

ORIGINAL RESEARCH

Workers' compensation board claims and emergency department diagnostic management of non-specific low back pain

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Abstract

Background: Low back pain is a leading cause of disability worldwide and results in enormous healthcare and lost productivity costs. Guidelines exist to guide the management of low back pain, but guideline adherence varies.

Objective: This study assessed whether initial presentation to the emergency department for non-specific low back pain with a Workers' Compensation Board of Nova Scotia claim was associated with different diagnostic management from non-claimants.

Methods: In this retrospective cohort study, we analyzed administrative data from four emergency departments in Nova Scotia on 18,337 adult patients who presented for non-specific low back pain between July 15, 2009 and May 1, 2019. All data were retrieved from the Nova Scotia Health Authority Emergency Department Information System.

Results: Patients had a mean age of 43 years and 51.3% were female. Most patients were assigned a Canadian Triage Acuity Scale score of 3 (51.9%) and reported moderate (51.2%) to severe pain (41.5%). Occupational injuries consisted of 11.6% of visits. More than 37% of patients received one or more diagnostic test. Patients with occupational injuries were less likely to receive diagnostic tests (odds ratio [OR] = 0.52, 95% CI 0.47 to 0.58), imaging (OR = 0.60, 95% CI 0.54 to 0.67), and laboratory tests (OR = 0.35, 95% CI 0.29 to 0.43). These results remained consistent when controlling for covariates.

Conclusion: Patients who presented to the emergency department for occupational non-specific low back pain were less likely to receive diagnostic tests compared to non-occupational non-specific low back pain patients.

Background

Low back pain is a leading cause of disability worldwide^{1,2}, affecting 49-90% of people during their lifetime³⁻⁷. While low back pain can resolve within a few weeks^{6,8}, it tends to follow a fairly persistent and painful course⁹⁻¹¹. There are extensive costs associated with the condition, including both direct (i.e. healthcare costs) and indirect costs (i.e. lost productivity, disability payments)^{12,13}.

Low back pain is a common cause for presentation to the emergency department (ED). In 2018, back pain was the fourth most common presenting complaint in Canadian EDs for individuals of the typical working population, between ages 19 and 64¹⁴. Over 85% of cases are non-specific, meaning that the pain cannot be attributed to a pathoanatomical cause^{5,8,13,15}. Low back pain is rarely attributed to serious pathologies, such as cancer or infection¹³. Thus, clinical practice guidelines state that diagnostic tests, such as diagnostic imaging and laboratory tests (i.e. bloodwork and urinalysis) should not be used in the absence of red flags^{5,15-18}. Further, diagnostic tests have been associated with

poorer outcomes, such as prolonged disability and inflated medical expenditure, and with unnecessary and harmful procedures^{5,19-21}. Despite the availability of guidelines, studies have found that diagnostic tests are still used frequently in the management of low back pain²²⁻²⁶.

Musculoskeletal injuries, like low back pain, commonly occur within compensation systems for workplace incidents²⁷. According to the Workers' Compensation Board of Nova Scotia (WCB-NS), the back was the most commonly cited 'part of body' injury in 2018, representing 25.8% of recorded injuries²⁸. Numerous studies have found compensation to be associated with poorer outcomes following musculoskeletal injuries. For example, a Japanese study found that the odds of developing chronic low back pain were significantly higher among people who had received compensation for a previous bout of low back pain compared to patients who had not been compensated⁴. However, some of the systematic reviews that support this association are based on primary studies with significant methodological flaws, according to Spearing & Connelly²⁹.

Although, one study found that workers with musculoskeletal pain who receive large amounts of income replacement (>100%) claim benefits for longer than those receiving income replacement of equal or lesser value than their income³⁰. These results appear to reinforce the association between compensation and poorer outcomes if the resolution of low back pain is defined as time until return to work.

The association between compensation and outcomes may arise from differential management or leniency with occupational and non-occupational patients. One study found that general practitioners were more accommodating with their workers' compensation patients in prescribing time off work³¹. They also found that 24% of workers with acute low back pain had firm beliefs about how their pain should be managed, which often were not in accordance with evidence-based care³¹. Further, physicians' beliefs have been associated with the management of low back pain due to reasons such as potential legal action if imaging is not ordered for patients³². Such factors could potentially influence physicians to order more diagnostic tests for patients if their injuries will be investigated by the WCB-NS.

We are not aware of any research that has compared the frequency of use of diagnostic tests in the ED between occupational and non-occupational non-specific low back pain. The purpose of this study was to fill this gap and assess whether initial presentation to

the ED for non-specific low back pain with a WCB-NS claim was associated with different diagnostic management from non-claimants.

Methods

Design and data source

This retrospective cohort study analyzed administrative data collected from the Nova Scotia Health Authority Central Zone Emergency Department Information System (EDIS) between July 15, 2009 and May 1, 2019. All patients who presented to the ED during this time were captured in the database. This study received ethical approval from the Nova Scotia Health Authority Research Ethics Board (ROME0 # 1024608).

Study population

Our study population was identified from EDIS data from four EDs in the Nova Scotia Health Authority Central Zone: QEII Health Sciences Centre, Dartmouth General Hospital, Hants Community Hospital, and Cobequid Community Health Centre. We defined our eligible population as adults who presented for the first time to these EDs with a chief complaint of "Back Pain" or "Traumatic Back/Spine Injury" and who left with an ICD-9 code consistent with non-specific or mechanical low back pain. We included patients

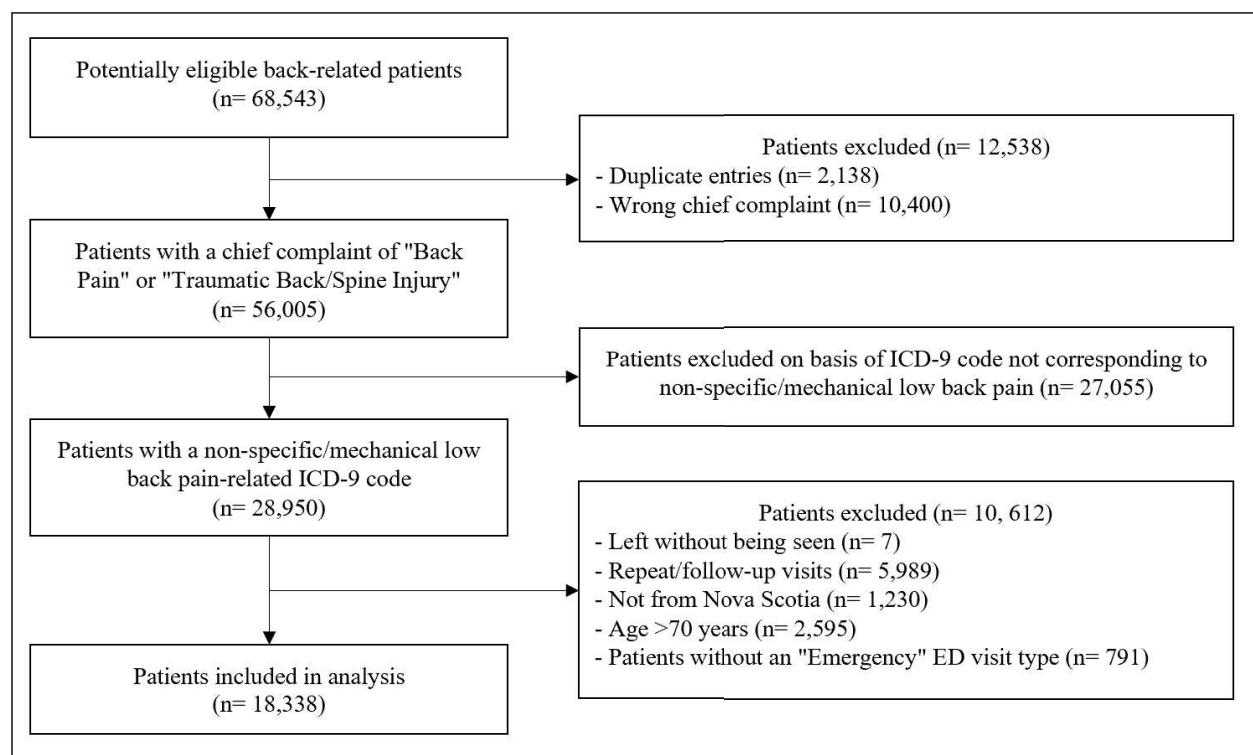


Figure 1. Flow diagram of the study population.

who presented independently or through Emergency Health Services (i.e. helicopter or ambulance). We excluded patients who were not residents of Nova Scotia. Finally, we made a post hoc decision to set the upper age limit of patients to 70 years, inclusive, in order to represent a majority working population and to limit potential confounding, as very few older patients (70+) had presented with an occupational injury.

Exposure, covariates, and outcomes

Our exposure status consisted of being a WCB-NS claimant, as opposed to a non-claimant. EDIS recorded the responsibility for payment of the patients' ED visits, allowing us to determine whether patients were WCB-NS claimants or not. Under the "responsibility for payment" column, patients who were categorized as "WCB Nova Scotia," "Department of Health," "Dept of Health," and "Self – NS Resident," were considered to be residents of Nova Scotia. The former category was used to categorize WCB-NS claimants while the latter three were used to categorize non-claimants.

While we described our exposure as being a WCB-NS claimant, we also identified a number of covariates including age, sex, Canadian Triage Acuity Scale (CTAS) score, method of arrival, whether the patient had a primary care provider at the time of presentation, and the site of presentation. These covariates were controlled for in our analysis.

The primary outcome measures in this study were the categorical variables for diagnostic tests (i.e. none or any one or more of: x-ray, CT, MRI, urinalysis, and bloodwork), diagnostic imaging (i.e. none or any one or more of: x-ray, CT, and MRI), and laboratory tests (i.e. none or any one or both of: urinalysis and bloodwork).

Statistical analysis

All data were imported into and analyzed with Stata statistical software³³. Descriptive analyses consisted of describing categorical variables as frequencies (%) and continuous variables as a mean with a standard deviation since the data were distributed normally. Multivariable logistic regression analyses were performed to assess the association between the exposure and outcome measures. Odds ratios (OR) and adjusted ORs were calculated for the associations of interest and presented with corresponding 95% confidence intervals.

Results

Study population selection

Sociodemographic and ED visit characteristics (Table 1) were retrieved from EDIS for 66,543 potentially el-

igible patients who presented to the ED. Patients were then excluded if they were duplicate entries or if they presented with a chief complaint other than "Back Pain" or "Traumatic Back/Spine Injury," were assigned an ICD-9 code that did not represent non-specific or mechanical low back pain, left without being seen, presented for a repeat/follow-up visit, were not Nova Scotian, were over 70 years old, and if they did not present as an "Emergency" to the ED (Figure 1). This resulted in the inclusion of 18,338 patients in our analysis.

Characteristics of the study population

Characteristics of the 18,338 included patients were analyzed and aggregated (Table 2). Patients had a mean age of 43 years and 51.3% were female. Upon arrival, the majority of patients were assigned a CTAS score of 3 (urgent) and about one third were assigned a score of 4 (less urgent). Most patients reported experiencing moderate (52.2%) or severe pain (41.5%), while fewer reported mild pain (7.3%). The WCB-NS was responsible for the payment of 11.6% of visits and the rest (88.4%) were paid for by the individual or by the Department of Health of Nova Scotia. Almost all patients reported having a primary care provider at the time of presentation. 90.9% of patients presented to the ED independently, while 9.1% arrived via Emergency Health Services. The most common sites of presentation were the QEII Health Sciences Centre (34.5%), Cobequid Community Health Centre (29.4%), and Dartmouth General Hospital (26.0%). On average, patients stayed in the ED for 3.4 hours and few patients (0.4%) were admitted to hospital.

Frequency of diagnostic tests

Upon presentation to the ED, 37.2% of patients received a diagnostic test (Table 3). More than 30% of patients received an imaging study, most of whom received an x-ray (27.5%). Over 12% of patients received a laboratory test. While 25% of WCB-NS claimants received a diagnostic test, roughly 39% of non-claimants received a test. For imaging, roughly 22% of claimants received a study, while over 31% of non-claimants received one. Meanwhile, the frequency of laboratory tests ordered for claimants (5.1%) was less than half that for non-claimants (13.2%).

Compared to non-claimant patients, claimants were less likely to receive a diagnostic test (OR = 0.52, 95% CI 0.47 to 0.58), an imaging study (OR = 0.60, 95% CI 0.54 to 0.67), and a laboratory test (OR = 0.35, 95% CI 0.29 to 0.43). When controlling for covariates, similar associations were found: claimants were less likely to receive a diagnostic test (adjusted OR = 0.57, 95% CI 0.51 to 0.63), an imaging study (adjusted OR = 0.66,

Table 1. EDIS variables collected and respective descriptions.

Concept	Description
Age	Presented in years
Sex	<ul style="list-style-type: none"> • Male • Female
Has/does not have a primary care provider?	<ul style="list-style-type: none"> • Yes • No
Responsibility for payment	Various categories, including but not limited to: <ul style="list-style-type: none"> • Department of Health of Nova Scotia • Self - NS Resident • WCB-NS • Other provinces • Private insurance
Type of ED visit	Various categories, including but not limited to: <ul style="list-style-type: none"> • Emergency • Return visit • Referral from GP/clinic • 811 referral
Method of arrival	<ul style="list-style-type: none"> • Independent • EHS (ambulance or helicopter)
Time of presentation	Presented as a date
Chief complaint	<ul style="list-style-type: none"> • Back pain • Traumatic back/spine injury
CTAS score	Number between 1-5: <ul style="list-style-type: none"> • 1 = Resuscitation • 2 = Emergent • 3 = Urgent • 4 = Less Urgent • 5 = Non-Urgent
Pain Score	Number between 0-10, signifying level of pain: <ul style="list-style-type: none"> • Mild (0-3) • Moderate (4-7) • Severe (8-10)
ICD-9 code	Various ICD-9 codes consistent with non-specific low back pain
Discharge diagnosis	Various categories, including but not limited to: <ul style="list-style-type: none"> • Back pain • Chronic back pain • Muscle spasm back
Site of presentation	One of the following: <ul style="list-style-type: none"> • QEII Health Sciences Centre • Dartmouth General Hospital • Cobequid Community Health Centre • Hants Community Hospital
Diagnostic test information	Information on whether the following tests were ordered: <ul style="list-style-type: none"> • X-ray • CT • MRI • Routine bloodwork • Urinalysis
Length of stay	Presented in hours
Admission to hospital	<ul style="list-style-type: none"> • Yes • No

Table 2. Patient and visit characteristics for Nova Scotian non-specific low back pain patients presenting to Nova Scotia Health Authority Central Zone EDs (n = 18,338)

Characteristic	Number (%)*
Age (Mean, SD)	43 years (14)
Female sex	9,399 (51.3)
Primary Care Provider	16,543 (90.2)
Method of arrival (n= 18,338)	<ul style="list-style-type: none"> • Independent 16,675 (90.9) • Emergency Health Services 1,663 (9.1)
CTAS (1-5)	<ul style="list-style-type: none"> • 1 0 (0.0) • 2 2,254 (12.3) • 3 9,515 (51.9) • 4 6,350 (34.6) • 5 219 (1.2)
Pain score (0-10) (n= 11,841; 6,497 missing)	<ul style="list-style-type: none"> • Mild (0-3) 863 (7.3) • Moderate (4-7) 6,061 (51.2) • Severe (8-10) 4,917 (41.5)
ED of presentation	<ul style="list-style-type: none"> • QEII Health Sciences Centre 6,324 (34.5) • Dartmouth General Hospital 4,771 (26.0) • Cobequid Community Health Centre 5,399 (29.4) • Hants Community Hospital 1,844 (10.1)
Length of stay (Mean, SD)	3.4 hours (2.8)
Hospital admission	79 (0.4)
Responsibility for payment	<ul style="list-style-type: none"> • Department of Health, NS or Self 16,219 (88.4) • Workers' Compensation Board of Nova Scotia 2,119 (11.6)

* Unless noted otherwise.

95% CI 0.59 to 0.74), and a laboratory test (adjusted OR = 0.38, 95% CI 0.31 to 0.47) than non-claimants.

Discussion

Our study population was similar to that of US EDs between 2002 and 2006, according to a secondary data analysis of the National Hospital Ambulatory Medical Care Survey (NHAMCS). For example, the NHAMCS recorded statistics similar to those in this study for average age of patients (40 years), proportion of patients who were female (51.2%), and proportion of patients who presented independently to the ED (91.3%)²³. However, a greater proportion of patients presented with severe pain (54.2%) than moderate pain (30.6%) in the US²³, while more patients presented with moderate pain than severe pain in our study. Additionally, 7.5% of patients were workers' compensation cases in the US, while we recorded 11.6% as such.

We found that the odds of receiving a diagnostic test or imaging was lower in claimants presenting to the ED with non-specific low back pain compared to

Table 3. Frequency of diagnostic tests performed for non-specific low back pain patients in Nova Scotia Health Authority Central Zone EDs (n = 18,338)*

Diagnostic test	Total	WCB-NS	Non WCB-NS
	Number (%)		
Any diagnostic test	6,815 (37.2)	526 (24.8)	6,219 (38.8)
Any imaging	5,539 (30.2)	456 (21.5)	2,083(31.3)
X-ray	5,044 (27.5)		
CT	779 (4.3)		
MRI	8 (0.04)		
Any laboratory test	2,242 (12.2)	107 (5.1)	2,135 (13.2)
Urinalysis	971 (5.3)		
Bloodwork	2,240 (12.2)		

* Frequency of certain diagnostic tests are missing as we were not able to access the data due to COVID-19 closures.

non-claimants when adjusted for covariates (including age, sex and CTAS score). While the direction of this relationship was not expected, the rates of imaging we found were similar to the rates of imaging reported in other studies (27.2%-30.5% for x-rays; 29%-37% for any imaging)^{23–26,34}. Meanwhile, the rate of urinalysis was lower among our study population in comparison to other studies (18.8%-21.9%)^{23,34}. As we believe that this is the first study to compare the diagnostic management of non-specific low back pain in the ED between occupational and non-occupational cases, we cannot compare our rates to previously reported ones.

Our results may have differed from our hypothesis due to a variety of reasons. For example, there is a level of oversight associated with WCB-NS claims. It is possible that ED physicians feel more empowered to adhere strictly to guideline recommended care given that all patients will be followed by the WCB-NS, providing opportunity for diagnostic investigations at a later date, if necessary. Additionally, occupational cases may be linked to a specific or known injury more frequently than non-occupational cases, making diagnostic testing unnecessary in most cases.

Strengths and Limitations

Using EDIS enabled us to ascertain detailed descriptions of patients' characteristics retrospectively at minimal cost. Further, variables were well recorded with only a relatively small number of missing observations. This study also included all patients who met the inclusion criteria rather than a sample, reducing potential selection bias and increasing generalizability of the results. Misclassification bias was also likely low in this study as diagnostic tests would have had to be classified properly in the database for the test(s) to be ordered. While it is possible that patients filed WCB-NS claims that later turned out to be unsuccessful, they

would have been managed as a claim by ED physicians, nonetheless.

Eliminating patients from the study population based on age, residency status, repeat/follow-up visits, and visit type, was our way to reduce potential confounding by only including working age Nova Scotians initially presenting to the ED for emergent non-specific low back pain. Eliminating patients over the age of 70 may have weakened our results as older patients were less likely to be claimants and may have been more likely to receive diagnostic testing due to comorbidities. In addition, it is possible that not all workers were eligible to file a claim with the WCB-NS and so did not report being a claimant. We believe that the measures taken to ensure minimal confounding and bias were adequate to determine robust associations.

Despite the fact that the rates of diagnostic testing among non-claimants were significantly higher than the rates among claimants, we cannot determine whether there was overuse of diagnostic tests. We did not collect patient information beyond what was available on EDIS; therefore, we were unable to ascertain the presence of red flags, comorbidities, or mechanism of injury in either category to determine the appropriateness of imaging studies. The nature of administrative data also limited our interpretations as we could not collect patients' education status, ethnicity/background, history, physical examination results, or treatment(s) received. These factors could have potentially influenced the results of the study.

Patient sociodemographic characteristics, injury characteristics, and occupational injury incidence may also differ around the country and thus may hinder generalizability. Additionally, provincial differences in healthcare availability and structure may also act as barriers to national generalizability.

Future Research

Future research should aim to understand why fewer diagnostic tests were ordered for claimants than non-claimants on initial presentation to the ED and investigate repeat visits in both groups. Other research should also attempt to replicate our study in different geographical settings and healthcare systems, as well as compare management between academic, tertiary, and community care centres. Further, as most patients seeking care for non-specific low back pain present to primary care centres⁶, future studies should examine the role of WCB-NS claimant status on diagnostic tests ordered by primary care physicians.

Conclusion

We found that diagnostic tests were used less frequently in the ED management of occupational non-specific low back pain in comparison to non-occupational cases. While clinical practice guidelines are available to guide physicians in the management of non-specific low back pain, there appears to be a discrepancy of adherence to them when treating occupational and non-occupational injuries. The results elucidate an association between WCB-NS claimant status and diagnostic management that warrants further study.

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