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

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\cite{1,2}. In 2011, back pain was the sixth most common reason for Canadians to visit the emergency department (ED)\cite{3}. In the United States, LBP is the fifth most common presenting ED complaint and is responsible for nearly 3 million ED visits annually\cite{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.
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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