

Johns Hopkins University School of Medicine
Appropriate Use Criteria
Priority Clinical Area: Low Back Pain
Setting: Ambulatory and Emergency Department

INTRODUCTION

The Centers for Medicare and Medicaid Services (CMS) Appropriate Use Criteria (AUC) program takes effect January 2020 and requires ambulatory and emergency medicine providers to consult AUC using a CMS approved clinical decision support mechanism when ordering advanced imaging (CT, MRI or nuclear medicine) in eight priority clinical areas (PCAs). The AUC must be derived from evidentiary literature review performed by an informationist, in conjunction with subject specialists. Physicians at the Johns Hopkins University School of Medicine evaluated the evidence in the literature pertaining to the utility of CT and MRI for patients with low back pain and identified high-grade evidence to guide decision making about when advanced imaging will add value to patient management.

LITERATURE REVIEW

A broad search of the literature from 1990 to the present was performed by an informationist in conjunction with subject specialists to identify research investigations, systematic reviews, meta-analyses and clinical practice guidelines measuring the utility of advance imaging (CT, MRI or nuclear medicine) for patients with low back pain. Results from the search strategy were uploaded to Covidence and screened in duplicate by two radiology faculty members — with disagreements resolved by consensus — followed by the same process for full text review. From each publication, one or more rules reflecting results and conclusions about the utility of CT or MRI in these clinical settings were extracted into an evidence table. Each publication was graded using Oxford Centre for Evidence Based Medicine Levels of Evidence.

Literature search criteria performed Jan. 26, 2019:

("low back pain"[mh] OR "low back pain"[tiab]) AND ("diagnostic imaging"[mh] OR "diagnostic imaging" OR "tomography, x-ray computed"[mh] OR "computed tomography" OR "CT"[tiab] OR "magnetic resonance Imaging"[mh] OR "magnetic resonance" OR "MRI" OR "nuclear medicine") AND ("clinical study"[Pt] OR "clinical trial"[Pt] OR "clinical trial protocol"[Pt] OR "comparative study"[Pt] OR "controlled clinical trial"[Pt] OR "evaluation studies"[Pt] OR "meta analysis"[Pt] OR "multicenter study"[Pt] OR "observational study"[Pt] OR "practice guideline"[Pt] OR "randomized controlled trial"[Pt] OR "systematic review"[Pt] OR "validation studies"[Pt] OR "meta-analysis"[ti] OR "randomized"[tiab] OR "randomised"[tiab] OR "clinical study"[ti] OR "clinical trial"[ti] OR "observational study"[ti]) AND 1990:3000[dp] AND eng[la]

PRISMA

- 1,309 references imported for screening
- Zero duplicates
- 1,309 studies screened as title and abstract
- 1,143 studies excluded
- 52 studies assessed for full-text eligibility
- Five studies excluded
- 47 studies included

Evaluation focused on studies that defined red flags for serious pathology and investigations of low back pain that were not specific to an imaging modality (N=15).

Publication type

- Two meta-analysis
- 10 systematic reviews (including one systematic review of clinical practice guideline)
- One randomized controlled trial
- Two prospective studies
- One clinical practice guideline

Strength of evidence for low back pain red flags

- Four studies with Oxford Grade 1 evidence
- Four studies with Oxford Grade 2 evidence
- Six studies with Oxford Grade 3 evidence

Johns Hopkins University School of Medicine
Appropriate Use Criteria
Priority Clinical Area: Low Back Pain
Setting: Ambulatory and Emergency Department

- One study with Oxford Grade 4 evidence
- One study with Oxford Grade 5 evidence

Results varied according to modalities tested. Evidence supports avoidance of immediate advanced imaging at first presentation in the absence of neurologic deficit or serious underlying conditions including cancer, infection, fracture and cauda equina syndrome.

APPROPRIATE USE CRITERIA

Title	Clinical scenario 1: Low back pain with high probability of fracture	Clinical scenario 2: Low back pain with high probability of infection, tumor or hemorrhage	Clinical scenario 3: Low back pain and low probability of pathology	Clinical scenario 4: Low back pain and low probability of fracture without radiograph	Clinical scenario 5: Low back pain and low probability of fracture and negative radiograph	Clinical scenario 6: Low back pain and intermediate probability of fracture	Clinical scenario 7: Radiographically confirmed (noncompression) fracture	Clinical scenario 8: Radiographically confirmed uncomplicated compression fracture	Clinical scenario 9: Radiographically confirmed complicated compression fracture	Clinical scenario 10: High probability of fracture in the absence of neurologic deficit	Clinical scenario 11: Low probability of infection, hemorrhage or tumor in the absence of neurologic deficit	Clinical scenario 12: High probability of infection, hemorrhage or tumor in the absence of neurologic deficit	Clinical scenario 13: Radiographically confirmed infection, tumor or hemorrhage
Definition	Each of the following: • Neurologic deficit • Concern for fracture	Each of the following: • Neurologic deficit • History and physical consistent with presence of infection, tumor or hemorrhage	Low suspicion of fracture, infection, tumor or hemorrhage based on history and physical exam	All of the following: • No neurologic deficit • Low probability of fracture based on history and physical • No radiograph	All of the following: • No neurologic deficit • Low probability of fracture based on history and physical • Negative radiograph	Each of the following: • No neurologic deficit • Equivocal or suspicious radiograph	Positive radiograph	Each of the following: • No neurologic deficit • Uncomplicated or chronic, stable compression fracture on radiograph	Each of the following: • Compression fracture on radiograph • Refractory pain (planning for vertebroplasty)	Each of the following: • No neurologic deficit • Presence of risk factor: osteoporosis, steroids, mechanism of injury	All of the following: • No neurologic deficit • Low probability of infection, tumor or hemorrhage based on history and physical • Negative radiograph	Each of the following: • No neurologic deficit • High probability of infection, tumor or hemorrhage based on history and physical	Each of the following: • No neurologic deficit • Radiographic or CT evidence of infection, tumor or hemorrhage
AUC rules													
Consistent with AUC	CT	MRI	No cross-sectional imaging is consistent with AUC for this clinical scenario	No cross-sectional imaging is consistent with AUC for this clinical scenario	• No cross-sectional imaging is consistent with AUC for this clinical scenario	• CT • MRI	CT	No cross-sectional imaging is consistent with AUC for this clinical scenario	CT	CT	No cross-sectional imaging is consistent with AUC for this clinical scenario	MRI	MRI

Johns Hopkins University School of Medicine
Appropriate Use Criteria
Priority Clinical Area: Low Back Pain
Setting: Ambulatory and Emergency Department

Allowable by AUC	MRI	CT	No cross-sectional imaging is consistent with AUC for this clinical scenario	No cross-sectional imaging is consistent with AUC for this clinical scenario	No cross-sectional imaging is consistent with AUC for this clinical scenario		MRI	No cross-sectional imaging is consistent with AUC for this clinical scenario	MRI	MRI	No cross-sectional imaging is consistent with AUC for this clinical scenario	CT	CT (if MRI contraindicated and not already performed)
Not consistent with AUC	NA	NA	<ul style="list-style-type: none"> • CT • MRI • PET/CT • Bone scan 	<ul style="list-style-type: none"> • CT • MRI • PET/CT • Bone scan 	<ul style="list-style-type: none"> • CT • MRI • PET/CT • Bone scan 	NA	NA	<ul style="list-style-type: none"> • CT • MRI • PET/CT • Bone scan 	NA	NA	<ul style="list-style-type: none"> • CT • MRI • PET/CT • Bone scan 	NA	NA
Not Applicable	<ul style="list-style-type: none"> • PET/CT • Bone scan 	<ul style="list-style-type: none"> • PET/CT • Bone scan 				<ul style="list-style-type: none"> • PET/CT • Bone scan 	<ul style="list-style-type: none"> • PET/CT • Bone scan 		<ul style="list-style-type: none"> • PET/CT • Bone scan 	<ul style="list-style-type: none"> • PET/CT • Bone scan 		<ul style="list-style-type: none"> • PET/CT • Bone scan 	<ul style="list-style-type: none"> • PET/CT • Bone scan

EVIDENCE TABLE

Evidence tables are found separately on the Johns Hopkins Medicine’s Appropriate Use Criteria [website](#).

MULTIDISCIPLINARY TEAM

The Johns Hopkins University School of Medicine requires that all practicing physicians participating in the development of AUC disclose any conflicts of interest using the International Committee of Medical Journal Editors (ICJME) form. This information is publically available in a timely fashion upon request, for not less than five years after the most recent published update of the relevant appropriate use criteria. Members of the low back pain AUC development team are:

- Steven Levin, Anesthesiology, The Johns Hopkins Hospital
- Edana Mann, Emergency Medicine, The Johns Hopkins Hospital
- Susan Peterson, Emergency Medicine, The Johns Hopkins Hospital
- Louis Piper, Emergency Medicine, Sibley Memorial Hospital
- Mustapha Saheed, Emergency Medicine, The Johns Hopkins Hospital
- Steven Blash, Family Medicine, Johns Hopkins Community Physicians
- Paul O’Rourke, General Internal Medicine, Johns Hopkins Bayview Medical Center
- Clifton “Bing” Bingham, Internal Medicine and Rheumatology, Johns Hopkins Bayview Medical Center
- Laura Fayad, Musculoskeletal Radiology, The Johns Hopkins Hospital
- Rohini Nadgir, Neuroradiology, The Johns Hopkins Hospital
- Sheng-Fu Larry Lo, Neurosurgery and Spinal Oncology, The Johns Hopkins Hospital
- Cameron McDougall, Neurosurgery, The Johns Hopkins Hospital
- Lee Riley, Orthopaedic Surgery, Johns Hopkins Medicine at Green Spring Station
- Brian Neuman, Orthopaedic Surgery, Johns Hopkins Medicine - White Marsh
- Marlis Gonzalez-Fernandez, Physical Medicine and Rehabilitation, The Johns Hopkins Hospital

Johns Hopkins University School of Medicine
Appropriate Use Criteria
Priority Clinical Area: Low Back Pain
Setting: Ambulatory and Emergency Department

Soo Yeon Kim, Physical Medicine and Rehabilitation, Johns Hopkins Medicine at Green Spring Station

Pamela Johnson, Radiology, The Johns Hopkins Hospital

Thomas Grader-Beck, Rheumatology, Johns Hopkins Bayview Medical Center

Disclosure: AUC developers may receive future royalties from licensure of AUC to CMS-approved clinical decision support mechanisms.