylosing spondylitis, before and after successful therapy with infliximab: evaluation of a new scoring system. *Arthritis Rheum* 2003;48:1126-36.
7. Braun J, Baraliakos X, Hermann KG, et al. Golimumab reduces spinal inflammation in ankylosing spondylitis: MRI results of the randomised, placebo- controlled GO-RAISE study. *Ann Rheum Dis* 2012;71:878-84.
8. de Hooze M, van den Berg R, Navarro-Compán V, et al. Magnetic resonance imaging of the sacroiliac joints in the early detection of spondyloarthritis: no added value of gadolinium compared with short tau inversion recovery sequence. *Rheumatology (Oxford)* 2013;52:1220-4.
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Recommendation 4. Monitoring structural changes in axial SpA

Conventional radiography of the SI joints and/or spine may be used for long-term monitoring of structural damage, particularly new bone formation, in axial SpA. If performed, it should not be repeated more frequently than every 2nd year. MRI may provide additional information.

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Recommendation 5. Monitoring disease activity in peripheral SpA

US and MRI may be used to monitor disease activity (particularly synovitis and enthesitis) in peripheral SpA, providing additional information on top of clinical and biochemical assessments. The decision on when to repeat US/MRI depends on the clinical circumstances. US with high-sensitivity colour or power Doppler is sufficient to detect inflammation and the use of US contrast medium is not needed.

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Recommendation 6. Monitoring structural changes in peripheral SpA
In peripheral SpA, if the clinical scenario requires monitoring of structural damage, then conventional radiography is recommended. MRI and/or US might provide additional information.

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Recommendation 7. Predicting outcome/severity in axial SpA

In patients with ankylosing spondylitis* (not non-radiographic axial SpA), initial conventional radiography of the lumbar and cervical spine is recommended to detect syndesmophytes, which are predictive of development of new syndesmophytes. MRI (vertebral corner inflammatory or fatty lesions) may also be used to predict development of new radiographic syndesmophytes.

***i.e. radiographic axial spondyloarthritis**

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Recommendation 8. Predicting treatment effect in axial SpA
Extensive MRI inflammatory activity (bone marrow edema), particularly in the spine in ankylosing spondylitis patients, might be used as a predictor of good clinical response to anti-TNF treatment in axial SpA. Thus, MRI might aid in the decision of initiating anti-TNF therapy, in addition to clinical examination and CRP.

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Recommendation 9. Spinal fracture

When spinal fracture in axial SpA is suspected, conventional radiography is the recommended initial imaging method. If conventional radiography is negative, CT should be performed. MRI is an additional imaging method to CT, which can also provide information on soft tissue lesions.

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Recommendation 10. Osteoporosis

In axial SpA patients without syndesmophytes in the lumbar spine on conventional radiography, osteoporosis should be assessed by hip DXA and AP-spine DXA. In patients with syndesmophytes in the lumbar spine on conventional radiography, osteoporosis should be assessed by hip DXA, supplemented by either spine DXA in lateral projection or possibly QCT of the spine.

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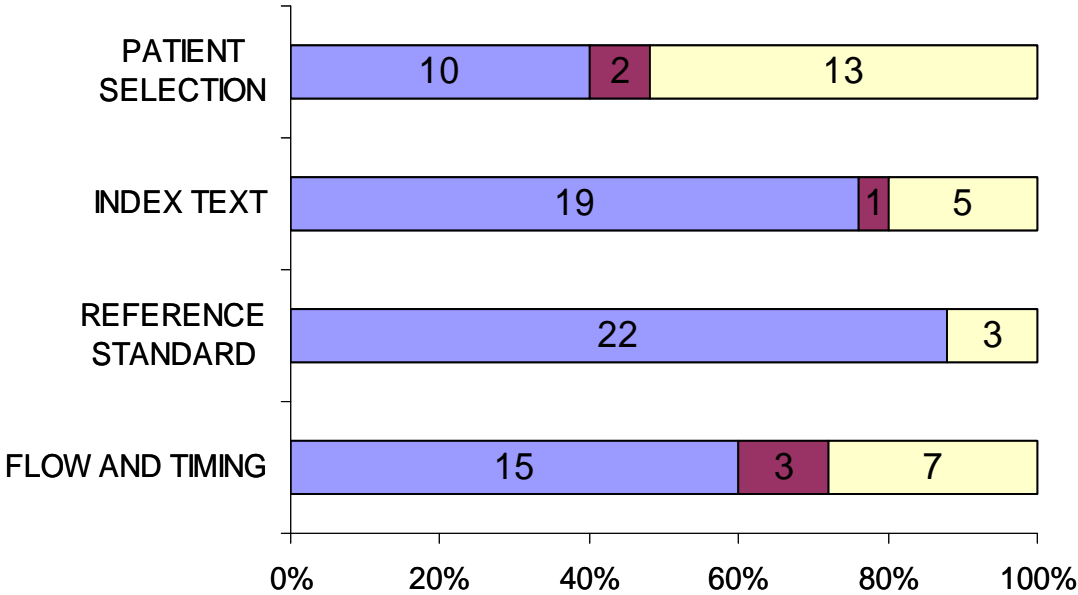
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S6. Quality assessment of included studies for individual recommendations (R) with QUADAS-2

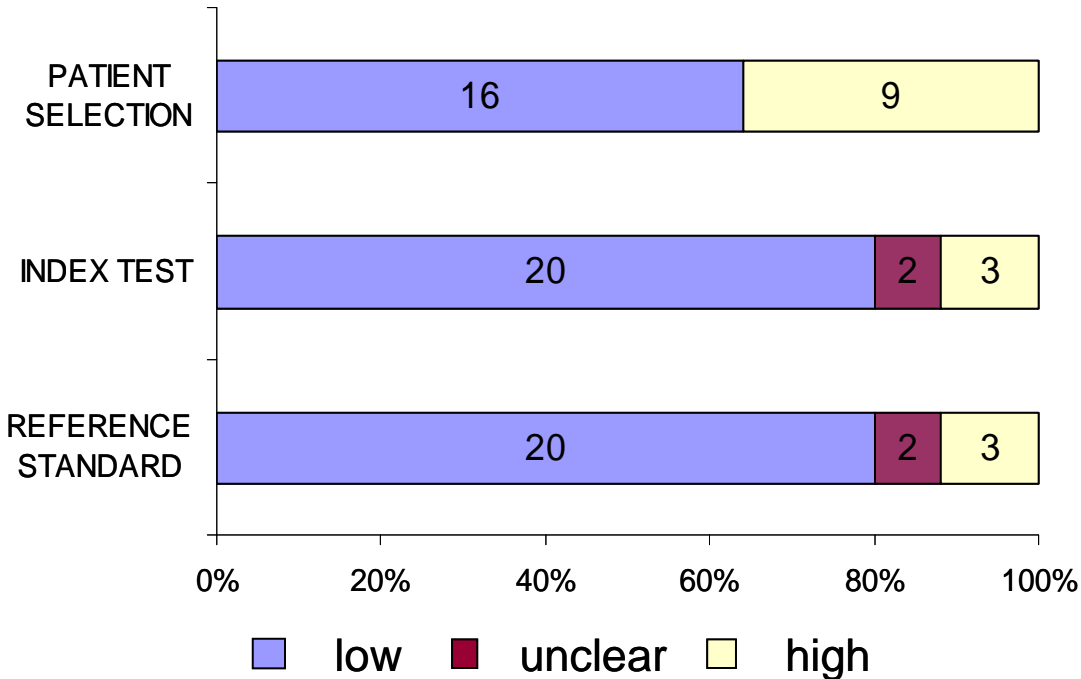
S6.1

R1

Risk of bias

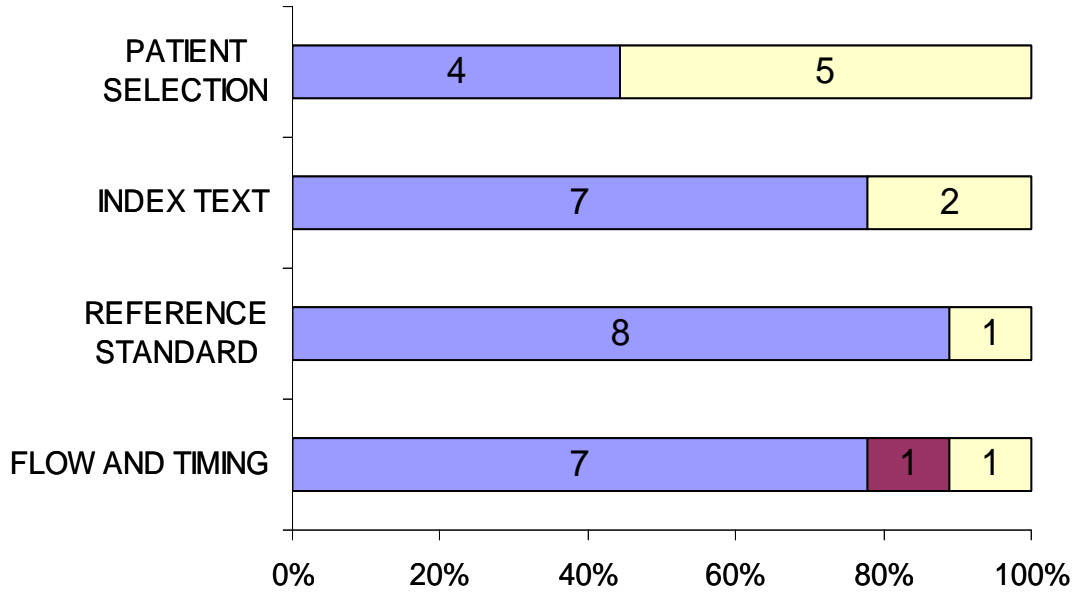


Applicability concerns

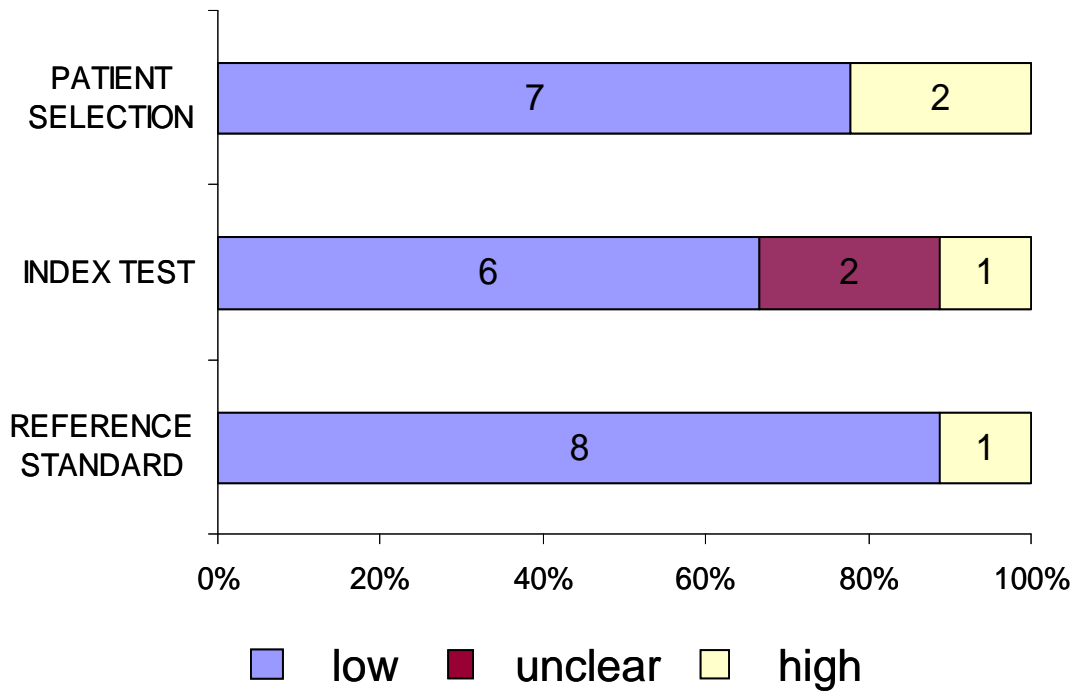


R2

Risk of bias

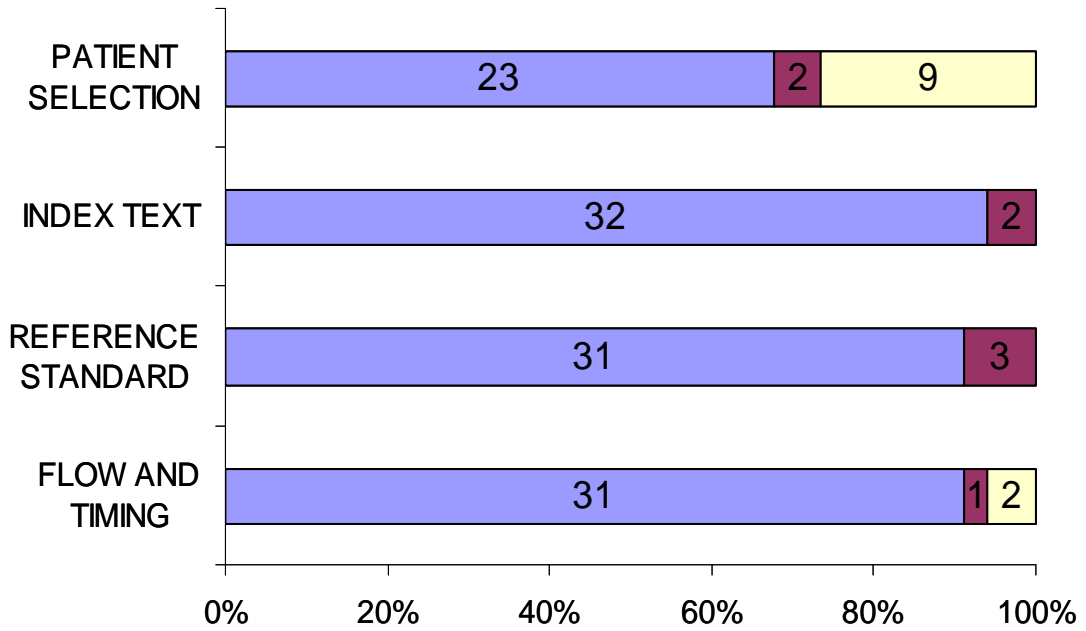


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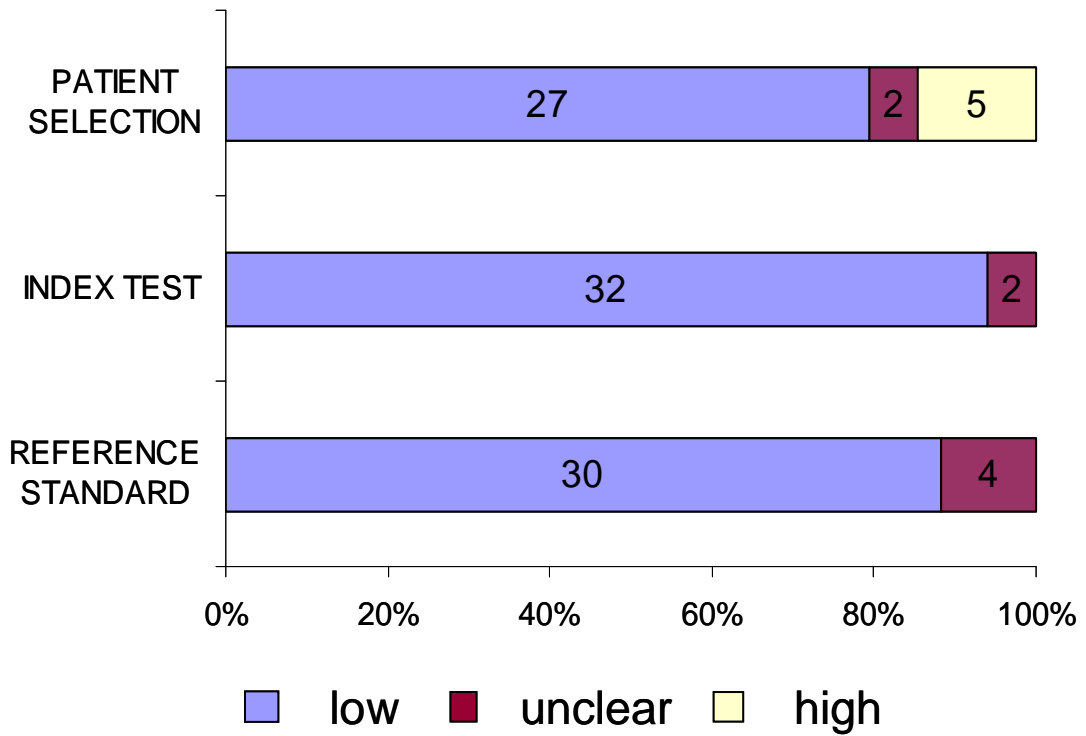


R3

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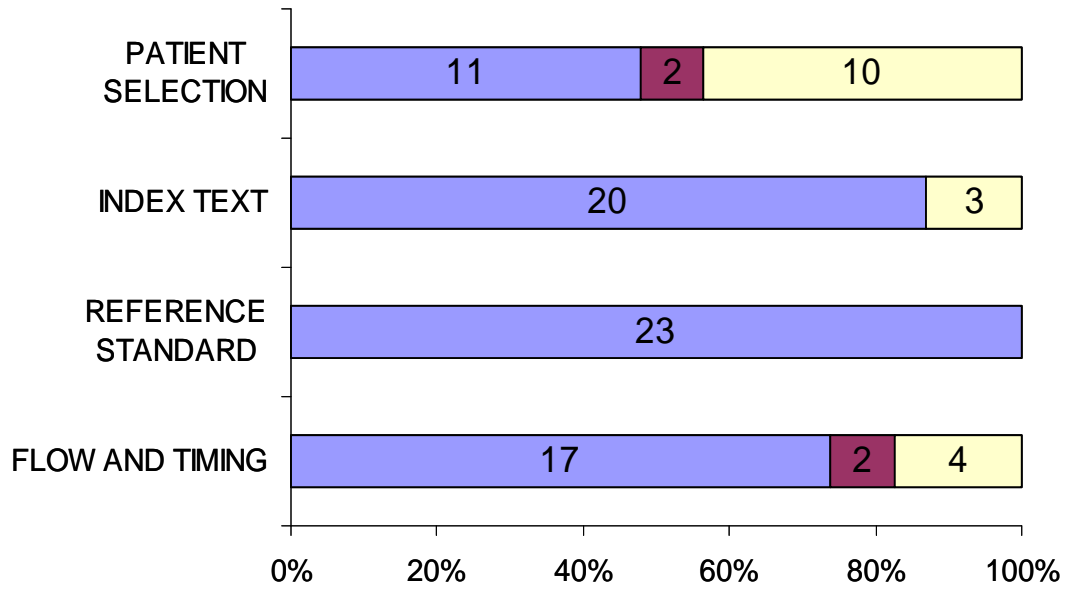


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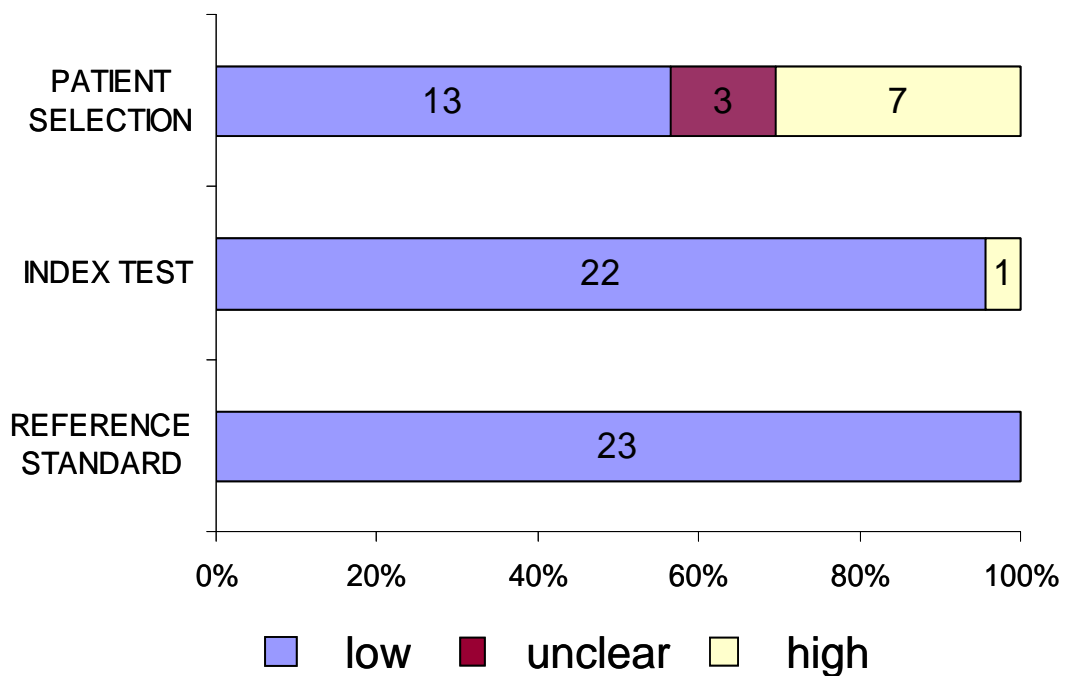


R4

Risk of bias

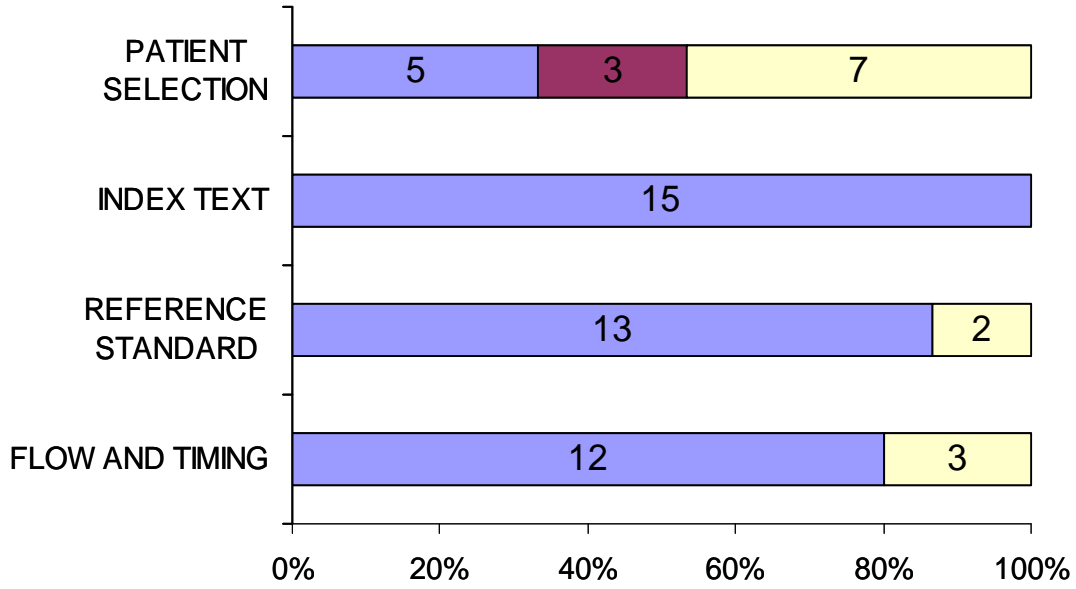


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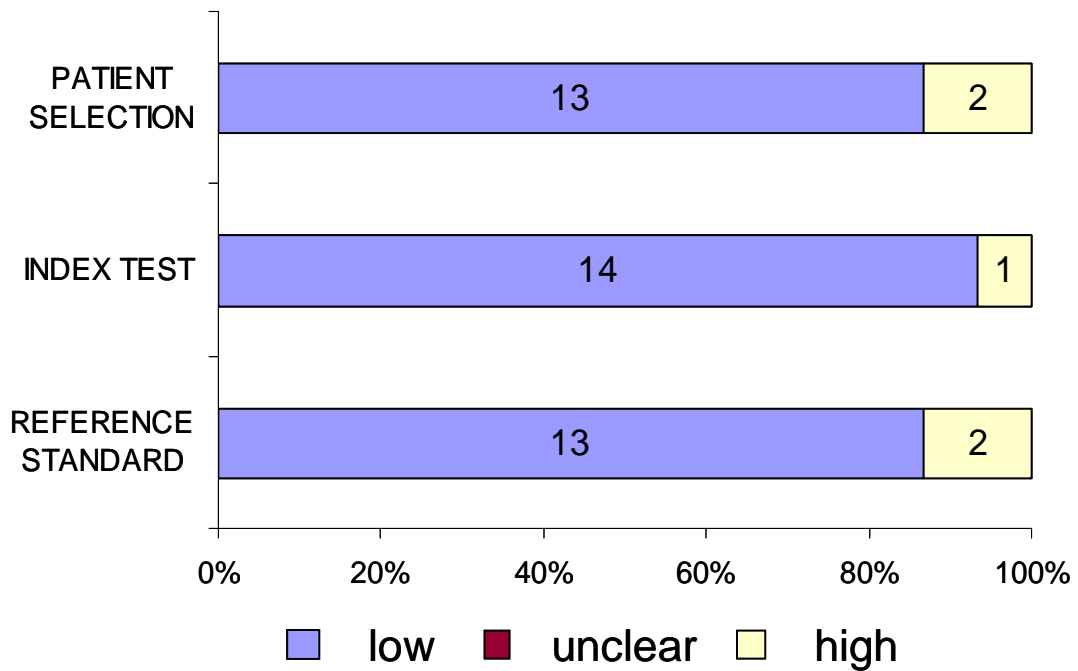


R5

Risk of bias

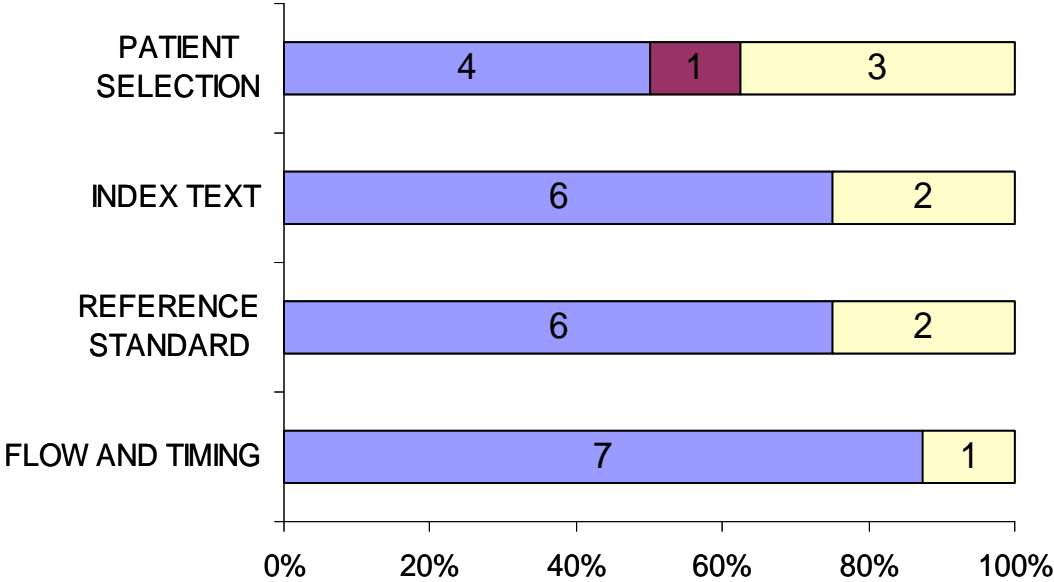


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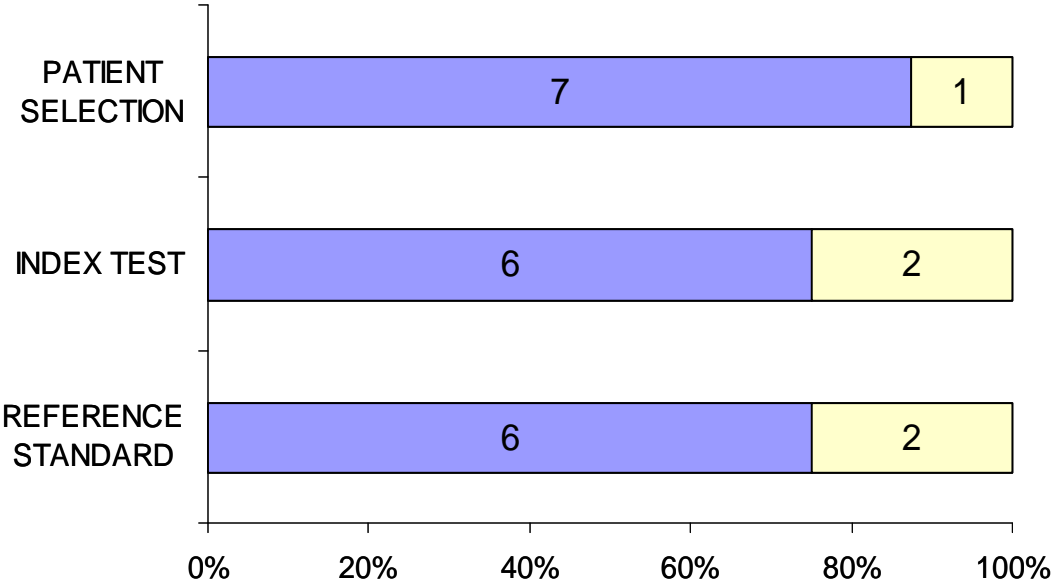


R6

Risk of bias



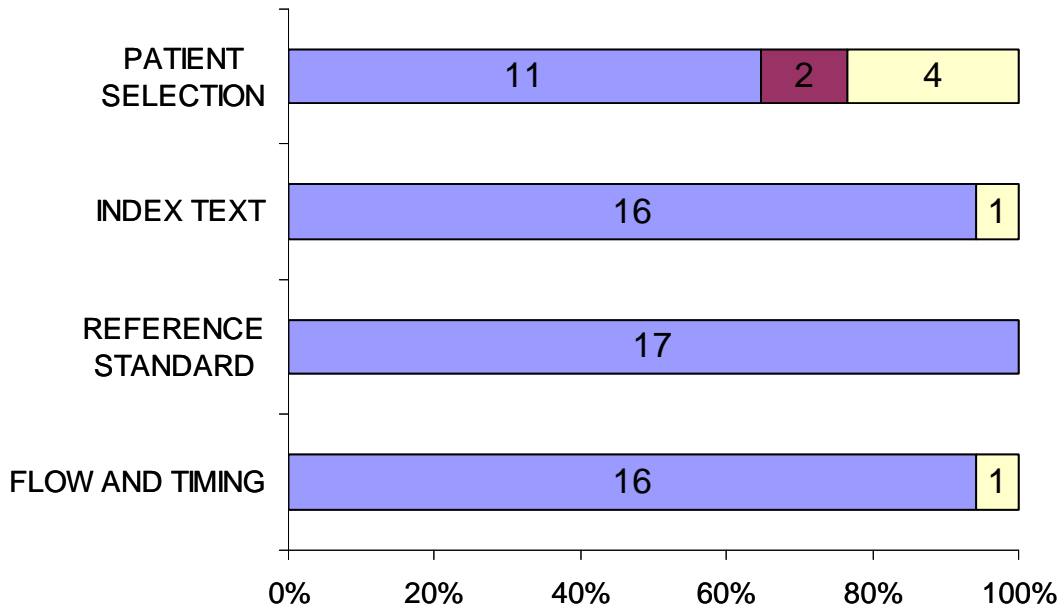
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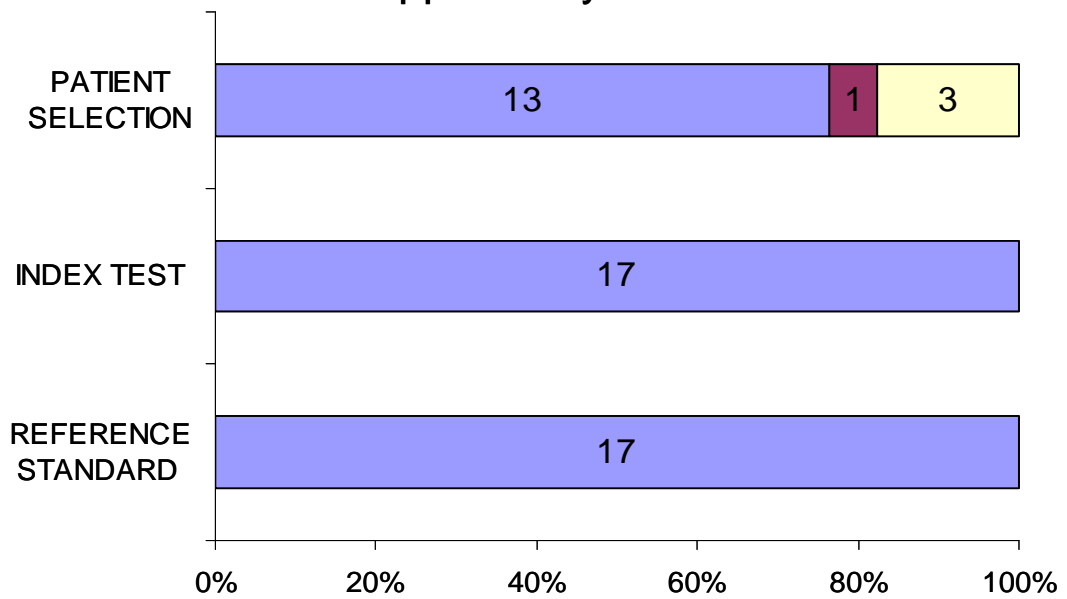
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R7

Risk of bias



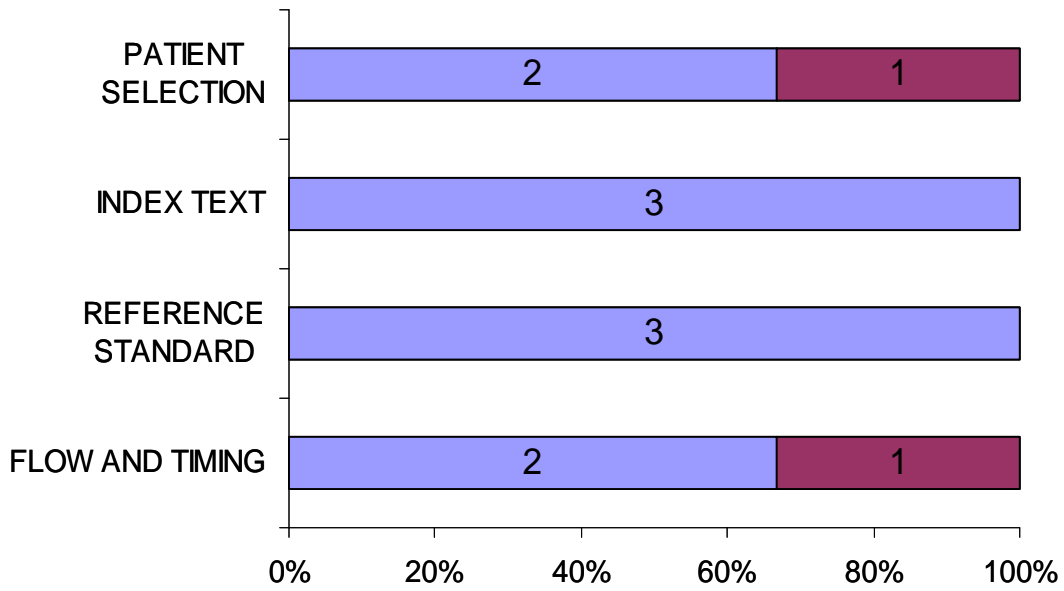
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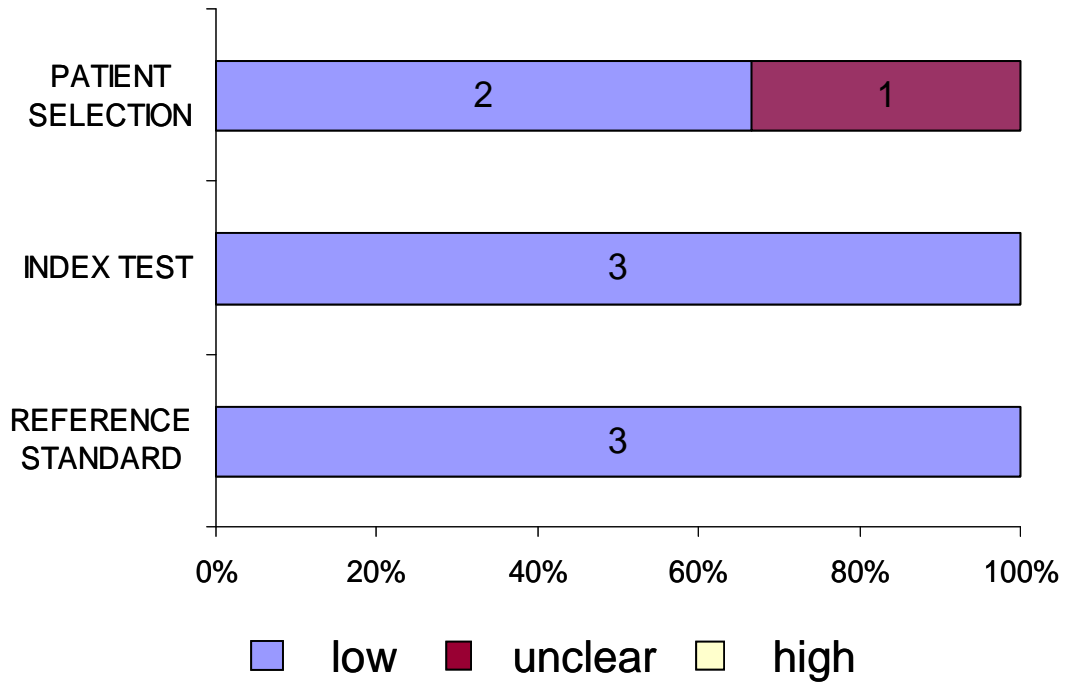
low unclear high

R8

Risk of bias

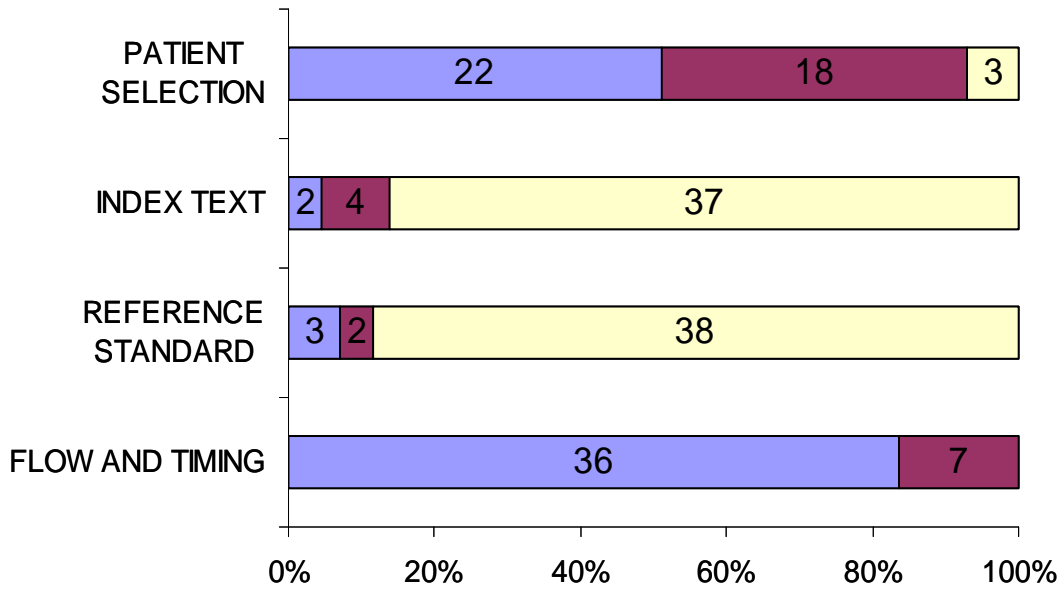


Applicability concerns



R10

Risk of bias



Applicability concerns

