BOOMERANG: New Software

1. **Highlights Changes** between Preliminary vs. Final versions of Radiology Reports to Improve Feedback to Residents and Fellows.

2. **Search Past Reports** for Interesting Cases or Follow-up.

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**SCREEN SHOTS:**

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**Background:**

Traditional feedback provided to radiology trainees on their reports is sporadic and limited. Thorough feedback requires significant time and effort, and is also logistically difficult. Radiologists in training (residents and fellows) generate preliminary reports containing their interpretation of the images. These reports are sent electronically to the attending radiologist to be signed to become final reports. The attending may ask the preliminary report to change the findings, interpretation of lesions, recommendations, or specificity of language. Due to the typically high volume of reports is impractical for the attending to review and provide prompt feedback. Over time, this feedback dysfunction can lead to negative experiences, loss of time, and may result in missed opportunities for learning.

Most feedback is provided by the attending radiologist individually, after several days, or via e-mail. Unfortunately, this is less efficient than expected and often doesn’t reach all residents and fellows. This method of feedback is non-standardized, inconsistent, and often not received in a timely manner. The attending’s feedback is dependent on their schedule and their ability to communicate with the residents.

**Boomerang**, a web-based program developed to periodically fetch all new radiology electronic reports and their revisions, highlights the changes, and present these to the trainees and attendings. Radiology trainees can securely login with a username and password using any web browser on either a computer or portable device. They are then presented with a scrollable page containing all of their recent reports, with all changes clearly marked. Deletions are marked by red highlight and strike-through, while additions are highlighted blue. Reports with unchanged changes are easily identified by light-green backgrounds and absence of red highlights. Preliminary reports that have not yet been edited/approved by the attending are displayed separately with gray backgrounds.

This program allows the trainees to easily see added text in their reports, and thus provides valuable educational feedback without requiring any additional time or effort from the attendings. Attendings also benefit: time spent on feedback is reduced, and trainees are made aware of common minor stylistic changes, resulting in the trainee adopting these in their reports sooner.

Trainees can download the views of their reports. All reports, including those reports can no longer displayed from a previous view, are generated daily. The technical implementation of Boomerang utilizes the PHP programming language and a database that stores multiple revisions of the reports and authorized users (configurable for MySQL/SQL Server, or both). The reports are obtained by polling the underlying database of the dictation software. This has been tested with Amsterdam e-VOC dictation servers, with tested installations on servers carrying either Linux (SLES 12.04, CentOS 5.9, or Microsoft Windows Server). Other server operating systems were not tested, but most are likely compatible due to the portability of PHP and MySQL.

Attendings can use any computer with a web browser (such as Windows, Apple, or portable devices), and can log-in using either their password specific to Boomerang, or institution-wide password authenticated against institutional LDAP servers. The LDAP (Lightweight Directory Access Protocol) authentication facilitates user management, especially if institutional policy mandates periodic changes to the passwords, allowing such changes to be automatically propagated to Boomerang, and users can have the same passwords as for other applications such as PACS or electronic health record. Gradually highlighted changes can be configured to either whole words (default), sentences, or characters. Due to the necessity to protect patients’ health information, deployment on firewall protected hospital network utilizing HTTPS/SSL is suggested.

**Discussion:**

Automated improvement in feedback to radiology trainees would facilitate their education as they would be exposed to report changes. This in turn can result in improvement in the quality of subsequent preliminary reports. The tool is particularly helpful for overnight reports, since the attending resident may not have the opportunity to discuss all the cases with all of the morning subspecialty attendings. It also provides an opportunity for real-time feedback to the residents who are working that night. This immediate feedback allows for real-time training and feedback. The trainees can attend meetings, read the feedback, and use it to improve their training and feedback for future reports, or for those cases where the attending is not available.

**Conclusion:**

Boomerang software has been deployed at our institution leading to improvement in feedback to trainees on their preliminary reports. The feedback is asynchronous, complete, and non-judgmental. The tool is being used for all preliminary reports.