Sustaining a High-Quality Breast MRI Practice

Janie M. Lee, MD, MSc

Associate Professor of Radiology
Section Chief of Breast Imaging
University of Washington
Director of Breast Imaging
Seattle Cancer Care Alliance

September 20, 2016
Overview

• High quality image acquisition
  – Previously covered (DeMartini)

• Standardized reporting

• Auditing
Why is Standardized MRI Reporting and Auditing Important?

- Consistency and ease of information exchange can affect patient outcomes
- Medicare reimbursement now requires breast MRI accreditation and auditing program
Standardized Reporting
Breast Imaging Reporting and Data System (BI-RADS)

• Lexicon of terms
  - Developed in 1993 for mammography
  - Extended to include MRI and US in 2003 (4th ed)
  - Updated in 2013 (5th ed)

• Standardized reporting
  - Improves consistency of interpretation and reporting, communication of management recommendations, and facilitates patient care
ACR BI-RADS reporting guidance

- Clinical information and MRI technique
- Breast composition
- Description of findings
- Comparison to prior examinations
- Assessment
- Management
Clinical information and acquisition parameters

• Pertinent clinical history
• Reason for examination
• Acquisition parameters
  – Should adhere to ACR guidelines
Breast Composition

• Breast Tissue
  – Fibro glandular tissue
    • Assessed on T1W imaging (+/- fat saturation)
    • Almost entirely fat/Scattered/Heterogeneous/Extreme
  – Background parenchymal enhancement
    • Minimal / Mild / Moderate / Marked
  – Symmetric or asymmetric
  – Implants (if present)
Breast MRI Lexicon - Findings

• Size and Location
  – Laterality, quadrant, clock face, depth, CMFN

• Mass
  – Shape / Margin / Internal enhancement

• Non-mass enhancement
  – Distribution / Internal enhancement pattern

• Kinetic assessment
  – Initial phase / Delayed phase

• Associated features
Breast MRI Lexicon - Findings

• Focus/foci
  – Too small for characterization, usu <5mm
  – If irregular shape, non-circumscribed margin, or internal enhancement, describe as a mass

• Nonenhancing findings
  – Cyst, Post-surgical, post-treatment, clips

• Fat containing lesions

• Skin / Lymph nodes
Comparison to priors

• Prior MRI – include date
• Other imaging studies
# Assessment and Management

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Management</th>
<th>Recommendation</th>
<th>Additional Imaging:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Incomplete</td>
<td></td>
<td></td>
<td>US, Mammo</td>
</tr>
<tr>
<td>1 Negative</td>
<td></td>
<td></td>
<td>Routine follow up</td>
</tr>
<tr>
<td>2 Benign</td>
<td></td>
<td></td>
<td>Routine follow up</td>
</tr>
<tr>
<td>3 Probably Benign</td>
<td></td>
<td></td>
<td>Short interval f/u</td>
</tr>
<tr>
<td>4 Suspicious</td>
<td></td>
<td></td>
<td>Biopsy</td>
</tr>
<tr>
<td>5 Highly Suggestive of Malignancy</td>
<td></td>
<td></td>
<td>Biopsy</td>
</tr>
<tr>
<td>6 Known Biopsy Proven Malignancy</td>
<td></td>
<td></td>
<td>F/U surgeon/oncol.</td>
</tr>
</tbody>
</table>
Concordance of MRI BI-RADS Assessments and Management Recommendations in Community Practice

AY Lee MD\textsuperscript{1,2}, L Ichikawa MS\textsuperscript{3}, JM Lee MD MS\textsuperscript{1}, CI Lee MD MSHS\textsuperscript{1}, WB DeMartini MD\textsuperscript{4}, BN Joe MD, PhD\textsuperscript{2}, KJ Wernli PhD\textsuperscript{3}, BL Sprague PhD\textsuperscript{5}, SD Herschorn MD\textsuperscript{5}, CD Lehman MD PhD\textsuperscript{1}


AJR, 2015
Purpose

• To evaluate the concordance of MRI BI-RADS assessments and management recommendations in community practice
N=14,412 MRIs
Age: 18-79 years-old
Exam: 2005-2011

Study Exclusions

1,069 MRIs
Assessment Missing

4,557 MRIs
Recommendation Missing

503 MRIs
Recommendation “other” or “f/u MRI” with f/u time not specified

N=8,283 MRIs
4 Regional Registries
40 Individual Facilities

Final Sample
Results: Concordance

- Overall percentage concordance between assessments and management recommendations was 77% (6412/8283)
Concordance Rates by Assessment Category

- Category 0 (Needs additional Imaging): 84% (348/417)
- Category 1 (Negative): 87% (1668/1909)
- Category 2 (Benign): 93% (2476/2657)
- Category 3: 56% (311/554)
- Category 4: 83% (208/252)
- Category 5 (Highly suspicious for malignancy): 83% (208/252)
- Category 6: 74% (230/311)

**Highest** concordance with BI-RADS assessment categories:
<table>
<thead>
<tr>
<th>Category</th>
<th>Concordant</th>
<th>Discordant</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>84%</td>
<td>16%</td>
</tr>
<tr>
<td>1</td>
<td>87%</td>
<td>13%</td>
</tr>
<tr>
<td>2</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td>3</td>
<td>36%</td>
<td>64%</td>
</tr>
<tr>
<td>4</td>
<td>74%</td>
<td>26%</td>
</tr>
<tr>
<td>5</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>6</td>
<td>56%</td>
<td>44%</td>
</tr>
</tbody>
</table>

**Lowest** concordance with BI-RADS assessment categories:
- 3 (Probably benign)          36% (302/837)
- 6 (Known biopsy proven malignancy) 56% (676/1218)
64% of MRIs with Category 3 assessment were discordant:
- 28% due to a recommendation of “Routine mammography or clinical follow-up”
- 26% due to a recommendation of “Ultrasound”
Concordance Rates by Assessment Category

- Category 0: 84%
- Category 1: 87%
- Category 2: 93%
- Category 3: 36%
- Category 4: 74%
- Category 5: 83%
- Category 6: 44% of MRIs with Category 6 assessment were discordant:
  - 72% due to a recommendation of “Biopsy”
Overall concordance was higher for MRIs performed in 2009-2011 compared to those performed in 2005-2008.

*p value calculated by Pearson chi-squared test
Conclusion

• Further interventions and continued monitoring are needed to improve the reporting of appropriate management recommendations for BI-RADS assessment categories
Auditing Your Breast MRI Practice
Quality in clinical practice

• How am I doing?

• How can I do what I do better?

• How can I and my practice do what we do better?
How am I doing?

• Performance at the level of the individual
  – Important for improving clinical practice
  – Required for ACR Breast MRI accreditation
    • Requires each facility to establish a medical outcomes audit program for each physician and for each facility
      – Follow up positive results
      – Correlate pathology with interpreting physician’s report
      – At the level of both the individual and facility
    • Must use the BI-RADS assessment codes and terminology
    • Annual review by lead interpreting physician

How am I doing?

- Critical first step is measurement
- Supported by the American College of Radiology
  - Developed the ACR Breast Imaging Data and Reporting System (BI-RADS)
  - Provides guidance for auditing that meets and exceeds that required by the FDA
  - Most recent 5th edition extends auditing from mammography to multimodality breast imaging (US and MRI)
Performance measures

• For breast MRI interpretation
  – Cancer detection rate per 1,000 examinations
  – Positive predictive values (PPV2 and PPV3)
  – Sensitivity and specificity (if measurable)
  – Characteristics of breast cancers

• Definitions provided to enable consistent calculation

• More complete audit guidance also available
How can I do what I do better?

• Auditing of performance is more clinically useful when compared with accepted benchmarks

• Suggested by ACR BI-RADS manual
  – For mammography: Breast Cancer Surveillance Consortium (BCSC) provides data from facilities likely to be representative of practice in the United States
    • Recommendations from expert breast imaging radiologists, based on critical analysis of scientific data
    • Outcomes from the ACR National Mammography Database
Performance benchmarks

• For breast MRI interpretation
  – Available for screening MRI, new in BI-RADS 5th ed
  – From international trials of high risk screening
    • Women with hereditary predisposition for breast cancer
  – Data from US academic and community practices not yet included
Performance benchmarks

Currently, “insufficient rigorous data” for diagnostic breast MRI benchmarks

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer detection rate (per 1,000 examinations)</td>
<td>20-30</td>
</tr>
<tr>
<td>Median size of invasive cancers (in mm)</td>
<td>TBD(^b)</td>
</tr>
<tr>
<td>Percentage node-negative of invasive cancers</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>Percentage minimal cancer(^c)</td>
<td>&gt;50%</td>
</tr>
<tr>
<td>Percentage stage 0 or 1 cancer</td>
<td>TBD(^b)</td>
</tr>
<tr>
<td>PPV(_2) (recommendation for tissue diagnosis)</td>
<td>15%</td>
</tr>
<tr>
<td>PPV(_3) (biopsy performed)</td>
<td>20-50%</td>
</tr>
<tr>
<td>Sensitivity (if measurable)(^d)</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>Specificity (if measurable)(^d)</td>
<td>85-90%</td>
</tr>
</tbody>
</table>
Tracking of Volumes and Clinical Indications for MRI

- Assess trends over time
- Auditing for patient populations by risk level
  - Part of the More Complete Audit
    - Risk factors such as age, personal or family history of breast/ovarian cancer, history of atypia/LCIS, mammographic breast density, hormone replacement
- Auditing of cancer detection
  - By indication or by prevalence vs incidence examinations
How can I and my practice do what we do better?

- Audit, and look for areas of improvement
- ABR Maintenance of Certification PQI projects
  - Concurrently meet quality improvement and certification goals
Recent Changes to ABR Maintenance of Certification Part 4 (PQI): Acknowledgment of Radiologists’ Activities to Improve Quality and Safety

Lane F. Donnelly, MD, Vincent P. Mathews, MD, David J. Laszakovits, MBA, Valerie P. Jackson, MD, Milton J. Guiberteau, MD

Expanded options for meeting requirements

• Active participation in submitting data to a national registry
• Annual participation in the required MQSA medical audit or ACR Mammography accreditation program
• Attestation required; documentation needed only if audited
• If PQI participation is “meaningful and ongoing” the activity can be used repeatedly to meet PQI requirements
Summary

- Quality practice increasingly focuses on performance and outcomes measurement.
- Important for demonstrating the value of imaging for our patients and increasingly required as well.
- Tools and guidance are available to support these efforts.
- Methods and benchmarks will continue to evolve.
Thank you!