Correlation of the Strength of Recommendations for Additional Imaging to Adherence Rate and Diagnostic Yield

SA-CME

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Abstract

Purpose: The aim of this study was to evaluate the association between the wording of radiologist recommendations for chest CT with the likelihood of recommendation adherence and the diagnostic yield of the recommended follow-up CT imaging.

Methods: This HIPAA-compliant retrospective study had institutional review board approval, including waiver of the requirement for patient consent. All outpatient chest radiographic (CXR) studies performed at a tertiary care academic medical center in 2008 (n = 29,138) were searched to identify examinations with recommendations for chest CT. The wording of chest CT recommendations was classified as conditional or absolute, on the basis of whether the recommendation stood independent of the clinical judgment of the ordering clinician. Using the radiology information system, patients who underwent chest CT within 90 days of the index CXR study containing the recommendation were determined, and the CT studies were evaluated to determine if there were abnormalities corresponding to the CXR abnormalities that prompted the recommendations. Corresponding abnormalities were categorized as clinically relevant or not, on the basis of whether further workup or treatment was warranted. Groups were compared using *t* tests and Fisher exact tests.

Results: Recommendations for chest CT appeared in 4.5% of outpatient CXR studies (1,316 of 29,138; 95% confidence interval [CI], 4.3%−4.8%); 39.4% (519 of 1,316; 95% CI, 36.8%−42.0%) were conditional and 60.6% (797 of 1,316; 95% CI, 58.0%−63.2%) were absolute. Patients with absolute recommendations were significantly more likely to undergo follow-up chest CT within 90 days than patients with conditional recommendations (67.8% vs 45.8%, respectively, $P < .001$). Despite this difference in provider adherence, there was no significant difference between the conditional and absolute recommendation groups with regard to the incidence of clinically relevant corresponding findings ($P = .16$) or malignancy ($P = .08$) on follow-up CT.

Conclusions: Conditional radiologist recommendations are associated with decreased provider adherence, though the likelihood of a clinically relevant finding on follow-up CT is no different than with absolute recommendations.

Key Words: Recommendation, strength, radiology reporting, adherence, diagnostic yield

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INTRODUCTION

Imaging is an integral tool in the diagnosis and management of patients, providing data essential for clinical decision making. In addition to providing an interpretation of an imaging study, as many as 10% of diagnostic imaging studies will include recommendations for additional imaging (RAIs), and studies suggest that the frequency of RAIs is increasing [1,2]. In making an RAI, a radiologist provides an ordering physician with guidance about how to proceed with patient care. A radiologist may recommend follow-up imaging for a wide variety of reasons, including uncertainty about whether a finding is real or artifactual, the need to further characterize an ambiguous lesion, or the need to assess the temporal stability of an indeterminate lesion. Studies have shown compliance rates with RAIs varying from 30% to 77% [3-7].

When making an RAI, a radiologist may phrase the recommendation more or less strongly, depending on the

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impetus for the recommendation or the radiologist's reporting style. One way in which a radiologist may alter the strength of a recommendation is by wording an RAI in conditional language. For example, using conditional wording, a radiologist might write, "Consider follow-up chest CT, if clinically indicated." This wording expressly communicates that the necessity of the follow-up imaging is dependent on the clinical judgment of the ordering clinician. Worded in absolute language, the recommendation sounds stronger: "Follow-up chest CT is recommended." The absolute recommendation stands independent of the clinical judgment of the ordering clinician.

Little is known about how the wording of recommendations correlates with the adherence rate and timing of the recommended imaging studies. To that end, in a recent study, Al-Mutairi et al [8] found that language in a radiology report communicating doubt about the results did not affect the timeliness of follow-up, but the study design was not limited to the language of the recommendation. Likewise, we are unaware of any study correlating the strength of a recommendation to the diagnostic yield of the recommended follow-up imaging. The objective of this study was to evaluate the association between the wording of radiologist recommendations for chest CT and the likelihood of recommendation adherence and the diagnostic yield of recommended follow-up CT imaging. This was studied in the common context of an outpatient chest radiographic (CXR) prompting an RAI for chest CT.

METHODS

Study Population

The retrospective study was HIPAA compliant and approved by the institutional review board under an expedited protocol for analyzing anonymous aggregated radiology data, including waiver of patient consent. The study was performed at a 907-bed tertiary care academic medical center with a large referral base serving a catchment area of eastern Massachusetts. The radiology department includes more than 100 staff radiologists and interprets more than 450,000 outpatient diagnostic imaging studies annually.

Patient Selection

Using a custom-designed software program, the radiology reports of all outpatient diagnostic posterior-anterior and lateral CXR examinations interpreted by radiologists at our institution in 2008 were searched for the character string "recommend." It was the practice within the department to include recommendations in a separate section of the report in a dedicated "Recommendations" field. This dedicated field permitted our search strategy to identify recommendations, even if the recommendation language did not actually include the character string "recommend," such as "Consider chest CT" or "Further evaluation with chest CT, if clinically indicated." Query results were returned as a single row of data for every unique study, including the patient identification number, patient date of birth, patient gender, examination accession number, date of examination, interpreting radiologist, and examination report text. Duplication related to multiple billing codes, multiple accession numbers or addendums was avoided.

Radiographic and CT Interpretation

Posterior-anterior and lateral CXR studies were performed on AGFA computed radiographic and GE digital radiographic units at average tube current—time products of 1.5 mAs (posterior-anterior studies) and 6 mAs (lateral studies) at 120 kV using a phototimer and a grid. Chest CT examinations were performed on 16- and 64-slice GE and Siemens CT scanners with an average pitch of 1.375 and a typical slice thickness of 2.5 mm at an average of 120 kV, with tube current modulation (range, 120—350 mA). Use of intravenous contrast was based on standard departmental protocols incorporating ordering provider preferences.

CXR and chest CT studies were interpreted primarily by board-certified thoracic radiologists with 2 to 40 years of experience (mean, 19.5 $\pm$ 14.2 years) on a dedicated PACS workstation (AGFA Diagnostic Software, Impax, version 5.3.2; AGFA, Ridgefield Park, New Jersey). No instruction was provided regarding study interpretation or use of recommendations, and computer-assisted detection software was not used at the time of image interpretation.

Evaluation of Examination Recommendations

The reports returned by the query were manually and retrospectively reviewed to determine if a recommendation for chest CT was made, and if so, the recommendation for chest CT was further characterized by a single board-certified radiologist to determine whether the wording of the recommendation most reflected conditional or absolute language. Recommendations were considered absolute if they stood independent of the clinical judgment of the ordering clinician, as described previously. Absolute CT recommendation rates were calculated for the entire sample and individually for the 11 interpreting thoracic radiologists.

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