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Imaging incidence and type in primary care patients with low back pain: a cross-sectional study on new referrals to an Australian specialist spinal surgical centre

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ABSTRACT

Introduction. Low back pain (LBP) is common and a significant cause of morbidity. Many patients receive inappropriate imaging for LBP in primary care. **Aim.** To explore the incidence and type of spinal imaging conducted for LBP patients referred from general practice for specialist surgical opinion, and evaluate whether imaging conformed to clinical guidelines. **Methods.** Audit of a sequential cohort (n = 100) of new LBP patients referred from primary care for specialist opinion at a suburban Australian capital city independent Spinal Centre. **Results.** In the 6 months before referral, 90% (95% CI 83–95%) of patients underwent spinal imaging. Imaging was performed in 95% of those who did and 79% of those who did not meet guidelines for radiological investigation. 35% of patients were inappropriately imaged and 3% inappropriately not imaged. Spinal computed tomography (CT) imaging was used in 52% of patients, magnetic resonance imaging (MRI) in 42% and image-guided lumbar spinal interventional procedures in 28%. **Discussion.** Most patients with LBP referred for surgical opinion have diagnostic radiological investigations whether or not it is indicated by clinical guidelines. The more frequent use of spinal CT compared to MRI may be due to idiosyncrasies of the Australian Medicare Benefits Schedule (MBS) rebate system. The findings of this pilot study provide support for the changes recommended by the 2016 MBS Review Taskforce on LBP that permit GP access to subsidised lumbar MRI, while constraining access to lumbar CT, and provide novel data about spinal imaging and practice in this cohort of patients.

Keywords: back pain, clinical guidelines, general practitioners, health financing, health funding, health policy, musculoskeletal disease, neurosurgeons, New Zealand health strategy, primary health care.

Introduction

Low back pain (LBP) is a significant cause of morbidity in adults;[1,2] however, approximately 90% of cases are termed 'non-specific' in etiology[3] and often resolve within a few weeks.[4] Spinal imaging for LBP in primary care is therefore not recommended by guidelines[5] unless, among other things, a serious cause of pathology is suspected,[4] radicular pain has been present for 6–8 weeks or severe neurological deficits are present.[6] Despite these recommendations, many patients with LBP undergo inappropriate imaging in primary care,[4,7,8] and many patients that should have imaging do not receive it.[7] Inappropriate imaging causes clinical harm[4,9,10] and is a financial burden to the government and often also the patient.[11]

A 2016 report on diagnostic imaging for LBP by the Medicare Benefits Schedule (MBS) Review Taskforce has attempted to improve patient primary care management by limiting use of CT and increasing access to subsidised MRI, where specific clinical indications are met.[12] In Australia, certain imaging modalities for LBP are subsidised only under specialist care,[11] and we have continued to note a high incidence of inappropriate spinal CT scanning in new patients with LBP referred to our Centre for specialist surgical opinion.[13] Though data are available on imaging incidence[14,15] and conformity to guidelines[7] in primary care, no such data are available from within the population group of patients referred for surgical opinion. Thus, an audit was undertaken that focused on

WHAT GAPS THIS FILLS

What is already known: Low back pain is a common presenting complaint to primary care, and frequently is investigated with imaging that does not conform to guideline recommendations. In Australia, general practitioner access to lumbar magnetic resonance imaging (MRI) is restricted, while subsidies are easier to access for spinal computed tomography (CT) and X-ray scan.

What this study adds: This preliminary research contextualises the claims of spinal over-imaging by providing novel data, derived from new patient referrals from primary care to a specialist spinal surgical centre, which compares imaging guideline compliance levels by specific imaging indication. This study also found a high incidence of lumbar CT compared to lumbar MRI, despite guideline recommendations, validating recent statements released by the Australian Commission on Safety and Quality in Healthcare regarding expanding GP access to subsidised MRI and restricting CT access.

radiological studies in the 6 months prior to the new patient's referral. The primary objective of this study was to explore both the incidence and type of imaging used for these patients. The secondary objective was to determine if spinal imaging was warranted by comparing the patient's presenting complaint and clinical features with guidelines for imaging in primary care.

Methods

Study type

This was a single-centre, cross-sectional observational study.

Setting

This study was set in an interdisciplinary, independent spinal centre in an Australian capital city.[13]

Participants

Included in this study were 100 sequential new patient referrals for LBP management from primary care to surgeons at the spinal centre between January and February 2022. Eligible referrals for this audit met the criteria outlined in Table 1.

Variables

Variables included epidemiological data, duration of LBP, radiation of pain, presence of 'red flags' and all lumbar imaging performed in the prior 6 months to referral. All data were collected from patient referral documents. Diagnostic imaging was divided into three categories: lumbar plain radiograph (XR) and diagnostic spinal CT and MRI. Interventional lumbar imaging was also documented. These variables enabled patients to be separated into 3 subgroups that corresponded to local guidelines (The South Australia Health Spinal Imaging Recommendations; SA Health guidelines).[6] Table 2 describes these subgroups and lists all 'red flag' symptoms according to these guidelines.

Statistical methods

This study used simple descriptive data analysis with calculations of 95% confidence intervals (95% CI).

Ethics

This study is classified as negligible risk research according to the guidelines of the NHMRC (National Health and Medical Research Council)[16] and the University of Adelaide Human Research Ethics Committee (see Supplementary File S1). All patients gave written permission for their medical records to be used in clinical research and an audit.

Results

To obtain 100 eligible referrals, 227 consecutive new patient referrals were needed (109 were for complaints other than LBP; seven patients had complaints of both LBP

Table 1. Inclusion and exclusion criteria for patient referrals.

Inclusion criteria	Exclusion criteria
The referral was made by a GP to the interdisciplinary spinal centre.	Patient self-enquiries and referrals by allied health staff or other medical specialities.
The presenting complaint to the referral was 'low back pain'. Synonyms for 'low back' such as 'lumbar' and 'lumbar spinal' pain were also accepted. Additionally, referrals that stated only 'back pain' were accepted, provided the examination described in the referral letter was pertinent to LBP.	Presenting complaints other than 'low back pain'. Additional presenting complaints that include LBP, as well as an unrelated type of spinal pain (such as cervical or thoracic back pain), were excluded.
The referral provided some comment on the duration of symptoms. Both specific statements providing the precise duration of symptoms, as well as comments such as 'chronic', 'subacute' and 'acute', were accepted.	Referrals that did not provide any guidance on duration of symptoms. This omission made it difficult to clarify whether the patient met guideline criteria for the appropriate use of imaging.

For the purposes of this study, 'chronic' is defined as LBP persisting for >12 weeks, 'subacute' as pain lasting for 6–12 weeks, and 'acute' refers to LBP of <6 weeks' duration.[3]

Table 2. Three patient subgroups and subgroup criteria based on imaging recommendations, as per SA Health guidelines.[6]

Patient subgroup 1	Patient subgroup 2	Patient subgroup 3
These patients experienced symptoms consistent with sciatica (LBP accompanied by radicular pain) for longer than 6–8 weeks, and therefore qualified for magnetic resonance imaging or diagnostic computed tomography only.	These patients qualified for all imaging types as their history revealed at least one 'red flag' symptom for LBP. 'Red flags' listed in these guidelines were: severe neurological deficit (persistent numbness or paraesthesia, motor symptoms or saddle anaesthesia), bladder or bowel dysfunction, traumatic onset of pain, weight loss, fever, unremitting severe night pain, oral steroid use and cancer history pain.[6]	These patients met no indications for any imaging, as they had no 'red flag' symptoms and either presented with LBP in the absence of radicular pain or had such pain for a duration of <6–8 weeks.

Table 3. Frequency and types of radiological imaging in the three different patient subgroups, together with 95% CI ($N = 100$).

Patient subgroup	Subgroup 1 ($n = 34$)		Subgroup 2 ($n = 24$)		Subgroup 3 ($n = 42$)	
Criteria	Patient cohort that met indications for MRI or CT (but not XR)		Patient cohort that met indications for imaging due to presence of a red flag		Patient cohort that did not meet criteria for imaging	
Statistics	*n*	% of cohort (95% CI)	*n*	% of cohort (95% CI)	*n*	% of cohort (95% CI)
Any radiology	31	91 (77–97)	24	100 (86–100)	35	83 (69–92)
All diagnostic radiology	30	88 (73–95)	23	97 (80–99)	33	79 (64–88)
All CT (diagnostic)	20	58 (42–74)	13	54 (35–72)	19	45 (31–60)
All MRI	13	38 (24–55)	10	42 (25–61)	19	45 (31–60)
All interventional radiology	8	25 (12–40)	8	33 (18–53)	12	29 (17–44)
All XR	4	12 (5–27)	5	22 (9–41)	8	19 (10–33)
No diagnostic or interventional radiology	3	9 (3–23)	0	0 (0–14)	7	17 (8–31)

CT, diagnostic computed tomography scan; MRI, magnetic resonance imaging; XR, lumbar X-ray.

and thoracic or cervical pain; 11 had no comment on the duration of symptoms). The median age of patients was 55 years, 60% were male and 40% female.

Eighty-six percent of patients (95% CI 78–92%) received diagnostic lumbar spinal imaging, and four others had imaging as part of an interventional procedure for an overall imaging incidence of 90% (95% CI 83–95%). Many patients (36% : 95% CI 27–46%) underwent two or more different imaging modalities. The frequency of different types of radiological imaging, and their permutations, are provided as Supplementary Table S1. Fifty-two percent of the cohort (95% CI 42–62%) underwent diagnostic CT, 42% (95% CI 33–52%) underwent MRI and 28% (95% CI 20–37%) also underwent CT-guided interventional spinal procedures (nine 'epidural injections'; seven 'facet joint injections'; nine 'nerve root injections' and three 'rhizolysis procedures'). The different types of imaging and their frequencies performed in the three subgroups, according to guideline indications for imaging, are summarised in Table 3.

Sixty-two percent of patients were appropriately imaged or appropriately not imaged. Thirty-three percent of patients were inappropriately imaged (33 of 42 in subgroup 3) and 5% inappropriately not imaged (four in subgroup 1 and one in subgroup 2). Table 4 summarises the proportions of patients who were investigated appropriately according to the imaging guidelines.[6]

Discussion

The incidence of diagnostic radiology for new patients referred from primary care for a specialist spinal surgical opinion was 86% (95% CI 78–92%). The high, but appropriate, incidences of diagnostic radiology in subgroups 1 (88%) and 2 (96%) revealed that, in these clinical categories, guidelines are being followed for imaging, but often not for the recommended modality because CT imaging was more common than MRI scanning. Patients without guideline indications for spinal imaging (subgroup 3) are commonly inappropriately investigated (79%), again with the overuse of CT. Though it was noted that rates of inappropriate over-imaging were high and the rates of inappropriate 'non-imaging' were low, direct comparison of these data with datasets from primary care – where both the incidence of imaging and use CT and MRI are respectively around 3 and 8-fold lower[7,8] – is not appropriate because of the specific nature of our cohort. Referred patients, which accounted for only 5.2% of 846 patient with LBP in a prospective French

Table 4. Frequency of appropriateness and inappropriateness of radiological investigations according to cohort, as defined by the imaging guidelines.

Imaging pathway	Frequency and % of specific cohort
Appropriately imaged (diagnostic radiology performed in subgroups 1 and 2)	53 (91)
Appropriately not imaged (patients in subgroup 3 without diagnostic radiology performed)	9 (21)
Total patients appropriately investigated[A]	62 (62; 95% CI 52–71)
Inappropriately imaged[A] (diagnostic radiology performed in subgroup 3)	33 (79)
Inappropriately not imaged (patients in subgroups 1 and 2 without diagnostic radiology performed)	5 (9)
Total patients investigated inappropriately[A]	38 (38; 95% CI 29–48)

[A]This Table does not discriminate as to whether the use of CT over MRI was or was not appropriate.

study,[17] incur higher imaging rates for reasons such as patient demand,[18] GP diagnostic uncertainty and desire to streamline and expedite the referral process.[19] Additionally, whether imaging patterns vary according to patient referral to specific medical or surgical sub-specialty is unknown.

The relative high incidence of CT use compared to MRI was not an unexpected finding given it was one of the main reasons for the audit. However, it is disconcerting in view of the better tissue imaging with MRI, and absence of any radiation exposure,[3,20] the guideline recommendations[6] and recent statements released by the Australian Commission on Safety and Quality in Healthcare (ACSQHC),[21] recommending MRI as the modality of choice when imaging is indicated for LBP.[21] The continued use of spinal CT in preference to MRI is perhaps an unwarranted legacy of the MBS rebate system in Australia, which subsidises general practitioner (GP) lumbar CT requests, but not lumbar MRI requests,[11] and has remained unchanged in over a decade.[22] The findings of this pilot study support the MBS Review Taskforce's recommendations regarding MRI and CT subsidy changes:[12] improving primary care access to MRI subsidy when guidelines recommend its use, while restricting access to CT where clinical criteria are not met.[12] Considering the ACSQHC's recent statements on best practice imaging for LBP[21] and this audit's findings, the necessity for change to these subsidies is becoming more cogent.

In New Zealand, the government's Accident Compensation Corporation (ACC) has introduced operational guidelines for the subsidised use of GP referred MRI, in the context of presentations for knee, lumbar or cervical spine injury.[23,24] The ACC's strategy of increasing GP access to subsidised MRI within the framework of increased GP training may act as a useful template for a similar process to be adopted in Australia.[23] Given recent statements by the ACC, which extol the effectiveness of this program in reducing MRI wait times and improving patient care,[25] it would be prudent to consider the development and pilot of a similar training and imaging access program in Australia.

Some limitations of this preliminary study include the assumption that new referrals constitute a new case of LBP and not a recurrence of such pain. To comprehensively define the cohort and their past medical histories would require interrogation of additional data sources; however, previous attempts at such an investigational approach have revealed vital data remains missing.[26] The size of the cohort selected for this preliminary study resulted in small subgroup sizes (*post-hoc* analysis suggests that increasing the sample size to 228 patients per subgroup would enable detection of statistically significant differences); however, the pilot study has revealed some useful data and trends in radiological investigations and practice in primary care. One unexpected finding was that 28 patients had undergone interventional spinal therapeutic procedures using image guidance. Previous studies on LBP imaging practices in primary care lack data on the use of interventional radiology.[7,8] The indications for, outcomes of and relative costs of such practice is worthy of further study.

Although this was a study at a single centre over a limited time period, the centre receives 2200 new patient referrals annually from many primary care providers across the state, and therefore is representative of current imaging practices in predominantly privately insured patients. The latter fact may limit the generalisability of these findings because whether non-insured patients undergo the same imaging pathway in primary care, before referral to public, healthcare spinal specialists, is unknown. Although there are many different national and international clinical imaging guidelines for LBP, they are now substantially similar,[27] so this variable is unlikely to be a source of major variance in future studies in this area.

Conclusions

This pilot study of patterns of lumbar spinal imaging in patients with LBP referred to an Australian spinal surgical specialist centre found most referring GPs conformed to guideline recommendations when imaging was indicated, but they over investigated patients in whom guidelines recommended no imaging. The preference for CT over MRI imaging and frequency of interventional image-guided spinal procedures prior to referral both warrant further study to determine the causes of these practices.

Supplementary material

Supplementary material is available online.

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Data availability. The data that support this study cannot be publicly shared due to ethical or privacy reasons, but may be shared, if appropriate, upon reasonable request to the corresponding author.

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