

Use of Health Information Exchange and Repeat Imaging Costs

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Abstract

Purpose: The aim of this study was to quantify the association between health information exchange (HIE) use and cost savings attributable to repeat imaging.

Methods: Imaging procedures associated with HIE were compared with concurrent controls on the basis of propensity score matching over the period from 2009 to 2010 in a longitudinal cohort study. The study sample (n = 12,620) included patients ages 18 years and older enrolled in the two largest commercial health plans in a 13-county region of western New York State served by the Rochester Regional Health Information Organization. The primary outcome was a continuous measure of costs associated with repeat imaging. The determinant of interest, HIE use, was defined as system access after the initial imaging procedure and before repeat imaging.

Results: HIE use was associated with an overall estimated annual savings of \$32,460 in avoided repeat imaging, or \$2.57 per patient. Basic imaging (radiography, ultrasound, and mammography) accounted for 85% of the estimated avoided cases of repeat imaging. Advanced imaging (CT and MRI) accounted for 13% of avoided procedures but constituted half of the estimated savings (50%).

Conclusions: HIE systems may reduce costs associated with repeat imaging. Although inexpensive imaging procedures constituted the largest proportion of avoided repeat imaging in our study, most of the estimated cost savings were due to small reductions in repeated advanced imaging procedures. HIE systems will need to be leveraged in ways that facilitate greater reductions in advanced imaging to achieve appreciable cost savings.

Key Words: Radiology, utilization, health care costs, electronic health records, health information exchange

J Am Coll Radiol 2015;12:1364-1370. Copyright © 2015 American College of Radiology

INTRODUCTION

Imaging utilization increased rapidly during the first half of the past decade [1]. Although imaging utilization has stabilized [2-5], imaging procedures constitute a large portion of health care expenditures in the United States [6]. The federal Medicare program alone spends \$10 billion annually on medical imaging [7]. Repeat

imaging is a substantial contributor to imaging costs [8,9]. Patients frequently undergo repeat imaging procedures [10], particularly when prior images are difficult to obtain [11]. For these reasons, payers and policymakers have sought to reduce costs associated with repeat imaging [6,7].

Health information exchange (HIE), the electronic sharing of patient information, has the potential to improve the quality and efficiency of care by increasing provider access to patients' medical histories, including recent laboratory tests and imaging procedures [12-14]. Improved access to patients' medical histories may eliminate the need to repeat imaging procedures by making prior images more easily available [11,15,16] or by providing information indicating that a procedure is unwarranted [14].

Despite enthusiasm among policymakers and health policy experts, evidence supporting the ability of HIE to reduce imaging costs is inconsistent. For example, two studies found reductions in the use of neuroimaging and repeat imaging for lower back pain among adults presenting to emergency departments but did not identify

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Dr. Unruh reports personal fees from naviHealth. No other authors have conflicts of interest related to the material discussed in this article.

cost savings [17,18]. Similarly, a recent investigation did not find an association between the implementation of HIE and imaging costs in ambulatory settings [19]. However, the results of two additional studies indicate potential reductions in imaging costs associated with HIE use in emergency departments. One of these studies projected cost savings through HIE on the basis of observed reductions in repeat imaging [20], whereas the other found that some imaging costs decreased with HIE use, but others increased [21]. Conversely, a nationwide analysis of exchange-capable electronic health records cited increased use of imaging, suggesting that these systems were not an effective mechanism for mitigating imaging costs [22]. The results of a more recent study of patients from a 13-county area of western New York State found potential reductions in repeat imaging associated with HIE that varied by imaging modality [23]. However, the study relied on a cross-sectional analysis to identify correlations between HIE use and counts of imaging procedures.

Understanding the relationship between HIE and imaging costs is critical given the nation's \$30 billion investment in health IT [24-26]. Identifying cost savings attributable to specific imaging modalities will provide insights that allow payers and policymakers to better gauge potential savings from HIE use and develop policies that target specific imaging procedures that are more likely to drive efficiency gains from these systems. In this study, we examined the relationship between provider use of HIE and cost savings associated with repeat imaging, including changes in costs associated with specific imaging modalities, using a propensity score-matched cohort from the same population. The more rigorous study design mitigates confounding, and the analysis of specific imaging modalities potentially allows us to identify which procedures generate cost savings through provider use of HIE and which procedures should be targets of additional interventions to reduce costs.

METHODS

Study Setting

We conducted a cohort study of patients who underwent imaging procedures during 2009 and 2010 in western New York State. These patients consented to have their information made accessible to providers participating in the Rochester Regional Health Information Organization (RHIO). The Rochester RHIO is a nonprofit organization that facilitates HIE in a 13-county region [23,27].

The study was approved by the Human Research Protections Office of Weill Cornell Medical College.

HIE Intervention

Hospital systems, federally qualified health centers, private practices, reference laboratories, radiology groups, insurers, and county offices contribute data to the HIE. Authorized physicians, other clinicians, and nonclinical staff members can access patient information through a query-based web portal at the point of care. Data are fed from member sites continuously, giving users access to near real-time discharge summaries, prior diagnoses, radiology reports, medication history, and payer information [28]. More than two-thirds of the region's hospitals and physicians participate in the HIE system. At the time of the study, there were 1,318 authorized users of the HIE.

Data and Study Sample

Two commercial health insurance plans that cover more than 60% of the area's population supplied claims files for the individuals who had provided RHIO consent. Claims were limited to patients aged 18 years and older who were continuously enrolled in one of these plans. The data included six months of claims for each patient after their date of consent. These claims were merged with system logs that automatically track users' access of the HIE. A third-party data aggregation company managed the extraction of claims files and deidentification of patients.

Study participants were limited to patients who underwent imaging procedures within the first three months of their date of consent. This ensured a 90-day follow-up period after imaging. Procedures were identified using Current Procedural Terminology (CPT) codes. The third-party data aggregation company, which supplied the claims files, translated CPT codes to mutually exclusive imaging modality groups and body regions. We created a single indicator for each procedure regardless of the number of associated CPT codes used in billing. Each imaging procedure was defined as a unique combination of modality and body region on a calendar day for a given patient. For example, radiography of the chest and radiography of the abdomen on the same day would be counted as two different procedures. The earliest imaging procedure conducted after a patient's consent was defined as the index procedure, with each participant being observed only once during the study period.

Variables

The primary dependent variable was a continuous measure of costs associated with repeat imaging procedures. To derive our measure of costs, we first defined repeat imaging

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