ORIGINAL ARTICLE

Imaging Decision Support Does Not Drive Out-of-Network Leakage of Referred Imaging

Anand M. Prabhakar, MD[a,b], H. Benjamin Harvey, MD, JD[b], Alexander S. Misono, MD, MBA[b], Ann E. Erwin, MMHS[c], Nan Jones, MHA[c], James Heffernan, MBA[c], Daniel I. Rosenthal, MD[b], James A. Brink, MD[b], Sanjay Saini, MD[b]

Abstract

Purpose: Leakage (out-of-network referral) is undesirable because it limits ability to control costs of services. Clinical decision support (CDS) systems seek to ensure appropriate imaging of patients but theoretically could drive leakage if ordering providers attempt to circumvent CDS recommendations and obtain studies from other imaging providers. This study assessed the incidence of leakage of imaging studies that had low appropriateness scores.

Methods: We queried our outpatient CDS system over a three-year period (2011-2013) for studies that received a low CDS appropriateness score and were canceled by the ordering physician. For patients meeting these criteria and participating in risk-shared contracts, we cross-referenced their imaging utilization reports in the risk-contract insurance payment database to determine if they received outpatient imaging within 60 days of the index order, contrary to the decision support recommendation.

Results: The risk-shared insurance database contained an average of 63,378 patients who had 18,008 MRIs and 18,014 CTs. A total of 11,234 (31.2%) studies were leaked: 3,513 (9.8%) to affiliated institutions; 7,721 (21.4%) to unaffiliated imaging facilities. Overall, 111 imaging studies received a low appropriateness score in the risk-shared patient population and were performed within 60 days despite the low score. Of these studies, 106 of 111 (95.5%) were ultimately performed within our hospital system (104 at the home institution; 2 at affiliated institutions); only 5 of 111 (4.5%) were performed outside of our hospital system.

Conclusions: Decision support systems for ordering providers do not seem to drive imaging referrals out of hospital systems to other institutions. Hospital systems can implement decision support without fear of this occurring.

Key Words: Leakage, decision support, referral management

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INTRODUCTION

Appropriateness criteria, such as those developed by the ACR, can help clinicians make evidence-backed choices when obtaining diagnostic imaging. However, an historical challenge to harnessing the power of the ACR Appropriateness Criteria and others has been making them easily accessible at the point of care. Over the past decade, order-entry clinical decision support (CDS) systems have addressed this challenge. Order-entry CDS brings evidence-based guidance to physicians at the time of ordering, and has been shown to reduce both the number of low-utility examinations and growth in imaging volume [1-5]. As a result of this success, order-entry CDS will be mandated for all advanced imaging examinations (ie, CT, MRI, nuclear medicine, and PET) in Medicare patients, starting in 2017 [6].

Despite these benefits, research has shown that order-entry CDS systems can have negative unintended consequences. Ash et al [7] found that providers complained of rigidity of the CDS system, user fatigue, and potential errors. Other CDS users have reported feeling antagonized by systems that might seem to question their judgment [8]. As a result, providers may opt

[a]Division of Cardiovascular Imaging, Department of Radiology, Massachusetts General Hospital, Boston, Massachusetts.

[b]Department of Radiology, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts.

[c]Massachusetts General Physicians Organization, Massachusetts General Hospital, Boston, Massachusetts.

Corresponding author and reprints: Anand M. Prabhakar, MD, Department of Radiology, Division of Cardiovascular Imaging, Harvard Medical School, Massachusetts General Hospital, 55 Fruit St, Gray 2, Boston, MA 02114; e-mail: aprabhakar@mgh.harvard.edu.

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to avoid CDS altogether, instead choosing to make referrals to imaging providers and health systems that have not implemented such systems. Thus, one potential concern for institutions that implement CDS is the possibility that providers may refer imaging elsewhere. Out-of-network referral is commonly known as "leakage" and is undesirable because it may lead to poor care coordination and lost revenue. In addition, for institutions participating in accountable care organizations and other risk-shared contracts, it may lead to financial penalties [9].

Although leakage is a well-recognized concern for health care systems, particularly under evolving risk-share payment models, little effort has been made to understand the frequency of imaging leakage or its sources in the academic literature [10]. The limited information that is available indicates that an estimated 20%-30% of imaging referrals are leaked to an out-of-network provider, resulting in the average 300-bed hospital losing about $20 million in revenue per year [11-13]. The purpose of the current study was to determine whether CDS systems contribute to out-of-network leakage for advanced imaging.

METHODS

Subjects and Study Site

This retrospective, HIPAA-compliant study was approved by the institutional review board, which waived the patient consent requirement. The study was performed at a 999-bed, tertiary-care, academic medical center and level-1 trauma center that is part of a larger integrated health care system composed of 10 hospitals. The medical center is urban in location and serves eastern Massachusetts. The radiology department receives imaging referrals from more than 2,500 hospital-based physicians and more than 1,000 community-based physicians, including both primary care physicians (~20%) and specialists (~80%). More than 300,000 outpatient diagnostic imaging studies are performed and interpreted in the radiology department annually, at either the hospital-based outpatient imaging facility or four ambulatory imaging facilities.

Order-Entry CDS System

The order-entry CDS system was first implemented in 2001 and is integrated into a web-based system with which referring clinicians order and schedule diagnostic imaging. The order-entry CDS system is used by more than 98% of clinicians who order an outpatient imaging study from the radiology department. To use the system, an ordering clinician is required to enter the desired imaging test, and then select signs, symptoms, known diagnoses, and/or abnormal prior tests from an examination-specific menu of choices.

The CDS system calculates an appropriateness score, ranging from 1 to 9, for the requested imaging examination, based on modified ACR Appropriateness Criteria. Scores indicate a low (1-3), moderate (4-6), or high (7-9) level of appropriateness. In addition to an appropriateness score for the requested imaging study, the CDS system provides the ordering clinician with alternative imaging studies that might be appropriate and their respective appropriateness scores. Ordering providers have the opportunity to modify their order to gain additional clinical information. They may choose to change their order to one that has a higher appropriateness score, or to cancel the order altogether. However, they may elect to proceed with their initial choice, regardless of the score. The web-based order-entry CDS system prospectively collects and stores information related to any interaction with an ordering provider, whether the interaction results in an ordered examination or a canceled examination. Aggregated appropriateness scores are tracked and reviewed by senior medical leaders.

Collection and Analysis of CDS and Leakage Data

A database of patients who belonged to three risk-shared insurance contracts and had a primary care doctor within the institution was queried to determine where outpatient CT and MRI examinations were performed (as determined by provider payments). The query was performed to cover the three-year study period, from January 1, 2011 through December 31, 2013. The risk-shared insurance contract population was chosen as the study group because our institution receives data for all reimbursed health care services utilized by the patients in this population, whether the service was provided at our institution or another. This choice allowed comparisons of imaging utilization based on the provider of imaging services. Leakage was defined as imaging services performed out of the home hospital. Leakage was subcategorized based on whether the imaging was performed at an affiliated hospital (ie, owned not by our medical center, but by a member of the larger integrated health system) or at a nonaffiliated hospital or imaging center. Other CDS systems for ordering physicians are utilized at 6 of 10 (60%) affiliate hospitals. Given the large number of potential nonaffiliated hospitals and imaging centers, the presence of CDS systems at those locations was unknown.

Over the same study period, the order-entry CDS system at the study institution was queried for all CT and