

Acute back pain: Clinical and radiologic diagnosis: WFNS spine committee recommendations

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ABSTRACT

Objective: To formulate the most current, evidence-based recommendations for the clinical and radiologic diagnosis of acute low back pain lasting <4 weeks.

Methods: A systematic literature search in PubMed and Google Scholar databases was performed from 2012 to 2022 using the search terms “acute back pain AND clinical diagnosis” and “acute back pain AND radiologic diagnosis”. Screening criteria resulted in a total of 97 papers analyzed. Using the Delphi method and two rounds of voting, the WFNS (World Federation of Neurosurgical Societies) Spine Committee generated ten final consensus statements.

Results: Ten final consensus statements address the clinical diagnosis of acute LBP, including which clinical conditions cause acute LBP and how we can distinguish between the different causes of LBP, including discogenic, facet joint, sacroiliac joint, and myofascial pain. The most important step for the radiologic diagnosis of acute LBP is to evaluate the necessity of radiologic investigation, as well as its timing and the most appropriate type of imaging modality. Importantly, imaging should *not* be a routine diagnostic tool, unless red flag signs are present. In fact, routine imaging for acute LBP can actually have a negative effect as it may reveal incidental radiographic findings that exacerbate patient fear and anxiety.

Conclusion: Overall, the quality of evidence is not high for most of our consensus statements, and further studies are needed to validate the WFNS Spine Committee recommendations on the clinical and radiographic diagnosis of acute LBP.

1. Introduction

Low back pain (LBP) is an extremely common and non-specific symptom. This musculoskeletal condition usually affects the adult and elderly population, with a prevalence estimated at ~85%.^{1,2} LBP is classified into acute back pain (lasting a few days up to 4 weeks), sub-acute back pain (4–12 weeks), and chronic back pain (>12 weeks). Approximately 20% of patients with acute back pain will go on to develop chronic back pain.^{3,4}

In this review, we focus specifically on acute LBP, lasting less than 4 weeks. The appropriate clinical diagnosis is of utmost importance in this patient population. Up to 85–90% of patients with acute LBP have non-

specific pain, but the remaining 10–15% may have neurologic deficit (due to compression of neural structures in spinal stenosis, for example) or serious underlying disease (such as malignancies or fractures).^{5–10} The traditional notion that the etiology of non-specific LBP is unknown has been a mistake for decades.¹ In most cases, LBP can be attributed to a specific pain generator, such as, for example, the intervertebral disc, facet joints, sacroiliac joints, or soft tissue. The accurate and timely diagnosis of acute LBP can be challenging and complex, as these subtypes of LBP have their own characteristics and optimal treatment strategies. Reliable clinical diagnosis is the key to successfully managing these patients.^{1,11,12,15}

To address this issue, the World Federation of Neurosurgical Societies (WFNS) Spine Committee convened a consensus conference on

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Abbreviations	
WFNS	World Federation of Neurosurgical Societies
MRI	Magnetic resonance imaging
CT	Computer tomography
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

acute back pain management. The goal of this conference was to produce up-to-date, evidence-based recommendations for the prevention, clinical and radiological diagnosis, conservative and surgical treatment, as well as rehabilitation of LBP. In this paper, we focus specifically on the clinical and radiologic diagnosis of acute LBP, including which clinical conditions cause acute LBP, how we distinguish the various causes of LBP, when (and which type of) radiographic imaging is appropriate to order, and how imaging correlates with clinical manifestations of acute LBP. While several guidelines on the clinical and radiological diagnosis of lumbar spine disease already exist, our

recommendations are developed for practicing spine surgeons internationally, with a particular focus on those in low and middle-income countries.

2. Methods

This systematic review was conducted following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines⁹ and the methods recommended by the Cochrane Handbook for Systematic Reviews of Interventions.

We performed a literature search in PubMed and Google Scholar using the following key words: “Acute back pain AND clinical diagnosis”. This search produced 1398 abstracts in PubMed and 266 in Google scholar, respectively. Inclusion criteria were studies from 2012 to 2022 (the last ten years) and those written in the English language. We excluded duplicate articles, those for which full text was not available, case reports and non-human studies. We focused specifically on prospective and retrospective case series, randomized control trials, systematic reviews, and meta-analyses. Using this screening criteria (Fig. 1), 97 studies were selected for full review.

We collected and organized the data to answer the following

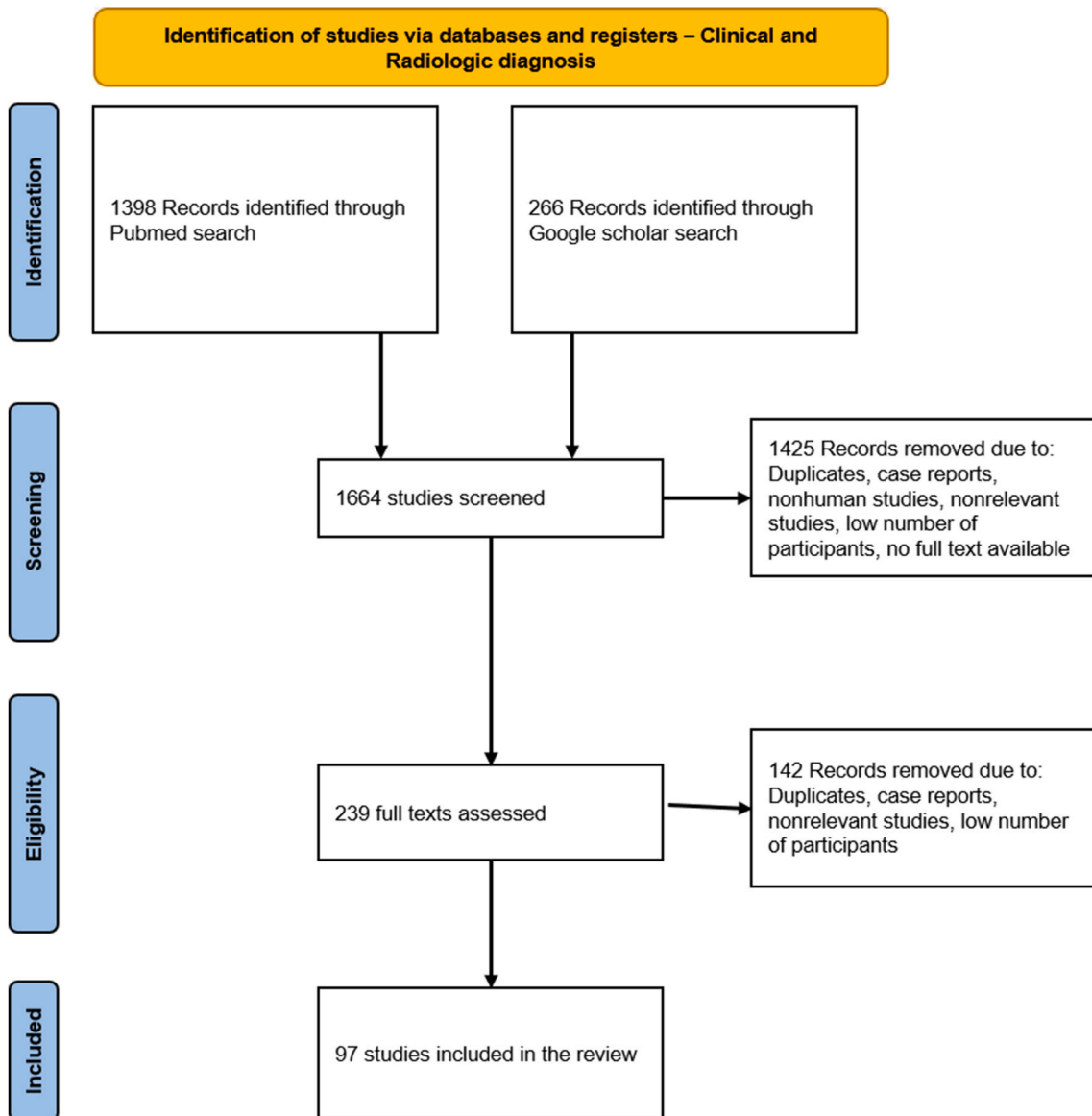


Fig. 1. Prisma chart for the review.

questions:

- (1) Which clinical conditions cause acute LBP (lasting less than 4 weeks)?
- (2) How do we differentiate the various causes of acute LBP?
- (3) When is radiographic imaging appropriate to order for acute LBP?
- (4) Which imaging modality is most appropriate (specifically, CT, MRI, plain x-rays, flexion-extension x-rays, or other)?
- (5) How does radiographic imaging correlate with clinical manifestations of acute LBP?

We presented our search results and produced recommendations using the Delphi method at two consensus meetings of the World Federation of Neurosurgical Societies (WFNS) Spine Committee (first in Karachi, Pakistan, in May 2022 and then in Istanbul, Turkey, in September 2022). The WFNS Spine Committee is a group of experienced, well-known neurosurgeons from around the world, including high, middle, and low-income countries, specializing in spine. Ten participants were given a set of statements which were discussed and revised at the initial meeting. After a preliminary anonymous voting session, some statements were excluded due to low evidence. Ten final statements were presented for review and voted on again at the second meeting. Voting used a Likert scale from 1 to 5 (1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = disagree, 5 = strongly disagree). Consensus was achieved when the sum for agreement (1, 2, 3) or disagreement (4, 5) was $\geq 66\%$. The final ten consensus statements with final voting responses are presented in Table 3.

3. Results and discussion

3.1. Classification of clinical diagnosis of acute low back pain

There are several clinical patterns of acute LBP. While the majority of acute LBP (up to 85–90% of cases) is deemed “non-specific”, there are specific physical findings that can be used to make a definitive diagnosis (see Table 1).¹⁶ The most common etiologies of back pain are discogenic, facet joint, sacroiliac joint, and myofascial pain, as outlined below.

3.1.1. Discogenic pain

The source of pain is the degenerated intervertebral disc. As the degeneration progresses, the disc dehydrates and loses nutrients, leading to nerve terminal irritation and resulting in axial back pain. Typical complaints for discogenic pain include pain in the center of the lower back with minimal radiation. However, if radiation is present, it may occur in the buttocks or thighs. Discogenic pain is commonly described as a deep, dull ache. Patients often report that pain is worse with sitting, driving, flexion, bending, twisting, Valsalva, or coughing, and improves with standing, lying flat, or extension. A higher incidence of discogenic lower back pain occurs in obese patients and smokers.¹⁷

3.1.2. Facet joint pain

The source of pain in this case is related to progressive degenerative disease of the lumbar spine. Facet joints take on loading forces of the spine, resulting in spondyloarthrosis and local inflammation that results

Table 1
Most common causes of acute LBP.

Type of pain	Characteristic finding
Discogenic back pain	Axial pain, worse in flexion, relieved in recumbency
Facet joint pain	Worse on extension
SI pain	At least 3 positive provocative tests and pain improved with SI joint injection
Myofascial pain	Trigger point on back with hyperesthesia, reproducible pain with firm palpation

in back pain. Patients with facet joint pain often complain of back stiffness, which is typically worse in the morning or after sitting for prolonged periods of time. This pain is described as a deep, aching sensation, either unilaterally or bilaterally. Occasionally there may be radiation to one or both buttocks, groins, and/or thighs, but this usually stops above the knee. Factors that can exacerbate facet-mediated pain include psychosocial stressors, increased or decreased physical activity, lumbar extension with or without rotation, and prolonged standing or sitting.^{18,19} On physical exam, this type of pain can often be provoked with lumbar extension, lateral bending, and/or paraspinal palpation.

3.1.3. Sacroiliac joint pain

Sacroiliac (SI) joint pain can have numerous systemic or local etiologies. A comprehensive medical history, elicitation of clinical symptoms, and full neurologic exam are therefore paramount in all patients with suspected sacroiliac joint dysfunction. SI joint pain can be caused by trauma, infection, or inflammatory disease; it may also be due to prior spinal fusion, scoliosis, or leg-length discrepancy.²⁰

SI joint pain typically occurs in the lower back or upper buttocks overlying the SI joint. There are several provocative tests to diagnose sacroiliac joint pain, including the FABER/Patrick test, compression test, distraction test, thigh thrust, and Gaenslen test. While various sensitivities and specificities for these tests are reported in the literature, it is overall reasonable to consider a diagnosis of SI joint pain if 3 out of 5 provocative tests are positive (see Table 2).

3.1.4. Myofascial pain

Myofascial pain is characterized by the presence of myofascial trigger points that are located in the fascia, tendons, and/or muscle which, when triggered, result in a symptomatic pain response. Myofascial trigger points can be identified by eliciting pain on palpation. Myofascial pain can also be provoked by forward flexion. The range of motion of the lumbar spine is also reduced.^{21–23}

3.2. Radiologic diagnosis of acute low back pain

The most important step for the radiologic diagnosis of acute LBP is to evaluate the necessity of radiologic investigation, as well as its timing and the most appropriate type of image modality. Importantly, imaging should *not* be a routine diagnostic tool, unless red flag signs are present.

3.2.1. Red flags

Taking a medical history and performing a full neurologic exam is highly important in patients with acute back pain in order to determine if there are any “red flags”. Red flags include age (under 18 or over 50 years), drug use (including IV drugs or anticoagulants), trauma (including recent surgery, fractures), fever/infection, immunocompromised status, personal history of malignancy, and presence of neurological deficits (including motor, sensory, and/or bowel/bladder dysfunction) (Fig. 2). In particular, cauda equina syndrome, which is defined as compression of the nerve roots of the cauda equina leading to acute LBP with lower extremity radiculopathy, saddle anesthesia, urinary retention and/or bowel/bladder incontinence, should be recognized immediately (This will be addressed comprehensively in a separate consensus document in this issue.) The presence of red flags in

Table 2
Sacroiliac joint provocative maneuvers.

Diagnostic test	Description
FABER/Patrick test	Applies tensile force on the anterior aspect of the SI joint on the side tested
Compression test	Applies compression force across the SI joints
Distraction test	Applies tensile forces on the anterior aspect of the SI joints
Thigh thrust	Applies anteroposterior shear stress on the SI joint
Gaenslen test	Applies torsional stress on the SI joints

Table 3

Final voting for ten consensus statements on the clinical and radiographic diagnosis of acute LBP.

Statement	Voting
(1) Axial back pain that worsens with flexion, coughing, or Valsalva and improves with recumbency is suggestive of discogenic backpain	7 (70%) strongly agree 2 (20%) agree 1 (10%) somewhat agree
(2) Back pain with unilateral or bilateral distribution that worsens on lumbar extension is suggestive of facet joint pain.	6 (60%) strongly agree 4 (40%) agree
(3) Facet joint pain may radiate to the buttock or thigh but not below the knee and is not exaggerated by Valsalva or coughing.	8 (80%) strongly agree 2 (20%) agree
4) Three positive sacroiliac joint provocative tests are suggestive of sacroiliac joint pain, which can be confirmed with a diagnostic injection.	5 (50%) strongly agree 5 (50%) agree
5) Presence of a taut band trigger point on the back with hyperesthesia that is painful with firm palpation is suggestive of myofascial pain.	4 (44.4%) strongly agree 3 (33.3%) agree 2 (22.2%) somewhat agree
6) Patients with persistent radiculopathic symptoms, severe progressive neurologic deficits, or serious underlying conditions with acute LBP should undergo diagnostic imaging.	9 (90%) strongly agree 1 (10%) agree
7) Patients with first-time presentation of acute LBP without red flags do not require radiological investigation.	9 (90%) strongly agree 1 (10%) agree
8) When red flags are present or pain persists beyond 6 weeks, MRI is the recommended imaging for LBP.	6 (60%) strongly agree 2 (20%) agree 2 (20%) somewhat agree
9) CT scans are superior in showing bone, but not as useful as MRI in depicting soft-tissue pathologies, such as disc disease or spinal stenosis.	7 (70%) strongly agree 3 (30%) agree
10) There is strong evidence that routine imaging for acute LBP does not provide clinical benefit. Diagnostic imaging studies might reveal incidental findings without pathological value and should be performed only in selected patients.	5 (50%) strongly agree 5 (50%) agree

Table 4

The most relevant papers regarding clinical and radiologic diagnosis of acute back pain.

Raised topics	Studies	Sample	Results
Red flag signs	Verhagen et al., ²⁴ (2016)	16 guidelines	Lack of evidence for the accuracy of red flags in analyzed studies
	De Palma, ¹³ (2020)	–	
	Underwood et al., ¹⁴ (2013)	–	
Diagnostic imaging	Scott et al., ⁴⁰ (2021)	24 + 34 studies	Classification systems do not improve outcomes of managing low back pain Moderate diagnostic accuracy for all modalities Lumbar imaging LBP without indications of serious underlying conditions does not improve clinical outcomes Advanced spinal imaging studies may have an important effect on variation in spine surgery rates LBP is significantly associated with disk space narrowing and spondylolisthesis “Specific” LBP is more common in Japan than in western countries
	Kim et al., ³⁴ (2018)	14 studies	
	Chou et al., ³⁶ (2011)	6 trials	
	Lurie et al., ³⁸ (2003)	Random 5% sample across 306 hospitals	
Clinical diagnosis of low back pain	Raastad et al., ³² (2015)	28 studies	
	Suzuki et al., ¹⁶ (2016)	320 patients	

higher risk of LBP) may have MRI-incompatible prostheses (e.g., older hip or knee replacements, pacemakers). In these cases, a CT myelogram, dynamic CT scan, or diagnostic block may be necessary.

3.2.3. Diagnostic accuracy of spinal imaging

Physicians should determine the most appropriate spinal imaging modality based on the individual clinical situation, with goals of avoiding unnecessary radiation exposure and minimizing cost. In addition, it is important that physicians do *not* obtain radiologic imaging for non-specific acute LBP without red flags. Imaging in these cases has not been shown to impact the natural course of the disease with regards to pain, function, or quality of life, and rarely affects treatment plans.^{35–39} On the contrary, it may cause negative psychological impact. In particular, becoming aware of clinically irrelevant imaging findings may cause patients to have high levels of anxiety, to focus excessively on minor back symptoms, and to avoid exercise or other recommended activities due to fear of injury. These fears may be further exacerbated by lack of social support, small number of social contacts, low mood/depression, overprotective family members, financial problems, and other so-called “yellow flag” signs.

3.2.4. WFNS spine committee recommendations

Taking this literature in summary, and via the two rounds of voting outlined in our methods section, the WFNS Spine Committee formulated the following ten consensus statements. Overall, the quality of evidence is not high for each statement, and future randomized control trials are needed to validate these recommendations.

Acute LBP: clinical diagnosis

- (1) Axial back pain that worsens with flexion, coughing or Valsalva and improves with recumbency is suggestive of discogenic back pain.
- (2) Back pain with unilateral or bilateral distribution that worsens on lumbar extension is suggestive of facet joint pain.
- (3) Facet joint pain may radiate to the buttock or thigh but not below the knee and is not exaggerated by Valsalva or coughing.

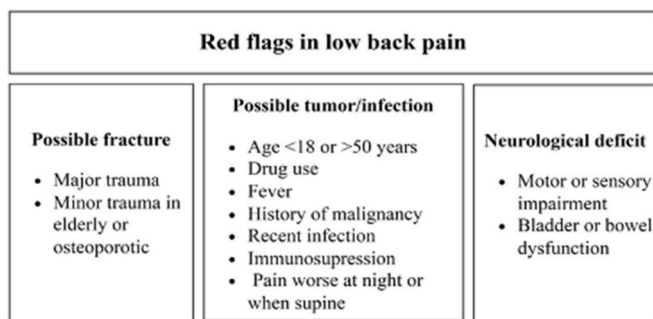


Fig. 2. Overview of red flags in back pain.

acute LBP indicates the potential for serious pathology and requires diagnostic imaging and specialist referral (see Table 4).^{25–27}

3.2.2. Choice of radiologic imaging modality

A plain X-ray or CT scan is indicated for acute LBP if a fracture, tumor, or bone infection is suspected. Flexion-extension x-rays are performed when instability or spondylolisthesis is suspected.^{28,29}

Although it is an expensive study, a lumbar spine MRI is indicated if a neurologic deficit present. This is due to the fact that it is the best imaging modality to visualize soft tissue, including disks and nerves, and is the “gold standard” for diagnosis of disk herniation and spinal stenosis, including both central, lateral recess, and foraminal stenosis.^{30–33}

However, some patients (particularly older patients who are at

- (4) Three positive sacroiliac joint tests are suggestive of SI joint pain, which can be confirmed with a diagnostic injection.
- (5) Presence of a taut band trigger point on the back with hyperesthesia that is painful with firm palpation is suggestive of myofascial pain.

Acute LBP: radiologic diagnosis

- (1) Patients with persistent radiculopathic symptoms, severe progressive neurologic deficits, or serious underlying conditions with acute LBP should undergo diagnostic imaging.
- (2) Patient with first-time presentation of acute LBP without red flags do not require radiological investigation.
- (3) When red flags are present or pain symptoms persist beyond 6 weeks, MRI is the recommended imaging for LBP.
- (4) CT scans are superior in showing bone, but not as useful as MRI in depicting soft-tissue pathologies, such as disc disease or spinal stenosis.
- (10) There is strong evidence that routine imaging for acute LBP does not provide clinical benefit. Diagnostic imaging studies might reveal incidental findings without pathological value, and should be performed only in selected patients

4. Conclusion

Acute LBP is extremely prevalent, particularly in western countries. Despite its high prevalence and seeming simplicity, it can be challenging to appropriately diagnose the cause of “non-specific” LBP. Once the exact cause (e.g., discogenic, facet joint, SI joint, or myofascial pain) is determined, the patient can be treated more precisely.

Patients with first-time presentation of acute LBP without red flags do not require radiological investigation. When imaging is indicated, MRI is the “gold standard” for diagnosing disk herniations and spinal stenosis.

Overall, the quality of evidence is not high for each of our ten consensus statements, and future randomized control trials are needed to validate these recommendations.

Availability of data and materials

The raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher.

CRedit authorship contribution statement

Artem O. Gushcha: Writing – original draft, Conceptualization. **Salman Sharif:** Formal analysis, Data curation, Conceptualization. **Mehmet Zileli:** Data curation, Conceptualization. **Joachim Oertel:** Writing – review & editing, Conceptualization. **Corinna C. Zygorakis:** Conceptualization, Writing – original draft, Writing – review & editing. **Adilya R. Yusupova:** Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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