Electronic Mammography Exchange: Improving Patient Callback Rates
Overview

This case study explores the impact of a mammography-specific electronic exchange network on patient callback rates at the University of Florida Health – Jacksonville, Department of Breast Imaging. For it, we compare metrics from a control period and the metrics following the implementation of the exchange network.

Background

Mammography is a field that requires comparison with prior images to make an accurate medical diagnosis about breast cancer. Breast tissue is different from most other organs in that it is unique to each individual woman. As such, demonstration of stability between comparison mammograms and the current mammogram is a major determinant of ‘normal.’ Therefore, a radiologist depends heavily on these prior comparison mammograms in order to make the most accurate image interpretation.

This field is also unique in that measuring quality is straightforward. Facilities must comply with the Mammography Quality Standards Act (MQSA), a quality assurance measure for mammography facilities. Breast Imaging Reporting and Data System (BIRADS) is a widely adopted risk assessment method compliant with MQSA standards for breast imaging diagnostic categorizations, including mammography, ultrasound, or MRI. A BIRADS 0 score indicates ‘more information is needed,’ which could mean that prior images were not made available for comparison and additional imaging is therefore needed. This results in a ‘callback,’ or a recommendation for the patient to return for additional imaging. BIRADS 1 or BIRADS 2, however, indicates that there is a definitive interpretation of no findings of cancer. Therefore, a decrease in BIRADS 0 categorizations and an increase in BIRADS 1 or 2 is an indicator that breast imagers are overall better able to interpret mammography exams (more specificity).
The other critical component of these quality measures is the federally mandated MQSA reporting requirements. If a patient does not have a report in her hands within 30 days of the exam performed, the facility may be fined. Hospitals will often employ a policy to wait a maximum of 14 days to procure prior mammograms; if the priors are not received in this period, the radiologist must proceed with generating a report to stay compliant. If priors are received after this time period, the radiologist will re-read the exam, and add an addendum to the report, if needed.

In this field, a high callback rate, or, the percentage of patients asked to undergo a diagnostic exam within a specific amount of time after the screening exam, measured by BIRADS 0 readings, often indicates that radiologists are unable to provide definitive diagnoses without additional diagnostic exams. The United States has an average recall rate of 10\%\(^1\), and when prior mammograms are not available for comparison, the chances of a patient being called back for additional examinations increases by 260\%\(^2\).

**Pilot Study**

At UF Health Jacksonville, a three-month study on the effect of a mammography-specific image exchange network was conducted from July 1, 2015 to September 30, 2015. The first month served as a control group, and was distinguished from the following two months in that there was no network available to exchange prior mammograms. The control group consisted of data from 68 patients who presented at the breast-imaging department at UF Health Jacksonville without their prior mammograms. This group showed an overall 37\% callback rate, with a 12\% callback rate when priors were available and a 74\% callback rate when priors are not available, suggesting an 84\% reduction in callbacks when priors are made available. Additionally, the control group demonstrated that, without a mammogram-specific exchange network, 40\% of the prior images were not procured at the time of the reading.

<table>
<thead>
<tr>
<th>BIRAD 0</th>
<th>BIRAD 1-2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams Read <strong>with Priors</strong> available in 14 Days</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
<td>Exams Read <strong>without Priors</strong> available in 14 Days</td>
<td>20</td>
<td>7</td>
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**Table 1: Raw data from the control month data collection period indicates a high callback rate and a high percentage of cases without procured mammograms available for comparison during interpretation.**

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The breast imaging department at UF Health Jacksonville then began to electronically exchange breast images with a private imaging facility, Elite Imaging Centers, via Mammosphere, a cloud-based image exchange network that provides secure, patient-portable accessibility of prior mammograms for more accurate interpretation of mammography exams. Mammosphere is an internet-based platform that works in conjunction with any PACS and RIS systems, resulting in a minimal disruption of current workflow.

Highly referenced literature in the field has shown that immediate access to prior images significantly reduces patient callback rates, increasing the amount of definitive readings and also greatly improving efficiency within a hospital. Therefore, to measure the effectiveness of the mammography image exchange network, researchers monitored changes in callback rates.

### Results

Mammosphere metrics showed dramatic increase in usage in these experimental months due to the high-volume of data exchanged between UF Health Jacksonville and Elite Imaging. With the network in place, only 21% of priors were not available at the time of the report generation, as opposed to the control group’s 40% (representing a nearly 50% reduction in exams interpreted without prior comparisons). Additionally, there was a 70% reduction in callbacks when priors are made available in the months of August and September.

<table>
<thead>
<tr>
<th>BIRAD 0</th>
<th>BIRAD 1-2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams Read <strong>with Priors</strong> available in 14 Days</td>
<td>23</td>
<td>85</td>
</tr>
<tr>
<td>Exams Read <strong>without Priors</strong> available in 14 Days</td>
<td>20</td>
<td>8</td>
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**Table 2:** Raw data from the experimental group shows a dramatic decrease in cases with unavailable priors, and a significant drop in patients who are recalled.

Data from the entire pilot study (control and experimental) indicates a 19% callback rate when priors are available, and 73% callback rate when priors are not available, resulting in a 74% reduction in callbacks (“false-positives”) when priors are made available.
Mammography patients with no prior exams available at time of imaging

(Priors then requested before and after installation of Mammosphere; Exams interpreted after 14-day wait for prior comparison to become available)

Without Mammosphere

N = 68

- No Priors Available
  - 27 (40%)

  - Needs Additional Imaging
    - 20 (74%)
  - Negative/ Benign
    - 7 (26%)
  - Needs Additional Imaging
    - 5 (12%)

- Priors Available
  - 41 (60%)

  - Negative/ Benign
    - 36 (88%)

Overall Callback Rate: 37%

With Mammosphere

N = 136

- No Priors Available
  - 28 (21%)

  - Needs Additional Imaging
    - 20 (71%)
  - Negative/ Benign
    - 8 (29%)
  - Needs Additional Imaging
    - 23 (21%)

- Priors Available
  - 108 (79%)

Overall Callback Rate: 32%

14% relative reduction in recall rate with Mammosphere

Portion of Patients (not presenting with priors at time of execution) who received priors within 14 days

<table>
<thead>
<tr>
<th></th>
<th>Total exams performed without priors available at time of execution</th>
<th>Exams read with priors obtained in 14 days</th>
<th>Exams read without priors obtained in 14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>68</td>
<td>41 (60%)</td>
<td>27 (40%)</td>
</tr>
<tr>
<td>EXPERIMENTAL</td>
<td>136</td>
<td>108 (79%)</td>
<td>28 (21%)</td>
</tr>
</tbody>
</table>

Note: 27% (August) – 30% (July) of those read without prior exams are actually re-read (double work) and changed status from BIRADS 0 to BIRADS 1 or 2 when priors eventually arrive after the 2-week wait period.

48% reduction in mammograms read without priors
Impact

The participation of a single, additional imaging facility on the mammography exchange network drastically increased the number of priors procured within the 14-day limit, and decreased the amount of patient callbacks.

With access to prior mammograms, radiologists can make more accurate and definitive diagnoses, which has numerous benefits.

**Better patient outcomes** – Patients will benefit from lower false-positive screening rates and increased access to second opinions and consultations.

**Increased patient satisfaction** – Women aren’t unnecessarily called back for more testing, diminishing exam-related anxiety, decreasing unnecessary radiation exposure, and generally improving their perception of the screening process.

**Earlier detection** - Comparison with previous examinations is associated with earlier stage of breast cancer diagnosis by 25% with a reduction of cancers involving axillary lymph nodes by 3.6%. Lower treatment costs – A reduction in recall rates will significantly reduce costs of unnecessary additional imaging, follow up, and biopsies, as well as less costly cancer treatments due to a detection of earlier stage cancers.

**Health system savings** – Hospitals and outpatient imaging facilities can cut costs associated with procuring prior exams, and will generate revenues from increased patient throughput and improved net reimbursement with earlier cancer diagnoses.

There has never been a more important time to reduce false-positive exams and improve screening accuracy. Recently, the United States Preventative Services Task Force recommended a reduction in screening mammography in order to reduce the risks and societal costs associated with false-positives, despite the acknowledged fact that screening mammography reduces cancer mortality by approximately 40%. Since these recommendations have a massive impact on governmental insurance policies, proving that reducing false positives while maintaining an annual screening exam recommendation is absolutely essential to ensuring that women have access to breast cancer screening.

Mammosphere aims to connect all 8,738 (May 1, 2016 update of number of MQSA facilities) FDA-certified facilities for effective mammography image exchange. As patients become accustomed to cloud storage and image exchange with a mammography-specific network, it is likely that their general image exchange utilization will evolve further.

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