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Management of people presenting with low back pain to a private hospital emergency department in Melbourne Australia

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ABSTRACT

Background: Recent studies suggest many people with non-specific low back pain presenting to public hospital emergency departments receive low-value care.

Objectives: The primary aim was to describe management of people presenting to the emergency department of a private hospital in Melbourne, Australia with low back pain and received a final diagnosis of non-specific low back pain. We also determined predictors of hospital admission.

Methods: Retrospective review of patients who presented with low back pain and received a final emergency department diagnosis of non-specific low back pain to Cabrini Malvern emergency department in 2015. Demographics, lumbar spinal imaging, pathology tests and medications were extracted from hospital records. Multivariate logistic regression was used to determine independent predictors of hospital admission.

Results: 450 presentations were included (60% female); 238 (52.9%) were admitted to hospital. 177 (39.3%) patients received lumbar spine imaging. 280 (62.2%) patients had pathology tests and 391 (86.9%) received medications which included opioids (298, 66.2%), paracetamol (219, 48.7%), NSAIDs (161, 35.8%), benzodiazepines (118, 26.2%) and pregabalin (26, 5.8%). Predictors of hospital admission included older age (OR 1.03, 95% CI 1.02 – 1.05), arrival by ambulance (OR 2.03, 95% CI 1.06-3.90), and receipt of pathology tests (OR 3.32 (95% CI 2.01 – 5.49) or CT scans (OR 1.86 (95%CI 1.12-3.11).

Conclusions: We observed high rates of imaging, pathology tests and hospital admissions compared with previous public hospital studies, while medication use was similar. Implementation of strategies to optimise evidence-based emergency department care are needed to reduce low-value care and improve patient outcomes.

INTRODUCTION

Low back pain is a major cause of disability in Australia and around the world.[1 2] The lifetime prevalence of low back pain in Australian adults has been reported to be 79.2%,[3] with approximately one in six people experiencing chronic back pain.[4] The economic burden is also large. In 2013**,** healthcare costs in Australia were estimated to be $5 billion.[5]

Low back pain is a common reason for seeking care.[6] Bettering the Evaluation and Care of Health (BEACH) data from 2007 to 2008 indicates back complaints comprise the main reason for 2.7 (95% CI 2.6 to 2.9) per 100 encounters in general practice in Australia.[6] An increasing number of people with low back pain present for emergency care. In 2017-18**,** low back pain was the fifth most common principal diagnosis made for attending a public hospital emergency department in Australia.[7] It accounted for 1.9% of all emergency presentations in Perth, Western Australia between 2000 and 2004,[8] and 2.2% of presentations to a large metropolitan teaching hospital in Sydney, New South Wales in 2013.[9]

Care for low back pain is often at odds with recommendations from evidence-based guidelines.[10] Major issues include underuse of advice, education and exercise prescription and overuse of diagnostic imaging in the absence of clinical features suggestive of serious or specific pathology, as well as overuse of opioids, spinal injections and surgery. While it is unclear whether or not primary care guidelines for low back pain can be entirely extrapolated to the emergency department setting due to a paucity of evidence for this patient cohort,[11] previous studies have indicated that care in these settings is also characterised by high use of imaging and opioids, as well as high rates of hospital admission.[2 12 13]

While there are several studies that have described the characteristics and management of patients who present with low back pain to the emergency department in Australia,[2 8 9] these have all been in the public hospital setting. The primary aim of our study was to describe the characteristics and management of people who presented to an Australian private hospital emergency department in 2015 with low back pain and received a final diagnosis of non-specific low back pain**.** We also determined predictors for hospital admission.

METHODS

Setting and participants

Cabrini Health is a large not-for-profit private hospital located in a high socio-economic region of Melbourne's inner east with over 22,000 emergency department presentations in 2016-2017. All adults aged over 18 years who presented for emergency care in 2015 with low back pain as their primary complaint were included.

Eligible patients were identified from medical records by 1) a triage presenting complaint code of either low back pain or back pain; and/or 2) an emergency department discharge diagnosis of low back pain or possibly related to low back pain; and/or 3) a main complaint of low back pain in triage notes. Appendix 1 shows the complaint and discharge diagnosis codes that were considered. Only the first 'index' presentation was included in the analysis. Two independent authors (RB and GB) then reviewed the clinical notes of potentially eligible ED presentations and excluded participants from the analysis if a primary complaint other

than non-specific low back pain was identified. Pain due to major trauma, falls, known vertebral fractures, renal colic and malignancy were exclusions.

Data extraction

The following de-identified patient data were extracted: age, sex, time and day of presentation, Australasian Triage Scale, arrival mode (ambulance, private car, other) length of stay and discharge destination (admission to hospital or home), requests for lumbar spine imaging (plain radiographs, CT and/or MRI scans) and pathology including full blood examination, electrolytes, urea and creatinine, ESR, CRP, liver function tests, blood cultures, calcium, vitamin D and medications prescribed. Medications for management of concurrent medical conditions were not extracted.

Data analysis

Statistical analysis was performed using StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP. Descriptive statistics were used to summarise the study cohort and results were presented as N (%) for categorical data and median (Inter Quartile Range (IQR)) for continuous data. Multivariable logistic regression was used to determine predictors of patients' admission to the hospital and included interaction between ambulance arrival and triage category.

Ethical Considerations

Ethics approval for this study was obtained from the Cabrini Human Research Ethics Committee (EC00239) and the Monash University Human Research Ethics Committee (EC00234). All data were de-identified.

RESULTS

Four hundred and fifty patients met inclusion criteria (Table 1). Median age was 69 years (interquartile range (IQR): 71 to 83) and 270 (60%) were female. Most (N=263, 58.4%) received a triage score of 4 (potentially serious) but over a third (N=177, 39.3%) were categorised as triage score 3 (potentially life-threatening). Most patients (N=246, 54.7%) presented between 8am and 6pm Monday to Friday. Almost a third arrived by ambulance (N=135, 30%), and just over half (N=238, 52.9%) were admitted to hospital.

At least one type of lumbar spine imaging was requested for 39.3% presentations (N=177)(Table 2). In total there were 193 imaging requests. Of those that had imaging, the majority had a CT scan (N=127, 71.8%), while 32 patients had an MRI (18.1%) and 24 had a plain radiograph (13.6%). Sixteen patients had more than one imaging test requested. Most patients also had at least one blood test (N=280, 62.2%). Over half had electrolytes, urea and creatinine (67.8%), FBE (60.4%) and CRP (52%), while a significant number also received LFTs (37.3%), calcium (31.6%) and ESR (17.3%).

A majority of patients (391, 86.9%) received medication (Table 2). Over three quarters (n=348 (77.3%)) received an opioid, 269 (59.8%) received paracetamol, 161 (35.8%) received an NSAID (161, 35.8%), 118 (26.2%) received a benzodiazepine (118, 26.2%) and 26 (5.8%) received pregabalin.

The results of multivariate logistic regression indicated that patients were more likely to be admitted if they were older. Each year increase in age led to a 3% increase in odds of

admission (Odds Ratio (OR) 1.03 (95% Confidence Interval (CI) 1.02 – 1.05), p<0.001). Arrival by ambulance also increased the odds of admission (OR 2.03 (95% CI 1.06-3.90), p=0.034). In general, those who arrived by ambulance were also less likely to be classified as emergency or urgent patients (triage category 2 or 3) compared to those who arrived using other modes (31.1% vs 44.4%, p=0.008). Spending more time in the emergency department also increased the odds of admission (OR 1.16 (95% CI 1.07 – 1.26), p<0.001). Finally, patients who had pathology tests or CT scans were also more likely to be admitted (OR 3.32 (95% CI 2.01 – 5.49), p<0.001 and OR 1.86 (95%CI 1.12-3.11), p=0.017, respectively).

DISCUSSION

We have described the characteristics and management of patients who presented to a private hospital emergency department with low back pain in 2015 and received a final diagnosis of non-specific low back pain. Just over a third arrived by ambulance and over half were admitted. Care was characterised by liberal use of imaging, laboratory tests and medications including opioids.

Our data are broadly consistent with other emergency department studies performed in Australia,[2 9] and overseas,[12-14] although there are some notable differences. In contrast to other studies that found a predominance of plain radiograph requests,[2 9 12-14] CT scans were most frequently requested in our setting. This may reflect a recent global trend towards a preference for more advanced diagnostic imaging,[13 15] and/or a higher suspicion of injury in our cohort which had a higher proportion of older patients compared with previous studies. CT scans are also easily accessible within our private hospital setting while many public

hospitals require approval from a radiology consultant or registrar to perform advanced imaging.

Our finding that two in five people received at least one imaging test is consistent with other studies. A review of 45 studies representing over 19 million consultations to primary or emergency care found a pooled proportion of 35.6% (95% CI 29.8 to 41.8%) receive imaging in emergency care.[15] Although we were unable to establish the appropriateness of imaging requests based upon the clinical notes, it is likely many were unnecessary. This may reflect a perceived obligation to perform imaging when people present for emergency care even in the absence of suspicious clinical features. An analysis of low back pain presentations to three Australian public emergency departments over a two and a half year period found that the majority (85.4%, 5461/6393) had non-specific low back pain based upon discharge diagnosis, 10.1% had radiculopathy and only 4.5% had serious spinal pathology.[2] Similarly a US study found that 51.9% of patients presenting for emergency care receive nonindicated imaging.[16] Arriving by ambulance and private health insurance were among several factors associated with overuse of radiographs in another study. [17] These factors likely also played a role in our setting.

Another area of potential low value care was the abundant number of pathology tests requested. While few other studies have examined laboratory tests for people with low back pain presenting for emergency care, the proportion who received a complete blood count or renal function test were far higher in our study in comparison to a US study (60.4% versus 9.7% and 67.8% versus 5.2% respectively).[13] While some may have been requested

to exclude specific conditions such as infection or to check on contraindications to treatment (e.g., renal function for NSAIDs), it is unclear why the remainder were requested.

The much higher rates of imaging and laboratory tests among patients who were admitted to hospital may have been performed at the request of the admitting consultants as part of their 'routine' management of inpatients. The admission rate in our setting (51.9%) was also notably higher than the rates of between 17.1% and 31.4% reported in other Australian studies.[2 8 9] Unlike public hospitals, private hospitals do not have shorts stay units which may at least partially explain the admission disparity. Our patients were also generally older, and many may have had additional comorbidities. Patients with private health insurance presenting to a private emergency department and/or their family and carers may also have different preferences and expectations to those presenting to a public hospital. Private hospitals only receive funding for inpatient care which might also create perverse incentives for admission over coordinating care in the community. Another possibility is that patients were admitted to hospital to facilitate transfer for inpatient rehabilitation as direct community admission to private inpatient rehabilitation is not currently an option.

Similar to previous studies, there was ubiquitous use of both strong and weak analgesics as well as other classes of medications including NSAIDs, benzodiazepines and anti-convulsant medication. This may appear justified based upon indirect evidence from 12 observational studies (n=7,701), which found higher levels of both pain and disability among those presenting to the emergency department.[18] While pain levels were not recorded in the clinical notes that we reviewed, it may also be due to a standard practice of providing

opioids in emergency care for patients who report pain for any reason above a score of 7 out of 10.

Most of the medicines that were prescribed, other than NSAIDs in selected patients without contraindications to their use, are no longer recommended first or second line treatment options for low back pain. This is due to high certainty evidence of their lack of efficacy and/or significant potential for harm, particularly when used in combination.[10 19-22 27] For example, a recent series of trials performed by Friedman et al demonstrated that adding paracetamol,[20] various muscle relaxants, [19 22 23] benzodiazepines,[21] or opioids combined with paracetamol[19] to an NSAID does not improve outcomes for patients with low back pain presenting for emergency care.

A strength of our study was inclusion of all non-specific low back pain cases presenting for emergency care over a one-year period who received a final diagnosis of non-specific low back pain. We used a stringent process to identify eligible cases based upon triage presenting complaint coding and discharge diagnosis, as well as independent examination of both the triage and clinical notes, and we excluded patients who presented with trauma or falls, known vertebral fractures and malignancy. While it is possible that some relevant cases were missed, and others may have been included incorrectly, we think it is unlikely that this would have significantly altered our results.

Exclusion of diagnoses other than non-specific low back pain could be viewed as a weakness of our study although we would have been unable to draw any conclusions about their prevalence or management among people presenting with low back pain to our emergency

department. At least some cases with known serious causes of their pain were likely to have been directed to the emergency department by their treating doctor to simply wait for a hospital bed when none were available. Usually, the treating doctor would direct their emergency department care. We can also not draw any conclusions about the sequence of events that led to a final diagnosis of non-specific back pain and whether it was influenced by any imaging and/or pathology test findings. Further, it was not possible to determine whether the requested investigations were guideline-concordant due to the lack of consistent and detailed reporting of presence or absence of concerning features in the medical records.

A significant limitation of our study was that we were unable to retrieve imaging reports or admission records for admitted patients as these are not linked with the patient billing database that we accessed. This means we cannot be entirely confident that all admitted patients had non-specific low back pain rather than a more specific cause for their symptoms. However, other studies have found that similar to general practice, most patients who present to the emergency department with back pain have a non-serious condition.[2 24] Furthermore, a systematic review (8 studies, N=1994) found moderate certainty evidence that patients experience rapid reduction in symptoms immediately after attending for care although symptoms are likely to persist.[25]

For discharged patients we do not know if patients were provided with a supply of medications to take home, and for admitted patients we did not have access to their inpatient records so cannot comment on the quality of inpatient care or length of stay. Other management strategies including general advice about remaining active and exercise

or referrals for physical therapy may also have occurred but were not evident from the clinical notes. Like all studies that use record linkage data collected for another purpose (in this case, billing) and rely on hospital clinical notes of variable quality, our results should be interpreted with caution. The variability in what was recorded in the medical records limits our ability to determine whether or not the management approach was justified.

Our study set in a private hospital setting adds to the literature that has identified clear gaps between evidence and practice in emergency care of people with non-specific low back pain.[10] Rates of imaging, particularly CT scans, pathology tests and hospital admissions were higher compared with rates observed in Australian public hospital settings, while medication use was similar. While few cases of low back pain constitute medical emergencies, emergency care for low back pain is increasing in both Australia [26] and elsewhere,[10] an increasing number are arriving via ambulance,[27] and the age-standardised rate of admission to hospital is also increasing.[26] Multifaceted and locally tailored strategies to reduce low-value emergency care are urgently needed and several are under development. For example, the Australian Commission on Quality and Safety in Health Care are preparing an Australian Low Back Pain Clinical Care Standard aiming to support best practice across all settings.[28]

Implementation of a promising evidence-based model of care across four emergency departments in NSW was recently evaluated in a stepped-wedge cluster randomised trial and demonstrated a 12.3% reduction in opioid use from 62.8% to 50.5% and improved clinician beliefs and knowledge, but no reduction in lumbar spine imaging or hospital admission.[29] They identified that likely impediments to reducing imaging rates included

patient expectations as well as clinician factors relating to fear of missing serious pathology, fear of litigation, time constraints and lack of belief that imaging itself is harmful. This is in keeping with a qualitative evidence synthesis of 69 studies (1747 clinicians and patients) that found that both patients and clinicians mistakenly believe diagnostic imaging is important to locate the cause of the symptoms, harms of unnecessary imaging is underappreciated and clinicians use imaging to manage patients' expectations.[30] Impediments to reducing admissions centred around patient factors including inability to manage and/or being fearful of remaining at home. These factors are also likely to be relevant in our private hospital setting.

To optimise evidence-based care for people presenting with low back pain in our setting, we plan to locally adapt and evaluate the evidence-based model of care that was tested in the SHAPED trial.[29] The care model will be co-developed with all relevant emergency department and other clinicians. It will include provision of recovery expectations and same or next day access outpatient rehabilitation services to provide patients with ongoing support.

CONCLUSION

Our study has described the care that people who presented with low back pain and received an emergency department diagnosis of non-specific low back pain received at a private hospital emergency department over a one-year period. We identified liberal use of imaging, laboratory tests and opioids and this mirrors care that occurs in public hospital settings. Implementation of strategies to optimise evidence-based emergency department care are needed to reduce low-value care and improve patient outcomes.

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Table 1: Characteristics of patients presenting to Cabrini Health Emergency Department in 2015 with a primary complaint of low back pain, overall and according to discharge or hospital admission

	All (N = 450)	Discharged from emergency department (N = 212)	Admitted to hospital (N = 238)
	Median (IQR)	Median (IQR)	Median (IQR)
Age, years	69 (41, 83)	58 (44, 73)	77.5 (63, 87)
Time in ED, hours	5.23 (3.64, 7.21)	3.96 (2.66, 5.93)	6.31 (4.84, 8.25)
	N (%)	N (%)	N (%)
Female	270 (60.0)	123 (58.0)	147 (61.8)
Australasian Triage Scale*			
Scale 2	5 (1.1)	4 (1.9)	1 (0.4)
Scale 3	177 (39.3)	73 (34.4)	104 (43.7)
Scale 4	263 (58.4)	131 (61.8)	132 (55.5)
Scale 5	5 (1.1)	4 (1.9)	1 (0.4)
Mode of arrival			
Ambulance	135 (30.0)	33 (15.6)	102 (42.9)
Private car	309 (68.7)	175 (82.6)	134 (56.3)
Other	6 (1.3)	4 (1.9)	2 (0.8)
Presenting Monday to Friday 8am to 6pm	246 (54.7)	109 (51.4)	137 (57.6)

*Australasian Triage Scale: 1 immediately life threatening, 2 imminently life threatening, 3 potentially life threatening, 4 potentially life-serious, 5 less urgent

Table 2: Lumbar spine imaging, pathology requests and medications prescribed for patients with a primary complaint of low back pain presenting to Cabrini Health Emergency Department in 2015, overall and according discharge or hospital admission

	All (N = 450)	Discharged from emergency department (N = 212)	Admitted to hospital (N = 238)
	N (%)	N (%)	N (%)
Imaging requests			
Any lumbar spine imaging	177 (39.3)	55 (25.9)	122 (51.3)
CT only	112 (24.9)	32 (15.1)	80 (33.6)
X-Ray only	25 (5.6)	11 (5.2)	14 (5.9)
MRI only	24 (5.3)	8 (3.8)	16 (6.7)
CT & MRI	7 (1.6)	3 (1.4)	4 (1.7)
CT & X-ray	8 (1.8)	1 (0.5)	7 (2.9)
MRI & X-ray	1 (0.2)	0 (0)	1 (0.4)
Total imaging requests	193	59	134
Pathology requests			
Any pathology request	280 (62.2)	83 (39.2)	197 (82.8)
Electrolytes, urea, creatinine	278 (67.8)	82 (38.7)	196 (82.4)
Full blood examination	272 (60.4)	76 (35.9)	196 (82.4)
ESR	78 (17.3)	15 (7.1)	63 (26.5)
CRP	234 (52)	62 (29.3)	172 (72.3)
Liver function tests	168 (37.3)	44 (20.8)	124 (52.1)
Calcium	142 (31.6)	35 (16.5)	107 (45)
Blood cultures	18 (4.0)	3 (1.4)	15 (6.3)
Vitamin D	14 (3.1)	0 (0)	14 (5.9)
Medications			
Any pain medication	391 (86.9)	169 (79.7)	222 (93.3)
Opioids	298 (66.2)	117 (55.2)	202 (84.9)
Paracetamol	219 (48.7)	59 (27.8)	181 (76.1)
Paracetamol & opioid	50 (11.1)	29 (13.7)	21 (8.8)
NSAIDs	161 (35.8)	84 (39.6)	77 (32.3)
Benzodiazepines	118 (26.2)	36 (17)	82 (34.5)
Pregabalin	26 (5.8)	3 (1.4)	23 (9.7)
Anti-depressants	1 (0.2)	0 (0)	1 (0.4)

Appendix 1: Diagnostic codes considered for inclusion

1. Triage presenting complaint codes

BP: Back pain

LBP: Lower back pain

2. Discharge diagnosis codes

M1999: Osteoarthritis back pain

M543: Sciatica

M545: Low back pain / Loin pain / Low back strain / lumbago

M5499: Backache unspecified

M7919: Muscle & musculoskeletal pain / myalgia

R102: Pelvic pain

R522: Chronic pain syndrome

S337: Sprain/strain of lower back (includes loin)

S346a: Injury to nerve of lower back (includes loin)

S381a: Crush injury of lower back (includes loin)

S399a: Unspecified injury of lower back (includes loin)