Bibliographic Cite	Literature Type	Level of Evidence	Purpose	Population	Intervention and Outcome Measures	Results/ Recommendations	Study Limitations
Dionne N, Adefolarin A, Kunzelman D, et al. What is the diagnostic accuracy of red flags related to cauda equina syndrome (CES), when compared to magnetic resonance imaging (MRI)? A systematic review. Musculoskelet Sci Pract. 2019; 42:125-133.	Systematic review	Low	To review and statistically pool available evidence on the diagnostic accuracy of red flags to clinically identify MRI confirmed Cauda Equina Syndrome (CES).	Primary diagnostic studies were considered if they examined the results of physical examination and/or subjective history for signs and symptoms related to CES. Seven articles were included in the final pool, of which six were retrospective studies.	Data extraction, assessment of study quality using a modified QUADAS-2 tool and the use of GRADE to synthesize the results for each test was performed by three independent assessors. Diagnostic accuracy statistics applied to the identified data and pooled analysis performed using Meta-DiSc, version 1.4. Moderator analyses planned for pooled results.	Seven studies (total N=569 participants) were included. Potential signs or symptoms of CES were compared to MRI findings. Diagnostic data could be pooled for reduced anal tone, leg pain, back pain, saddle anaesthesia, urinary retention, urinary incontinence and bowel incontinence from six of seven studies. The pooled sensitivity for the signs and symptoms ranged from 0.19 (95% CI 0.09 to 0.33) to 0.43 (95% CI 0.30 to 0.56) while the pooled specificity ranged from 0.62 (95% CI 0.59 to 0.73) to 0.88 (95% CI 0.85 to 0.92). Conclusion: Red flags used to identify potential CES appear to be more specific than sensitive. As such, when these are present, they should be considered justification for prompt diagnostic workup.	The following limitations were noted: • Data available is generated from secondary and tertiary care settings, making the generalization of the results to primary care settings questionable. • A lack of a priori study protocol with notable unclear ratings in the quality assessment. Incomplete data records, lack of standardized assessment protocol compared to when a prospective study design is used • Unclear if all included studies consistently adopted the Standards for the Reporting of Diagnostic Accuracy studies (STARD) statement in their reporting. • Possible overestimation of effect from included studies. •Overall high risk of bias and applicability concerns due to some uncertainties surrounding patient selection, conduct and interpretation of index tests and the reference standard.
Kim JH, van Rijn RM, van Tulder MW, et al. Diagnostic accuracy of diagnostic imaging for lumbar disc herniation in adults with low back pain or sciatica is unknown; a systematic review. Chiropr Man Therap. 2018;26:37.	Systematic review and meta-analysis	Low	To summarize the available evidence on the diagnostic accuracy of imaging (index test) compared to surgery (reference test) for identifying lumbar disc herniation (LDH) in adult patients.	The authors searched MEDLINE, EMBASE and CINAHL (June 2017) for studies that assessed the diagnostic accuracy of imaging for LDH in adult patients with low back pain and surgery as the reference standard.	Two review authors independently selected studies, extracted data and assessed risk of bias. The authors calculated summary estimates of sensitivity and specificity using bivariate analysis, generated linked ROC plots in case of direct comparison of diagnostic imaging tests and assessed the quality of evidence using the GRADE-approach.The authors found 14 studies, all but one done before 1995, including 940 patients. Nine studies investigated Computed Tomography (CT), eight myelography and six Magnetic Resonance Imaging (MRI). The prior probability of LDH varied from 48.6 to 98.7%. The summary estimates for MRI and myelography were comparable with CT (sensitivity: 81.3% (95%CI 72.3-87.7%) and specificity: 77.1% (95%CI 61.9-87.5%)). The quality of evidence was moderate to very low.	The diagnostic accuracy of CT, myelography and MRI of today is unknown, as the authors found no studies evaluating today's more advanced imaging techniques. Concerning the older techniques the authors found moderate diagnostic accuracy for all CT, myelography and MRI, indicating a large proportion of false positives and negatives.	heterogeneity; 10 out of 14 studies had high risk of bias
Shraim BA, Shraim MA, Ibrahim AR, et al. The association between early MRI and length of disability in acute lower back pain: A systematic review and narrative synthesis. BMC Musculoskelet Disord. 2021; 22(1):983.	Systematic review	Low	To investigate whether early MRI (eMRI) for acute low back pain (LBP) without red flags is associated with an increased length of disability.	All epidemiologic study designs examining the association between eMRI and LOD in patients with acute LBP were considered for inclusion. Patients with a medical diagnosis of acute LBP, occupational LBP or non specific LBP were included. Studies including patients with chronic or complicated LBP (e.g., severe injuries, multiple traumas, infection, autoimmune disease, or cancer) were not considered for inclusion in the review.	Medline, EMBASE, and CINAHL bibliographic databases from their inception until June 5, 2021 were included, using medical subject heading (MeSH) or Emtree and free-text terms on LBP, MRI, and work disability. The exposure was eMRI defined as an MRI of the lumbar spine for LBP within the first 4 to 6 weeks of the first recorded medical visit for the current LBP episode. The main outcome was the measure of association between eMRI and LOD whether it was reported as odds ratios, relative risk, or mean difference in LOD between the eMRI group and the no eMRI group. The LOD was defined as the number of disability days (absence from work) due to the current episode of LBP. Methodological quality assessment of included studies was conducted independently by two reviewers using the Newcastle–Ottawa scale for cohort studies and any disagreements were resolved by discussion with a third reviewer. Where there was a conflict of interest or potential reviewer bias, the reviewer in question was not involved in the quality assessment.	The search identified 324 records, in which seven studies met the inclusion criteria. Three of the included studies used the same study population. Owing to between-study heterogeneity, a narrative synthesis of results was used. All included studies were of good methodological quality and consistently reported that patients with acute LBP without red flags who received eMRI had increased LOD compared to those who did not receive eMRI. Three retrospective cohort studies reported that the eMRI groups had a higher mean LOD than the no eMRI groups ranging from 9.4 days (95% CI 8.5, 10.2) to 13.7 days (95% CI 13.0, 14.5) at the end of 1-year follow-up period. The remaining studies reported that the eMRI groups had a higher hazard ratio of work disability ranging between 1.75 (95% CI 1.23, 2.50) and 3.57 (95% CI 2.33, 5.56) as compared to the no eMRI groups. Conclusion: eMRI is associated with increased LOD in patients with acute LBP without red flags. Identifying reasons for performing non-indicated eMRI and addressing them with quality improvement interventions may improve adherence to clinical guidelines and improve disability outcomes among patients with LBP.	First, the current review included a small number of studies (7 studies from 5 study populations). Second, the included studies in this review used WC databases as the primary source of data. This data does not provide information on some predictors of LOD, such as level of functional disability, work accommodation, nature of job, fear-avoidance, and other comorbidities, including psychiatric conditions. Third, the included studies measured LOD using wage replacement data. This may underestimate the observed association between eMRI and increased LOD. Finally, formal pooling of the results using meta-analysis was not feasible owing to between-study heterogeneity.
Srinivas SVD, R. A. Berger, Z. D. Application of "less is more" to Low back pain. Arch Intern Med. 2012 172(13):1016-20.	Systematic review	Low	An initiative of the National Physicians Alliance, the project titled "Promoting Good Stewardship in Clinical Practice," developed a list of the top 5 activities in primary care for which changes in practice could lead to higher-quality care and better use of finite clinical resources. One of the top 5 recommendations was "Don't do imaging for low back pain within the first 6 weeks unless red flags are present." This article presents data that support this recommendation.	Acute low back pain patients	The authors searched the literature using PubMed for articles published in the past 5 years using the terms lower back pain, Low back pain, imaging, and either systematic review or meta-analysis. the authors selectively reviewed the literature, including recent reviews, guidelines, and commentaries, on the benefits and risks of routine imaging in Low back pain. the authors also assessed the cost of spine imaging using data from the National Ambulatory Medical Care Survey.	One high-quality systematic review and meta-analysis focused on clinical outcomes in patients with Low back pain and found no clinically significant difference in pain or function between those who received immediate lumbar spine imaging vs usual care. Published data also document harms associated with early imaging for Low back pain, including patient "labeling," unneeded follow-up tests for incidental findings, irradiation exposure, unnecessary surgery, and significant cost. RESULTS: Routine imaging should not be pursued in acute low back pain. Not imaging patients with acute Low back pain will reduce harms and costs, without affecting clinical outcomes. Our literature search identified only one systematic review published in the past 5 years that provides data on outcomes related to imaging of acute Low back pain.	Limited number of studies limited assessment of study quality