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Original Research Article

Assessing the appropriateness of lumbar spine MRI referrals in low back pain management: a tertiary care hospital study

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ABSTRACT

Background: Low back pain (LBP) is a leading cause of disability globally, yet most cases are nonspecific, with no clear pathology. The routine use of MRI for diagnosing LBP is debated, as overuse may lead to unnecessary procedures, increased healthcare costs, and patient anxiety. This study aimed to evaluate adherence to the American College of Radiology (ACR) appropriateness criteria for lumbar spine MRI referrals at a tertiary care hospital.
Methods: A retrospective study analysed 200 lumbar spine MRI referrals from January to June 2022. Referrals were reviewed for appropriateness based on ACR guidelines. Data included patient demographics, referring specialties, and clinical indications. Referrals were classified as appropriate or inappropriate, with trends across specialties identified.
Results: Of the 200 referrals, 71% (142) were deemed appropriate, primarily for cases with red flags or persistent neurological symptoms. 29% (58) were inappropriate, often involving acute back pain without red flags or failed conservative management. General practitioners and emergency medicine specialists had the highest rates of inappropriate referrals (43.5% and 37.2%, respectively), while orthopedics and neurosurgery showed more adherence to guidelines.
Conclusions: This study highlights the need for improved adherence to the ACR appropriateness criteria in MRI referrals for LBP. Overuse of MRI contributes to unnecessary healthcare costs and patient risk. Enhancing clinician education, documentation practices, and decision support tools could reduce inappropriate MRI use, improving patient care and reducing costs.

Keywords: ACR appropriateness criteria, Clinical guidelines, Low back pain, MRI

INTRODUCTION

Low back pain (LBP) is a widespread medical condition affecting millions of individuals globally and is one of the leading causes of disability worldwide, as reported by the World Health Organization (WHO).[1] It is a significant contributor to the global burden of disease, both in terms of healthcare costs and lost productivity.[2] Around 70-85% of adults will experience LBP during their lifetime, with many enduring recurrent episodes.[3] Despite its high prevalence, most cases of LBP are nonspecific, meaning there is no clear underlying pathology, yet these cases still cause substantial disability and lead to high healthcare utilization.[4]

Magnetic resonance imaging (MRI) is commonly used to diagnose LBP and is invaluable in identifying specific spinal conditions like disc herniations, tumors, and infections.[5] However, the routine use of MRI for nonspecific LBP is a subject of debate. There is growing concern about the overuse of MRI, particularly in cases where conservative management should be the first-line approach.[6] Over-reliance on imaging can often result in incidental findings such as degenerative changes or disc

bulges, which may not be clinically significant but can lead to unnecessary procedures or interventions.[7]

The American College of Radiology (ACR) has developed the ACR Appropriateness Criteria, a set of guidelines to assist clinicians in determining when MRI is truly necessary for LBP.[8] These guidelines provide evidence-based recommendations and appropriateness scores based on specific clinical scenarios. Despite these guidelines, real-world practice often deviates from them, leading to unnecessary MRI requests.[9] Overuse of MRI not only adds unnecessary healthcare costs but may also expose patients to risks, such as unnecessary invasive procedures, false positives, or increased anxiety.

To address these concerns, this study was conducted at our hospital to evaluate adherence to the ACR Appropriateness Criteria for lumbar spine MRI referrals in patients with low back pain. The primary objectives of this study were: (1) to evaluate the proportion of lumbar spine MRI referrals that align with the ACR Appropriateness Criteria; (2) to identify referral trends across different medical specialties, including general practitioners (GPs), orthopedics, neurosurgery, rheumatology, and emergency medicine; (3) to analyze common reasons for inappropriate MRI use; and (4) to propose strategies and interventions to optimize MRI utilization and enhance adherence to the ACR guidelines.

The results of this study could help improve the quality of care for patients with low back pain by ensuring that MRI is used appropriately. By reducing unnecessary imaging, healthcare costs could be lowered, and patients would be protected from potential risks associated with overuse. It will also contribute to informing future policies on the appropriate use of MRI in the diagnosis and management of low back pain.

METHODS

This study aimed to evaluate the adherence to the American College of Radiology (ACR) appropriateness criteria for lumbar spine MRI referrals in patients with low back pain (LBP) at a tertiary care hospital. A retrospective study was conducted over a 6-month period, from January 2022 to June 2022. The sample for the study included adult patients (≥18 years) who underwent lumbar spine MRI at the hospital during the specified period. The inclusion criteria for the study were adults aged 18 years or older, with a referral for lumbar spine MRI due to low back pain (acute or chronic), referred by healthcare providers from various specialties, including general practitioners, orthopedics, neurosurgery, rheumatology, and emergency medicine. The exclusion criteria included patients with previously diagnosed, specific spinal conditions such as tumors, infections, or severe trauma, which clearly warranted imaging based on clinical presentation, and patients under the age of 18.

A total of 200 referral forms were analyzed, representing both outpatient and inpatient referrals. The referral forms provided detailed information on patient demographics (age, sex), clinical history, reasons for the MRI referral, referring specialty, and MRI outcome (whether any pathology was identified). Since this was a retrospective study and used de-identified data, formal patient consent was not required. However, all data were handled in compliance with applicable data protection laws to ensure patient confidentiality.

Table 1: ACR appropriateness criteria® low back pain.

Variant	Imaging procedure	Rating	Comments
1. Acute, subacute, or chronic uncomplicated low back pain or radiculopathy. No red flags. No prior management.	MRI lumbar spine without IV contrast	2	-
2. 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.	MRI lumbar spine without IV contrast	7	CT is preferred. MRI can be useful to evaluate for ligamentous injury or worsening neurologic deficit. MRI can depict marrow edema in these scenarios.
3. Acute, subacute, or chronic low back pain or radiculopathy. One or more of the following: suspicion of cancer, infection, or immunosuppression.	MRI lumbar spine without and with IV contrast MRI lumbar spine without IV contrast	8 7	Contrast is useful for neoplasia patients suspected of epidural or intraspinal disease. Noncontrast MRI can be sufficient if there is low risk of epidural and/or intraspinal disease.
4. Acute, subacute, or chronic low back pain or radiculopathy. Surgery or intervention candidate with persistent or progressive symptoms	MRI lumbar spine without IV contrast MRI lumbar spine without and with IV contrast	8 5	This procedure is indicated if noncontrast MRI is nondiagnostic or indeterminate. Contrast is indicated if patient

Continued.

Variant	Imaging procedure	Rating	Comments
during or following 6 weeks of conservative management.			has history of prior lumbar surgery. See variant 5.
5. Low back pain or radiculopathy. New or progressing symptoms or clinical findings with history of prior lumbar surgery.	MRI lumbar spine without and with IV contrast	8	This procedure can differentiate disc from scar.
6. Low back pain with suspected caudaequina syndrome or rapidly progressive neurologic deficit.	MRI lumbar spine without IV contrast MRI lumbar spine without and with IV contrast	9 8	Use of contrast depends on clinical circumstances Use of contrast depends on clinical circumstances

Rating Scale: 1, 2, 3 usually not appropriate; 4, 5, 6 may be appropriate; 7, 8, 9 usually appropriate. For the purpose of this study, only MRI procedures for each variant were included in the table.

The primary data point of interest was whether the MRI referral met the ACR appropriateness criteria for LBP (Table 1).[8] Referrals were categorized into two groups: appropriate or inappropriate and the data were analyzed using descriptive statistics. The proportion of appropriate versus inappropriate MRI referrals was calculated. Additionally, trends in referral patterns across specialties and common reasons for inappropriate referrals were identified.

RESULTS

In this study, a total of 200 lumbar spine MRI referrals for patients with low back pain (LBP) were analyzed over a 6-month period. The sample consisted of adult patients aged 18 years or older, referred by various specialties including general practitioners, orthopedics, neurosurgery, rheumatology, and emergency medicine. Demographic data showed that the patients' ages ranged from 18 to 85 years, with a near-even distribution between males and females (Table 2 and 3).

Table 2: Age distribution of patients (n=200).

Age range (years)	Number of patients
18-24	22
25-34	28
35-44	47
45-54	48
55-64	28
65-74	17
75-85	10
Total	200

Table 3: Gender distribution of patients (n=200).

Gender	Number of patients	Percentage (%)
Male	101	50.5
Female	99	49.5
Total	200	100

The overall adherence to the ACR appropriateness criteria for lumbar spine MRI referrals was as follows (Figure 1): 142 (71%) of the 200 referrals met the criteria for appropriate use based on the clinical indications and patient presentation. These were primarily cases where red flags were present, or where specific pathologies (e.g., suspected herniated disc, spinal stenosis) were indicated.

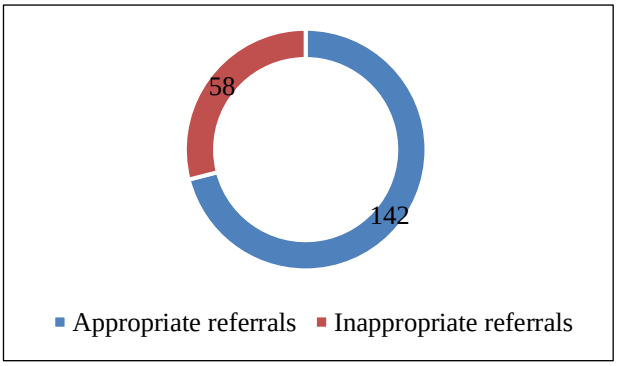

Figure 1: Distribution of MRI referrals into appropriate and inappropriate category.

58 (29%) of the referrals were considered inappropriate. These included cases where MRI was requested early in the patient's management, without red flags or where conservative management (e.g., physical therapy, medication) had not been tried before imaging was ordered. Many of these cases were referred by general practitioners or emergency departments, where early imaging requests were more common.

Further analysis revealed that referral trends varied across different specialties. General practitioners, had the highest number of MRI requests, with a total of 62 referrals. Emergency Medicine followed closely with 51 requests, indicating a significant volume of imaging referrals from this department. Orthopedics also accounted for 36 MRI requests, reflecting their role in diagnosing and managing spinal conditions. Neurosurgery had 29 MRI requests, which is consistent with their specialized focus on complex spinal issues and surgical interventions. Rheumatology, with 22 MRI requests, made the fewest referrals among the specialties included in the study (Table 4).

General practitioners and emergency medicine providers had the highest rates of inappropriate MRI requests (43.5% and 37.2%, respectively), whereas referrals from orthopedics and neurosurgery had significantly lower rates of inappropriate imaging, with only 19.4% and 13.7% of referrals deemed inappropriate respectively. Rheumatology referrals had the lowest rate of inappropriate MRI requests, with only 4.5% falling into the inappropriate category. This indicates that some specialties, particularly general practitioners and emergency medicine, may be more inclined to order MRI scans early, while others such as orthopedics and rheumatology are more conservative in their approach to imaging for low back pain (Table 4).

Table 4: Referral trends across different specialties along with number and percentages of inappropriate requests.

Specialty	Total MRI requests	Inappropriate MRI requests (%)	Number of inappropriate MRI requests
General Practitioners	62	43.55	27
Emergency Medicine	51	37.25	19
Orthopedics	36	19.44	7
Neurosurgery	29	13.79	4
Rheumatology	22	4.55	1

In this study, a majority of MRI requests for low back pain were considered appropriate, aligning with established clinical guidelines. These appropriate requests typically involved patients with red flags, such as suspected malignancy, neurological deficits, or trauma, which justified the need for imaging. Other requests were made for patients with chronic low back pain lasting more than six weeks, where MRI was necessary due to persistent neurological symptoms or failure of conservative management. Additionally, MRI was deemed appropriate for patients experiencing radicular pain that had not improved with initial treatments, prompting the need for further assessment, such as potential nerve impingement (Table 5).

Table 5: Breakdown of appropriate MRI requests (71%).

Reason for appropriateness	Number of requests	Percentage
Red flags identified	22	15.49
Chronic back pain with neurological symptoms	53	35.32
Radicular pain	39	28.46
Failed conservative treatment	28	19.72
Total	142	100

However, a significant portion of MRI requests were found to be inappropriate. Many of these requests involved patients with acute back pain of less than six weeks, where MRI was ordered despite the absence of red flags or neurological deficits. Clinical guidelines recommend against early imaging in these cases, as most acute back pain improves with conservative management. Another common issue was the lack of sufficient clinical documentation, making it difficult to justify the need for imaging. In some cases, MRI was requested for patients with mild, non-specific pain without any neurological concerns or trauma history. Additionally, some requests were made for patients who had not undergone conservative management, such as physical therapy or medication, before imaging was ordered, which violated clinical guidelines suggesting that imaging should follow the failure of conservative treatment (Table 6).

Table 6: Breakdown of inappropriate MRI requests (29%).

Reason for inappropriateness	Number of requests	Percentage
Acute back pain (<6 weeks)	23	39.66
Lack of clinical information	15	25.86
Unnecessary imaging for mild conditions	13	22.41
No prior conservative management	7	12.06
Total	58	100

Although the majority of MRI requests in this study were appropriate, a significant proportion of unnecessary imaging could be prevented with better documentation, improved clinical decision-making, and enhanced awareness of the appropriate indications for MRI.

DISCUSSION

Low back pain (LBP) is a major health issue affecting millions globally, contributing significantly to disability, healthcare costs, and lost productivity.[1] In most cases, however, LBP remains nonspecific, which means there is no clear underlying pathology that can be identified through conventional diagnostic methods like imaging. Magnetic Resonance Imaging (MRI) is frequently used to diagnose LBP, particularly in cases where more specific spinal conditions, such as disc herniations, infections, or tumors, are suspected.[4] However, the necessity and appropriateness of routine MRI use in nonspecific cases of

LBP have been a subject of increasing debate, raising concerns about overuse and the resultant unnecessary healthcare costs, patient anxiety, and potential exposure to unnecessary procedures.[5,6]

The routine use of MRI for diagnosing low back pain has been criticized, particularly in cases where conservative management such as physical therapy and medication has not yet been attempted. Studies have shown that early imaging for LBP, especially in the absence of "red flags" (clinical indicators suggesting a serious underlying pathology such as cancer, infection, or neurological compromise), may not change patient outcomes significantly.[7] The American College of Radiology (ACR) has developed the ACR appropriateness criteria as a guide to clinicians, helping determine when imaging is truly necessary for LBP.[8] These guidelines recommend MRI in specific scenarios, such as when red flags are present, or when a patient's symptoms persist despite conservative treatments.

In the present study, 70% of the MRI referrals were found to be appropriate, aligning with these criteria. Most of the appropriate referrals were made when red flags or chronic back pain with neurological symptoms were evident, justifying the need for MRI as part of the diagnostic process.[9] These findings confirm the utility of MRI in assessing patients with clear indications such as suspected herniated discs, radicular pain, or chronic conditions that have not improved with initial management. This suggests that adherence to established clinical guidelines is important for ensuring MRI is used in appropriate circumstances.

Despite the high rate of appropriate referrals, the study also revealed a concerning 30% of MRI referrals were deemed inappropriate. These included cases of acute back pain, where the MRI was ordered prematurely without a clinical indication or red flags.[10] This finding supports the argument that many healthcare providers, especially general physicians and emergency medicine providers, may be overutilizing imaging in cases where conservative treatments have not yet been exhausted. Previous research has shown that early imaging without the presence of red flags or without first attempting conservative management is associated with poorer outcomes and higher healthcare costs.[11]

The overuse of MRI in these scenarios is troubling because it could lead to unnecessary interventions, which may expose patients to risks associated with imaging, such as false positives, increased anxiety, and invasive procedures.[12] The study further revealed that many referrals were inadequately documented, lacking critical information such as symptom duration or evidence of prior treatments. This lack of documentation made it difficult to assess whether imaging was truly warranted based on clinical criteria. These findings underline the importance of comprehensive documentation to justify imaging requests and ensure that imaging is ordered based on evidence-based guidelines rather than clinical uncertainty or convenience.

The study also highlighted variations in MRI referral trends across different medical specialties. The variation in referral patterns across specialties may reflect different levels of familiarity with the ACR Appropriateness Criteria. Specialists in orthopedics, neurosurgery, and rheumatology-fields with more direct expertise in managing spinal disorders are likely to be more aware of when imaging is truly necessary and may be more conservative in their approach.[13] In contrast, General practitioners and emergency department physicians, who see a broader range of patients with nonspecific LBP, may rely on imaging as a safety measure or as part of an initial diagnostic workup, even when guidelines suggest that such imaging is unnecessary.

The high rate of inappropriate MRI use identified in this study indicates a need for improved adherence to the ACR Appropriateness Criteria. One of the key barriers to guideline adherence identified in the study was inadequate clinical documentation. Ensuring that MRI requests are accompanied by detailed clinical information, including a history of prior treatments and any symptoms suggesting the need for advanced imaging, could help clinicians better evaluate the necessity of MRI.[14] Additionally, as many inappropriate referrals came from primary care and emergency departments, targeted education and training programs aimed at these groups may help reduce unnecessary imaging requests. Educating healthcare providers about the risks of over-imaging, the financial implications, and the potential harm caused by unnecessary interventions could encourage more judicious use of MRI in LBP management.[15]

A further strategy could involve implementing clinical decision support systems (CDSS) that integrate the ACR Appropriateness Criteria directly into the referral process. Such systems can prompt clinicians to consider whether MRI is appropriate based on clinical indications, ensuring that imaging is reserved for cases where it will genuinely contribute to the patient's diagnosis and management.[16] This approach has been shown to improve adherence to clinical guidelines and reduce unnecessary imaging in other healthcare settings.[17]

One limitation of the study was the reliance on retrospective data, which could lead to incomplete or missing information from referral forms. Additionally, as the study was conducted at a single hospital, the findings may not be generalizable to other healthcare settings. The categorization of MRI appropriateness was based on the ACR guidelines, but subjective factors may have influenced clinicians' referral decisions, potentially affecting the appropriateness classification.

CONCLUSION

The findings of this study provide valuable insights into the current practices regarding MRI use for low back pain and highlight the need for improved adherence to evidence-based guidelines. By optimizing MRI utilization, healthcare costs can be reduced, and patients will be protected from potential risks associated with overuse. Furthermore, improved adherence to the ACR Appropriateness Criteria could lead to better patient outcomes, as unnecessary procedures and anxiety could be minimized. These results emphasize the importance of ongoing education and quality improvement initiatives aimed at optimizing the management of low back pain and ensuring that MRI is used appropriately in clinical practice.

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