# Making Feedback Easy: A Workflow-Integrated Quality Improvement Tool Increases Radiologist Engagement in the Technical Quality of Imaging Examinations

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## DESCRIPTION OF THE PROBLEM

Consistent diagnostic image quality along with timely and accurate performance of technical and clerical tasks is a requisite for high-level radiology patient care. To achieve these goals, radiologist input into the process of image acquisition is of paramount importance. At fast-paced, high-volume, or multisite radiology practices, where radiologists' time is limited and subspecialty oversight is often distributed, there are many challenges to the efficient delivery of constructive feedback and discovery of technical failure patterns.

In recent years, our department within a large urban academic medical center has expanded to include four hospitals (the primary West Campus, the North Campus, and two East Campus sites) and 11 outpatient imaging centers. This enterprise now performs approximately 700,000 examinations per year and employs 300 technologists, 83 faculty members, 40 residents, and 13 fellows. As new sites were incorporated, an effort was made to ensure that consistent technical image quality was achieved across our multisite, high-volume practice.

During this process, it became apparent that the reporting system used to identify technical issues was cumbersome and heterogeneous across sites, resulting in underreporting of suboptimal studies (with limited numbers of reported issues per site, suggesting underreporting), limiting our ability to identify and address deficiencies. Paper forms were available at the primary hospital site, whereas off-site radiologists relied on less formal feedback methods, such as e-mail or phone conversation with supervisors. At some sites, a technologist supervisor would oversee multiple modalities, whereas other sites relied on modality-specific technologists. Because of variability in radiologist and trainee schedules, radiologist cross-coverage of multiple sites from different locations, and a growing technologist workforce, there was confusion as to how and to whom constructive feedback should be provided. This issue was particularly apparent when image interpretation was not contemporaneous with the examination being performed (unlike real-time review of ultrasound images) or when interpretation occurred at a site different from where the examination was performed. These barriers to communication contributed to inefficient and ineffective feedback. This led to a feeling among radiologists that there was little that they could do to guide improvements in image quality and technical service.

From a systems standpoint, this process lacked a method of aggregating issues to allow the detection of enterprise-wide opportunities for improvement. Feedback communicated successfully to a particular technologist or supervisor stopped with that individual. There was no ability to analyze trends or to share these "teachable moments," to avoid repeating the same error. Despite some issues being discussed at intercampus quality assurance meetings, there was no mechanism for determining whether an issue represented an enterprise problem, necessitating more comprehensive workflow reengineering, or a local problem affecting a single site or technologist.

In a Just Culture, individuals are not held accountable for errors attributable to failure of the system in which they operate. Cultivating a nonpunitive culture, in which suboptimal outcomes are openly discussed, allows gaps in system design to be addressed and performance to improve [1]. Applying


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a Just Culture framework to assess and address suboptimal performance of allied health personnel in radiology is challenging [2]. We describe our attempt to engage radiologists in delivering actionable feedback on imaging quality, within a Just Culture framework.

## INTERVENTION

To address these problems, in the spring of 2016, the first author (S.G.-S.) partnered with the second author (O.K.), an IT specialist on staff at the medical center, to design and implement a web-based program (okQA) for technologist feedback. We did so after determining that no stand-alone tool was available commercially and that our PACS (Centricity; GE Medical Systems, Milwaukee, Wisconsin) and dictation software (PowerScribe 360; Nuance, Burlington, Massachusetts) did not have a comprehensive solution to meet these needs.

okQA is a system for reporting and tracking quality issues relating to the technical performance of imaging examinations and to provide positive feedback for exceptional performance. The tool is launchable from the EPIC (Epic Systems Corporation, Verona, Wisconsin) electronic medical record and the PowerScribe 360 voice recognition system and consists of a web application and a database, all residing inside the hospital firewall. The examination information is passed directly into the okQA submission page, and the radiologist selects an issue from a modality-specific list and provides written comments if necessary. Modality- and site-specific routing of submitted cases occurs at the time of submission, and local technologist managers were requested to address and respond to submissions within 36 hours. A postfeedback e-mail to the submitting radiologist or trainee is generated automatically once the issue is addressed by the tech manager, to allow the "loop to be closed" with the radiologist who reported the case. Cases track to a searchable database that sorts data by date, site, modality, issue, technologist and submitting radiologist. Statistical reports are built in for ease of review on a monthly basis. The goals of this tool were threefold.

### Increase Radiologist Engagement

The first goal was to lower the bar for radiologist input into the technical quality of an examination. To accomplish this, the program was integrated directly into the radiology department's dictation software and electronic medical record. Training sessions, department memos, staff meeting announcements, and reading room visits by IT and radiology liaisons strengthened radiologists' familiarity with case submission.

### Identify Systems Issues and Areas of Common Weakness

The second goal was for information generated to guide quality improvement initiatives, including education of technologists and protocol standardization. A robust searchable database was created to allow customized monthly reports and data mining by both site managers and quality improvement leadership, to identify common, repeating, or systemwide issues.

### Encourage Improvement Through Just Culture

The third goal was to place this initiative into a Just Culture framework to maximally encourage reporting, learning, and an iterative cycle of improvement and error prevention for technologists. This was accomplished through integration with our Technologist Review Committee, a peer-review body governed by nonpunitive Just Culture principles, in accordance with hospital policy.

## OUTCOMES

### Increase Radiologist Engagement

To determine the program impact on radiologist engagement, we analyzed reported suboptimal cases for each modality (computed radiography, CT, ultrasound, and MRI), relative to overall volume of cases of that modality, performed during 6 months before (February to July 2016) and after (September 2016 to February 2017) program introduction, at the primary hospital site. The month of program introduction (August 2016) was excluded. Only the main hospital was studied for impact because baseline data were extractable from forms that were submitted and tracked for monthly quality assurance meetings there, whereas at the other sites e-mails and phone calls made to various supervisors were not tracked. The Fisher exact test was applied to evaluate clinical significance. Odds ratios (ORs) were calculated.

At the primary hospital, during the 6 months before program introduction, 10 (of 71,020) radiographic, 6 (of 20,335) CT, and 34 (of 15,011) ultrasound suboptimal examinations were reported, whereas in the 6 months after program introduction, 75 (of 80,742) x-ray (OR, 7.66; 95% confidence interval [CI], 3.962-14.831), 83 (of 22,401) CT (OR, 14.759; 95% CI, 6.443-33.807), and 78 (of 16,400) ultrasound (OR, 2.491; 95% CI, 1.664-3.729) suboptimal examinations were reported ($P < .001$ for each). Reported suboptimal MRI studies increased from 0 (of 6,701) to 24 (of 7,627) examinations. Praise for exceptional