

Outcome of acute hospital admission for non-specific low back pain: what is the role of MRI?

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ABSTRACT

BACKGROUND: Low back pain is a common worldwide condition, affecting most people during their lifetime. Various imaging modalities are being used to assist clinicians in diagnosing and thus, aid in formulating a suitable management plan. Extensive research has been carried out in assessing this condition due to its high prevalence, with many guidelines published internationally.

AIM: To determine whether MRI imaging influences the management of patients admitted with acute, non-specific low back pain between 1 January 2013 and 31 December 2015.

METHOD: A total of 209 patients who met the inclusion criteria were included in the study. Suitable patients were initially identified from the ward admission book. Subsequently, relevant data regarding patient admission and management within the two-year period were obtained from the hospital patient management system, including radiology reports.

RESULTS: Out of the 209 patients included in this study, 131 patients (63%) had an MRI as part of the diagnostic process. Most patients were managed non-operatively with only 41 (20%) out of the 209 patients having undergone acute surgery while an inpatient. In this subgroup, 38 had an MRI done prior to surgery. Among the 168 patients who were treated non-operatively, including epidural steroid injection, 13 patients (8%) had elective surgery within one year from their initial presentation.

CONCLUSION: Use of MRI can aid in the early diagnosis and facilitate faster rehabilitation for patients. It can also potentially reduce patient stay in hospital and result in significant cost savings for the healthcare system. Imaging guidelines should be developed in the assessment of patients with low back pain in an acute hospital setting.

Low back pain is a very common condition affecting people worldwide. It can be defined as pain or stiffness affecting the region between the costal angles and gluteal folds and associated with or without leg pain.¹ An acute presentation is defined as low back pain for a duration between 6–12 weeks.¹ The back pain reported is considered to be non-specific when it is not associated with any known pathology such as infection, fracture or sinister causes like cauda equina syndrome or a tumour.²

Patients presenting acutely to the emergency department of a secondary or tertiary hospital often require inpatient admission for diagnostic and pain management reasons. The usefulness of MRI imaging

in the diagnostic process as well as its influence on the management of the patient has been well documented in the literature.^{2–7} However, there are no guidelines for clinicians to use in the assessment and management of acute low back pain in the context of an emergency department or acute hospital ward.

Chou et al in 2009 carried out a systematic review and meta-analysis on the effects of immediate lumbar imaging versus routine clinical care for patients with low back pain on their outcomes of pain and function.³ They concluded that there was no statistically significant difference between immediate lumbar imaging and routine clinical care at short-term as well as at

long-term follow-up.³ They added that the use of imaging itself can lead to unnecessary radiation exposure as well as additional invasive procedures.³ This was further confirmed from a more recent article published by Chou et al in 2011, which showed that patients who had MRI were twice as likely to undergo spinal surgery.⁴

In terms of current available guidelines, Koes et al looked into guidelines published from 13 countries including two European guidelines.⁵ All the guidelines were reported to have the same consensus that imaging is not recommended on initial presentation with low back pain unless there is a strong suspicion of serious pathology or red flags.^{2,5-7} Imaging is recommended in cases of patients' reporting no improvement in symptoms after 4-7 weeks.^{2,5-7} This guideline also includes the current guideline used in New Zealand, which is based on the ACC New Zealand Acute Low Back Pain Guide.⁸ The New Zealand guideline further added that MRI is not recommended as a diagnostic test in patients presenting with non-specific low back pain.⁸

In this study, we have focused our attention to patients presenting to the emergency department with an acute episode of low back pain with or without leg symptoms, who subsequently require inpatient admission to an orthopaedic ward. In this context, although most patients will have no serious underlying pathology, it is often difficult to exclude pathology such as infection, fracture, cauda equina compression or tumour.^{1-3,5,6,8} These patients often require orthopaedic admission for further investigation and pain management. The aim of this study was to determine how MRI would influence the management of these patients and how the cost of MRI would fit in with the overall cost of hospital expenditure in this patient group.

Method

In this study, we recruited patients presenting to the emergency department of Dunedin Hospital with acute back pain and who were subsequently admitted to the orthopaedic ward.

Figure 1:

INCLUSION CRITERIA OF THE STUDY	
1	Patients admitted acutely with non-specific low back pain from fracture clinic, outpatient clinic or the emergency department.
2	Patients with an acute presentation with a background of chronic back pain.
3	Patients who presented with a possible discitis.
4	Patients referred from within as well as outside of the Southern DHB region.
5	Patients who presented with back pain and thigh/hip/groin pain.
6	Patients who presented with back pain and fever.
7	Patients who presented with back pain associated with radiculopathy or sciatica.

Figure 2:

EXCLUSION CRITERIA OF THE STUDY	
1	Patients admitted to the orthopaedic ward with a confirmed fracture on imaging.
2	Patients referred following a trauma or motor vehicle accident (MVA).
3	Patients with known cancer or spinal metastases.
4	Patients with back pain post-removal of metal ware.
5	Patients admitted as an elective case to the ward.
6	Patients with a history of post-operative spinal infection.
7	Patients admitted with no formal imaging reports.

Patients admitted to the ward were firstly identified from the ward admission book. A total of 358 patients were selected between 1 January 2013 to 31 December 2015. Further details regarding the patient's admission were then obtained from iSOFT (computerised patient management system), which included notes from the emergency department, relevant outpatient clinic notes, imaging reports, operation notes and previous ward discharge summary if applicable. All imaging findings were obtained directly from the formal radiology report via PACS (computerised patient imaging system) that has been checked and reported by a radiologist in Dunedin Hospital.

Data obtained for analysis included age, gender, length of stay, number of previous admissions, main presenting complaint, imaging modality performed and its resulting findings, type of management, type of surgery performed, if applicable, and any elective surgery performed within one year from the patient's initial presentation. A total of 209 patients who satisfied all the inclusion criteria were included in the final analysis.

Results

From this study, we have included 209 patients into our analysis. The data has been stratified and summarised in Table 1A and 1B.

From Table 1A, we identified that there were 96 male patients and 113 female patients admitted to the orthopaedic ward with acute low back pain over the two-year study period. After stratifying the patients into age groups, male patients tended to be more in the older group with the peak seen in the 41–60 age group (48%) followed by the over 60 age group.

For female patients, admissions for low back pain were generally quite evenly distributed among the age groups. However, the peak age group for admission was in the 20–40 age group (35%). This was followed by those over 60 years old, similar to that seen in the male population of this study. In the over 60-years old group, both male and female patients accounted for about one-third of the patients in this cohort.

In terms of the length of stay, more than half of the study population (58%) were admitted for 3–10 days before being

Table 1A:

Male	Subject	Female
96	Gender count	113
	Age group	
1	<20	4
19	20–40	39
46	41–60	34
30	>60	36

Table 1B:

Length of stay (days)	
<3	64
3–10	122
>10	23
Number of admissions	
1	192
2	16
3 or more	1
Number who had MRI on admission	
Yes	131
No	78
Management	
Acute surgery	41
Non-operative management	156
CT-guided steroid injection	12
Number who had elective surgery within one year	
Yes	13
No	155
N/A	41

discharged. The mean length of stay was 5.4 (SD=4.6) and the median length of stay was four days. One-third of the study population (31%) was admitted for a much shorter course of less than three days. In assessing the number of admissions, majority of the patients were only admitted to the ward once (92%). Only 16 patients (8%) were admitted twice over the two-year admission period and one patient was admitted more than three times.

Table 2:

Pathology on imaging		Number of patients
Normal		13
Disc prolapse		81
Degenerative disc disease and facet joint	Spondylosis	28
	Disc dehydration	4
	Disc/osteophyte complex	7
Spinal column abnormalities	Scoliosis	16
	Spondylolisthesis	8
	Spondylolysis	2
Spinal stenosis	Present	36
	Absent	95
Nerve root compression	Present	42
	Absent	89
Cauda equina syndrome		4
Vertebral infection/discitis		11
Cancer/metastases		5
Fracture		2

In terms of imaging, a total of 131 patients had an MRI done during admission. The pathology found on MRI imaging is shown in Table 2.

For the purpose of this study, a disc prolapse is defined as all pathology described on the radiology report as disc prolapse, disc herniation, disc bulge, disc protrusion, disc extrusion and disc sequestration. Degenerative disc disease and facet joints also included spondylosis, disc/osteophyte complex and disc dehydration. Spinal stenosis included all cases reported as having spinal stenosis, foraminal stenosis and thecal sac stenosis.

The most common pathology found on MRI was disc prolapse with 81 patients, which accounted for 62% of all patients who had MRI. The second most common pathology was nerve root compression with a total of 42 patients (32%) followed by degenerative disc disease and facet joints with a total of 39 patients (30%). Discitis and vertebral infection were found in 11 patients

(8%) and cancer including spinal metastases in five (4%). Only four patients (3%) were found to have a cauda equina compression on MRI.

In terms of patient management, the majority (156 patients) were managed non-operatively (75%). Non-operative management included analgesia, spinal orthoses and physiotherapy. Forty-one patients (20%) out of the 209 study population underwent acute surgery during the admission while 12 patients (5%) received a CT-guided steroid injection. Among the 41 patients who had acute surgery, 38 of them had an MRI while the remaining had other imaging modalities done. This would mean that approximately one-third of the 131 patients in this study who had an MRI subsequently underwent acute surgery. Looking at the data over the two-year study period for patients who were managed non-operatively or had a CT-guided steroid injection, a total of 13 patients out of 168 (8%) underwent elective surgery within one year from their initial presentation.

Figure 3:

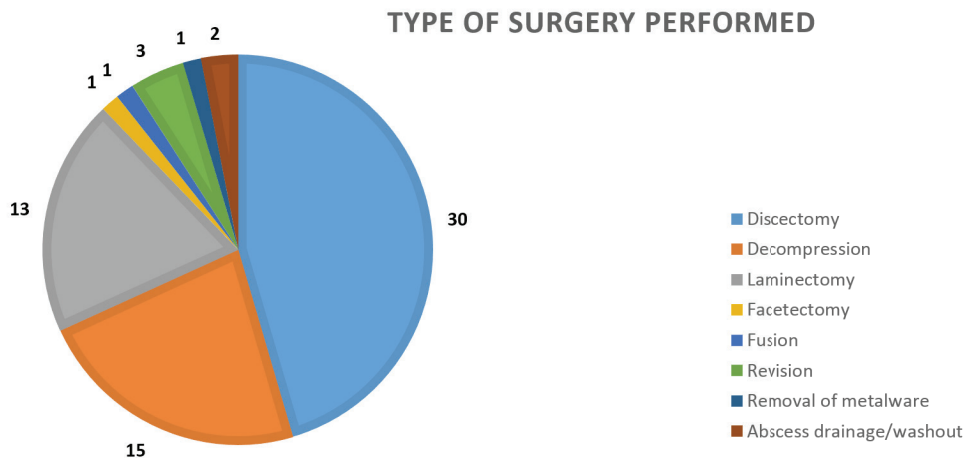
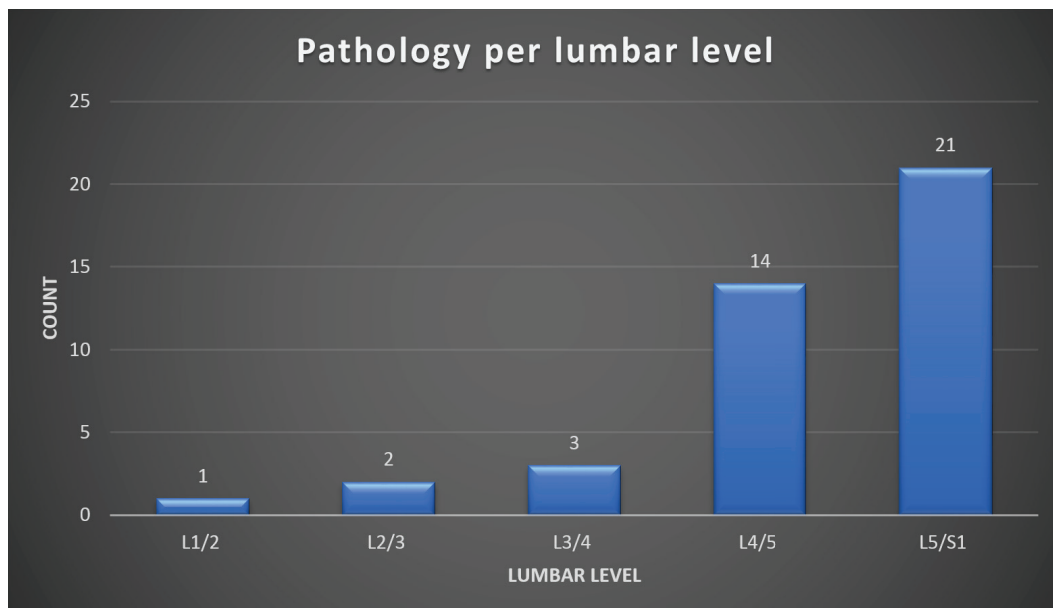


Figure 3 lists the type of surgery performed on the 41 patients who had surgery while an inpatient. The most common operation was a discectomy which accounted for almost 70% of the surgical cases. This was followed by a decompression and laminectomy. Most of the surgery performed involved pathology found in the L5/S1 level accounting for 21 patients and L4/5 level in 14 patients as listed in Figure 4 below.

Discussion

Our study has shown that more than half of patients (63%) admitted to Dunedin Hospital for acute back pain had an MRI to determine the cause of their low back pain. In this subgroup, 38 of them underwent acute surgery while inpatient. A total of 41 patients in this study underwent acute surgery with three of them having a non-MRI imaging modality performed

Figure 4:



prior to surgery. This makes up about 20% of the 209 study population who underwent surgical management while an inpatient with the majority being treated non-operatively. Of those patients, only 8% underwent elective surgery within one year from their initial presentation. One of the drawbacks of this study is that we were unable to ascertain if some patients might have had surgery done privately or outside the Southern DHB catchment region.

Imaging guidelines for the management of patients with low back pain in an acute hospital inpatient setting have to be different from those developed for general practitioners in the community. The aim of MRI imaging, even in the absence of clinical signs suggesting serious pathology, is to help in the management of the patient and in particular to determine whether there is an underlying surgically treatable pathology including infection and tumour. Being able to reassure the patient that the MRI has not shown any serious pathology will facilitate the rehabilitation, recovery and discharge of the patient.

A study carried out in Scotland and England has shown that patients who underwent early imaging reported an improvement in their symptoms.⁹ This was reflected by a significantly lower Aberdeen Low Back Pain score reported in this group.⁹ Furthermore, the study also assessed the diagnostic impact of early imaging compared to delayed imaging.⁹ It was found that early imaging itself increased the diagnostic confidence of treating physicians significantly, a difference of almost 30%, which was statistically significant.⁹

When taking into account the cost of MRI versus hospital bed stay, it appears that the cost of an MRI is the equivalent of one day in hospital on an acute ward at around NZD\$1,300 (Southern DHB Personal Communication, April 2016). If an MRI gets the patient out of hospital quicker, then it has to be seen as a cost-effective investigation. So, looking at the 131 patients in this study who had an MRI scan, the cost can be estimated

at around NZD\$170,000. If the MRI can save one day of hospital stay, then the cost to the healthcare system would be neutral. However, any additional hospital day saved would have led to a saving of NZD\$170,000 in this study or multiples of that amount. Unfortunately, there is often a waiting time of days before the MRI scan is carried out on inpatients with back pain in our institution, which will negate the potential cost saving.

Current evidence has stressed that the most important principle in the assessment of patients with acute low back pain is to provide a thorough history and physical examination.^{2,4,6} This is the most cost-efficient tool to assist the clinician in deciding the best approach in terms of investigation and management for the patient.

In the acute hospital setting, early MRI scanning helps identify or confirm the diagnosis and allow a prompt management plan to be put in place, which will be either surgery or non-operative. This has the potential to save hospital costs by reducing the length of stay. Further research is required to identify how early MRI should be performed to produce the best outcomes. Studies are also needed to assess the cost efficiency in performing MRI compared to other diagnostic interventions.

Conclusion

From our study, we have shown that 62% of patients (131 out of 209) admitted with acute low back pain had an MRI scan and that the majority (75%) were treated non-operatively. It is possible that early MRI scanning in all patients admitted with acute low back pain could possibly result in significant cost savings in terms of length of hospital stay, patient recovery and diagnostic confidence.

There is a need to adapt the current acute low back pain guidelines to the hospital setting. Through comprehensive clinical assessment and early MRI imaging, patient outcomes, length of stay and financial efficiency of the healthcare system will be optimised.

Competing interests:

Nil.

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