To Batch or Not to Batch

Does the benefit of batch reading for screening mammography extend to digital breast tomosynthesis?

ABSTRACT 17-159
ACR Annual Meeting
May 21st-25th, 2017
Christopher McAdams MD¹, Stephanie Taylor MD², Lauren Golding, MD³

1-Wake Forest School of Medicine, Winston Salem, NC
2-Carolinas Medical Center, Charlotte, NC
3-Triad Radiology Associates, Winston Salem, NC

No disclosures
Background

- Growing body of evidence supports the improved sensitivity (improved cancer detection) and specificity (reduced recall rate) of digital breast tomosynthesis (DBT) compared to standard mammography\(^1\)
- FDA approved DBT in 2011 with its usage growing ever since, reaching 89% of practices in a University of Colorado survey\(^2\)
- Optimal integration of DBT into practice workflow has not been established
Background

- Prior research demonstrates a performance advantage associated with dedicated, uninterrupted batch reading for standard screening mammography $^{3,4}$
- Interpretation time for DBT can be up to 50% longer than compared to standard mammography $^{5,6}$, which could result in reader fatigue and potentially a vigilance decrement
- The decreased recall rate intrinsically associated with DBT could predominate any differences in interpretation practices
- Batch reading of DBT has not been studied
Purpose

• We compared performance characteristics of DBT screening mammograms interpreted with and without batch reading
Methods

- We identified consecutive DBT screening mammograms interpreted by our practice from January 2016 to October 2016
- Symptomatic patients and technical repeats were excluded
- 3 radiologists read exams in the non-batch group only; mammograms interpreted by these radiologists were excluded
- 4,786 DBT mammograms were interpreted in a dedicated *batched* reading sessions
- 3,069 DBT exams were interpreted by radiologists frequently interrupted by other responsibilities such as diagnostic breast exams, interventional procedures, and phone calls (*non-batched*)
Methods

• We compared prognostic factors (age, breast density, and availability of comparison mammograms) between the batch read and non-batch read groups
• We analyzed recall rate, cancer detection rate, and detection of low-stage cancers in each group
  • Low-stage cancers were defined as stage 0 or 1
• Microsoft Excel was used for data collection
• SAS software was used for statistical analysis
Results

• 7,855 total screening DBT exams were included in the study
• The groups were well balanced with respect to prognostic factors, except for age
• No significant difference in:
  • breast density
  • availability of priors
  • type of abnormality detected (asymmetry, mass, architectural distortion, calcifications)
Baseline Characteristics by Group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Non-Batch read</th>
<th>Batch read</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (mean, SD)</td>
<td>67.7 (10.3)</td>
<td>69.8 (7.9)</td>
<td>0.009*</td>
</tr>
<tr>
<td>Density</td>
<td></td>
<td></td>
<td>0.60</td>
</tr>
<tr>
<td>1</td>
<td>6.8%</td>
<td>10.3%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>61.6%</td>
<td>60.7%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>30.6%</td>
<td>28.2%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.9%</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>Abnormality</td>
<td></td>
<td></td>
<td>0.69</td>
</tr>
<tr>
<td>Asymmetry</td>
<td>59.5%</td>
<td>60.0%</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>21.4%</td>
<td>18.5%</td>
<td></td>
</tr>
<tr>
<td>Calcifications</td>
<td>15.0%</td>
<td>16.6%</td>
<td></td>
</tr>
<tr>
<td>Architectural distortion</td>
<td>4.1%</td>
<td>4.2%</td>
<td></td>
</tr>
<tr>
<td>Prior Exams (yes)</td>
<td>91.4%</td>
<td>90.1%</td>
<td>0.79</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05
## Unadjusted Outcomes by Group

<table>
<thead>
<tr>
<th>Metric</th>
<th>Non-Batch read</th>
<th>Batch read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall rate</td>
<td>5.2%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Cancer detection rate</td>
<td>5.2 per 1000</td>
<td>7.0 per 1000</td>
</tr>
<tr>
<td>Proportion low stage cancers</td>
<td>85.7%</td>
<td>88.8%</td>
</tr>
<tr>
<td>Biopsy rate</td>
<td>1.4%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Positive predictive value for recall</td>
<td>7.4%</td>
<td>15.2%</td>
</tr>
</tbody>
</table>
Results

• The recall rate was not significantly different between the groups (5.3% vs 5.2%)
• The cancer detection rate was significantly higher in the batch group (5.2 vs 7.9 per 1,000 screened), however the difference was eliminated when controlling for age (adjusted OR 0.903; CI 0.715, 1.140)
• Low-stage cancers comprised a similar proportion of screening detected cancers in both groups
Discussion

- DBT has been shown to improve cancer detection and reduce recall rate
- Batch reading has been shown to improve cancer detection and reduce recall rate for standard (2D) mammography
- It seems intuitive that combining these 2 strategies would further enhance the performance of breast cancer screening
- However, our results do not support a performance advantage associated with batch reading DBT screening mammograms
Discussion

• For an average 55mm thick breast, radiologist views about 250 images with DBT, compared to 4 images with standard mammography\(^7\)
• Increases interpretation time by 50-100\(^%\)\(^5,6\)
• Greater effort required by DBT might interfere with vigilance at a lower volume compared to standard mammography
• Is there a vigilance decrement or “fatigue factor” associated with batch reading of DBT?
Discussion

- Well established robust decrease in recall rate associated with DBT (reduced 10-42\%)\(^1\)
- Improved performance of DBT may overshadow a smaller difference in performance related to interpretation practices (batch reading)
Conclusion

• Our experience suggests that the performance advantage of batch reading for standard screening mammography may not extend to DBT
• The equivalence of these methods may allow greater flexibility when considering staffing requirements and workflow
• Radiology groups may be more likely to embrace patient-centered practices such as offering same-day screening mammography interpretations
References