

# Ditching the Disc: The Effects of Cloud-Based Image Sharing on Department Efficiency and Report Turnaround Times in Mammography

Matthew B. Morgan, MD, MS<sup>a</sup>, Elizabeth Young, MD<sup>b</sup>, Scott Harada, MD<sup>c</sup>, Nicole Winkler, MD<sup>a</sup>, Joanna Riegert, BS<sup>a</sup>, Tony Jones<sup>a</sup>, Nan Hu, PhD<sup>a</sup>, Matthew Stein, MD<sup>a</sup>

## Abstract

In screening mammography, accessing prior examination images is crucial for accurate diagnosis and avoiding false-positives. When women visit multiple institutions for their screens, these “outside” examinations must be retrieved for comparison. Traditionally, prior images are obtained by faxing requests to other institutions and waiting for standard mail (film or CD-ROM), which can greatly delay report turnaround times. Recently, advancements in cloud-based image transfer technology have opened up more efficient options for examination transfer between institutions. The objective of this study was to evaluate the effect of cloud-based image transfer on mammography department workflow, time required to obtain prior images, and report turnaround times. Sixty screening examinations requiring prior images were placed into two groups (30 each). The control group used the standard institutional protocol for requesting prior images: faxing requests and waiting for mailed examinations. The experimental group used a cloud-based transfer for both requesting and receiving examinations. The mean number of days between examination request and examination receipt was measured for both groups and compared. The mean number of days from examination request to receipt was 6.08 days (SD 3.50) in the control group compared with 3.16 days (SD 3.95) in the experimental group. Using a cloud-based image transfer to obtain prior mammograms resulted in an average reduction of 2.92 days ( $P = .0361$ ; 95% confidence interval 0.20-5.65) between examination request and receipt. This improvement in system efficiency is relevant for interpreting radiologists working to improve reporting times and for patients anxious to receive their mammography results.

**Key Words:** Efficiency, cloud, image transfer, workflow

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## INTRODUCTION

When interpreting screening mammograms, it is considered best practice to compare the current mammograms with any available prior images. This important interpretive exercise increases diagnostic accuracy, reduces recall rates, and in some cases may reduce unnecessary

procedures [1-3]. Because many women will likely visit multiple, unrelated imaging centers throughout their screening years, each institution must establish methods of obtaining comparison examinations from “outside institutions.” These methods involve locating, requesting, receiving, and processing the prior imaging for the radiologist to use at the time of interpretation.

At our institution, like many, the standard procedure for obtaining prior mammograms from other institutions has involved asking the patient at the time of scheduling to obtain her prior images and bring them with her to her upcoming appointment. This required her to call the institution(s), navigate the medical records office, and then physically collect them. If she was successful and arrived to her appointment with the comparison images, they were sent to the film library, processed, and then uploaded into our breast imaging viewing system or loaded on the image alternator. If she arrived for her appointment but had not obtained the prior images (the

<sup>a</sup>Department of Radiology, University of Utah School of Medicine, Salt Lake City, Utah.

<sup>b</sup>Department of Radiology, University of New Mexico School of Medicine, Albuquerque, New Mexico.

<sup>c</sup>Radiology Associates Inc, Honolulu, Hawaii.

Corresponding author and reprints: Matthew B. Morgan, MD, MS, 30 North 1900 East #A071, Department of Radiology, University of Utah School of Medicine, Salt Lake City, UT 84132; e-mail: [mbmrad@gmail.com](mailto:mbmrad@gmail.com).

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majority of cases), then a telephone or fax request was made to the outside institution. Then, after a variable delay, the prior images would arrive via standard mail in analog (film) format or on a CD-ROM. The images would then be processed by the film library, uploaded to the radiology imaging system, or hung in the reading room, and the study could then be interpreted. If prior images could not be obtained through these methods, the delay was over 14 days, or the radiologist subjectively thought that the examination did not need prior images, then the study was interpreted without the benefit of comparison with the prior examinations.

Recently, advancements in cloud-based storage and retrieval systems have made it possible to share images electronically between unaffiliated institutions, thereby eliminating much of the processing and wait times associated with handling physical media (film and CD-ROMs) [4]. Just as cloud-based storage has gained popularity for individuals to store and share documents, this same approach is being rapidly adopted to share medical information. This advancement has also coincided with patient access requirements to participate in stage 2 of the Medicare and Medicaid EHR (electronic health record) Incentive Programs for meaningful use [5]. Regional network providers and private vendors now offer solutions for image sharing between institutions. Our radiology department selected a vendor-based product to manage the growing need for digital image exchange (Nuance, Powershare, formerly SeeMyRadiology, Burlington, MA). This product was selected for all image transfer needs in the department. Given the much more efficient transfer between institutions, the mammography section quickly identified this as a timely opportunity to reduce or eliminate the physical media (CD-ROMs or film) and improve the efficiency of obtaining prior mammograms. The objective of this study was to quantify the workflow and efficiency effects of cloud-based image transfer.

## MATERIALS AND METHODS

This study was HIPAA compliant and, as a quality improvement study limited to the tracking of operational data for administrative uses, was institutional review board exempt [6].

The study period was between June 19, 2013, and August 30, 2013. The population included women over 40 who were receiving screening mammograms. We defined prior imaging as screening mammogram (which could include tomosynthesis). Other modalities such as ultrasound and MRI were not requested for comparison

at screening. Prior reports were also requested with the images. Electronic image exchange included full fidelity DICOM mammographic images, which were equivalent or identical to CD-ROM files received through the mail.

Two methods of obtaining prior imaging were compared. We compared our then-standard method of obtaining prior images using faxes and postal mail with cloud-based, electronic transfer. The control group (30 consecutive screening examinations with outside imaging) used the standard method of obtaining prior images (ie, the patients were asked at the time of scheduling to obtain their prior mammograms and bring them to their appointment). If the patient was unable to obtain the images by the time of the appointment, then our center faxed a request to obtain them from the outside facility. The current mammogram was placed in a holding status and not interpreted until the prior images arrived. When the images (usually a CD-ROM) arrived by mail, they were sent to the film library and uploaded into our imaging system. The number of days elapsed between the request and receipt of the prior images was recorded. The time from study completion to report finalization was also measured.

The next 30 consecutive screening examinations with outside imaging were selected for the cloud-based transfer method as the experimental group. When these patients scheduled their appointments, we immediately sent a request to the outside facility through the cloud-based system (Nuance Powershare, formerly SeeMyRadiology) to obtain the prior images. If the facility was not familiar with the electronic transfer system, they were contacted by our image manager and asked to create a free, linked account. The outside facility then uploaded the images into our institution's cloud-based image repository. The images were downloaded directly into our PACS (Philips iSite, Amsterdam, Netherlands) and then transferred to the mammography PACS (Hologic, Marlborough, MA).

With both the control and experimental groups, the patient screening mammogram proceeded normally, and the studies were interpreted when the prior images became available. The following date and time stamps were recorded: scheduled, prior images requested, priors received, examination completed, examination reported. The intervals between these time stamps were compared for the traditional and cloud-based systems.

Patients were excluded from the analysis if the required images were from out of state (to eliminate variance in distance), were never received, inadvertently arrived via analog method for the digital group (or vice versa), or were brought to the appointment by the

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