Patient-Centered Radiology Reporting: Using Online Crowdsourcing to Assess the Effectiveness of a Web-Based Interactive Radiology Report

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Abstract

Purpose: The aim of this study was to evaluate the effectiveness of a patient-centered web-based interactive mammography report.

Methods: A survey was distributed on Amazon Mechanical Turk, an online crowdsourcing platform. One hundred ninety-three US women ≥18 years of age were surveyed and then randomized to one of three simulated BI-RADS® 0 report formats: standard report, Mammography Quality Standards Act–modeled patient letter, or web-based interactive report. Survey questions assessed participants' report comprehension, satisfaction with and perception of the interpreting radiologist, and experience with the presented report. Two-tailed t tests and χ^2 tests were used to evaluate differences among groups.

Results: Participants in the interactive web-based group spent more than double the time viewing the report than the standard report group (160.0 versus 64.2 seconds, $P < .001$). Report comprehension scores were significantly higher for the interactive web-based and patient letter groups than the standard report group ($P < .05$). Scores of satisfaction with the interpreting radiologist were significantly higher for the web-based interactive report and patient letter groups than the standard report group ($P < .01$). There were no significant differences between the patient letter and web-based interactive report groups.

Conclusions: Radiology report format likely influences communication effectiveness. For result communication to a non-medical patient audience, patient-centric report formats, such as a Mammography Quality Standards Act–modeled patient letter or web-based interactive report, may offer advantages over the standard radiology report. Future work is needed to determine if these findings are reproducible in patient care settings and to determine how best to optimize radiology result communication to patients.

Key Words: Patient-centered, mammography, crowdsourcing

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INTRODUCTION

Health care expenditure in the United States accounts for 17.5% of the nation's gross domestic product and is one of the nation's largest societal issues [1]. Studies have shown that patients who are more engaged in their health care experience better outcomes at a lower cost [2,3]. Partly in response to the 2009 Health Information Technology for Economic and Clinical Health Act, many health care systems are implementing online portals to provide patients access to their medical records [4]. In 2015, 92% of Americans had online access to their medical records, up from 43% in 2013 [5]. In one study performed at an imaging center, more than 75% of patients indicated a preference for receiving radiology results through an online portal compared with traditional methods of communication, such as phone calls, letters, and repeat physician visits [6]. Recent data from a large academic medical center

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showed that of the >60,000 patients with online access to radiology reports, more than half viewed their reports [7]. One of the goals of providing patients online access to their medical records is to increase patient engagement and potentially improve health outcomes [8]. However, the full potential of this goal may be unrealized, in part because much of the content in online patient portals is communicated in medical terms that patients may not fully understand [9]. The radiology report, in its current form, is a technical document written in medical terminology, intended primarily for other medical professionals and not directly for patients [10]. Thus, the conventional radiology report is one example of the possible unrealized potential of online patient portals.

The Mammography Quality Standards Act (MQSA) requires mammography facilities to provide patients a summary of their results, written in lay terms, within 30 days, including clear follow-up directions [11]. Despite this mandate, studies suggest that patients often fail to understand their results. For example, in one study of 970 women, approximately half of women with mammographic abnormalities did not understand that their results were abnormal [12]. This extrapolates to 2 million women annually who, after receiving the results of their screening mammographic examinations, may still not understand that their results are abnormal [13].

Online crowdsourcing offers a unique opportunity to perform survey-based research in health care. Amazon Mechanical Turk (MTurk) is one such platform, allowing users to perform web-based tasks in exchange for minor monetary compensation. MTurk provides researchers means to collect large volumes of data from a diverse population expeditiously and at relatively low cost and has been previously used in evaluation of consumer health tools. For example, Yu et al [14] used MTurk to evaluate subject comprehension of medical pictograms. Other investigators have used MTurk to obtain feedback on oral health promotion materials and assess patient portal usability and lung cancer health literacy [15,16]. Given the growing interest and need for effective patient communication in radiology reports, crowdsourcing platforms such as MTurk may offer an efficient strategy to study the effectiveness of radiology communication to an audience that lacks medical literacy.

Our purpose was to evaluate the effectiveness of a web-based interactive radiology report by using online crowdsourcing. This web-based interactive radiology report was created to improve patients' understanding of imaging results. This interactive report is not meant to replace the standard radiology report, but rather to supplement the standard report by conveying the salient contents of the report in a patient-centered manner. Namely, the platform uses narrative-style, patient-friendly terminology (ie, plain language void of technical medical terms or medical jargon) as well as interactive diagrams to explain imaging findings and convey the radiologist's follow-up recommendations. We specifically sought to compare report comprehension, satisfaction with and perception of the interpreting radiologist, and report viewing experience between this web-based interactive radiology report and more conventional forms of communication of radiologic results, including the standard radiology report and a MQSA-modeled patient letter.

METHODS

A survey was designed to compare measures of report comprehension, satisfaction with and perception of the interpreting radiologist, and report viewing experience among three radiology reporting styles for mammography: (1) the standard radiology report, (2) a patient letter modeled after MQSA requirements, and (3) a web-based interactive report (Fig. 1). The survey was distributed on MTurk, an online crowdsourcing platform [17]. Survey responses were gathered over 2 hours via voluntary participation of MTurk users (known as Turkers). Participants were asked to confirm their gender and select their age group (18-24, 25-44, 45-64, or ≥65 years of age) before survey initiation. Inclusion criteria for survey participation were female gender, US residency, and age greater than 18 years. Participants were compensated $1 for survey completion. The survey construction ensured that each participant completed only one survey.

After viewing a brief set of instructions, participants were randomized to one of the three versions of a simulated BI-RADS® 0 mammography report: the standard report, a MQSA-modeled patient letter, or a web-based interactive report (Fig. 1). Each of these three reports contained the same imaging BI-RADS 0 result, indicating an incomplete study and necessity for further imaging. The length of time each participant spent viewing the report was recorded. After report viewing, participants completed a series of questions relating to the report. The survey questions are shown in Online Appendix 1.

The first portion of the survey assessed participants' comprehension of report content. As a subjective measure of report comprehension, participants were asked to rate their overall understanding of the report on a 5-point scale, ranging from "understood 0%" to "understood 100%," in