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Review Article

A systematic review of diagnostic imaging use for low back pain in the United States

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Abstract

BACKGROUND CONTEXT: Various studies have reported on the increasing use and costs of diagnostic imaging for low back pain (LBP) in the United States. However, it is unclear whether the methods used in these studies allowed for meaningful comparisons or whether the reported use data can be used to develop evidence-based use benchmarks.

PURPOSE: The primary purpose of this study was to review previous estimates of the use of diagnostic imaging for LBP in the United States.

STUDY DESIGN/SETTING: The study design is a systematic review of published literature.

METHODS: A search through May 2012 was conducted using keywords and free text terms related to health services and LBP in Medline and Health Policy Reference; results were screened for relevance independently, and full-text studies were assessed for eligibility. Only studies published in English since the year 2000 reporting on use of diagnostic imaging for LBP using claims data from the United States were included. Reporting quality was assessed using a modified Downs and Black tool for observational studies.

RESULTS: The search strategy yielded 1,102 citations, seven of which met the criteria for eligibility. Studies reported use from commercial health plans (N=4) and Medicare (N=3), with sample sizes ranging from 13,760 to 740,467 members with LBP from specific states or across the United States. The number of diagnostic codes used to identify nonspecific LBP ranged from 2 to 66; other heterogeneity was noted in the methods used across these studies. In commercial health plans, use of radiography occurred in 12.0% to 32.2% of patients with LBP, magnetic resonance imaging (MRI) was used in 16.0% to 21.0%, computed tomography (CT) was used in 1.4% to 3.0%, and MRI and/or CT was used in 10.9% to 16.1%. Findings in Medicare populations were 22.9% to 48.2% for radiography, 11.6% for MRI, and 10.4% to 16.3% for MRI and/or CT.

CONCLUSIONS: The reported use of diagnostic imaging for LBP varied across the studies reviewed; differences in methodology made meaningful comparisons difficult. Standardizing methods for performing and reporting analyses of claims data related to use could facilitate efforts by third-party payers, health care providers, and researchers to identify and address the perceived overuse of diagnostic imaging for LBP.

Keywords: Low back pain; Diagnostic imaging; X-rays; Magnetic resonance imaging; Computed tomography; Utilization; Claims data

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Introduction

Low back pain (LBP) is experienced by 25% to 50% of the adult population in the United States each year, making it one of the most common reasons for seeking health care from a variety of clinicians, including primary care providers (PCPs), nonsurgical specialists, spine surgeons, allied health providers, as well as complementary and alternative medicine providers [1–3]. The costs associated with health care services for spine pain (primarily LBP) in the United States increased from $45.9 billion in 1997 to $102.6 billion in 2004—an annualized growth rate of more than 12% [4]. Yet despite the increased resources allocated to health services for LBP, their value has been questioned as a result of rising chronicity, disability, and unexplained geographic variations in care [4–8].

One of the contributors to the growing costs of LBP is the increased use of medical technologies, particularly advanced diagnostic imaging such as magnetic resonance imaging (MRI) and computed tomography (CT), which now account for nearly 14% of Medicare Part B expenditures [7,9–12]. Use of spinal MRI in Medicare increased by 83% from 1993 to 1998, whereas lumbar MRI increased by 300% between 1994 and 2006 [7,10]. Numerous factors have been offered to explain the increase of diagnostic imaging for LBP, including changing demographics, increased care seeking and patient expectations about LBP, increased physician ownership of imaging facilities, and fee-for-service payment models [10,11,13–16]. The supply of imaging equipment may also play a role, as the number of MRI scanners in the United States increased from 7.6 per 1 million people to 26.6 per 1 million people between 2000 and 2005, and ongoing use is necessary to recoup initial and operating expenses [11,17].

Researchers have observed large geographic variations in the use of diagnostic imaging for LBP across the United States that seemingly cannot be attributed to clinical need alone, leading to concerns that these services are not always clinically necessary, also leading to subsequent use of related health services [10,18–20]. For example, MRI frequently detects anatomic irregularities that are not responsible for the symptoms of LBP observed, but may nevertheless trigger a cascade of additional diagnostic testing or surgical procedures aimed at correcting those anomalies [17,20,21]. Concerns have also been voiced about other harms associated with diagnostic imaging, including the ionizing radiation of spinal radiography and CT, whose effects increase with repeated exposure [22].

Reports of increased use, high costs, and potentially inappropriate use of diagnostic imaging for LBP have fueled interest in this topic by third-party payers, including commercial, employer-sponsored, and government-sponsored health plans, as well as health services researchers and health administrators eager to identify potential targets for cost containment, particularly when evidence-based clinical practice guidelines (CPGs) are available to guide appropriate use [13]. For example, the proportion of patients with LBP receiving diagnostic imaging has been endorsed as a measure of health care quality by the National Committee for Quality Assurance (NCQA), is currently incorporated into the Healthcare Effectiveness Data and Information Set (HEDIS) measures reported by a majority of health plans, and will likely be included in quality measures for patient-centered medical homes (PCMH) [23,24].

Efforts to develop programs targeting the potential overuse of health services often begin by analyzing claims data, which are readily available to third-party payers, administrators, and researchers; are directly relevant to the populations of interest; and offer relatively large sample sizes [25]. Findings from such analyses can then be compared with various proposed benchmarks to determine whether overuse is occurring, which can prompt administrative, reimbursement, or policy changes that can affect patients with LBP and spine care clinicians. However, it is unclear whether meaningful benchmarks related to the use of diagnostic imaging for LBP can currently be developed based on existing studies reporting on use of these health services.

Therefore, the primary objective of this study was to conduct a systematic review to identify, appraise, summarize, and synthesize studies reporting on the use of diagnostic imaging for LBP in the United States. Secondary objectives were to compare the methods used for such analyses, and to describe factors that have been reported to influence use of diagnostic imaging for LBP.

Methods

Information sources and search

Medline was searched through May 2012 using the Medical Subject Headings and free text terms developed by the Cochrane Back Review Group to identify studies related to LBP, with additional terms related to use, claims, and third-party reimbursement (Supplementary Appendix 1) [26]. A broad search strategy was used to identify studies related to any health service for LBP; findings not related to diagnostic imaging will be reported in future studies. The Medline search strategy was modified for the Health Policy Reference Center (HPRC) database using both subject headings and free text to search abstracts of academic journals. Author files and references from relevant studies were also scanned to uncover additional studies.

Eligibility criteria

Studies were included if they reported on use of any diagnostic imaging for LBP in adults (age, 18 years or older) in the United States based on third-party payer records (eg, claims). Studies were excluded if they were published before 2000, were in languages other than English, relied on self-reported use (eg, surveys), did not report primary