

# Implementation of a smart CDS tool for improved lumbar spine MRI ordering

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# Background

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- ◆ Under Public Law 113-93 (Protecting Access to Medicare Act of 2014) the Centers for Medicare & Medicaid Services (CMS) requires physicians who order advanced imaging exams to interact with a Clinical Decision Support (CDS) system that relies on established Appropriate Use Criteria (AUC).
- ◆ If there is not compliance with the AUC mandate of P.L. 113-93 and documentation of a consult to a qualified CDS entity, providers will not receive Medicare payment for the procedure after the educational and testing period is completed on **December 31, 2021**.

# Current Condition

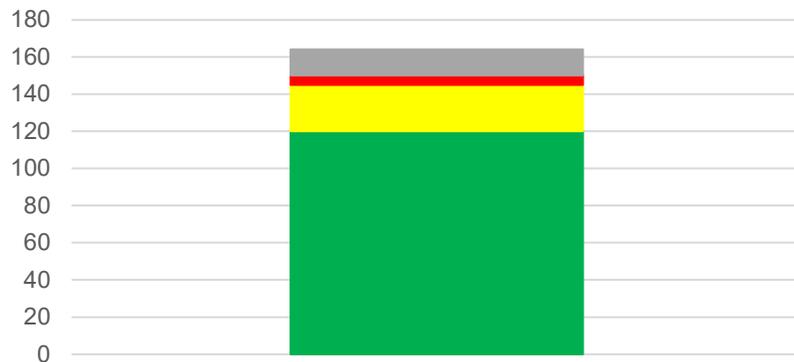
## Problem Statement:

- ◆ Advanced imaging with lumbar spine (LS) MRI for patients with nonspecific low back pain is inconsistent with high-value care
- ◆ Lumbar Spine MRI exams categorized as 'No Score' by CDS represent a lost educational opportunity for ordering providers. These 'No Score' orders are predominantly due to the use of free text only

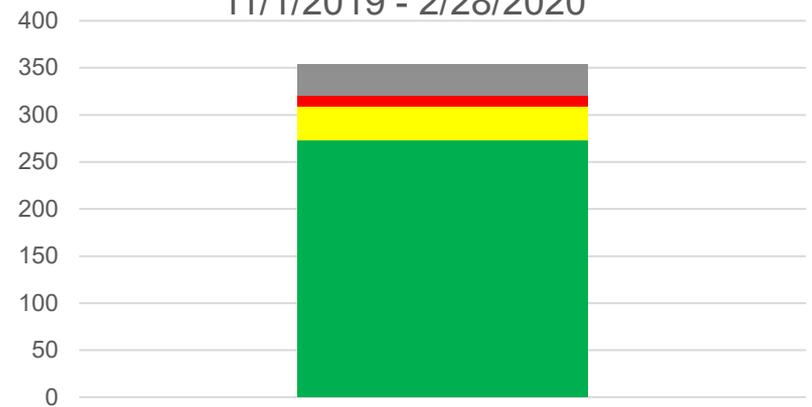
## Project Scope:

- ◆ Compare rates of 'No Score' orders before and after implementation of an AI tool between subspecialty spine surgery clinicians, who generate the largest volume of MR Lumbar Spine orders, and all orthopedic providers

MR Lumbar Spine CDS Scores Ortho Spine Surgery Providers  
11/1/2019 - 2/28/2020



MR Lumbar Spine CDS Scores All Ortho Providers  
11/1/2019 - 2/28/2020



■ Usually Appropriate ■ Maybe Appropriate  
■ Usually Inappropriate ■ No Score

# Root Cause Analysis

## Voice of the Customer: Key Takeaways

### Ortho Spine Attending

- Incentives of radiology and ordering provider often different
- No feedback on overall ordering behavior
- Clinical Decision Support (CDS) not front of mind

### Ortho PA

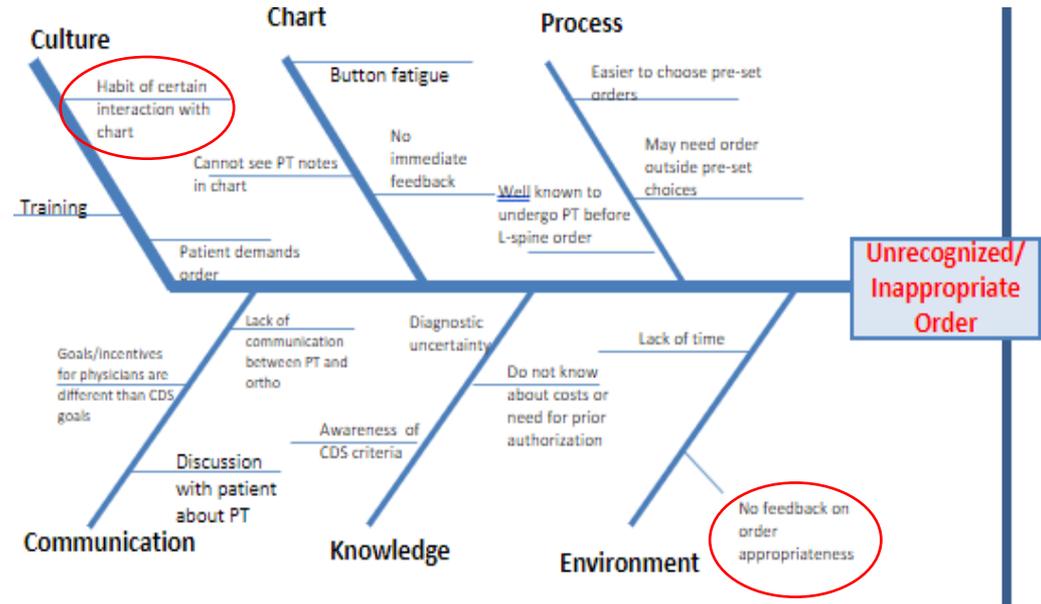
- No feedback on ordering behavior
- Difficulty accessing physical therapy documentation in chart

### Ortho care coordinator

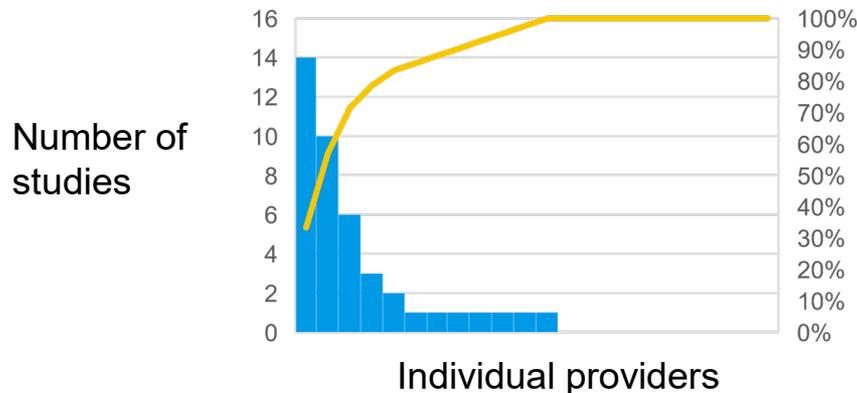
- Performs insurance pre-authorization
- Motivated to decrease need for peer-to-peer consults

### Radiology administration

- Compliance with CMS mandate that all orders use CDS by 2022
- Use CDS data to decrease pre-authorization burden with insurers



Pareto Chart - MR Lumbar Spine Orders with "No Score" on CDS  
11/1/2019 - 2/28/2020



# Countermeasure / Intervention

- ◆ Implementation of a commercially available EPIC-integrated AI driven tool to match Free Text order entries to recognized and scorable structured indications.

The screenshot shows an Epic EHR interface. At the top, there is a 'Priority:' dropdown set to 'Routine', with buttons for 'Routine', 'STAT', and 'Today'. Below that is a 'Reason for Exam:' field containing the text 'low back pain'. A dropdown menu is open, displaying a list of medical conditions with checkboxes and their corresponding Medical Cond IDs. The conditions are:

%	Medical Cond Name	Medical Cond ID
<input type="checkbox"/>	Back pain, cauda equina syndrome suspected	1051831
<input type="checkbox"/>	Back pain, chronic, mechanical or overuse (Ped 0-18y)	1054003
<input type="checkbox"/>	Back pain or radiculopathy, > 6 wks	1051825
<input type="checkbox"/>	Back pain or radiculopathy, < 6 wks, uncomplicated	1051827
<input type="checkbox"/>	Back pain or radiculopathy, cancer or infection suspected	1051860
<input type="checkbox"/>	Back pain or radiculopathy, immunocompromised	1051823
<input type="checkbox"/>	Back pain or radiculopathy, osteoporosis presence or risk	1051862
<input type="checkbox"/>	Back pain or radiculopathy, prior surgery, new symptoms	1051864
<input type="checkbox"/>	Back pain or radiculopathy, trauma	1051829
<input type="checkbox"/>	Back pain, progressive neurologic deficit	1051832

At the bottom of the dropdown menu, there are buttons for 'Search' and 'Recent', and a 'None apply' option with a checkmark. The background shows parts of other form fields, including 'Does the patient have...' and 'Is the patient any of...'.

Appearance of the selection of indications for MRI-LS in the Epic EHR.

# Results to Date – Spine-Only Providers

- Orthopedic spine surgery providers entered significantly fewer ‘No Score’ orders after implementation of the AI tool, driven primarily by ordering behavior of Advanced Practice Providers (APPs).

Ortho Spine Provider scores		
	Pre	Post
Appropriate	120 (73%)	163 (80%)
May be Appropriate	25 (15%)	32 (16%)
Inappropriate	5 (3%)	2 (1%)
No Score	14 (9%)	7 (3%)
Total	164	204

Chi-Square Analysis of Ortho Spine Providers		
Order Score	Association	p-value
Appropriate	None	0.1278
May be Appropriate	None	0.907
Inappropriate	None	0.161
No Score	Significant Decrease	0.036

Pre vs. Post MR Lumbar Spine Order CDS Scores for MD spine providers



Pre vs. Post MR Lumbar Spine Order CDS Scores for APP spine providers



■ Usually Appropriate   
 ■ Maybe Appropriate  
■ Usually Inappropriate   
 ■ No Score

# Results to Date – All Ortho Providers

- ◆ In comparison, across all orthopedic providers there was no significant overall change in ordering behavior using a 2x4 chi-square contingency table between the pre- and post-intervention periods (p=0.397).

Total	Before	After
Appropriate	273 (77%)	223 (71%)
May be appropriate	36 (10%)	37 (12%)
Inappropriate	11 (3%)	6 (2%)
No Score	34 (10%)	48 (15%)
<b>Total</b>	<b>354</b>	<b>314</b>

- ◆ The significant differences in the ordering habits between physicians and APPs after the AI tool intervention remain in the broader cohort of all orthopedic providers.

BEFORE INTERVENTION	MD	PA
Appropriate	122 (77%)	151 (77%)
May be appropriate	16 (10%)	20 (10%)
Inappropriate	3 (2%)	8 (4%)
No Score	18 (11%)	16 (8%)
<b>Total</b>	<b>159</b>	<b>195</b>

2x4 Chi-square, p= 0.517

AFTER INTERVENTION	MD	PA
Appropriate	136 (65%)	87 (83%)
May be appropriate	26 (12%)	11 (11%)
Inappropriate	3 (1%)	3 (3%)
No Score	45 (21%)	3 (3%)
<b>Total</b>	<b>210</b>	<b>104</b>

2x4 Chi-square, p <0.001

# Discussion and Future Direction

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## Discussion

- The CDS AI tool was more effective at reducing 'No Score' orders in the subspecialty orthopedic spine clinic compared to all orthopedic providers.
- The AI tool positively decreased the proportion of 'No Score' orders and increased the proportion of 'Usually Appropriate' orders among APPs but not among physicians.

## Future Directions

- Evaluate the impact of the AI tool on ordering patterns of non-orthopedic providers (e.g. primary care physicians).
- Measure impact of AI tool on outlier providers.
- Consider targeted intervention with report cards on outlier providers.

# References

- ◆ Hentel K, Menard A, Khorasani R. New CMS Clinical Decision Support Regulations: A Potential Opportunity with Major Challenges. *Radiology*. 2017 Apr;283(1):10-13.
- ◆ Sutton RT, Pincock D, Baumgart DC, Sadowski DC, Fedorak RN, Kroeker KI. An overview of clinical decision support systems: benefits, risks, and strategies for success. *NPJ Digit Med*. 2020;3:17.
- ◆ “Hospital Outpatient Quality Reporting Program.” *Center for Medicare and Medicaid Services*, <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalOutpatientQualityReportingProgram>. Web. Accessed 10/4/2021.

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