

Impact of a Commercially Available Clinical Decision Support Program on Provider Ordering Habits

SA-CME

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Abstract

Purpose: Clinical decision support (CDS) software designed around the ACR Appropriateness Criteria assists health care providers in choosing appropriate imaging studies at the time of order entry. The goal of this study was to determine the impact of commercially available CDS on the ordering habits of inpatient and emergency providers.

Methods: In 2014, ACR Select was integrated into our electronic health record, though without displaying appropriateness scores in a “silent” mode for 6 months. Then, feedback regarding examination appropriateness was “turned on” at order entry for adult patients in the emergency and inpatient settings for 24 months. We retrospectively compared the appropriateness scores of imaging tests before and after displaying feedback at order entry and evaluated these data by modality and attending versus trainee status.

Results: The commercially available CDS-generated scores for 34% and 20.4% of pre- and postintervention studies, respectively. After feedback, the relative frequency of low utility studies decreased to 5.4% from 11%, and the relative frequency of indicated studies increased to 82% from 64.5%. This was most pronounced in trainees for whom the percentage of low utility studies decreased from 10.8% (95% confidence interval [CI]: 10.0%, 11.7%) to 4.8% (95% CI: 4.4%, 5.2%) and the percentage of indicated studies increased from 65.6% (95% CI: 64.3%, 66.9%) to 83.7% (83.0%, 84.3%).

Conclusions: After implementation of a commercially available decision support tool integrated into the electronic health record, there was a significant improvement in imaging study appropriateness scores, more pronounced in studies ordered by trainees.

Key Words: Clinical decision support, informatics, appropriateness criteria, health care information technology, health policy

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INTRODUCTION

In response to ballooning health care expenditures, which currently account for approximately 18% of gross domestic product [1], a series of legislative actions have been passed [2,3]. Two recent pieces of legislation, the Protecting Access to Medicare Act of 2014 and the

Medicare Access and CHIP Reauthorization Act of 2015, have attempted to address rising health care costs by shifting focus away from volume-based reimbursement models to payment systems that account for quality and outcomes to derive greater value from health care dollars spent. The significant growth of medical imaging over the past two decades has been singled out as a key driver of increasing health care costs; hence, reducing unnecessary imaging is a potentially modifiable factor that could help reduce overall health care expenditures. In light of this new health care transition from volume-driven care to more value-driven care, radiologists now have an opportunity to help “bend the cost curve” [2] by

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focusing on efforts to improve imaging appropriateness. Clinical decision support (CDS) software integrating appropriateness criteria are one potential way for radiologists to achieve this goal [4,5].

In the outpatient setting, the implementation of locally developed CDS software has been shown to reduce the growth rate of advanced imaging studies [6] as well as reduce the percentage of inappropriate studies being ordered [7]. Improved appropriateness scores with feedback after integration of locally developed CDS software into computerized order entry systems have been described by multiple authors, most recently Moriarity et al [8].

After the implementation of a commercially available CDS platform (ACR Select, version 6, National Decision Support Company, Madison, Wisconsin), several questions developed. How did this program impact the appropriateness of inpatient and emergency imaging tests? Did trainees and attending physicians respond similarly? Was there consistency in performance across imaging modalities?

The purpose of this study was to analyze the impact of a commercially available CDS software integrated with a commonly used electronic health record on the ordering habits of inpatient and emergency providers by modality and provider type (ie, attending, trainee, or midlevel provider).

MATERIALS AND METHODS

This study was performed in compliance with our institutional security policies as well as HIPAA regulations. At our institution, this study qualified as a health care delivery improvement project for which formal institutional review board approval was not required. Our academic health system implemented a commercially available CDS platform (ACR Select) in 2014 and integrated it into the order entry process of our electronic health record (Epic version 2013 initially, then version 2015, Epic Systems Corporation, Verona, Wisconsin). As an early adopter of this young technology, our institution was uncertain of its impact and thus initially operated the CDS in the background or in silent mode in which appropriateness scores were generated and stored but not displayed, and thus could not influence ordering providers for 6 months. After an operational assessment, our institution turned feedback regarding examination appropriateness “on” at order entry so that inpatient and emergency providers of adult patients could see the appropriateness score of the selected test as well as the

scores of alternative tests for the selected structured indication(s).

CDS Application

A commercially available CDS software package, ACR Select, was integrated into our electronic health record in late June 2014. As part of clinical implementation, structured indications for our imaging tests were mapped to appropriateness scores based upon content curated by the ACR [9]. An appropriateness score of 1 to 3, denoted in red, indicates a low utility study or one that is usually not appropriate; a score of 4 to 6, denoted in yellow, indicates an examination of marginal or intermediate utility or one that may be appropriate; and a score of 7 to 9, denoted in green, reflects a well-indicated study or one that is usually appropriate.

At the time of order entry, the referring provider is prompted to select a structured indication for the study. The CDS server is queried and an appropriateness score for the proposed study is generated and stored. During the first 6 months of our implementation, the CDS platform accrued data, but feedback was not offered to the ordering providers at the time of order entry (ie, an alert was not displayed although the data was hidden and stored). For our study, we refer to this operation of the CDS as the “silent mode.” Beginning in January 2015, the CDS was switched to “feedback mode” in which the ordering provider would get a real-time alert indicating the utility of the study ordered, as well as that of alternative examinations, at the time of order entry.

Our institution made an operational decision to activate alerts for adult patients only, because local experts felt that the available pediatric content was limited. Another operational decision was to implement the alerts for inpatients and emergency department patients to allow a period of operational assessment of this technology before expanding to outpatients. At the time of this writing, our institution had implemented CDS for outpatients in June 2017; however, this article is focused on the greater experience with inpatient and emergency department settings.

Data Collection

We retrospectively retrieved de-identified data regarding advanced imaging orders (ie, MRI, CT, nuclear medicine [NM] and PET, and ultrasound [US]) for the 6 months (ie, July to December 2014) of silent mode and the subsequent 24 months (ie, January 2015 to 2017) of feedback mode. These orders comprised 23,912

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