ACR Value-Based Practice Quality Improvement Project Proposal:
Reducing unnecessary imaging in patients with acute, nonspecific low back pain

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American College of Radiology
Mount Desert Island Hospital’s Clinical Quality Committee
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Executive Summary

Acute low back pain is unique in that it has an extraordinary high prevalence and high cost in the general population, yet it is largely self-resolving. In an environment where total national healthcare expenditures are unsustainable and new payor models centered around global payment continue to emerge, clinicians and healthcare organizations are going to need to find ways to become more efficient in ordering tests and appropriately treating conditions like low back pain.

Recognizing this, the American College of Radiology has put forth a number of novel initiatives (termed “value based PQI projects”) aimed at reducing inappropriate imaging expenditures. The initiatives, which will formally launch nationwide in 2015, will achieve this by educating referring physicians on various Choosing Wisely® topics.

Our team is proposing that our organization straightaway adopt such a model and become a beta testing site for a PQI project. Specifically, we would attempt to reduce the amount of inappropriate imaging by advancing the following Choosing Wisely® topic:

*Don’t perform advanced imaging (i.e. MRI) of the spine within the first 6 weeks in patients with nonspecific acute low back pain in the absence of red flags.*

The basic components of our proposed project are as follows: a retrospective medical records review would be conducted and MRIs that have been ordered within 6 weeks of the onset of symptoms that were not associated with specific red flag symptoms would be deemed unnecessary. A face-to-face educational intervention would then be provided to the major referring clinicians about when it is appropriate to order a lumbar MRI for low back pain. After the education, a prospective medical records review would be performed to determine if the intervention was successful. At that time, a formal proposal would be provided advising whether or not face-to-face education was the most effective way of educating referring providers on the appropriate selection of imaging exams.
Statement of Problem

Low back pain was recently reported as being the second most common reason for all physician appointments in the United States [1]. An estimated 75% of the population will experience mechanical low back pain at some point in their life [2].

Given the high prevalence of low back pain, it is no surprise that the total annual direct and indirect cost associated with the treatment of low back pain in the US is estimated to be $100-200 billion [3]. As the nation’s healthcare expenditure exceeds $2.7 trillion annually, it is important that we find ways to reduce unnecessary expenditures in order to keep our health system viable and affordable [4]. A graphical representation of the growing expense of healthcare can be seen in Figure 1, below.

![Figure 1. US healthcare expenditure as a percent of GDP [5].](image)

Clearly, this rate of spending is unsustainable. While the entire scope of this problem lies far beyond the limits of this proposal, there are plenty of low-hanging fruit opportunities for healthcare organizations and practitioners to become more prudent allocators of healthcare dollars. As it pertains to this plan, we suggest that given the expense and frequency of patients presenting with low back pain, it would prove beneficial to determine whether or not opportunities exist to reduce unnecessary low back pain imaging studies. By doing so, organizations can:

- ensure that patients are charged for only necessary medical services,
- free up valuable human resources to be allocated to other patients,
• better enable healthcare organizations to align themselves with new global payment models which emphasize cost-efficient care, and

• help reduce the total healthcare expenditure at a national level

In order to determine what qualifies as “unnecessary” imaging for low back pain, our team would operate under the following Choosing Wisely® guideline:

**Do not perform advanced imaging for low back pain (e.g MRI) within the first six weeks of the onset of symptoms, unless red flags are present.**

This guideline is based upon the principle that most low back pain self-resolves within 4 weeks [6]. One could therefore conclude that imaging that does not follow this guideline generally does not improve patient outcomes. There are numerous exceptions to this rule (these exceptions are outlined in the procedural approach section) and thus a number of exceptions have been made where imaging less than 6 weeks out is deemed necessary. The challenge therefore is to educate referring clinicians what constitutes a necessary imaging study for low back pain, and do so in a way which positively impacts their ordering habits.

It should be noted that many organizations, including Mount Desert Island Hospital, have strategically identified Choosing Wisely® topics as worthwhile endeavors. Therefore, this project is congruent with the overarching strategic direction of this organization.
Objectives

The aforementioned Practice Quality Improvement project has five specific objectives. They are as follows:

1) **Quantify the amount of unnecessary lumbar MRI exams at our institution.** This would be reported both as a percent of all lumbar spine MRIs and as an annual charge cost.

2) **Educate referring physicians on the appropriate use of advanced imaging for low back pain.** One-on-one education would be provided to the major referrers at our institution in order to ensure that they are fully-aware of the appropriate criteria for when to order advanced imaging of the lower spine.

3) **Improve the existing lumbar MRI ordering form.** With the new form, clinicians would now be asked to indicate whether or not 6 weeks have elapsed since the onset of the patient’s symptoms. This should help reinforce the education provided in the previous step.

4) **Determine the effectiveness of our interventions.** Repeat objective (1) after education has been provided to determine the degree to which face-to-face clinician education is an effective intervention at reducing unnecessary costs.

5) **Recommend a model that can be used to educate referring physicians at other institutions.** This recommendation would be based off of discussions with referring providers as to what method they prefer. It would also be impacted by how successful our face-to-face educational intervention was realized to be.
Methodology

Define Criteria

In order to achieve the aforementioned objectives, one must define what data to analyze in the patient medical records.

First, it is proposed that the use of lumbar MRIs be examined rather than other modalities of advanced imaging. Most importantly, MRI is the first line modality to examine acute low back pain. Additionally, as seen in Figure 2, below, there are significant costs to the patient associated with MRI exams.

<table>
<thead>
<tr>
<th>Advanced Imaging Facility Charges - Lumbar Spine</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI lumbar spine w/o contrast</td>
</tr>
<tr>
<td>MRI lumbar spine w/w/o contrast</td>
</tr>
<tr>
<td>CT lumbar spine w/o contrast</td>
</tr>
<tr>
<td>CT lumbar spine w/w/o contrast</td>
</tr>
</tbody>
</table>

*Figure 2. Lumbar Spine Facility Charges. The figure above presents the charges patients receive from MDIH for various lumbar imaging exams. Note: professional charges are not included in these figures.*

The combination of frequent MRI usage and high MRI cost would ensure that our limited resources for this project would be allocated to provide the greatest impact amongst potential defining criteria.

Second, a review of approximately 100 lumbar MRI scans would be set for the first phase (pre-intervention) of the study. It is anticipated this would be followed by roughly 50 scans in the second phase (post-intervention). Although the minimum number of patients for an ACR PQI project is 25, it was determined that 100-150 scans/patients would provide us with the largest sample size possible without delaying the completion of the project due to prolonged review of medical records.

Third, only the most recent lumbar spine MRIs from 2014 would be included in the analysis. By reviewing the most recent lumbar MRIs, we can ensure that any conclusions we draw are time-relevant.
Data Analysis and Medical Records Review

For each of the MRI studies, a thorough review of that patient’s inpatient, outpatient, and emergency room medical record would be conducted. Special attention would be paid to the specific progress note that made the determination that a lumbar MRI is necessary. The progress note would be scanned for any language that suggests the physician was ordering the exam for one of the clearly defined flags. An appropriateness score would then be assigned to that lumbar MRI, along with the physician who ordered it, so that the necessary data extrapolation can be performed.

Specifically, the medical records would be reviewed for one of the following red flags that would classify the exam as appropriate:

- Trauma
- Osteoporosis or compression fracture.
- Suspicion of cancer, unexplained fever or weight loss, infection, or intravenous drug use.
- Immunosuppression, prolonged use of corticosteroids, or diabetes mellitus.
- Age >70 years.
- Focal neurologic deficit(s) with progressive or disabling symptoms, cauda equina syndrome.
- Duration longer than 6 weeks.
- Prior lumbar surgery or surgical candidate

Provider Education

One-on-one personal education would be provided to the majority of the clinicians who refer to MDI hospital who reside in the immediate area. (Please see the Appendages section for a snapshot of the written material provided). In addition to the handouts, clinicians would have the opportunity to ask specific questions about what constitutes an appropriate MRI referral. They would also be provided with information on where to go online for additional information concerning appropriate criteria.

It is estimated that ~25 clinicians would be educated in this manner. The meetings would be brief, with an estimated time spent on each physician of 5 minutes. It was determined that this face-to-face interaction would be short as clinicians are inherently very busy and any educational intervention should be respectful of their time. Moreover, short interactions ensure that the clinicians receive only the most important points, increasing the likelihood they recall them when ordering scans.
**Modify Existing Order Form**

The ordering forms used by clinicians would be modified so that clinicians must indicate whether or not the lumbar MRI they are ordering is for a patient who presents less than 6 weeks from symptom onset. It is our hope that this additional question would jog clinician’s memory about the appropriateness of ordering such exams, without adding more documentation requirements.

**Data Extrapolation**

After the clinicians have been educated, a period of roughly 4 ½ months would elapse. During this time, lumbar MRI studies would be performed that would constitute the post-intervention data set. (4 ½ months was defined in order to ensure project completion prior to our internal deadline). The data would be suitably manipulated so that the 4 ½ months is analogous to the 9 month data set. Patient medical record review would occur continuously as the MRIs are performed in order to remain on schedule.
Project Management

Timeline

Figure 3, below, is a graphical representation of the anticipated timeline for the project.

![Figure 3. Proposed Timeline. Solid bars represent the projected amount of time to complete each of the design objectives.](image)

It is anticipated that the most time-intensive portion of the project would be the first round of medical records review. However, an April completion date is anticipated as the medical records for the 2nd dataset can be continuously reviewed as they are completed.

Deliverables

The following deliverables would be provided at project completion:

- A summary of the frequency of inappropriate MR imaging for patients referred for low back pain imaging.
- The total charge cost associated with all unnecessary images over the 9 month study period and extrapolated over 1 year.
• A breakdown of the frequency of inappropriate imaging by (unidentified) providers in order to determine whether or not this is a pervasive problem across referring providers.

• A summary of the most effective means of physician education, as determined by the physician preference survey.

**Project Limitations**

It should be noted that there are multiple limitations to our project. Specifically:

• One of the notable drawbacks to our design is sample error. The sample size of roughly 150 patients is presumably not large enough to ensure statistical significance. (However, one could argue that the time and resources required to perform a thorough review of >150 medical records is not feasible for many smaller organizations).

• By solely relying on patient data from our small institution in rural Maine, the project does not ensure conclusions were drawn from a heterogeneous patient base. Thus, we cannot guarantee that our results would be similar to those of another region of the country.

• Similarly, by relying on data from a small number of referring physicians, we cannot guarantee that our data would reflect the referring tendencies of physicians in other geographical areas.

**Team Qualifications**

• **John Benson, MD, FACR.** Dr. Benson is a graduate of the University of Pennsylvania School of Medicine. He serves as the Medical Director for Medical Imaging at Mount Desert Island Hospital in Bar Harbor, Maine, the first hospital in the country to receive the Diagnostic Imaging Centers of Excellence from ACR.

• **Clint Weiss, MHA.** Clint is a third year medical student at Tufts University School of Medicine. He formerly served as the Business Manager for Cardiovascular Services at Washington Hospital Center in Washington DC.
Conclusion

MR imaging of non-acute low back pain is the first line diagnostic choice. However, the exams themselves are expensive and in many instances are unwarranted given the self-resolving nature of the condition. It is our goal to educate clinicians on when to order exams, in an attempt to make healthcare more affordable and efficient, and to determine how we can better educate such physicians in the future. While, the extent to which we will be successful remains to be seen, we can assume with a high degree of certainty that such education would help our referring clinicians to be more conscientious and effective consumers of imaging services.
Appendages

Clinician Education Handout #1

*Appropriateness of Advanced Imaging for Acute Low Back Pain*

- Low back pain was recently reported as being the second most common reason for all physician appointments in the US. 90% self-resolves within one month.

- The American College of Radiology and the American Board of Internal Medicine (Choosing Wisely®) have identified reducing the number of unnecessary advanced imaging exams for lumbar pain as a strategic initiative.

- Specifically, acute (<6 weeks) uncomplicated lower back pain is a largely self-resolving condition that does not require advanced imaging evaluation (e.g. MRI).

- MRI is however the initial imaging modality of choice in low back pain with certain characteristics (see table below).

<table>
<thead>
<tr>
<th>Low Back Pain Patient Characteristics</th>
<th>Appropriateness Rating*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lumbar MRI w/out Cont.</td>
</tr>
<tr>
<td>Uncomplicated low back pain or radiculopathy; neuro deficits not progressive or severe, none of the indications noted below</td>
<td>2</td>
</tr>
<tr>
<td>Low-velocity trauma, osteoporosis, progressive deficit, symptom duration &gt;6 wks, or age &gt; 70 years</td>
<td>8</td>
</tr>
<tr>
<td>Surgery or intervention candidate</td>
<td>8</td>
</tr>
<tr>
<td>Prior lumbar surgery</td>
<td>6</td>
</tr>
<tr>
<td>Suspicion of cancer, infection, or immunosuppression, unexplained fever or weight loss, or IV drug user</td>
<td>7</td>
</tr>
<tr>
<td>Cauda equina syndrome, multifocal deficits or progressive deficit</td>
<td>9</td>
</tr>
</tbody>
</table>

*Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate*

- CT is useful in patients with MRI contraindications (e.g. implanted electronic device).

- I am conducting a review of all lumbar MRIs ordered over the past 9 months at MDIH to determine whether or not they met the aforementioned criteria. This data will be compared to data collected over the next 4 ½ months to determine if an educational intervention was helpful and where opportunities for improvement still exist.

Additional information is available at the American College of Radiology’s website or at: http://www.acr.org/~media/ACR/Documents/AppCriteria/Diagnostic/LowBackPain.pdf
Clinician Education Handout #2
New MRI Ordering Form

Mount Desert Island Hospital MRI Requisition  Fax to 288-8639 (after scheduling)

Patient Name: ____________________________
DOB: ____________________________
Telephone #: ____________________________
Height: _______ Weight: _______ (350lbs max.)
EXAM DATE & TIME: ___________ Date: ___________
MRI Tech reviewing history: ___________ Date: ___________

CT or MRI Contrast Allergy □ YES □ NO
Bun: __________ CR: __________ Where: __________ Date: __________
Est. GFR: __________
Primary Insurance: __________ ID#: __________
Pre-certification #: __________
Workers Comp: __________ Claim#: __________
Approved By: __________

Procedure Requested (check scan requested and contrast requirement)

**HEAD/NECK: MRI ORBIT FACE & NECK**
- □ MRI - Brain
- □ MRI - Other - IAC/Pituitary/Trigeminal
- □ MRI - TMJ
- □ MRI - Orbit, Face
- □ MRI - Orbit, Face, Neck
- □ MRA - Head w/o Contrast
- □ MRA - Neck
- □ Without Contrast □ With Contrast □ With/Without Contrast

**SPINE: MRI SPINAL CANAL**
- □ MRI - C-spine
- □ MRI - L-spine
- □ MRI - T-spine
- □ MRA - Spinal Cord w/o & with contrast
- □ Without Contrast □ With Contrast □ With/Without Contrast

**BODY: CHEST**
- □ MRI - Chest
- □ MRA - Chest / Aorta
- □ Without Contrast □ With Contrast □ With/Without Contrast

**EXTREMITIES**
- □ L □ R MRI - SHOULDER
- □ L □ R MRI - HUMERUS
- □ L □ R MRI - ELBOW
- □ L □ R MRI - FOREARM
- □ L □ R MRI - WRIST
- □ L □ R MRI - HAND
- □ L □ R MRI - HIP
- □ L □ R MRI - FEMUR
- □ L □ R MRI - KNEE
- □ L □ R MRI - TIB/FOOT
- □ L □ R MRI - ANKLE
- □ L □ R MRI - FOOT
- □ Without Contrast □ With Contrast □ With/Without Contrast

**BODY: ABD/PELVIS**
- □ MRI - MRCP
- □ MRI - Abdomen
- □ MRA - Abdomen, Renals
- □ MRI - Pelvis or Sacrum (bone)
- □ MRI - Pelvis
- □ MRA - Pelvis
- □ Without Contrast □ With Contrast □ With/Without Contrast

Clinical Indications (check all applicable)
- □ Chest pain
- □ Abdominal pain
- □ Pelvic pain
- □ Back pain
- □ Neck pain
- □ Shoulder pain □ Right □ Left
- □ Leg pain □ Right □ Left
- □ Arm pain □ Right □ Left
- □ Numbness □ Right side □ Left side
- □ Weakness □ Right side □ Left side
- □ Trauma □ Contusion
- □ Headaches
- □ Syncope
- □ Dizziness
- □ Vertigo
- □ Seizures
- □ Nausea
- □ Blurred vision
- □ Ringing in ears (tinnitus)
- □ Memory loss
- □ Unexpected weight loss
- □ Tremors

Ordering Provider signature: ____________________________ Date: ___________ Time: ___________
Clinician Education Handout #3
Clinician Education Preference Survey

In your opinion, what would you find to be the most helpful intervention in reducing the number of unnecessary imaging exams ordered by clinicians?

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Not at all helpful</th>
<th>Very helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed educational material</td>
<td>□ 1 □ 2 □ 3 □ 4 □ 5</td>
<td></td>
</tr>
<tr>
<td>Educational material sent to your email inbox</td>
<td>□ 1 □ 2 □ 3 □ 4 □ 5</td>
<td></td>
</tr>
<tr>
<td>Face-to-face discussion</td>
<td>□ 1 □ 2 □ 3 □ 4 □ 5</td>
<td></td>
</tr>
<tr>
<td>Computerized order entry decision support</td>
<td>□ 1 □ 2 □ 3 □ 4 □ 5</td>
<td></td>
</tr>
<tr>
<td>Instructional web video</td>
<td>□ 1 □ 2 □ 3 □ 4 □ 5</td>
<td></td>
</tr>
</tbody>
</table>

Other

Please specify: ______________________________________________________________________
References


