Clinical Decision Support: Will It Matter?

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Relevant disclosures: None
Background

- US healthcare spending continues to increase reaching 17.5% of GDP, or approximately 3 trillion dollars.¹ When accounting for indirect costs, “pain” has been estimated to cost the US as much as $635 billion annually.² Low back pain has a major economic impact, with total annual costs related to this condition estimated in excess of $100 billion.³

- In 2014, the Protecting Access to Medicare Act mandated that clinical decision-support (CDS) for advanced imaging be integrated into computerized provider order entry (CPOE) systems by 2017.⁴

- Combined use of CPOE & CDS has been shown to reduce errors in medication ordering and to have potential to reduce inappropriate imaging utilization.⁵,⁶,⁷,⁸
Background

The ACR Appropriateness Criteria® are a compilation of evidence-based guidelines to assist ordering providers in selecting the most appropriate imaging protocol for a given clinical scenario.

- For the clinical scenario of low back pain, the ACR Appropriateness Criteria committee has separated their recommendations into 6 clinical variants:

<table>
<thead>
<tr>
<th>LBP Variant</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Acute, subacute, or chronic uncomplicated low back pain or radiculopathy. No red flags. No prior management.</td>
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<tr>
<td>2</td>
<td>Acute, subacute, or chronic uncomplicated low back pain or radiculopathy. One or more of the following: low velocity trauma, osteoporosis, elderly individual or chronic steroid use.</td>
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<tr>
<td>3</td>
<td>Acute, subacute, or chronic uncomplicated low back pain or radiculopathy. One or more of the following: suspicion of cancer, infection, or immunosuppression.</td>
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<tr>
<td>4</td>
<td>Acute, subacute, or chronic low back pain or radiculopathy. Surgery or intervention candidate with persistent or progressive symptoms during or following 6 weeks of conservative management.</td>
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<tr>
<td>5</td>
<td>Low back pain or radiculopathy. New or progressing symptoms or clinical findings with history of prior lumbar surgery.</td>
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<tr>
<td>6</td>
<td>Low back pain with suspected cauda equina syndrome or rapidly progressive neurologic deficit.</td>
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Background

• Our study was performed at an urban 953 bed hospital that is a Level I Trauma Center in the Southeast
  – Patient volume: 566,181 emergency, inpatient and outpatient visits per year
  – MRI volume in 2014:
    • 10,235 MRI exams
    • 1,073 Lumbar Spine MRI exams
Purpose

• Determine if we were following the ACR Appropriateness Criteria LBP imaging recommendations for lumbar spine MRI exams.

• Determine if implementation of CDS for advanced imaging modeled after ACR Appropriateness Criteria© in setting of low back pain will:
  1) affect overall MRI volume
  2) affect the type of study ordered
  3) have the potential to change wait time for imaging
Materials & Methods

• Retrospective RIS database search for all Lumbar Spine MRI exams performed in January 2015

  Variables recorded:
  – Date study ordered
  – Date study performed
  – Contrast (+/-)
  – Order indication
  – Ordering department
  – Patient demographics (DOB, age, gender)

• Classified as QI project by the IRB
## Materials & Methods

<table>
<thead>
<tr>
<th>Chart Review in EMR</th>
<th>Image Review in PACS</th>
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<tr>
<td><strong>Author ZR</strong></td>
<td><strong>Author AC</strong></td>
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### Chart Review in EMR
- **Data collection:**
  - Symptoms and duration
  - Previous treatment type (surgical/conservative), if any
  - Red flags as defined by ACR Appropriateness criteria
- **Each patient assigned to an ACR variant based on the results of the EMR review**

### Image Review in PACS
- Reviewer blinded to patient symptoms and history as well as the previous official interpretation. Recorded:
  - Presence of positive findings:
    - Spinal and/or foraminal stenosis
    - Degenerative changes
    - Fracture
    - Mass
    - Infection
    - Important incidental findings in imaged paraspinal soft tissues
  - Presence of severe stenosis
    - No CSF visible in thecal sac
    - No fat visible in neural foramen

**Imaging findings then correlated with reported symptoms and evaluated for concordance with initial image interpretation**
Results

Data analyzed with Chi-Squared tests using StatView (SAS Institute Inc. V5)

RIS search identified 83 lumbar MRI exams performed in 1/2015
- Gender: Male: 34; Female: 49
- Average Age: 53.6 years
- Contrast: Without contrast: 63; Without and with contrast: 20
- Patient Location: ED: 12; Inpatient: 15; Outpatient: 56

Mean time order placement to image completion

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<table>
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<tbody>
<tr>
<td>Outpatients</td>
<td>77 days</td>
</tr>
<tr>
<td>Inpatients</td>
<td>1 day</td>
</tr>
<tr>
<td>ED patients</td>
<td>&lt; 1 day</td>
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</tbody>
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Reviewer interpretation was in concordance with the initial read in 88% of studies.
Results

- All patients were successfully categorized under an ACR variant where MRI imaging is classified as “usually appropriate.”
- Distribution of patients amongst ACR variants was statistically significant (p<0.0001)
  - No patients fit ACR variant 1, for which an MRI was not indicated.
- No statistically significant difference existed between variants in regards to distribution of studies with positive findings, severe findings, or findings which had the potential to correlate with symptoms:
  - 89% of patients had at least one positive finding.
  - 50% of patients had at least one level of severe spinal or foraminal stenosis.
  - In 70% of the patients, imaging findings that could explain back pain were found.
Results

While an MRI was deemed usually appropriate in 100% of patients by ACR criteria, not all patients received the most appropriate type of scan.

• In ACR variants 2 and 4, MRI without and with contrast falls into the “may be appropriate” category, while MRI without contrast is considered “usually appropriate.” However, in our study, 10.5% and 11.4% of these patients received contrast, respectively.

• ACR variant 5, without and with contrast imaging is considered “usually appropriate,” but only 50% of the patients in our cohort had post contrast imaging.
Conclusion

• Each of the patients imaged were successfully categorized under an ACR variant where MRI imaging is considered usually appropriate. Therefore, when imaging, we are utilizing a “usually appropriate” means.

• In our study, ACR Appropriateness Criteria alone as CDS would not reduce the number of lumbar spine MRIs performed. All patients imaged fit into Variants 2-6; none were in Variant 1.
  – Our average wait times would not be expected to change upon institution of CDS.
  – Increased imaging capacity by the radiology department is necessary to reduce long outpatient wait times.

• However, clinical decision support would be expected to assist ordering physicians in selecting more appropriate contrast utilization & thereby decrease need for changed orders.
References