Original Investigation

Patients' Use and Evaluation of an Online System to Annotate Radiology Reports with Lay Language Definitions

Tessa S. Cook, MD, PhD, Seong Cheol Oh, MD, Charles E. Kahn Jr, MD, MS

Rationale and Objectives: The increasing availability of personal health portals has made it easier for patients to obtain their imaging results online. However, the radiology report typically is designed to communicate findings and recommendations to the referring clinician, and may contain many terms unfamiliar to lay readers. We sought to evaluate a web-based interface that presented reports of knee MRI (magnetic resonance imaging) examinations with annotations that included patient-oriented definitions, anatomic illustrations, and hyperlinks to additional information.

Materials and Methods: During a 7-month observational trial, a statement added to all knee MRI reports invited patients to view their annotated report online. We tracked the number of patients who opened their reports, the terms they hovered over to view definitions, and the time hovering over each term. Patients who accessed their annotated reports were invited to complete a survey.

Results: Of 1138 knee MRI examinations during the trial period, 185 patients (16.3%) opened their report in the viewing portal. Of those, 141 (76%) hovered over at least one term to view its definition, and 121 patients (65%) viewed a mean of 27.5 terms per examination and spent an average of 3.5 minutes viewing those terms. Of the 22 patients who completed the survey, 77% agreed that the definitions helped them understand the report and 91% stated that the illustrations were helpful.

Conclusions: A system that provided definitions and illustrations of the medical and technical terms in radiology reports has potential to improve patients' understanding of their reports and their diagnoses.

Key Words: Radiology reports; lay language; patient-centered radiology; evaluation.

INTRODUCTION

The increasing availability of patient portals—personalized access to the electronic health record—has made it easier for patients to access appointment information, medication lists, and test results online (1–4). A survey of adult outpatients undergoing imaging within an academic health system revealed that 64% of respondents were interested in receiving an electronic copy of their radiology report in its original form (5). A cross-sectional study of more than 100,000 patients within a single health system demonstrated that 51% of the patients who had access to their radiology reports viewed their reports online (6).

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From the Department of Radiology, Perelman School of Medicine, University of Pennsylvania, 3400 Spruce St., Philadelphia, PA 19104 (T.S.C., C.E.K.); Institute for Biomedical Informatics, University of Pennsylvania, Philadelphia, Pennsylvania (T.S.C., C.E.K.); Department of Radiology, Geisinger Wyoming Valley Medical Center, Wilkes-Barre, Pennsylvania (S.C.O.); Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia, Pennsylvania (C.E.K.). Received January 29, 2017; revised March 3, 2017; accepted March 7, 2017. **Address correspondence to:** C.E.K. e-mail: charles.kahn@uphs.upenn.edu

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Radiology reports historically have been composed to communicate findings to the ordering physician and guide the next steps in a patient's management (7). Even though patients now can access their imaging reports, they often find it difficult to interpret the medical jargon contained in these results (8). In many cases, they also do not fully appreciate the rationale for undergoing an imaging test (9). Furthermore, the difficulty in understanding reports reviewed online in the absence of a discussion with a physician on the care team may result in miscommunication and unnecessary patient anxiety (10,11). To mitigate this anxiety, most patient portals release results after a fixed delay to allow ordering physicians to contact patients directly and discuss abnormal test results before patients can view the results online. A survey of referring physicians did not indicate that they experienced an increased workload as a result of the introduction of patient portals or the implementation of the delay in releasing results to patients (12).

Patients who send radiology-related messages to their providers through an electronic portal are most often interested in obtaining the results of their imaging examinations (13). As such, it is becoming increasingly important for radiologists to convey results of imaging examinations such that they are both appropriate for the ordering physician, but also

consumable by the patient without a medical background. However, expecting two reports to now accompany every imaging study is not practical. We sought to understand patient sentiment about Patient-Oriented Radiology Reporter (PORTER), a web-based application to annotate reports, that was applied to reports generated for magnetic resonance imaging (MRI) of the knee (14). In this manuscript, we discuss the use and evaluation of this application by patients who accessed and reviewed their annotated reports through PORTER's web-based user interface.

METHODS

The organization's institutional review board approved the HIPAA (Health Insurance Portability and Accountability Act) compliant study protocol; informed consent was waived. From August 1, 2015 to February 29, 2016, we included a "Dear Patient" statement in the radiology department's default report template for knee MRI. The statement invited patients to view their report at the PORTER web address (Fig 1). The statement included the examination's accession number, which is an 8-digit number that uniquely identified each radiology examination in our department. Our institution does not consider the accession number to be protected health information. Patients used their examination's accession number, either through the online viewing portal or on printed copy of their report, in combination with their date of birth to gain access securely to the web site and view their knee MRI report.

When patients logged in during the trial period, the system recorded the patient's login time, retrieved their report, and searched for matching terms from a custom-built glossary of 310 terms (14). Each of the 190 primary terms included relevant abbreviations and alternate forms, and provided a lay language definition. When the user's mouse hovered over or clicked on an underlined term, PORTER displayed that term's definition as a pop-up balloon (Fig 2). We tallied the numbers of unique terms and total terms in each report; for example, if a report contained the term "medial meniscus" three times, that would count as one unique term and three total terms.

Alternate forms were shown with their primary term; for example, if the abbreviation "PCL" appeared in a report, the system displayed "posterior cruciate ligament (abbrev. PCL)." If available, a link to the corresponding Wikipedia page was displayed. If an image was available, it was displayed in a sidebar next to the report text and was updated as the user hovered over different terms. The system recorded the terms over which

Bones: Small tricompartmental osteophytes.
Soft Tissues: Mild prepatellar edema. There is also a multi loculated extra-articular fluid collection seen between the medial tibial plateau and the MCL, in keeping with bursitis.

DEAR PATIENT: Your knee MRI report is explained online at [redacted]. Enter this exam number ([redacted]) and your date of birth to view the explanation.

IMPRESSION:
1. Tricompartmental osteoarthritis, with moderate effusion and synovitis.

2. Tear of the posterior horn of the medial meniscus.

Figure 1. Part of a radiology report as shown in the patient portal. The web address and examination accession number have been obscured. MCL, medial collateral ligament; MRI, magnetic resonance imaging.

CONTRAST: None.

COMPARISON: Left knee radiographs from 11/5/2014.

FINDINGS:

Fluid: Large effusion.

medial collateral ligament
Ligament in the inner side of the knee W

posterior horn extending to the inferior to the undersurface with edema in the underlying tibial plateau.
- Medial collateral ligament: Edema surrounding the ligament in keeping with a grade 1 sprain.
- Cartilage: Intact.

Lateral compartment:
- Lateral meniscus: Radial tear of the posterior horn with a displaced fragment into the

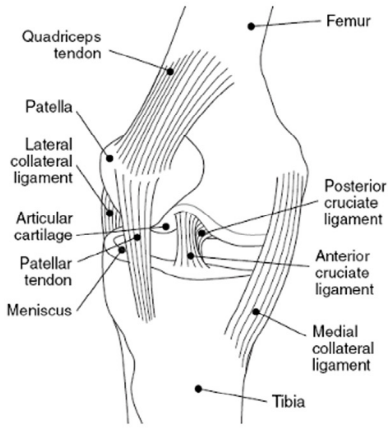

Figure 2. Part of a patient's radiology report as presented by PORTER (Patient-Oriented Radiology Reporter) shows the user hovering over a term ("medial collateral ligament"). The definition is shown in the yellow pop-up window; the "W" icon offers a link to a related Wikipedia page. A corresponding illustration appears on the right of the screen. Color version of figure is available online.