

Evidence-based imaging for the management of lower back pain in the emergency department: A narrative review

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Abstract

Patients often present to the emergency department with non-specific complaints of lumbar back pain. Because of the nature of the emergency department, the lack of knowledge or time on the part of providers, and the high levels of quick decision making, unnecessary imaging studies are often ordered to provide care for the patient's emotional and perceived physical needs. This narrative review will present a hypothetical typical standardized case of a patient presenting with lower back pain, examine the current evidence and recommendations from the major ruling bodies in internal medicine, neurology, neurosurgery, and radiology, evaluate the major statements released by the Choosing Wisely campaign, and finally, present a new diagnostic decision tree for the management of lumbar back pain.

Highlights

- Lumbar back pain is debilitating in nature and can affect activities of daily living.
- No medical testing, imaging study, treatment, or intervention is without effect on the entire bodily system.
- The major principle of value-based care is to utilize the lowest costing imaging study followed by more expensive imaging modalities if deemed necessary.
- Only through knowing the patient and considering their specific needs, including physical, financial, and emotional needs, can one both provide quality care and avoid doing harm.

Introduction

One of the most common chief complaints in the emergency department is that of musculoskeletal pain.^{1,2} Of these complaints, non-specific lower back pain often receives either imaging studies or consultation of the internal medicine, neurological, or neurosurgical services within the hospital system.^{1,2} Lumbar back pain is debilitating in nature and can affect activities of daily living due to the required integration of the musculature and skeletal structures during ambulation and simple postural positioning.^{3,4} Therefore, it is key that the clinician can balance the immediate desire to initiate action, regardless of if the action to help is actually beneficial, and the utility of that action for the betterment of the patient, especially

in the emergency department.

Often, imaging studies are utilized by clinicians as their first step in a treatment plan, with jokes in the emergency department discussing a therapeutic CT scan as first line for patients presenting with non-specific pain. As is often stated within the value-based care literature, no medical testing, imagining study, treatment, or intervention is without effect on the entire bodily system.⁵ Furthermore, imaging studies can be expensive for the patient and should only be utilized when the findings can significantly alter the course of care.⁵ Finally, and most importantly, the patient trusts their clinician implicitly,⁶ requiring that the medical practitioner take this trust and responsibly to act towards the benefit of the patient.⁷ Therefore, it is key that the clinician is judicious when ordering testing and imaging studies to ensure that the patient's safety, financial situation, and implicit trust in their doctor are held first and foremost.⁵⁻⁷ This article presents a hypothetical typical standardized case of a patient presenting with lower back pain, examines the current evidence and recommendations from the major ruling bodies in internal medicine, neurology, neurosurgery, and radiology, evaluates the major statements released by the Choosing Wisely campaign, and finally, presents a new diagnostic decision tree for the management of lower back pain.

Materials and Methods

This paper followed clear methods in the development of a narrative review looking at the major associations and organization involved in providing recommendation for the betterment of the patient. On top of consulting the major organizations including, but not limited to, the American Radiological Association, the American Association of Family Practitioners, the Radiological Society of North America, the European Society of Radiology, the American College of Physicians, the American Neurological Association, and the American Academy of Neurology, the team looked at the major papers which have come out on the topics of the evaluation and treatment of lumbar back pain, imaging for patients with non-specific lumbar back pain, and value based care from the period of 1998 to 2022. Papers were found utilizing key search terms of "Lumbar Back Pain", "Value Based Care", and "Imaging" on search engines including Google, PubMed, and the Cochrane Library. Papers were excluded based on availability in the English language, status of peer review, public access, generalizability to the general patient population, and age before 1998.

Case presentation

This case is a hypothetical, typical patient who presents to an emergency department with complaints of non-specific lumbar back pain. The patient is a 45-year-old right-handed Caucasian male with no pertinent past medical history, who presents to the emergency department with the chief complaint of non-specific lower back pain. The patient states that his back pain began roughly five (5) weeks ago while he was lifting a large box at work. The pain continues to bother him throughout the day and persists at night. It becomes worse when standing up, sitting up, or when lifting objects. He states that the pain is constant, does not become better or worse throughout the day, is dull and achy, and can extend down his right leg. He says that the use of over-the-counter pain relievers, such as acetaminophen or ibuprofen, helps a little, but that the pain continues to bother him even despite taking the maximum recommended dosage. He has tried stretching exercises and foam rolling techniques, but neither of these seem to help him. Upon further questioning, the patient states that he does not have numbness or tingling in any region of his body and that he is not experiencing any urinary or fecal incontinence. On physical examination, the patient ambulates normally with subjective pain and demonstrates 5/5 strength in the hip flexors, hip extensors, hip abductors, and hip adductors. The patient has a normal sensation to light touch and pinpoint in the bilateral lower extremities. Finally, the patient has a normal anal wink reflex, normal patellar reflex, and normal down going Babinski. The remainder of the physical examination is within normal limits.

The current recommendations

Because of the nuances associated with lower back pain, the different ruling bodies in neurology, neurosurgery, and internal medicine strongly recommend that the provider first obtain a thorough history and physical exam to assess the likelihood of serious spinal pathology. An effective history can identify any major "red flag" symptoms, which require further work up.⁸ These red flag symptoms include: immunocompromised state (chronic liver disease, chronic kidney disease, or medically induced immunosuppression), history of recent intravenous drug use, history of cancer, anticoagulant use, major trauma in children or young adults, minor trauma in older patients (>50 years of age), rheumatologic disease, symptoms of spinal cord compression (saddle anesthesia, urinary or bowel incontinence or retention, perineal sensory loss, or anal sphincter laxity), any systemic symptoms (fever, rigors, or weight loss), and finally severe or progressive neurological deficits.⁸ If the patient experiences any of these symptoms or falls into any of these categories, further evaluation with imaging is highly recom-

Table 1. Symptomatic categorical break down of lumbar back pain as a presenting symptom with recommended imaging or treatment modalities.9-15

Major Group	Minor Group	Imaging or therapy
Lumbar Back Pain Only 93% of all cases	Simple Back Pain (<50, No signs of systemic disease, no history of cancer, no neurological deficits) Complex Back Pain (>50 or Signs of systemic disease or History of cancer or Neurological deficits)	Conservative Therapy (NSAIDs and Hot/Cold compresses) for 6 weeks Obtain CRP or ESR, if greater than normal obtain plain film radiography
Lumbar Pain with Associated Radicular Pain 4% of all cases	Radiculopathy (Without bladder or bowel involvement)	Conservative Management (NSAIDs and Hot/Cold compresses) for 6 weeks unless there is progression of Neurological deficits
Possible Stenosis 3% of all cases	Urgent Situation Tolerable pain without Neurological Deficits Intolerable pain or Neurological Deficits	Urgent Neurosurgical consultation and CT or MRI Symptomatic Treatment alone MRI, CT, or EMG

mended.⁸ Of note, there is a lack of high-quality evidence for the diagnostic accuracy of red flag tests and there is no consensus on which red flags are most useful to identify serious spinal pathology or how they should be used in the clinical setting.⁸ Therefore, it is recommended to use medical history in conjunction with the patient’s determinants of health and physical exam when making diagnostic decisions.

Once a proper medical history has been obtained, the provider is encouraged to perform a physical examination with sensory, muscular strength, and reflex testing of the lower extremities and observation of ambulation. These physical examination maneuvers within the context of the patient’s history can help to demonstrate which pathologies are more or less likely.⁹ Per data collected from several different peer reviewed studies, patients usually fall into one of three major symptomatic categories: Lumbar Back Pain Only, Lumbar Back Pain with Associated Radicular Pain, and

Potential Lumbar Stenosis.⁹⁻¹⁵ Subcategories for each of these can be found in Table 1.

Choosing Wisely campaign

According to the Choosing Wisely campaign, a national organization focused on reducing unnecessary testing within medicine, the use of any imaging modalities on lower back pain without the aforementioned red flags is greatly discouraged within the first six weeks of the initial incidence of back pain.¹⁶⁻¹⁹ Choosing Wisely also recommends the utilization of either heat or cold packs as first line treatment and includes NSAIDs as potential first line treatment of lower back pain in their patient resources.^{18,19} The Choosing Wisely campaign, which also studied the effectiveness of evidence-based imaging for the management of lower back pain, concluded that patients with uncomplicated low back pain who received imaging studies often had worse outcomes than those who were only

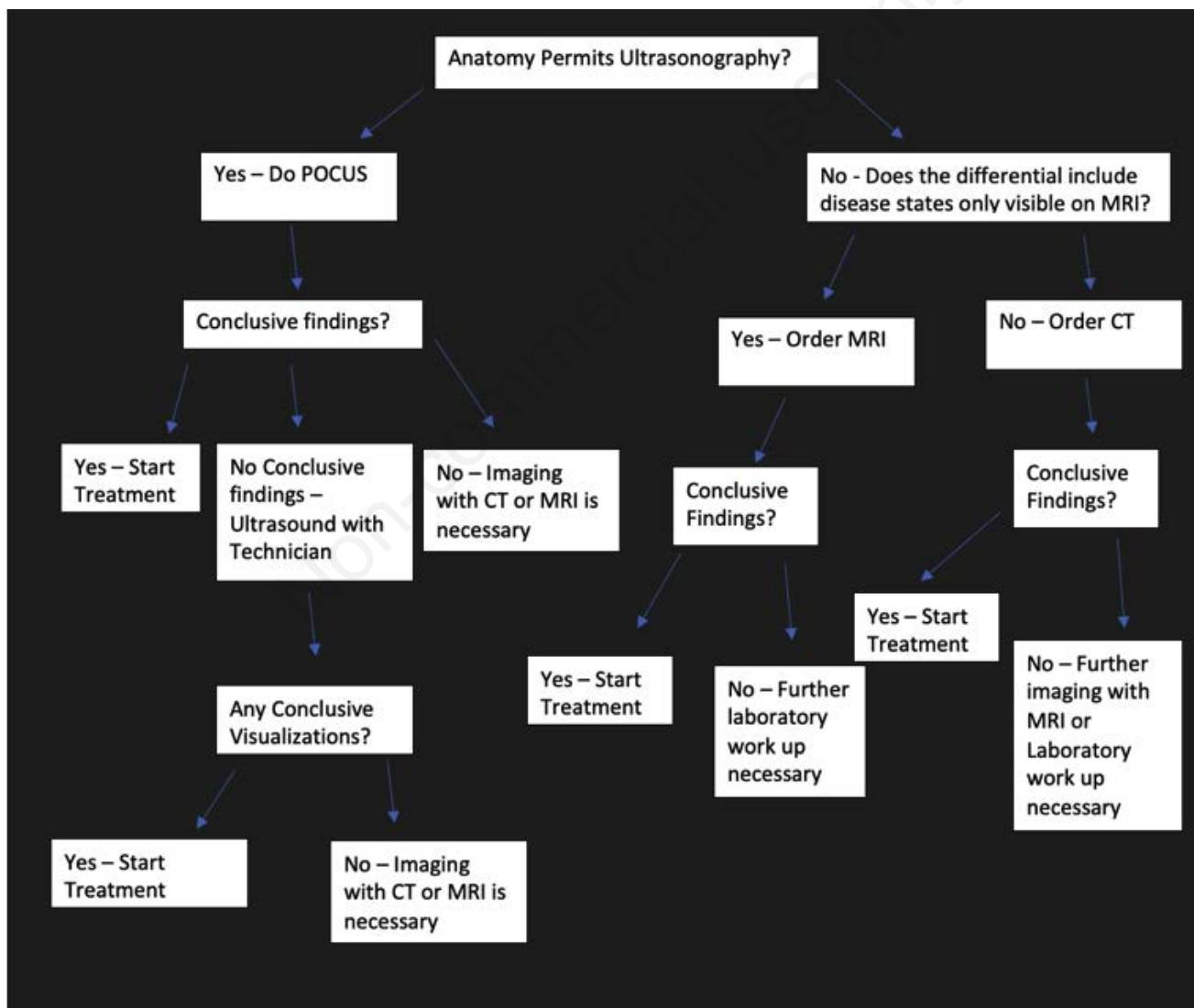


Figure 1. CT: computerized tomography; MRI: magnetic resonance imaging. This algorithm was based on recommendations of general principles from both the Radiological Society of North America and the European Society of Radiology.^{20,21}

treated with conservative management such as over-the-counter pain medication, heat, and physical exercise.¹⁶⁻¹⁹

Cost to the patient

As detailed in a recent case report by Sui *et al.*,⁵ the cost of ionizing imaging studies which are necessary to observe the musculoskeletal causes of back pain can range from a few hundred dollars to a few thousand dollars. The authors further state that the major principle of value-based care is to utilize the lowest costing imaging study followed by more expensive imaging modalities if deemed necessary, a generalized decision tree for all imaging studies is included here for the benefit of the readers (Figure 1).⁵ Therefore, in the case of the standardized patient in the case presentation, it is the highest recommendation of the authors to delay the use of imaging studies until at least six weeks have passed and to recommend the use of ice to minimize inflammation and heat to

reduce pain and relax the muscles. If the patient's symptoms had worsened, if the symptoms were debilitating, or if red flag symptoms (as listed above) became known to the team, then imaging studies to rule in or out diagnoses become necessary. If deemed necessary after the six-week window has passed, an imaging study can be used to see if there are signs of disease, which can be modified with the use of either medical or surgical action.

Clinical pearls for the emergency room

Due to either a lack of medical knowledge or lack of access to routine care, patients will often present with non-emergent complaints to the emergency department at their local hospital, leaving emergency physicians to decide whether to order an imaging study.² By understanding the overarching concepts presented in this article, it is the hope of the authors that emergency physicians will feel more comfortable making educated decisions on whether

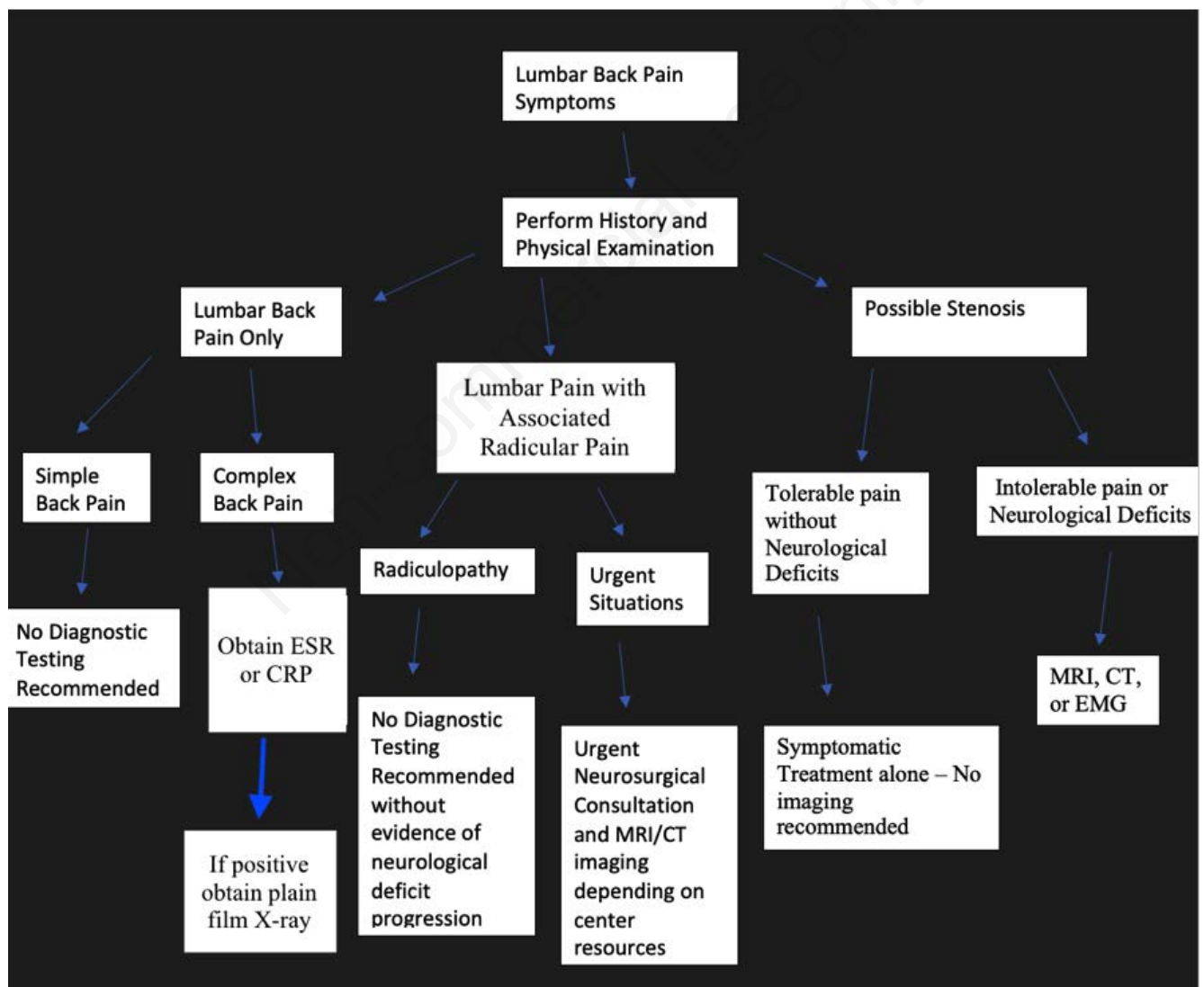


Figure 2. ESR: Erythrocyte Sediment Rate, CRP: C-Reactive Protein CT: computerized tomography; MRI: magnetic resonance imaging, EMG: Electromyography. Detailed here is a diagnostic decision tree based on data from several peer reviewed studies and literature reviews.⁹⁻¹⁵

to order testing. To improve efficiency and provide a standardized approach, we have created a new diagnostic tree with regards to the most common causes of lower back pain (Figure 2).

Patient-centered care

While clearly identifying risks and benefits before ordering a test or intervention is an important part of value-based care, this practice may not always include considerations of the patient's own fears and concerns. Although it may be clear to the physician that imaging a case of low-back pain will not be beneficial, patients may feel frustrated or dismissed if they do not receive these studies. In this case, the peer reviewed literature recommends that the clinician clearly explain their reasoning and thought process, provide reassurance and information for when to re-present for care, and give the patient resources for education.²² The astute clinician can and will encourage the patient to follow up with their PCP to receive referrals for physical therapy, exercise programs, and prescriptions for medications such as steroids, muscle relaxers, or high dose NSAIDs.^{23,24} It is also important to educate patients on stretching techniques to do at home, write doctor's note for work absence, and stress the importance of "team lifting" heavy objects and the use of proper lifting techniques.^{17,23} Through taking these actions, the physician will both provide for the emotional needs of the patient and ensure that the patient receives the best care possible.^{22,28,29}

Conclusions

In the emergency department, patients often present with non-specific complaints of back pain.^{1,2} Through proper evaluation and utilization of the history and physical examination, the astute clinician will be able to differentiate between those patients who require imaging studies to evaluate for potential interventions and those for whom conservative management will suffice. Following in the vein of Sir William Osler's "Great Physician," only through knowing the patient and considering their specific needs, including physical, financial, and emotional needs, can one both provide quality care and avoid doing harm, as is required by the Oath of Hippocrates.

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