

# Impact of Filmless Imaging on the Frequency of Clinician Review of Radiology Images

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**The purpose of this study was to determine the impact of filmless imaging on the frequency with which physicians access radiology images and to assess clinician perception of image accessibility using a hospital-wide Picture Archival and Communication System (PACS). Quantitative data were collected at the Baltimore VA Medical Center (BVAMC), prior to and after conversion to filmless imaging, to determine the frequency with which clinicians access radiology images. Survey data were also collected to assess physician preferences of image accessibility, time management, and overall patient care when comparing filmless and film-based modes of operation. In general, there was a significant increase in the average number of radiology images reviewed by clinicians throughout the hospital. However, the one area in the hospital where this trend was not observed was in the intensive care unit (ICU), where the frequency of image access was similar between film and filmless operations. Ninety-eight percent of clinicians surveyed reported improved accessibility of images in a filmless environment resulting in improved time management. The mean clinician estimate of time saved due to the use of PACS was 44 minutes. The study documented a combination of clinician perception of improved accessibility and substantial time savings with the use of a hospital-wide PACS, which was supported by objective measurements. The increased frequency of image review by clinicians and rapid image access should provide a further impetus to radiologists to decrease report turnaround time to provide "added value" for patient care.**

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**D**URING THE FIVE years of filmless operation to date at the BVAMC, a number of benefits have been realized. These include improved image management with fewer lost and unread studies, the ability to provide real-time interpretation, the use of computer enhancement to provide consistently higher quality images, and teleradiology capabilities.<sup>1</sup> An additional advantage of PACS is greater image accessibility, to both radiologists and clinicians. This enhanced operational efficiency achieved with PACS includes rapid image retrieval, access to multiple imaging modalities, and simultaneous access at multiple sites throughout the hospital.<sup>2</sup> The ability to increase image accessibility has the potential to enhance diagnosis and treatment and ultimately result in improved patient care.<sup>3-5</sup>

This study was performed to determine the impact of implementation of a hospital-wide PACS

on the frequency with which clinicians access radiology images. In addition, the subjective perceptions of physicians were assessed to determine differences in image accessibility when comparing filmless and film-based operations.

## MATERIALS AND METHODS

Data collection forms were developed to compare the frequency with which clinicians access radiology images. Data were collected by an independent observer at the BVAMC who recorded the actions of medical team members in the ICU and hospital ward teams over an interval of two weeks, prior to and after conversion to a hospital-wide PACS.

Survey data was also collected to determine physician preferences between film and filmless modes of operation. The questions referred to image accessibility, time management, and overall patient care. Questionnaires were mailed to 280 physicians practicing at the University of Maryland (UMD) and Baltimore VA Medical Centers, with 138 respondents. All respondents practiced in both filmless (BVAMC) and film-based (UMD) environments and were therefore familiar with both settings.

## RESULTS

In a film-based radiology department, the greatest barrier facing referring clinicians is access to radiologic images. Data collection at the BVAMC prior to conversion to filmless imaging revealed an overall initial success rate in image retrieval of 70%, compared with 98% in filmless operation. By strategically placing workstations throughout the hospital, time consuming trips to the radiology department were eliminated resulting in significant time savings to clinicians. These time savings were estimated by the clinicians to be in the range of 10 to 120 minutes, with a mean daily savings of 44 minutes (Table 1).

Table 2 shows a twofold increase in the average number of radiology images reviewed by medical team members in a filmless environment. Concurrently, as clinician access to images and reports increased using PACS, a corresponding decrease in

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0897-1889/98/1103-1045\$8.00/0*

**Table 1. Survey Results Comparing Physician Perceptions: PACS vs. Film**

	Agree	Disagree	Neither
PACS contributes to more effective utilization of clinician's time	98%	2%	0%
Better patient care provided using PACS	64%	10%	26%
PACS results in reduced length of hospitalizations	36%	19%	45%
Overall preference is for PACS vs. Film	92%	3%	5%

radiologist consultation frequency was observed. The one area in the hospital where this trend was not observed was the Intensive Care Unit (ICU) where the frequency of image review and radiologist consultations remained constant in film-based and filmless operations. This is probably a reflection of the need for rapid and comprehensive image and report access in the ICU, in order to facilitate timely diagnosis and treatment planning for this uniquely critical patient population.

These data are corroborated by survey results (Table 1), where a majority (92%) of respondents preferred PACS to film. A number of factors were reported to produce time savings using PACS. These included relative ease of image retrieval (current and prior studies), image access throughout the entire hospital (including the operating rooms), and the relative ease of using the computer workstations. Two-thirds of survey respondents believed the use of a PACS optimizes patient care with contributing factors including improvements in image access, report turnaround time, exam scheduling, and the potential for reduction in length of hospital stay.

### DISCUSSION

The complexity associated with storing, retrieving, and reporting diagnostic information has signifi-

**Table 2. Frequency of Image Review and Radiologist Consultations: PACS vs. Film**

	PACS	Film
Medical Ward Team		
Daily average number of images reviewed	23	11
Daily average number of consultations	2	7
Medical ICU Team		
Daily average number of images reviewed	30	32
Daily average number of consultations	5	5

cantly increased over time. Delayed access to images has resulted in an indirect or "hidden" cost to an institution. Subjective assessments by radiology service users indicate there is a significant cost due to delayed access to imaging information.<sup>6</sup>

Prior work by Straub<sup>6</sup> reported physician surveys estimated an average of 15% of physician total practice costs could be attributed to delayed access to image information. Increasing access to imaging information, through electronic means, has the potential to prevent costly delays in patient management decisions and potentially result in improved patient care.<sup>5</sup> Clinician access to images and reports is adversely affected in a film-based environment by lost and unread exams, delayed reports, and archival limitations in a film library. Replacing a traditional film-based system with a digital image management system provides added flexibility in display organization. In addition to rapidly accessing current images and reports, comparison studies can be rapidly retrieved due to the enhanced archival capabilities of PACS.<sup>7</sup>

### CONCLUSION

Study results demonstrated both objective and subjective improvements in image access and time management associated with the implementation of a hospital-wide PACS. The increased review of images and rapid image access by clinicians should provide a further impetus to radiologists to decrease report turnaround time to provide "added value" for patient care.

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