

# Implementing Appropriateness Criteria for Use of Imaging Technology (Project ACUITy) in MRI Lumbar Spine – A Singapore Experience

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# Background



- Acute low back pain is a leading cause of years lived with disability.
- In Singapore, there were 533,000 prevalent cases of back pain and 60,900 years lived with disability (YLD) in 2020 and formed 10.11% of total YLD in 2021<sup>1,2</sup>
- Currently, the American College of Radiology (ACR) recommends MRI imaging in patients with low back pain only if they have the potential red flags<sup>3</sup>
- In 2018, the Singapore Ministry of Health convened a multidisciplinary workgroup and developed the Agency for Care Effectiveness' Clinical Guidance (ACG) consensus guideline on for "When to order MRI for low back pain" in Oct 2020
- The aim of this study is to review and analyse the number of "inappropriate" MRI lumbar spine orders following implementation of the ACG indicators



## Methods



 Agency for Care Effectiveness' Clinical Guidance (ACG) consensus guideline on for "When to order MRI for low back pain" – with reference to references such as the American College of Radiology (ACR) Appropriateness Criteria, National Institute for Health and Care Excellence (NICE) guidelines and Veteran Affairs / Department of Defense (Va/DoD) Clinical Practice Guidelines<sup>4,5</sup>

"Appropriate"		"Inappropriate"	
- - -	Pain >4-6 weeks of conservative treatment Progressive neurological symptoms or signs Suspected or known cancer/infection Suspected cauda equina New/progressive pain post invasive spinal procedure	<ul> <li>Non-specific pain &lt;4-6 weeks</li> <li>Patient's request</li> <li>Others</li> </ul>	



### Methods



- "Appropriate" and "Inappropriate" indications were inserted into the MRI lumbar spine order request form in the hospital's electronic health record (EMR) system
- Mandatory for clinicians to specify on a drop-down list which of these indications applied to their scan requests.

Request Type (Medisave Claim	Diagnostic/Treatment C Screening		Clear		
MOH ACUITY Checklis	MOH ACUITY Checklist 🔀				
	Click here to view more details on MOH ACUTIY checklist ->		F		
Clinical Diagnosis and Reason for Exam 🔯		- 🔜 F	lease select		
			value		
Relevant History/Findings/Prev Surger	/		Suspected cauda equina syndrome or rapidly progressive neur	ological findings	
		받는	Suspected or known cancer or infection		
Creatinine Result	Received Date/Time: 17/03/2019 0235(Mar07); Reporting Information: Press buttor (Mar07);	받는	Prior lumbar surgery: new or progressive findings		(Mar07): Weight: 106(N
		받는	Persistent symptoms despite 4-6 weeks of conservative manage	5 weeks of conservative management	
		받는	Progressive neurological symptoms		
			History of low velocity trauma (osteoporosis, elderly, chronic st	eroid use)	
	Above results are extracted as of order date		Low back pain without motor deficits; less than 4-6 weeks*		
Non-contr	ast With IV contrast		Patient's request*		
th Dava actions has any history of			Others*	/	
1) Does patient has any history of: (i) Renal surgery (ii) Proteinuria (iii) Hypertension (iv) Gout (v) Diabetes ? If answer					
Is Patient Pregnant					
	C Yes C Pen			1.	pregnancy test)
Patient Mobilit					1





• For those who selected an "inappropriate" indication, a free-text "pop-up" was required for clinicians to elaborate on their clinical reasoning in order to proceed with the order

st Type (Medisave Claim) Diagnostic/Treatment	Clear	
Diagnostic/Treatment     O Screening		
		May be inappropriate. State reason
MOH ACUITY Checklist Low back pain without motor deficits; less than 4-6 weeks*		
Click here to view more details on MOH ACUTIY checklist ->	<u>7</u>	
	st Type (Medisave Claim) Diagnostic/Treatment	st Type (Medisave Claim) Diagnostic/Treatment Clear

- Orders were classified as "appropriate" or "inappropriate" based on order indication.
- To minimise information bias, we manually reviewed the EMR documentation at time of clinic visit to ensure that the indication written on the MRI request form matches the clinical history documented. If there was a mismatch, the order was re-classified.



## Results



#### MRI Lumbar Spine Orders Pre-Intervention (2019) vs Post-Intervention (2020-2022)



	"Appropriate " (%)	"In- appropriate" (%)	p- value *
January 2019 – March 2019 (Pre-intervention)	428 (87.0)	64 (13.0)	
December 2020 – March 2021 (Post-intervention)	854 (90.9)	86 (9.1)	0.07
December 2021 – March 2022 (Post-intervention)	483 (92.7)	38 (7.3)	0.01

\*Chi-square test with pre-intervention data as baseline reference



# Results



- Among all the 124 "inappropriate" studies post intervention,
  - 123 patients were treated conservatively
  - 1 patient with a schwannoma at L1 level accompanied by radiating pain required surgery
- Notable "inappropriate" studies
  - 5 newly diagnosed vertebral/sacral fractures with no significant nerve root/cord compression
  - 1 case of chronic cauda equina compression from listhesis
  - 1 case of sacroiliitis
  - 2 incidental indeterminate vertebral T1 hypointense lesions that proved to be stable on follow up.



## Discussion



- Overuse of MRI in low back pain has been widely prevalent with some studies reporting only 46-75% of orders being appropriate<sup>6,7,8</sup>.
- While we aim to decrease "inappropriate" MRI lumbar spine orders to optimise use of healthcare resources, care must be taken in crafting guidance documents to avoid being overly stringent and missing out on potentially urgent conditions
- Our intervention of mandatory filling in compulsory "appropriate" or "inappropriate" indications serves as a "just-in-time" check prior to placing the MRI spine order.
- This successfully shown significant decrease in "inappropriate" scans from 13.0% to 7.3%., equivalent to 214 MRIs a year (based on an outpatient case load of 940 MRIs from 15 December 2020 to 15 March 2021).



## Discussion



- The ACG guidelines excluded spondyloarthropathy as an "appropriate" criteria.
  - Lumbar spine radiograph or SI joint imaging should be the first line evaluation of inflammatory back pain<sup>9</sup>
  - However, MRI if done for the appropriate patient can demonstrate early spondyloarthropathy changes. Hence the workgroup is considering modifying the guidelines to make work up of spondyloarthropathy an "appropriate" indication.
- Limitations
  - No inpatient imaging order which we hypothesise will have a greater rate of "inappropriate" scans as there is greater impetus to obtain definitive diagnosis to decrease bed occupancy rate the problem of bed shortages.
  - Single tertiary hospital with imaging orders only from specialists. The patient cohort and practice pattern in the primary care were not taken into account.



### References



- <sup>1</sup>The Lancet R. The global epidemic of low back pain. Lancet Rheumatol. 2023;5(6):e305. 10.1016/S2665-9913(23)00133-9
- <sup>2</sup>Evaluation IfHMa. GBD Compare-Singapore. HME Viz Hub. 2021 [Available from: <u>https://vizhub.healthdata.org/gbd-compare/</u>.
- <sup>3</sup>Patel ND, Broderick DF, Burns J, Deshmukh TK, Fries IB, Harvey HB, et al. ACR Appropriateness Criteria Low Back Pain. J Am Coll Radiol. 2016;13(9):1069-78. 10.1016/j.jacr.2016.06.008
- <sup>4</sup>de Campos TF. Low back pain and sciatica in over 16s: assessment and management NICE Guideline [NG59]. J Physiother. 2017;63(2):120. 10.1016/j.jphys.2017.02.012
- <sup>5</sup>Pangarkar SS, Kang DG, Sandbrink F, Bevevino A, Tillisch K, Konitzer L, et al. VA/DoD Clinical Practice Guideline: Diagnosis and Treatment of Low Back Pain. J Gen Intern Med. 2019;34(11):2620-9.PMC6848394. 10.1007/s11606-019-05086-4
- <sup>6</sup>Flynn TW, Smith B, Chou R. Appropriate use of diagnostic imaging in low back pain: a reminder that unnecessary imaging may do as much harm as good. J Orthop Sports Phys Ther. 2011;41(11):838-46. 10.2519/jospt.2011.3618
- <sup>7</sup>Hudson D, Knapp K, Benwell M. An evaluation of MRI lumbar spine scans within a community-based diagnostic setting. Musculoskeletal Care. 2021;19(3):384-95.
- 8Jenkins HJ, Downie AS, Maher CG, Moloney NA, Magnussen JS, Hancock MJ. Imaging for low back pain: is clinical use consistent with guidelines? A systematic review and meta-analysis. Spine J. 2018;18(12):2266-77. 10.1016/j.spinee.2018.05.004
- <sup>9</sup> Expert Panel on Musculoskeletal I, Bernard SA, Kransdorf MJ, Beaman FD, Adler RS, Amini B, et al. ACR Appropriateness Criteria((R)) Chronic Back Pain Suspected Sacroiliitis-Spondyloarthropathy. J Am Coll Radiol. 2017;14(5S):S62-S70. 10.1016/j.jacr.2017.01.048



