RadChanges: An Automated Tool to Improve Radiology Resident Learning

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Hypothesis

A learning tool, which can automatically display the differences between the preliminary radiology resident report and the final signed attending radiologist report, will improve radiology resident education, and may be useful for radiology resident evaluation.

Introduction

Reviewing changes between preliminary reports and the final report can be challenging for radiology residents. Our goal is to increase resident engagement in the learning process by actively reviewing changes made by the attending in an efficient way.

For a radiology resident to learn from a preliminary report at many hospital systems, such as Columbia University Medical Center, the resident must remember the initial preliminary report, and then assess differences between his or her memory and the final signed report. Subtle stylistic word choice changes to preliminary reports are generally even more challenging for radiology residents to review since the final report and preliminary report appear visually nearly identical to each other. This process poses significant cognitive fatigue for the resident, thereby making them less likely to review changes in final reports, unless specifically alerted to them by the attending radiologist or their own inclination for select cases.

This problem can be exacerbated by different factors, particularly when radiology residents have a high volume of studies to perform. In the overnight call environment, radiology residents usually are not able to review the finalized report until the overnight call shift is completed. The finalized report is often not completed until the morning or day after the overnight call shift, which is when the resident is off hours to rest for their next subsequent shift; the only option then is to review the study at a later date, however at this point, memory retention is significantly decreased.

We examine the utility of a tool designed to solve this problem, RadChanges. RadChanges was created to automatically display the changes made between the resident’s preliminary report and final signed attending report. This tool also enables the resident to sort their reports so that final signed reports with the most significant changes can be reviewed first.

Methods

A secure web application with a customized dashboard (Figure 1-3) was created within Columbia University Medical Center’s InfoNet, only accessible by employees within the hospital network.
The web application was specifically modeled after the radiology-reporting platform (PowerScribe 360, Nuance Communications, Burlington, MA) utilized at Columbia University Medical Center’s Department of Radiology, to optimize familiarity for new users.

Figure 1

Figure 2
The Levenshtein distance is an algorithm, which provides the minimal distance between two sets of strings. This thus allows two text documents to be easily compared, noting how many changed characters are required to arrive from the original document (preliminary report) to the final document (final signed report). Implementations of Levenshtein distance can also be applied so that differences between documents are assessed in words, instead of characters.

Levenshtein distance was implemented such that reports on the Radiology Information System (RIS) could be compared: specifically so that the preliminary report and final reports for any given resident report could be compared. The specific text differences (Figure 2) between the preliminary report and final report were visually highlighted in color: text that needed to be added to the preliminary report was marked green, and text that needed to be deleted from the preliminary report was marked red.

A search portal (Figure 1) was created for the website so a resident could search a range of reports performed for any given date, sorted by the Levenshtein distance (Figure 3) in characters or Levenshtein distance in words. All radiology residents at Columbia University Medical Center were given access to their individual reports so they could review changes between the preliminary report and final report.
Results

RadChanges effectively displays differences between radiology resident reports and the final signed attending radiologist report. An empirical survey of residents at CUMC who have tried the beta version of the RadChanges after being “on call” have provided enthusiastic feedback on its utility.

Discussion

There is a growing trend in radiology that has increased the workload as assessed by the number of imaging examinations interpreted by diagnostic residents. This increased workload makes it essential to optimize the resident learning and review process. RadChanges helps address this problem by selectively providing the radiology resident the most vital reports to review first.

While RadChanges has proved useful in its initial implementation, it does have some limitations, which may limit its use in certain contexts. One of the most significant limitations we observed is that there is significant variation in the degree to which different radiology attendings modify the style of the preliminary report, without changing the underlying recommendation and diagnoses conveyed. This may limit RadChanges utility in assessing resident performance, as attendings that prefer changing preliminary reports to match their own dictation style will have a higher (character and word change) score, as opposed to attendings who prefer making the minimal changes deemed necessary.

Further advancements to RadChanges are intended, to help determine if specific diagnoses are missed by radiology residents and to improve the search functionality to identify select reports. As residents use the tool for a longer duration of time, we will also further analyze RadChanges utility for resident education.

Conclusion

Tools like RadChanges are effective for providing another resource for radiology resident education and should be readily available. Ongoing data collection and analysis will be performed to assess the utility of RadChanges on radiology resident education.

References


Keywords

resident education dictation automated tools