

Clinical Decision Support Decreases Volume of Imaging for Low Back Pain in an Urban Emergency Department

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Abstract

Purpose: To determine whether point-of-care clinical decision support can effectively reduce inappropriate medical imaging of patients who present to the emergency department (ED) with low-back pain (LBP).

Materials and Methods: This was a prospective, single-center study of lumbar imaging referrals made by 43 emergency physicians at a major acute care center. Each physician saw at least 10 LBP cases in both pre- and post-intervention periods. A point-of-care checklist of accepted red flags for LBP was designed by a working group of physicians and embedded in the computerized order entry form for lumbar imaging. We compared imaging rates of LBP and physician variation in imaging ordering before and after the implementation of the checklist. We then measured the potential harms of reduced imaging.

Results: After intervention, the proportion of LBP patients with an imaging order fell significantly (median: 22% to 17%; mean: 23% to 18%; $P = .0002$) compared with pre-intervention baseline. The percentage of patients without imaging who were later imaged at a hospital outpatient clinic within 30 days was 2.3% before intervention and 2.2% after ($P = .974$). In addition, the proportion of patients discharged from the ED without imaging who returned to the ED within 30 days was 8.2% before intervention and 6.9% after ($P = .170$). One minor thoracic spine compression fracture was missed, but management was not impacted. No serious diagnoses were missed.

Conclusion: Clinical decision support integrated in electronic order entry forms can safely and effectively reduce imaging orders for LBP patients in the ED.

Key Words: Low back pain, clinical decision support, diagnostic imaging, appropriateness, Choosing Wisely, emergency department

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INTRODUCTION

Low back pain (LBP) is one of the most common reasons for people in Canada and the United States to seek emergency medical care [1,2]. In 2011, back pain was the sixth most common reason for Canadians to visit the emergency department (ED) [3]. In the United States, LBP is the fifth most common presenting ED

complaint and is responsible for nearly 3 million ED visits annually [4-6].

Although its prevalence has not changed, the cost of LBP management has been steadily increasing each year. Between 1997 and 2005, spine-related expenditures in the United States rose by 65%, a rate of growth that was significantly higher than that of overall health expenditures

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[7]. Much of this cost can be attributed to the increasingly common practice of routine medical imaging in the workup of LBP over the past several years [8,9]. Currently, 42% of patients with LBP receive either an x-ray, CT, or MRI within 1 year of diagnosis, and of these, 80% receive imaging within 1 month of presentation [10,11]. According to one study, approximately 30% of patients who presented to the ED with LBP received an x-ray and 6% received either a CT or MRI [4]. In an American study of national trends in CT use in the ED, 13.9% of patients with a presenting complaint of back pain received a CT scan during the same ED visit [6].

However, such imaging studies are of low yield in the general population presenting with LBP. Evidence shows that medical imaging is of value only when LBP is accompanied by red flag symptoms that point to more serious underlying conditions [12,13]. Among all patients with LBP, the majority are uncomplicated, self-limited, and benign, and therefore do not require imaging. Of the remainder of LBP patients, 4% have vertebral compression fractures [14], 0.7% have cancer, 0.04% have cauda equina syndrome, and 0.01% have spinal infection [15,16]. Indeed, a significant proportion of imaging studies ordered for patients presenting to the ED with LBP are unnecessary, with studies reporting inappropriate imaging rates between 15% and 30% [17-23].

Both physician and patient factors contribute to the persistence of inappropriate diagnostic imaging [17,18]. Patients often insist that imaging studies be ordered for their LBP [24], and many physicians acquiesce to these demands even when they know these tests are not necessary [25]. At other times, physicians may order inappropriate medical imaging out of fear of missing a serious diagnosis [26,27]—a practice that has been described as “defensive medicine” [28].

In response, Choosing Wisely Canada has published guidelines recommending against indiscriminately imaging patients with LBP without red flag findings. These guidelines were created at the recommendation of several Canadian medical organizations, which include the Canadian Association of Emergency Physicians, the College of Family Physicians of Canada, Occupational Medicine Specialists of Canada, the Canadian Association of Radiologists, and the Canadian Spine Society. However, guideline dissemination and other educational strategies have been shown to have limited efficacy in altering physician behavior [27,29,30].

Clinical decision support (CDS) is a point-of-care strategy that has proven more successful in modifying physician behavior than traditional educational methods [27,29-33]. CDS employs a series of questions and checklists added to the existing computerized order entry form for medical imaging to help physicians make appropriate imaging decisions.

Previous studies of CDS for LBP imaging have focused mainly on its efficacy in outpatient clinics; however, the role of CDS in the ED, and any potential harms it may cause, has yet to be examined in detail [5,31]. This study was undertaken to determine if CDS is indeed a safe and effective strategy for reducing inappropriate imaging of LBP patients in an urban, academic hospital ED.

METHODS

We retrospectively extracted data to evaluate the impact and effectiveness of implementing a CDS tool for LBP diagnostic imaging at the ED of a major acute care and teaching center in Vancouver, British Columbia, Canada. Because this project constituted a quality initiative, institutional review board approval was not required.

In January and February 2015, communication regarding process changes for LBP diagnostic imaging requests and supplementary education material was delivered to physicians. The CDS tool went live on March 4, 2015. Evaluation was divided in two phases: pre- and post-implementation of CDS. ED electronic health records from January 1, 2013, to May 31, 2016, were examined (Fig. 1).

Working Group

A diverse working group consisting of emergency physicians, radiologists, and family physicians was created to achieve a wider and more comprehensive approach. The team was involved in all stages, from study conception to CDS development, implementation, and evaluation. This helped with early engagement of physicians, a key component for the success of the project.

The group was asked to define the target population, confirm the problem definition and appropriateness criteria and red flags informed by literature, confirm methodology of data collection (baseline data), design the evaluation framework, develop educational material for patients and physicians, and develop and implement red flag recommendations in the physician order entry system.

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