Interoperability Matters: Impact on Mammography Outcomes

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Speaker Introduction

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Speaker Introduction

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Conflict of Interest

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Conflict of Interest

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Agenda

• Image sharing and interoperability
  – Why we need it and current state
  – How the RSNA Image Share Project seeks to meet these challenges

• Application to breast imaging
  – Research-proven value to all stakeholders (patients, providers & payers)
    • Overview of University of Florida Health Jacksonville Pilot Study
Learning Objectives

Improving outcomes, workflow, patient engagement:

• Identify areas of need for medical image sharing in the healthcare enterprise
• Discuss real-world outcomes data from mammography study and appraise how to repeat the results
• Evaluate and recognize specialties needing interoperability improvement at your facility
The Value of Health IT in Breast Cancer Screening and Detection

- Better, more efficient care & increased throughput
- Earlier breast cancer detection & decreased false-positives
- IHE XDS/XCA: Cross-enterprise data exchange
- Patients empowered to take control of the future of their health
- Lower costs for Dx/Tx
Image sharing- Why?

• The ACR estimates medical imaging accounts for 10% of total annual medical expenditures in US: $100 billion/year

• At least 10-20% of these costs are due to duplicate exams
  – Frequently due to inadequate access to prior exams when transferring patients between institutions

• Additional benefits from reducing duplicate imaging
  – Reduction in radiation exposure
  – Access to priors improves interpretation
Current State of Image Sharing

• Radiology was one of the first specialties to go digital
  – No more film
• Nearly all images are now in a standard digital format:
  – DICOM
• Frequently distributed on portable media (CD, DVD)
Limitations of Physical Media

- Lost or misplaced disks
- Damaged or unreadable disks
- Non-DICOM disks
  - Some vendors burns disks with proprietary image format
- Locked down PCs prevent viewing of images on disk
- **Wastes physician and patient time and results in repeat imaging**
To The Cloud???

- Electronic exchange means images everywhere at anytime
- Growing market with a lot of companies
- Numerous vendors with proprietary solutions that don’t talk to each other: **Tower of Babel problem**
RSNA Image Share Project

• NIBIB Funded Project to:
  – Explore the feasibility of patient mediated image exchange
  – Promote the standards needed to enable vendors to interoperate

• Initial project period was 2009 through 2012, extended through early 2017
RSNA Image Share Project

• Participants
  – RNSA oversight
  – *Patient mediated exchange:*
    • Five initial pilots sites growing to 20 medical centers
    • Three vendors
  – *Vendor interoperability:*
    • Sequoia Project
    • Seven vendors
Patient Mediated Exchange

- Patient Engagement
  - Patients control the flow of images via PHRs (personal health records)

- Bootstrapped from IHE XDS-I/XDR-I profiles
  - IHE generally has not focused on consumer driven solutions but rather on institutional and enterprise workflow
  - Required alterations to the IHE profiles to address concerns regarding security and a consumer driven workflow
Architecture: “Hub & Spoke Model”

- **PACS**
- **DICOM**
- **HL7**
- **RIS**

**Site A**

- **Edge Server**

**Site B**

- **Edge Server**

**Clearinghouse**

- **XDS Registry/Repository**
- **XDR-I**

**PHR**

- **XDS Doc Consumer**

**HIE**

- **XCA & XCA-I**

**Site B**

- **XDS & XDS-I**
Alterations of IHE Model

• Not a true XDS affinity domain
• No exposure PHI or subject discovery through network
  – No coordination of local patient IDs across sites: PIX Manager functionality greatly simplified
  – All metadata containing PHI is removed
  – Replace the use of patient identifiers with a “transaction id” that’s used to locate and retrieve images & reports from network
Vendor Interoperability

- Patient mediated exchange well received:
  - 20 imaging centers currently enrolling patients in the network
  - Utilization as of Dec 17, 2016
    - 28,236 patients enrolled with exams 123,430 sent
- However, the NIBIB and RSNA are not in the business of providing image exchange services.

• For true interoperability the vendor community must be engaged
The RSNA Image Sharing Validation Program

• A partnership between the RSNA & Sequoia Project
• Intended to overcome barriers to vendor interoperability
• Certifies compliance of vendor systems to standards
Validation Program Overview

• Validates four “bundles”:
  – XDS-I Document Source and Consumer
  – XDS-I Registry and Repository
  – XCA-I Gateway
  – Patient focused exchange (original Image Share use case)

• Bundles give vendors the flexibility to choose their architecture

• Results of 1st round of testing announced at RSNA Annual Meeting
  – Seven vendors validated against one or more bundles
Essential need in Breast Imaging: High volume, Emotional engagement, Research-proven value

The Economic and Social Value of an Image Exchange Network: A Case for the Cloud

Ray Cody Mayo III, MD, Kathryn L. Pearson, MD, David E. Avrin, MD, Jessica W. T. Leung, MD

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Diagnostic Problem: Breasts are Unique

Courtesy of Dr. Wendie Berg

DenseBreast-info.org
Normal asymmetric tissue versus Cancer?

Need prior comparisons.

Courtesy of Dr. Jennifer Harvey

Improved Accuracy of Mammography when comparison exams are available

• Improves breast cancer detection:
  25% earlier (stage 0 or 1); 4% before spread to lymph nodes
  
  *Burnside E, AJR 2002;179:1173*

• Decreases false-positives of screening mammo by 40-60%
  
  *Roelofs AA, Radiology 2007;242:70*
  *Thurfjell MG, Acta Radiol  2000;41:52*
  *Sickles EA, Radiol Clin North Am 2010;48:859*
  *Hayward JH, AJR, 2016;207:918*

• Decreases false-positives of diagnostic mammo by 80%
  
  *Kleit AN, HealthServRes 2003;38:1207*
If No prior comparison exam is available:

- **Risk of callback exam is increased by 260%**
  
  
  Hayward JH, AJR, 2016;207:918

- **Risk of unnecessary biopsy is 8-24%**
  

- **Cancers may go undetected (25% higher stage; 4% more LN involvement)**

- **No available prior comparison at time of examination in 25% of screening & 60% of diagnostic patients**
  
  Kleit AN. Health Serv Res. 2003 Aug;38(4):1207
  
  
  
  Bassett LW. *Am J Roentgenol*. 1994;163:1083
Historically: Prior exam procurement

- **Poor:** 51% could not be obtained despite “vigorous efforts”
- **Costly:** $12-$30 per patient (staff, tech, mailing)
- **Time-inefficient:**
  - average 43 days (range 6-80 days)
  - 8 days, if patient provides images on CD
- **Discs unreadable, broken, or locked:** 20%

Bassett LW. *AJR Am J Roentgenol.* 1994;163:1083
Wilson TE. *Radiology.* 1996;198:661
Kleit AN, Ruiz JF. *Health Serv Res.* 2003 Aug;38(4):1207
Improved Patient, Provider, Payer Satisfaction

Patients:
Decreased false-positives by 60%
Lower anxiety, time, radiation, costs = better patient experience

Providers:
Better & more efficient care;
Increased throughput

Payers:
Lower cost of diagnosis & treatment of breast cancer
Treatment/ Clinical: Better Patient Outcomes

Increase in detection of earlier breast cancer by 25%

Decrease in lymph node positive cancer by 3.6%
University of Florida Health Jacksonville
Pilot Study:

Adding 1 frequent imaging exchange center to the network of 22 hospitals/imaging centers in NE Florida, comparing one month prior to and two months post-installation:

- Exams read *without comparison*: reduced by over 48%
- Callback rate (false-positives): reduced by 73%
- Re-reads with addenda: reduced by 30%
Patient Engagement & Population Management

- **Enhanced adoption of screening**
- **Patients empowered to take control of the future of their own health**
- **Improved population health**
  - Earlier cancer detection at decreased cost
Cost Savings & Revenue Generation

- Decreased cost of breast cancer diagnosis and treatment with earlier dx
- Decreased cost of prior exam procurement
- Increased revenue with increased screening capacity
Cost Savings per patient (Medicare):

• Screening Exam With Prior Comparison:  **Total cost = $135**

• Screening Without Prior Comparison:  **Total cost = $530**

Cost = $135

Plus 20% receiving unnecessary recall: two Diagnostic Mammograms ($164 each) = $65.60

Plus 20% undergoing Ultrasound ($162.28) = $32.46

Plus 15% undergoing Biopsy ($1981.46 average cost per CMS.gov 2014) = $297.22

→ 393% increased cost screening without prior
or 75% reduction in cost of screening with prior
Electronic Image Exchange Improves Revenue: (Breast Center Economics)

• Diagnostic Mammograms (Callbacks) are cost-inefficient:
  60 min. exam for $164 *

• Screening Mammograms generate revenue:
  15-20 min. exam for $135 *

One hour equipment / technologist time generates:
$405 - $540 revenue with Screenings versus
$164 revenue with unnecessary Diagnostic callback

→ Revenue Difference of $241-$376 per hour per machine

* Medicare rate
Lack of access to priors creates $\sim 1.2B$/year of unnecessary Medicare expenditure

Avoidable: REPEAT IMAGING
Avoidable: UNNECESSARY BIOPSIES
Avoidable: LATE TREATMENT

(Analysis based on conservative clinical rates data and Medicare-only reimbursement)
Lack of access to priors creates \( \sim \$1.2B / \text{year} \) of unnecessary Medicare expenditure

Approximately 20% of these patients undergo follow-up imaging (false-positive)

Of the 6.8M screening without priors (25% of all screeners), 20% need further imaging @ \$164 \times 2 \text{ exams per pt.}

\( \$446 \text{ M} \)

(Analysis based on conservative clinical rates data and Medicare-only reimbursement)
Lack of access to priors creates ~$1.2B/year of unnecessary Medicare expenditure

Avoidable: UNNECESSARY BIOPSIES

Approximately 8% of recalled patients undergo a biopsy
= 103K patients @ $1,981 per biopsy

$203M

(Analysis based on conservative clinical rates data and Medicare-only reimbursement)
Lack of access to priors creates $\sim$1.2B/year of unnecessary Medicare expenditure

Avoidable: LATE TREATMENT

Priors facilitate 4% increase in diagnosis of non-metastatic cancer

8.5K @ $65,000 per

$549M

(Analysis based on conservative clinical rates data and Medicare-only reimbursement)
The Value of Health IT in Breast Cancer Screening and Detection

• 25% earlier detection of curable breast CA
• 60% reduction of avoidable false-positive Callback exams
• 30% reduction in re-reads (report addenda)
• Increased patient throughput, efficiency, and screening revenue generation
• Lower costs of screening, diagnosis, and treatment → Improved population health
Essential Conversation

- Implementation
- Interoperability
- Barriers
- Policy
Questions

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