Do Picture Archiving and Communication Systems Improve Report Turnaround Times?

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Radiology departments are beginning to embrace new technologies to decrease operating budgets and improve services. One of these technologies is the picture archiving and communication system (PACS). PACS, through immediate availability of images to the radiologist, promises to decrease turnaround times of reports to the clinician. The purpose of this study was to determine if this technology actually decreases the time for referring clinicians to receive reports generated by the radiologist. The time to provide a preliminary report by a resident and time to finalize this report by a board-certified radiologist was retrospectively obtained for 6,022 abdominal and pelvic computed tomography (CT) scans over two 1-year periods from March 1, 1997 to March 1, 1998 and from March 1, 1998 to March 1, 1999. During the first year, interpretation was conducted using hard-copy film and during the second using PACS. In both 1-year periods, Med-Speak voice recognition software (IBM, White Plains, NY) was employed for dictation. The average time for a preliminary report for a abdominal and pelvic CT, dictated by a resident or fellow, to be available in alphanumeric form on the hospital information system using hard-copy film was 3.73 days. The installation of a PACS system decreased this turnaround time to 0.56 days, representing an 85.0% improvement. The time to availability of final reports, ie, signed by board-certified staff radiologists, was 5.49 days in the hard-copy interpretation subset and 5.97 days in the PACS subset. The addition of PACS into an academic gastrointestinal radiology division improves availability of alphanumeric preliminary reports of abdominal and pelvic CTs on the hospital information system (HIS), dictated by a resident or fellow, by 85.0%. There was no impact with a PACS on the time to final sign reports by a staff board certified radiologist as signing patterns remained relatively constant over the two interpretation formats.

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THE PAST DECADE has seen an explosion in the application of information technologies within the field of radiology. Picture archiving and communication systems (PACS) have enabled departments across the country to become "filmless" by using the digital medium for the creation, transfer, and interpretation of images. While the benefit experienced by the PACS solution is primarily by the radiology department and the institution, the applications are truly beyond these physical barriers and can encompass the "enterprise."^{1,2} One of the first objectives of the PACS at the Massachusetts General Hospital was to improve

report turnaround times. PACS was a technology that enabled this effort and promised to allow improved operations by impacting interpretation report turnaround times. The improved report turnaround times for studies routed through PACS versus conventional hard-copy film were also identified by several vendors in the request for proposal (RFP) process; however, few data existed to substantiate this claim. Thus, the purpose of this study was to determine if PACS technology actually decreased the report turnaround time or the time for referring clinicians to receive reports generated by the radiologist.

Prior to the implementation of a PACS within the abdominal imaging division of our department, we had begun the installation of a voice recognition system to gain the benefits of this technology. We had begun receiving anecdotal praise for the improved turnaround time of radiology reports with the new system and postulated that although there had been a dramatic improvement with the voice recognition system, the synergy of the addition of a PACS would further bolster turnaround time.

MATERIALS AND METHODS

Turnaround time was defined for practical purposes as the time from completion of a study on the radiology information system (RIS) to the time a report was available on the hospital information system (HIS). All temporal data was obtained from querying the RIS. Two types of reports were defined before the mining of data from the RIS—a "preliminary" report is defined as a report that has been dictated by a non-staff physician, usually a resident or fellow. While this report does reflect review with a staff radiologist, it has not undergone final editing for inclusion into the official medical record. The "final" status of a report reflects the review of a staff radiologist of the report, after which no additions or edits can be made.

All data were obtained by running queries through the RIS defining specific criteria. These criteria included the time of completion of a study, the time to enter "preliminary" status, and the time to enter "final" status. Each of these times was

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obtained for each of 6,022 abdominal and pelvic computed tomography (CT) scans performed over two 1-year periods from March 1, 1997 to March 1, 1998, and from March 1, 1998 to March 1, 1999. During the first year, interpretation was conducted using exclusively hard-copy film and during the second year, using PACS.

In both 1-year periods, MedSpeak voice recognition software (IBM, White Plains, NY) was employed for dictation versus a conventional dictation system. It was understood a priori that the implementation of voice recognition software had a large beneficial impact on the turnaround times of reports. However, the obtained times eliminated this factor by remaining constant over the two study periods and isolated the improvement due to PACS alone.

RESULTS

The average time for a preliminary report for an abdominal and pelvic CT, dictated by a resident or fellow, to be available in alphanumeric form on the HIS at our institution using hard-copy film and a voice recognition system was 3.73 days. Report turnaround times ranged from 0.01 minutes to 24.1 days, with a median of 0.95 days.

The installation of a PACS system decreased this mean turnaround time to 0.56 days. Report turnaround times ranged from 0.002 to 25.8 days, with a median of 0.29 days.

The mean time to availability of final reports, ie, signed by board-certified staff radiologists, was 5.49 days, with a range from 0.04 to 28.6 days and median of 3.6 days in the hard-copy interpretation subset, and 5.97 days, with a range from 0.005 to 65.5 days and median of 3.2 days, in the PACS subset.

The decrease in report turnaround time with PACS represents an improvement of 85.0%. This improvement is realized in dictations predominantly performed by residents, because, at our institution, the bulk of reports are generated by residents after review with the staff radiologist. The difference in the time to have a final signed report, ie, by the staff radiologist, for official inclusion in the medical record was slightly greater with PACS, by 9%.

DISCUSSION

As health care proceeds into the next century, medical practice will continue to experience drastic changes due to decreasing reimbursements. Despite constraints in health care spending, radiology services will continue to gain a larger percentage of the total. Clinicians will require improved services

and hospitals will demand higher productivity in all departments. To be competitive in this new environment, radiology departments must begin to employ emerging technologies to improve operations. PACS represents a technology that can enable the radiologist to provide services to referring physicians in a more efficient manner as demonstrated by decreased report turnaround times. Voice recognition has enabled a further marked reduction in turnaround times of reports to clinicians by eliminating the step of transcribing dictations. Many of the other benefits of voice recognition are discussed elsewhere. As an adjunct to PACS, voice recognition software empowers the radiologist to provide timely and accurate interpretation services.

Using PACS decreased report turnaround time or the availability of an alphanumeric report on the HIS at our institution by 85%. There was a slight increase by 9% in the time to availability of a final signed report by a staff radiologist; however, this slight increase is not thought to reflect on the PACS, but rather signing practices of staff radiologists, which fluctuate from month to month depending on research schedules and vacation times. This is reflected in the fact that the time to availability of a final signed report was greater than 5 days in both the PACS and hard-copy film subsets.

There are limitations to this study that revolve primarily around familiarity. As PACS represented a relatively new technology in our department at the time of this study, there was a steep learning curve and growing familiarity with the system that ultimately is thought to improve turnaround times with interpretation of studies. This includes manipulation of images, windowing and leveling, and other routine tasks that improve with familiarity with the layout of workstation screens and workflow lists. This improving familiarity over the course of the 1-year PACS subset is not inherent to the hard-copy subset, as our radiologists have been accustomed to using film for many years. It is postulated that if a similar study is performed once the PACS has been in use for several years and each user who is employed in the study is maximally efficient with the system, interpretation and thus report turnaround times may improve.

CONCLUSIONS

The addition of PACS into an academic gastrointestinal radiology division improves availability of

alphanumeric preliminary reports of abdominal and pelvic CTs on the HIS, dictated by a resident or fellow, by 85.0%. There is no gross perceived impact with a PACS on the time to final sign reports

by a staff board-certified radiologist as signing patterns remained relatively constant over the two interpretation formats. This improvement in turnaround times can be used in justifying PACS.

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