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Original Research Article

APPROPRIATE USE OF IMAGING FOR DIAGNOSING LOW BACK PAIN IN PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT

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Abstract: *The retrospective study was conducted in Shifa Hospital from January 2022 to January 2023 to assess the use of lumbar imaging in patients presenting to the emergency department for lower back pain. Participants' data, including case history, triage notes, imaging requests, and imaging results, were recorded. Decisions based on the clinician's clinical judgment and the American College of Physicians' guidelines were used to calculate the prevalence of underuse and overuse of lumbar imaging. (Rotondi and Donner, 2012). Kappa ≥0.5 indicated moderate inter-observer agreement and was considered acceptable. Data from 550 patients were reviewed. Results showed that 137 (24.9%) were referred for lumbar imaging and were older than those not. Of 550 cases, 44 (8%) were overused of images, and 22 (4%) of underuse. Many patients visiting the emergency department for low back pain are subjected to inappropriate lumbar imaging decisions.*

Keywords: Low Back Pain, Lumbar Imaging, Emergency Department

Introduction

Pain in the lower back is a common reason for visits to the emergency department (ED) and poses a major diagnostic challenge. In most patients, the problem is related to the spine (Ferreira et al., 2019). Almost 2.5 to 5.1% of the lumbar spine is due to serious pathologies like spinal cord compromise or infection (Galliker et al., 2020). Lumbar imaging is required to confirm the suspected serious pathology and guide management. The remaining patient has non-specific lower back pain or sciatica that does not require lumbar imaging (Oliveira et al., 2018). Deciding which patients who present to the emergency department need urgent lumbar imaging is important. Emergency physicians believe that most patients are unnecessarily advised of lumbar imaging (Juang et al., 2022). The unnecessary use of imaging exposes patients to radiation risk and consumes the resources needed for more serious cases (Evans et al., 2022). Overuse of imaging also increases the cost and duration of ED stay, while its underuse harms patients in whom serious pathology remains undiagnosed.

A recent meta-analysis conducted on guidelines for lumbar imaging reported almost 3.8%-12.5% cases of overuse (proportion of cases who received inappropriate imaging) and 42%-77% cases of underuse (proportion of cases in whom imaging was not provided despite need) (Jenkins et al., 2018; Logan et al., 2019). These results were based on crude and variable criteria for assessing appropriateness, few studies on the topic, and moderately certain evidence. It is important to accurately estimate the overuse and underuse of diagnostic imaging to design effective policies and interventions. More reliable estimates will enable clinicians to reflect upon their practice. Recently, imaging research has prioritized assessing imaging quality rather than quantity. This study aims to assess the use of lumbar imaging in patients presenting to the emergency department for lower back pain.

Methodology

The retrospective study was conducted in Shifa Hospital from January 2022 to January 2023. The study included patient's aged≥ 18 who visited ED due to back pain. The ethical board of the hospital approved the study. Data of the participants, including case history, triage notes, imaging request, and imaging result, was recorded. The clinician-researcher examined data to identify any clinical features relevant to imaging decisions. These features included fever, recent infection, history of cancer, urine retention, fecal incontinence, IV drug use, progressive spinal motor deficits at the spinal level, old age, trauma, unexplained weight loss, corticosteroids, osteoporosis, or any clinical feature leading to further investigation.

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The American College of Physicians' guidelines on diagnostic imaging of low back pain was used as the criteria for judging appropriateness (Chou et al., 2011). For elaboration, 'suspected spinal pathology' was recorded for the advised imaging cases. The pathology was used to assess whether the requested imaging modality was informative. Cases of uninformative modality were considered underuse. Expert clinicians regarded Imaging decisions as 'appropriate' or 'inappropriate.' Rotondi and Donner's confidence interval approach was used to estimate reliable sample size (Rotondi and Donner, 2012). Kappa ≥0.5 indicated moderate inter-observer agreement and was considered acceptable (De Voogd et al., 2021).

For the calculation of weighted Kappa, categorical data were classified as 'appropriate, 'moderately appropriate,' or 'inappropriate.' Kappa results were interpreted according to Landis and Koch approach (Marchevsky et al., 2020). Decisions based on the clinician's clinical judgment and international clinical guidelines were used to calculate the prevalence of underuse and overuse of lumbar imaging. 95CIs were calculated to assess whether clinical guidelines or clinicians' judgments were similar.

Data from 800 patients who visited BD for back pain were screened. 250 were excluded due to the absence of follow-up. Thus, data from 550 patients were reviewed (Table I). The mean age of the participants was 53±20 years, and the majority, 52%, were female. 66 (12%) had various features, and 214 (38.9%) had at least one clinical feature that indicated lumbar imaging. 137 (24.9%) were referred for lumbar imaging and were older compared to those who were not referred.

Of 137 cases, 18 (13.1%) suspected pathology was explicitly listed while referring, and 119 (86.8%) were referred due to clinician's suspicion. 6 (4.3%) of 137 cases were referred for uninformative imaging modality (Table II). Of these 6 cases, 4 were referred for CT and 2 for X-ray, while the appropriate modality was lumbar MRI. There was significant inter-observer agreement (based on international guidelines) on the appropriateness of imaging decisions (Weighted Kappa = .69).

Of 550 cases, 44 (8%) overused the image, and 22 (4%) underused. Table III summarizes the prevalence of underuse and overuse based on international clinical guidelines and clinicians' judgment. CIs overlapped in both cases.

Results

Table I Appropriateness of lumbar imaging decisions based on clinical guidelines

Variables	No. of cases (%) n=550
Appropriate imaging	47 (8.5%)
No Appropriate imaging	368 (550)
Overuse	44 (8%)
Underuse	22 (4%)
Potentially appropriate imaging	27 (4.9%)
Potentially appropriate no imaging	28 (5%)

Table II Inappropriately used imaging modality in various spinal pathologies

Suspected pathology	No. of cases referred for spinal imaging	No. of cases referred for uninformative imaging modality
Fracture	40	0
Cancer	16	0
Cauda equina	7	1
Cord compromise	2	2
Infection	4	3
Radiculopathy	8	0
Inflammatory arthropathy	10	0
None Specified	50	0
Total	137	6

Table III Underuse and Overuse Based on clinical guidelines vs. Clinicians' independent judgment

Prevalences	Clinical guidelines	Clinicians' judgment
Prevalence of Overuse (95% CI)	8(6.9–11.3%)	7(5.7–9.5%)
Prevalence of Underuse (95% CI)	4(3.1–6.2%)	3(2.1–4.8%)

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Discussion

Clinical guidelines were used as a criterion for assessing most imaging decisions. About one-third of the total cases referred for imaging were considered inappropriate. A few patients were not advised of appropriate imaging when indicated in the guidelines. This included cases with suspected infection, cord compromise, and cauda equina syndrome who were advised radiography instead of MRI. Various studies have applied crude appropriateness criteria for assessing the appropriateness of imaging decisions. Previous studies have used various idiosyncratic back pain 'red flags' as a criterion for assessing the appropriateness of imaging, limiting our results' comparability with previous literature. A review study reported that previous studies had mentioned more than 42 red flags (Yates et al., 2020). In this study, the American College of Physicians' guidelines were used instead of these red flags, which is the strength of this study. This study reported an 8% prevalence of overuse, which is consistent with the findings of a previous study which reported a 9% prevalence (95% CI 7.5–11.1%) (Jenkins et al., 2018). However, the prevalence of underuse was much higher than ours (60.7%). It may be because it was a meta-analysis and included larger data from one study (Pakpoor et al., 2020). Reliable estimates provide department-level insight to clinicians on imaging decisions, which helps reduce overuse (Belavy et al., 2022; To et al.). This reliable study system based on internationally acceptable guidelines was used for assessing appropriateness, and estimates of underuse and overuse were compared with the independent judgment of the clinician.

This study has a few limitations. First, clinical guidelines were not specific to the emergency department. Though there are no internationally accepted emergency department guidelines, considering the high acuity of ED, more specific guidelines may have given variable results. Second, there might be a difference in documentation and actual patient presentation. Third, clinician-researchers who conducted this study might have more knowledge of clinical guidelines than average emergency clinicians. As they were aware of the purpose of the study, their clinical judgment may have been biased to be aligned with guidelines.

Conclusion

Many patients visiting the emergency department for low back pain are subjected to inappropriate (overuse and underuse) lumbar imaging decisions.

Conflict of interest

The authors declared absence of conflict of interest.

References

Belavy, D. L., Tagliaferri, S. D., Buntine, P., Saueressig, T., Samanna, C., McGuckian, T., Miller, C. T., and Owen, P. J. (2022). Reducing low-value imaging for low back pain: systematic review with meta-analysis. *Journal of Orthopaedic & Sports Physical Therapy* **52**, 175-191.

Chou, R., Qaseem, A., Owens, D. K., Shekelle, P., and Physicians*, C. G. C. o. t. A. C. o. (2011). Diagnostic imaging for low back pain: advice for high-value health care from the American College of Physicians. *Annals of internal medicine* **154**, 181-189.

De Voogd, F., Wilkens, R., Gecse, K., Allocca, M., Novak, K., Lu, C., D'Haens, G., and Maaser, C. (2021). A reliability study: strong inter-observer agreement of an expert panel for intestinal ultrasound in ulcerative colitis. *Journal of Crohn's and Colitis* **15**, 1284-1290.

Evans, B., Ali, H., and Ekpo, E. (2022). Are chest X-rays valuable for patients presenting to emergency departments with acute abdominal pain? *Australasian Emergency Care* **25**, 84-87.

Ferreira, G. E., Machado, G. C., Shaheed, C. A., Lin, C.-W. C., Needs, C., Edwards, J., Facer, R., Rogan, E., Richards, B., and Maher, C. G. (2019). Management of low back pain in Australian emergency departments. *BMJ Quality & Safety* **28**, 826-834.

Galliker, G., Scherer, D. E., Trippolini, M. A., Rasmussen-Barr, E., LoMartire, R., and Wertli, M. M. (2020). Low back pain in the emergency department: prevalence of serious spinal pathologies and diagnostic accuracy of red flags. *The American journal of medicine* **133**, 60-72. e14.

Jenkins, H. J., Downie, A. S., Maher, C. G., Moloney, N. A., Magnussen, J. S., and Hancock, M. J. (2018). Imaging for low back pain: is clinical use consistent with guidelines? A systematic review and meta-analysis. *The Spine Journal* **18**, 2266-2277.

Juang, W.-C., Chiou, S. M.-J., Yang, H.-L., and Li, Y.-C. (2022). Exploring emergency physicians' knowledge, attitudes, and behaviour towards Choosing Wisely in Taiwan. *Plos one* **17**, e0271346.

Logan, G. S., Pike, A., Copsey, B., Parfrey, P., Etchegary, H., and Hall, A. (2019). What do we really know about the appropriateness of radiation emitting imaging for low back pain in primary and emergency care? A systematic review and meta-analysis of

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medical record reviews. *PLoS One* **14**, e0225414.

Marchevsky, A. M., Walts, A. E., Lissenberg-Witte, B. I., and Thunnissen, E. (2020). Pathologists should probably forget about Kappa. Percent agreement, diagnostic specificity and related metrics provide more clinically applicable measures of interobserver variability. *Annals of Diagnostic Pathology* **47**, 151561.

Oliveira, C. B., Maher, C. G., Pinto, R. Z., Traeger, A. C., Lin, C.-W. C., Chenot, J.-F., van Tulder, M., and Koes, B. W. (2018). Clinical practice guidelines for the management of non-specific low back pain in primary care: an updated overview. *European Spine Journal* **27**, 2791-2803.

Pakpoor, J., Raad, M., Harris, A., Puvanesarajah, V., Canner, J. K., Nadgir, R., and Jain, A. (2020). Use of imaging during emergency department visits for low back pain. *American Journal of Roentgenology* **214**, 395-399.

Rotondi, M. A., and Donner, A. (2012). A confidence interval approach to sample size estimation for interobserver agreement studies with multiple raters and outcomes. *Journal of clinical epidemiology* **65**, 778-784.

To, D., De Carvalho, D., Lawrence, R., Toomey, E., and Hall, A. Fidelity of interventions designed to reduce non-indicated imaging for low back pain: a protocol for a systematic review.

Yates, M., Oliveira, C. B., Galloway, J. B., and Maher, C. G. (2020). Defining and measuring imaging appropriateness in low back pain studies: a scoping review. *European Spine Journal* **29**, 519-529.