Intermountain Imaging Criteria:
Low Back Pain

Through its Intermountain Imaging Criteria Project, Intermountain Healthcare has developed a suite of standardized care process models (CPMs) for the use of advanced imaging procedures in eight priority clinical areas. These evidence-based guidelines are intended to be widely implemented in order to improve patient safety, improve outcomes, and reduce unnecessary medical spending for the Medicare population and the U.S. health system overall.

Why Focus ON INTERMOUNTAIN IMAGING CRITERIA?

Advanced imaging procedures, including MRI, CT, PET, and nuclear medicine, facilitate rapid and accurate detection and/or diagnosis of disease. The volume of advanced imaging procedures prescribed to patients in the U.S. increased three- to four-fold from 1996–2010 as the technologies became widely available. The inflating costs of advanced imaging outstripped that of any other medical service. These inflating costs resulted in up to $20–30 billion in unnecessary advanced imaging spending each year.

- **High cost.** Although the spending growth in advanced imaging dropped off after the early 2000s, 2014 costs to Medicare Part B for advanced imaging exceeded $2.4 billion for common conditions alone.
- **Limited effectiveness.** Multiple studies suggest that up to a third of advanced imaging procedures fail to contribute to diagnosis or are clinically inappropriate.
- **Patient safety.** Advanced diagnostic imaging often exposes the patient to ionizing radiation and/or contrast media, posing additional medical risks that must be weighed against the potential benefits of the imaging procedure.
- **Overdiagnosis and overtreatment.** There is an unrecognized risk of overdiagnosis and subsequent overtreatment that carries associated risks (e.g., drug reactions or unnecessary surgical interventions) if advanced imaging is performed in patients with low pretest probability. The Intermountain Imaging Criteria approach seeks to avoid these risks.

Goals and Measures

This CPM was developed by Intermountain clinical experts to outline appropriate use criteria (AUC) for advanced imaging for low back pain. These guidelines, together with those for other priority clinical areas, will improve the quality of care provided to patients by:

- Increasing adherence to evidence-based AUC for the use of advanced imaging
- Decreasing system-wide spending on unnecessary advanced imaging services
- Reducing imaging tests that do not conform to AUC or for which there are no guidelines
- Documenting the incidence of a significant positive on advanced imaging tests and aligning with downstream care

Indicates an Intermountain measure.

What’s Inside?

Overview: Intermountain Imaging Criteria AUC Content

Low Back Pain (LBP) Care

Pathway Algorithms

- LBP without complicating features
- LBP + weakness (cauda equina syndrome and/or lower motor neuron symptoms)
- LBP + weakness (myelopathy/upper motor neuron symptoms)
- LBP + suspected compression fracture
- LBP + significant trauma (ED setting)
- LBP + minor/moderate trauma (all settings)
- LBP without improvement + prior lumbar surgery: NO suspicion of hardware failure
- LBP + prior lumbar surgery: WITH suspicion of hardware failure
- LBP + suspected cancer
- LBP + suspected infection
- LBP + suspected spondylolysis

Point-of-Order Checklists

Resources

Bibliography

References
OVERVIEW: INTERMOUNTAIN IMAGING CRITERIA APPROPRIATE USE CRITERIA CONTENT

Intermountain Imaging Criteria appropriate use criteria (AUC) support clinicians in providing evidence-based care to the patients they serve. Although appropriate use of Intermountain Imaging Criteria fulfills compliance requirements under PAMA, patients only fully benefit from their use as they are deployed within the framework of a locally driven quality improvement program. To learn more about Intermountain’s process for developing and maintaining AUC, visit: https://intermountainhealthcare.org/services/imaging-services/intermountain-imaging-criteria/.

The care process model approach

Designed as care process models (CPMs), the Intermountain Imaging Criteria AUC content is a blueprint that logically guides the delivery of evidence-based care via an algorithmic visual presentation (see pages 5 through 16). Although these Intermountain Imaging Criteria CPMs specifically focus on the appropriate use of advanced imaging, they can be viewed as portions of broader CPMs that guide not only diagnostic but therapeutic interventions for a specific disease or condition.

Ideally, Intermountain Imaging Criteria CPMs are engaged early in the patient encounter and guide the various considerations that lead to the ultimate decision regarding ordering of an imaging study. Point-of-order checklists are also included (beginning on page 17). These checklist-based guidelines are logically equivalent to the algorithms from which they are derived.

Knowing that local factors will invariably impact decisions about selecting the most appropriate exam, Intermountain Imaging Criteria CPMs specify the generally preferred exam but also provide alternative choices that may be appropriate in certain clinical settings.

Relative imaging cost and radiation risk rankings

To further aid providers, each algorithm includes a ranking of relative costs and radiation risk for each advanced imaging test recommended. The cost scale is derived using global non-facility relative value units (RVUs) published by the Centers for Medicare and Medicaid Services (CMS) as a surrogate for cost. The radiation risk is derived from data published in 2010 by the Health Physics Society.

Evidentiary review and ranking

Intermountain used the following two conceptual frameworks for evidentiary review of relevant literature:

1. The 2011 revision of the Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence standard. This standard includes categorical levelling grades relevant to diagnostic studies and rates individual sources of evidence (published papers or other research data) on a five-point scale.

2. The extensively used Fryback and Thornbury conceptual framework, which uses six levels for assessing the efficacy of diagnostic imaging.

Each algorithmic presentation provides both rankings for the decision node (pairing of AUC and recommended/alternative tests).

Using the algorithms and checklists

Under “Care Pathways” on page 3, there is an annotated algorithmic sample for a typical clinical scenario found in this CPM. Under “Point-of-Order Checklist” on page 4, there is an annotated sample of a typical point-of-order checklist for an imaging procedure recommended within the above sample algorithm.
Care pathways
For each clinical scenario included (e.g., low back pain plus suspected cancer), there is an algorithmic presentation of the care pathway context for the imaging decisions made. This pathway contains not only the appropriate use criteria (AUC) and evidence-based advanced imaging recommendations, but also what constitutes significant positive imaging results and downstream care recommendations. Note that performing neuroimaging studies for chronic but stable low back pain (i.e., no new features and normal neurologic exam) is not recommended.

This page presents the elements of the care pathway below and key information provided in each test recommendation box at right. There is a legend at the bottom of each care pathway page.

The decision node box encompasses recommended advanced imaging based on the presence of evidence-based appropriate use criteria (AUC) or expert consensus (where evidence does not exist).
Point-of-order checklists

For each advanced imaging test (e.g., MRI and CT), there is a checklist that compiles all of the appropriate use criteria from each clinical scenario (shown in the care pathways) for that test. These are presented in a checklist format for the provider to select the appropriate scenario AND the criteria that apply to the patient’s situation.

Tables included on pages 17 through 19 indicate if the test is a primary recommendation or alternative recommendation.

### TABLE 2. MRI lumbar spine* WITH AND WITHOUT CONTRAST appropriate use indications

<table>
<thead>
<tr>
<th>PRIMARY recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ LBP without improvement + prior lumbar surgery (NO suspicion of hardware failure) (IF ANY):</td>
</tr>
<tr>
<td>□ Worsening back pain</td>
</tr>
<tr>
<td>□ New or acute radiculopathy</td>
</tr>
<tr>
<td>□ Weakness</td>
</tr>
<tr>
<td>□ High suspicion for disc disease adjacent to hardware</td>
</tr>
<tr>
<td>□ LBP + suspected cancer (IF ANY)</td>
</tr>
<tr>
<td>□ History of cancer</td>
</tr>
<tr>
<td>□ Multiple cancer risk factors</td>
</tr>
<tr>
<td>□ Strong clinical suspicion</td>
</tr>
<tr>
<td>□ LBP + suspected infection (IF ANY)</td>
</tr>
<tr>
<td>□ Fever/chills and/or pain with rest or at night</td>
</tr>
<tr>
<td>□ Other risk factors**</td>
</tr>
</tbody>
</table>

* Or C or T spine based on location
** Other risk factors (e.g., immunocompromised patient, UTI, IV drug use, recent spinal procedure)
**LOW BACK PAIN (LBP) CARE PATHWAY ALGORITHMS**

**DECISION NODE #1**

AUC met (IF ALL)?
- ≥3 months of symptoms and adequate conservative treatment* with no improvement
  - yes → Imaging: primary recommendation
  - no → REFER to Low Back Pain CPM (or other system-wide protocol). Imaging not recommended.

**Imaging: primary recommendation**
- MRI lumbar spine w/o contrast
  - R0 $0 – 5$ RVUs

**Imaging: alternative recommendation**
- CT lumbar spine w/o contrast**
  - R3 $(1 – 10)$ mSv

**Significant positive result?**
- yes → **Refer** to ortho/neuro spine surgeon OR non-operative spine specialist (PM&R/pain management physician)

**DECISION NODE #1 KEY EVIDENCE**


* Requires claim for either:
  - PT/chiropractic evaluation in preceding 60 days
  - Follow-up evaluation and management between 28 and 60 days preceding MRI

**During pregnancy, CT may be contraindicated. Consult with a radiologist.**

**FOR A FULL LIST OF REFERENCES FOR ALL DECISION NODES, SEE BIBLIOGRAPHY ON PAGES 22 THROUGH 26.**

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**DECISION NODE #2A**

**AUC met (IF ANY)?**
Suspected cauda equina syndrome (signs/symptoms):
- New bowel or bladder dysfunction
- Perineal numbness/saddle anesthesia
- Persistent/increasing lower extremity weakness, numbness, or tingling
- Sudden onset/rapidly progressive flaccid weakness
- Other lower motor neuron symptoms

**EMERGENCY REFERRAL OR emergency spine consult**

**Imaging: primary recommendation**
- MRI lumbar spine w/o contrast
  - Level of Evidence: 2
  - Intermountain Measure: $ (0 – 5 RVUs)
  - Risk: R0

**Imaging: alternative recommendation**
- CT myelogram lumbar spine*
  - Level of Evidence: 1
  - Intermountain Measure: $$$ (10 – 15 RVUs)
  - Risk: R3

**Significant positive result?**
- Severe stenosis
- Compression of cauda equina
- Large disc herniation

**CONSIDER (BOTH):**
- Clinical alternatives (demyelinating disease and intracranial pathology)
- Referral/consultation with neurology or neurosurgery

**REFER to ortho/neuro spine surgeon (URGENT)**

* During pregnancy, CT may be contraindicated. Consult with a radiologist.

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**DECISION NODE #2A KEY EVIDENCE**


(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)

---

**LEGEND**

- Clinical Scenario
- Urgent or Emergency Situation
- Level of Evidence
- Fryback & Thornbury Level of Evidence
- Intermountain Measure
- Risk: R0 (0 mSv) $ (0 – 5 RVUs)
- R3 (1 – 10 mSv) $ (5 – 10 RVUs)
- R4 (10 – 30 mSv) $$$ (10 – 15 RVUs)
- $$$ (15+ RVUs)
**INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)**

**DECISION NODE #2B**

**EMERGENCY REFERRAL**
emergency spine consult if high suspicion

- **Imaging: primary recommendation**
  - MRI spine (C, T, L) w/o contrast
    - Level of Evidence: II
    - RVUs: $$$
    - Radiation Dose: R0
  - MRI brain w/o contrast
    - Level of Evidence: II
    - RVUs: $1
    - Radiation Dose: R0

- **Imaging: alternative recommendation**
  - CT myelogram spine (C, T, L)*
    - Level of Evidence: II
    - RVUs: $$$
    - Radiation Dose: R4
  - CT brain / head w/ and w/o contrast*
    - Level of Evidence: I
    - RVUs: $1
    - Radiation Dose: R3

**DECISION NODE #2B KEY EVIDENCE**


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* During pregnancy, CT may be contraindicated. Consult with a radiologist.

---

**LEGEND**

- Clinical Scenario
- Urgent or Emergency Situation
- OCEBM Level of Evidence
- Fryback & Thornbury Level of Evidence
- Intermountain Measure
- R0 (0 mSv)
- R3 (1–10 mSv)
- R4 (10–30 mSv)
- See page 2–3 for explanation.

**REFERENCES**


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**DECISION NODE #3**

**LBP + suspected compression fracture**

- **AUC met?**
  - Osteoporosis/osteoporosis risk
  - Negative lumbar spine radiographs with high suspicion of compression fracture
  - OR
  - Age-indeterminate compression on radiograph

**Imaging: primary recommendation**

- MRI lumbar spine w/o contrast

**Imaging: alternative recommendation**

- CT lumbar spine w/o contrast

**DECISION NODE #3 KEY EVIDENCE**


*(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)*

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**Legend**

- Clinical Scenario
- Urgent or Emergency Situation
- OCEBM Level of Evidence
- Fryback & Thornbury Level of Evidence
- Intermountain Measure
- 
  - **RO** (0 mSv) $0 – 5$ RVUs
  - **R3** (1 – 10 mSv) $5 – 10$ RVUs
  - **R4** (10 – 30 mSv) $10 – 15$ RVUs
  - **R5** (30+ mSv) $15+$ RVUs

*During pregnancy, CT may be contraindicated. Consult with a radiologist.*
INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)

**DECISION NODE #4A-1**

**LBP + significant trauma (ED setting)**

- **AUC met?**
  - yes
    - Imaging: primary recommendation
      - CT lumbar spine w/o contrast*
      - 1 III $ R3
      - Significant positive result?
        - yes
          - REFER to ortho/neuro spine surgeon (URGENT)
        - no
          - MANAGE in the ED per clinical judgement
      - no
    - no
  - no
    - REFER to Low Back Pain in the ED CPM (or other system-wide protocol). Imaging not recommended.

**DECISION NODE #4A-2**

- **AUC met (IF ANY)??**
  - yes
    - Imaging recommendation
      - MRI lumbar spine w/o contrast
      - 2 II $ R0
      - Significant positive result (IF ANY)?
        - yes
          - Evidence of ligamentous injury
          - Hematoma
          - Instability
          - Acute disc herniation/nerve compression
        - no
      - no
    - no
  - no

**DECISION NODE #4A KEY EVIDENCE**


*During pregnancy, CT may be contraindicated. Consult with a radiologist.*

**MRI not usually needed for trauma.**

(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)
**INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)**

**LEGEND**
- Clinical Scenario
- Urgent or Emergency Situation
- OCEBM Level of Evidence
- Fryback & Thornbury Level of Evidence
- Intermountain Measure
- \( R_0 \) (0 mSv) \( \$ \) (0 – 5 RVUs)
- \( R_3 \) (1 – 10 mSv) \$ (5 – 10 RVUs)
- \( R_4 \) (10 – 30 mSv) \$ (10 – 15 RVUs)
- \$\$\$ (15+ RVUs)

**INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)**

**LEGEND**
- OCEBM Level of Evidence
- Fryback & Thornbury Level of Evidence
- Intermountain Measure
- \( R_0 \) (0 mSv)
- \( R_3 \) (1 – 10 mSv)
- \( R_4 \) (10 – 30 mSv)

**DECISION NODE #4B-1**

LBP + mild/moderate trauma (all settings)

- AUC met?
  - Mild/moderate trauma (WITH ANY OF THE FOLLOWING):
    - Questionable lumbar spine radiograph findings
    - Inadequate anatomical coverage on radiograph
    - High clinical suspicion in high-risk patient with known spondyloarthropathy (e.g., AS or DISH)

- **URGENT care or PCP evaluation**

- **Imaging: primary recommendation**
  - CT lumbar spine w/o contrast
  - \( 3 \) II \$ \( R_3 \)

- **Significant positive result (IF ANY)?**
  - \( \text{Fractures except isolated transverse process fractures (may not be urgent)} \)
  - Evidence of ligamentous injury
  - Hematoma
  - Instability
  - Acute disc herniation / nerve compression

- **REFER to ortho / neuro spine surgeon (URGENT)**

- **DECISION NODE #4B-2**

- **AUC met?**
  - \( \text{Known spondyloarthropathy (AS or DISH)} \)
  - High suspicion of injury
  - Negative CT findings

- **URGENT care or PCP evaluation**

- **Imaging: primary recommendation**
  - MRI lumbar spine w/o contrast
  - \( 3 \) II \$ \( R_0 \)

- **Significant positive result?**
  - \( \text{Fractures except isolated transverse process fractures (may not be urgent)} \)
  - Evidence of ligamentous injury
  - Hematoma
  - Instability
  - Acute disc herniation / nerve compression

- **FOLLOW UP (nonsurgical) in 1–2 weeks**

* During pregnancy, CT may be contraindicated. Consult with a radiologist.

See abbreviations on page 2.
INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)

DECISION NODE #4B-1 KEY EVIDENCE


(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)

DECISION NODE #4B-2 KEY EVIDENCE


(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)
DEcision Node #5A

LBP without improvement + prior lumbar surgery (NO suspicion of hardware failure)

AUC met (IF ANY)?
- New or acute radiculopathy
- Weakness
- Worsening back pain
- High suspicion for disc disease adjacent to hardware

yes

URGENT SPINE SURGERY REFERRAL if radiculopathy with weakness/disabling

Significant positive result?
- Spinal stenosis
- Disease adjacent to hardware
- Acute/new disc herniation
- Infection

yes

REFER to ortho/neuro spine surgeon

no

Imaging: primary recommendation
- MRI lumbar spine w/ and w/o contrast
- Level of Evidence: II
- Measure: $5 (0 – 5 RVUs)
- Radiation Dose: R0 (0 mSv)

Imaging: alternative recommendation
- CT myelogram lumbar spine*
- Level of Evidence: II
- Measure: $$$ (10 – 15 RVUs)
- Radiation Dose: R3 (10 – 30 mSv)

yes

REFER to ortho/neuro spine surgeon

no

MANAGE with conservative measures per Low Back Pain CPM (or other system-wide protocol) for 3 months

(IF not improved) CONSIDER referral to ortho/neuro spine surgeon or multidisciplinary spine center

DECISION NODE #5A KEY EVIDENCE


(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)

* During pregnancy, CT may be contraindicated. Consult with a radiologist.
LBP + prior lumbar surgery (WITH suspicion of hardware failure) →

AUC met (IF ALL)?
- Back pain with suspicion of hardware failure
  AND EITHER:
- Negative lumbar spine radiograph with flex/ex lateral + AP/lateral
  OR
- Equivocal plain film findings

yes →

Imaging: primary recommendation
CT lumbar spine w/o contrast* 5 II $ R3

Significant positive result?
- Halo around screws
- Evidence of incomplete or failed fusion
- New fractures

yes → REFER to ortho/neuro spine surgeon

no →

REFER to Low Back Pain CPM (or other system-wide protocol).
Imaging not recommended.

no (IF not improved) →

CONSIDER referral to ortho/neuro spine surgeon or multidisciplinary spine center
MANAGE with conservative measures per Low Back Pain CPM (or other system-wide protocol) for 3 months

DECISION NODE #5B KEY EVIDENCE


(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)

* During pregnancy, CT may be contraindicated. Consult with a radiologist.
**Decision Node #6 Key Evidence**


(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)

*During pregnancy, CT may be contraindicated. Consult with a radiologist.*
INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)

DECISION NODE #7

AUC met (IF ANY)?
- Fever/chills and/or pain with rest or at night
- Other risk factors*

yes →

Imaging: primary recommendation
- MRI lumbar spine w/ and w/o contrast (based on location)
  - 1 II $\$ R0

Imaging: alternative recommendation
- CT lumbar spine w/ and w/o contrast**
  - 1 II $\$ R4

no → REFER to Low Back Pain CPM (or other system-wide protocol).

Clinical suspicion still high?

yes → Refer to infectious disease

CONSULT with neurosurgery and/or spine surgery (EMERGENCY)

significant positive result?
- Epidural abscess
- Phlegmon with mass effect on nerve root/spinal canal
- Instability

yes → FOLLOW UP in 1 to 2 weeks

no → Osteomyelitis/discitis

DECISION NODE #7 KEY EVIDENCE


* Other risk factors include immunocompromised patient, UTI, IV drug use, recent spinal procedure.
** During pregnancy, CT may be contraindicated. Consult with a radiologist.

(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)
**DECISION NODE #8**

**AUC met (IF ANY)?**
- Pain with standing, walking, extension
- Negative lumbar spine radiograph and high suspicion
- Lower extremity weakness

**Imaging: primary recommendation**
CT lumbar spine w/o contrast (limit coverage to area of interest, usually L5/S1)**

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>2</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fryback &amp; Thornbury</td>
<td>II</td>
<td>II</td>
<td>R3</td>
<td>R4</td>
</tr>
</tbody>
</table>

**Significant positive result?**
- Symptomatic spondylolysis (≥ 4 mm)

**REFER to ortho/neuro spine surgeon**

**MANAGE with conservative measures per Low Back Pain CPM (or other system-wide protocol) for 3 months**

**REFER to Low Back Pain CPM (or other system-wide protocol). Imaging not recommended.**

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**DECISION NODE #8 KEY EVIDENCE**


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(For a full list of references for all decision nodes, see bibliography on pages 22 through 26)
INTERMOUNTAIN IMAGING CRITERIA FOR Low Back Pain (LBP)

TABLE 1. MRI lumbar spine* WITHOUT CONTRAST appropriate use indications

(PRIMARY recommendation)

<table>
<thead>
<tr>
<th>Relevant Clinical Scenario</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ <strong>LBP without complicating features (IF ALL):</strong></td>
<td>□ Adequate conservative therapy** with no improvement</td>
</tr>
<tr>
<td>□ ≥ 3 months of symptoms</td>
<td></td>
</tr>
<tr>
<td>□ Negative lumbar spine radiographs with high suspicion of compression fracture</td>
<td></td>
</tr>
<tr>
<td>□ Osteoporosis / osteoporosis risk</td>
<td></td>
</tr>
<tr>
<td>□ Negative lumbar spine radiographs</td>
<td></td>
</tr>
<tr>
<td>□ Age-indeterminate compression on radiograph</td>
<td></td>
</tr>
<tr>
<td>□ No significant positive on CT lumbar spine</td>
<td></td>
</tr>
<tr>
<td>□ High suspicion of ligamentous injury</td>
<td></td>
</tr>
<tr>
<td>□ Persistent neurologic deficit</td>
<td></td>
</tr>
<tr>
<td>□ Known spondyloarthropathy (AS or DISH)</td>
<td></td>
</tr>
<tr>
<td>□ High suspicion of injury</td>
<td></td>
</tr>
<tr>
<td>□ Negative CT findings</td>
<td></td>
</tr>
<tr>
<td>□ <strong>LBP + suspected compression fracture (IF ANY):</strong></td>
<td></td>
</tr>
<tr>
<td>□ Hyperreflexia / Hoffman’s sign</td>
<td></td>
</tr>
<tr>
<td>□ New-onset Babinski or clonus</td>
<td></td>
</tr>
<tr>
<td>□ New-onset gait / balance abnormalities</td>
<td></td>
</tr>
<tr>
<td>□ Upper and lower extremity weakness</td>
<td></td>
</tr>
</tbody>
</table>

* Or C or T spine based on location

**Requires claim for either: PT / chiropractic evaluation in preceding 60 days OR follow-up evaluation and management between 28 and 60 days preceding MRI

The provider must check BOTH:
1. The box next to the relevant clinical scenario
2. EACH AUC box that applies to the patient’s situation

See abbreviations on page 2.
## POINT-OF-ORDER CHECKLISTS, CONTINUED

### TABLE 2. MRI lumbar spine* WITH AND WITHOUT CONTRAST appropriate use indications

<table>
<thead>
<tr>
<th>(PRIMARY recommendation)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ LBP without improvement + prior lumbar surgery (NO suspicion of hardware failure) (IF ANY):</td>
<td>□ LBP + suspected cancer (IF ANY):</td>
</tr>
<tr>
<td>□ Worsening back pain</td>
<td>□ History of cancer</td>
</tr>
<tr>
<td>□ New or acute radiculopathy</td>
<td>□ Multiple cancer risk factors</td>
</tr>
<tr>
<td>□ Weakness</td>
<td>□ Strong clinical suspicion</td>
</tr>
<tr>
<td>□ High suspicion for disc disease adjacent to hardware</td>
<td>□ LBP + suspected infection (IF ANY):</td>
</tr>
<tr>
<td></td>
<td>□ Fever / chills and /or pain with rest or at night</td>
</tr>
<tr>
<td></td>
<td>□ Other risk factors**</td>
</tr>
</tbody>
</table>

* Or C or T spine based on location

** Other risk factors (e.g., immunocompromised patient, UTI, IV drug use, recent spinal procedure)

### TABLE 3. MRI brain WITHOUT CONTRAST appropriate use indications

<table>
<thead>
<tr>
<th>(PRIMARY recommendation)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ LBP + weakness: Myelopathy/upper motor neuron symptoms (IF ANY)</td>
<td>□ Hyperreflexia / Hoffman’s sign</td>
</tr>
<tr>
<td></td>
<td>□ New-onset Babinski or clonus</td>
</tr>
<tr>
<td></td>
<td>□ New-onset gait / balance abnormalities</td>
</tr>
<tr>
<td></td>
<td>□ Upper and lower extremity weakness</td>
</tr>
</tbody>
</table>

See abbreviations on page 2.
### TABLE 4. CT lumbar spine* WITHOUT CONTRAST appropriate use indications

**PRIMARY recommendation**

- **LBP + significant trauma (in the ED setting)**
- **LBP + mild/moderate trauma in any setting (WITH ANY OF THE FOLLOWING):**
  - Questionable lumbar spine radiograph findings
  - Inadequate anatomical coverage on radiograph
  - High clinical suspicion in high-risk patient with known spondyloarthropathy (e.g., AS or DISH)
- **LBP + prior lumbar surgery (with suspicion of hardware failure) (IF ALL):**
  - Back pain with clinical concern for hardware failure
  - Negative lumbar spine radiograph with flex/ex lateral + AP/lateral
  - Equivocal plain film findings
- **LBP + suspected spondylolysis (IF ANY)**
  - Pain with standing, walking, extension
  - Negative lumbar spine radiograph and high suspicion
  - Lower extremity weakness

**ALTERNATIVE recommendation**

- **LBP without complicating features (IF ALL)**
  - ≥3 months of symptoms
  - Adequate conservative therapy*** with no improvement
- **LBP + suspected compression fracture (IF ANY)**
  - Osteoporosis/osteoporosis risk
  - Negative lumbar spine radiographs with high suspicion of compression fracture
  - Age-indeterminate compression on radiograph

* Or C or T spine based on location

** Limit coverage to area of interest, usually L5/S1.

***Requires claim for either: PT/chiropractic evaluation in preceding 60 days OR follow-up evaluation and management between 28 and 60 days preceding MRI.
## TABLE 5. CT lumbar* spine WITH and WITHOUT CONTRAST appropriate use indications

( ALTERNATIVE recommendation )

- **LBP + suspected cancer (IF ANY):**
  - History of cancer
  - Multiple cancer risk factors
  - Strong clinical suspicion

- **LBP + suspected infection (IF ANY):**
  - Fever/chills and/or pain with rest or at night
  - Other risk factors**

* Or C or T spine based on location

** Other risk factors (e.g., Immunocompromised patient, UTI, IV drug use, recent spinal procedure)

## TABLE 6. CT myelogram* appropriate use indications

( ALTERNATIVE recommendation )

- **LBP + weakness: Cauda equina syndrome and/or sudden onset lower motor symptoms (IF ANY):**
  - New bowel or bladder dysfunction
  - Perineal numbness/saddle anesthesia
  - Persistent/increasing lower extremity weakness, numbness, or tingling
  - Sudden-onset/rapidly-progressive flaccid weakness (lower motor)
  - Sudden onset/rapidly progressive flaccid weakness
  - Other lower motor neuron symptoms

- **LBP + weakness: Myelopathy/upper motor neuron symptoms (IF ANY):**
  - Hyperreflexia/Hoffman's sign
  - New-onset Babinski or clonus
  - New-onset gait/balance abnormalities
  - Upper and lower extremity weakness

- **LBP without improvement + prior lumbar surgery (NO suspicion of hardware failure) (IF ANY):**
  - Worsening back pain
  - New or acute radiculopathy
  - Weakness
  - High suspicion for disc disease adjacent to hardware

* Or C/T/L spine based on location

## TABLE 7. CT brain/head WITH AND WITHOUT CONTRAST appropriate use indications

( ALTERNATIVE recommendation )

- **LBP + weakness: Myelopathy/upper motor neuron symptoms (IF ANY):**
  - Hyperreflexia/Hoffman's sign
  - New-onset Babinski or clonus
  - New-onset gait/balance abnormalities
  - Upper and lower extremity weakness
RESOURCES

Intermountain provides educational materials designed to support providers in their efforts to care for, educate, and engage patients and their families.

Intermountain’s patient education materials complement and reinforce clinical team interventions by providing a means for patients to reflect and learn in another mode and at their own pace.

Intermountain’s care process models (CPMs) outline evidence-based guidelines for patient care. In addition to the suite of Intermountain Imaging Criteria CPMs, Intermountain provides topical CPMs that have been developed by expert clinical teams. They can be accessed by navigating to intermountainphysician.org and selecting Care Process Models in the Tools and Resources drop-down menu.

To access Intermountain’s Imaging Criteria CPMs and supporting materials, visit: https://intermountainhealthcare.org/services/imaging-services/intermountain-imaging-criteria/.

Fact sheets:
- Low Back Pain (English) / (Spanish)
- Lumbar Spinal Fusion (posterior) (English) / (Spanish)
- Spinal Nerve Decompression (English) / (Spanish)

Patient education:
- Spine Guide (English)
- Managing Chronic Pain (English)
- Managing Chronic Pain: Treatment Options (English) / (Spanish)
- Pain Medicine Tracker (English) / (Spanish)

Related Care Process Models (CPMs):
- Low Back Pain CPM
- Prescribing Opioids for Chronic Pain CPM
- Imaging Radiation Exposure CPM
BIBLIOGRAPHY

NODE #1


NODES #2A – 2B


**BIBLIOGRAPHY, CONTINUED**

**NODE #3**


**NODE #4A**


**NODE #4B**


**NODES #5A – 5B**


**NODES #6 – 7**


**NODE #8**


REFERENCES (from pages 1 and 2)


This CPM presents a model of best care based on the best available scientific evidence at the time of publication. It is not a prescription for every physician or every patient, nor does it replace clinical judgment. All statements, protocols, and recommendations herein are viewed as transitory and iterative. Although physicians are encouraged to follow the CPM to help focus on and measure quality, deviations are a means for discovering improvements in patient care and expanding the knowledge base.