

Clinical Study

Impact of imaging guidelines on X-ray use among American provider network chiropractors: interrupted time series analysis

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Abstract

BACKGROUND CONTEXT: Overuse and misuse of spine X-ray imaging for nonspecific back and neck pain persists among chiropractors. Distribution of educational materials among physicians results in small-to-modest improvements in appropriate care, such as ordering spine X-ray studies, but little is known about its impact among North American chiropractors.

PURPOSE: To evaluate the impact of web-based dissemination of a diagnostic imaging guideline on the use of spine X-ray images among chiropractors.

STUDY DESIGN/SETTING: Quasi-experimental design that used interrupted time series to evaluate the effect of guidelines dissemination on spine X-ray imaging claims by chiropractors enlisted in managed care network in the United States.

PATIENT SAMPLE: Consecutive adult patients consulting for complaints of spine disorders.

OUTCOME MEASURES: A change in level (the mean number of spine X-ray imaging claims per month immediately after the introduction of the guidelines), change in trend (any differences between pre-intervention and postintervention slopes), estimation of monthly average intervention effect after the intervention.

METHODS: The imaging guideline was disseminated online in April 2008. Administrative claims data were extracted between January 2006 and December 2010. Segmented regression analysis with autoregressive error was used to estimate the impact of guideline recommendations on the rate of spine X-ray studies. Sensitivity analysis considered the effect of two additional quality improvement strategies, a policy change and an education intervention.

RESULTS: Time series analysis revealed a significant change in the level of spine X-ray study ordering weeks after introduction of the guidelines (-0.01 ; 95% confidence interval= -0.01 , -0.002 ; $p=.01$), but no change in trend of the regression lines. The monthly mean rate of spine X-ray studies within 5 days of initial visit per new patient exams decreased by 10 per 1000,

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a 5.26% relative decrease after guideline dissemination. Controlling for two quality improvement strategies did not change the results.

CONCLUSIONS: Web-based guideline dissemination was associated with an immediate reduction in spine X-ray imaging claims. Sensitivity analysis suggests our results are robust. This passive strategy is likely cost-effective in a chiropractic network setting. © 2014 Elsevier Inc. All rights reserved.

Keywords: Chiropractors; Health care; Primary care; Quality assurance; Test ordering; X-rays; Utilization

Introduction

Poor-quality care, including overuse and misuse of imaging for spine disorders, has been reported in the medical [1,2] and chiropractic literature [3,4]. Overuse may be defined as patients receiving unnecessary tests or procedures with associated risks and side effects, whereas misuse are mistakes that can harm people [5]. Spine X-ray studies are of little clinical use in the absence of clinical indicators of potentially serious pathology requiring specialist referral or urgent surgical intervention (red flags) [6,7]. The yield of a positive finding on imaging studies that would alter management is considered extremely low (only 1 in 2,500 lumbar spine radiographs) in the absence of red flags [8]. Potential harms from inappropriate use of spine X-ray imaging include unnecessary patient exposure to ionizing radiation [9–11], and inefficient and potentially inappropriate further investigations, including magnetic resonance imaging, computed tomography, and any subsequent treatment [12–14]. Although evidence-based diagnostic imaging guidelines are available, chiropractors remain divided on whether current recommendations for spine imaging apply to them [3,15,16].

Clinical practice guidelines (CPGs) are particularly useful where overuse and misuse of services exist, because they aim to describe appropriate care based on the best-available scientific evidence and broad consensus while promoting efficient use of resources [17,18]. The Diagnostic Imaging Guidelines for Adult Spine Disorders were developed to assist clinical decision-making and promote more selective use of imaging studies by chiropractors and other primary health care professionals [19]. Although these guidelines were released in 2008, recent systematic reviews [6], best-evidence synthesis [7], and national guidelines [20,21] still support the key recommendations for spine imaging of uncomplicated neck and back pain. In a review on the impact of guideline implementation and dissemination strategies in allied health professions, only 3 of the 14 included studies focused on physiotherapists, and there were none on chiropractors [22].

Distribution of printed educational material (PEM), including the posting of guidelines on the web, is a widely used passive dissemination strategy to improve knowledge, awareness, attitudes, skills, professional practice, and patient outcomes [23]. High-quality reviews suggested distribution of PEM was effective for improving physician ordering X-ray studies for low back pain [24,25] and other musculoskeletal conditions [24,25]. However, little is

known about the impact of dissemination of diagnostic imaging guidelines for spine X-ray study ordering behavior among chiropractors in the US setting [22]. To our knowledge, this is the first study to use a large database that reflects real-world chiropractic care delivery to assess the impact of a guideline dissemination strategy. We undertook an interrupted time series (ITS) to assess the impact of web-based dissemination of a spine imaging guideline on spine X-ray image claim rates among chiropractors enlisted with the American Specialty Network (ASH), a large chiropractic provider network (PN) in the United States.

Methods

Design

We performed a retrospective, quasiexperimental design using segmented regression analysis of ITS data to assess the significance of changes in level and slope of the regression lines before and after the introduction of a spine imaging guideline [26,27]. ITS design allows for the statistical investigation of potential biases in the estimate of effect of the intervention and is widely regarded as the strongest quasiexperimental design for causal inference guideline [26]. These potential biases include: secular trend, seasonal effects, duration of the intervention, random fluctuations, and autocorrelation [28].

Setting

The PN provides complementary health care networks for health plans across the United States and includes more than 15,000 chiropractors from 50 states [29].

Participants

Contracted providers who received payment for at least one claim submitted between 2006 and 2010 for consecutive adult patients consulting for complaints of spine disorders were identified from the PN administrative databases.

Interventions

The primary intervention was the introduction of the Diagnostic Imaging Guidelines [19]. These open access guidelines were first published in the *Journal of Manipulative and Physiological Therapeutics* in January 2008 [19]. In March 2008, the guidelines were posted on the National Guideline Clearinghouse [30], and the PN updated their

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