The Challenges Archiving Clinical Multimedia

March 3, 2016

Alexander J. Towbin, MD         @CincyKidsRad
Associate Chief, Department of Radiology

Neil D. Johnson Chair of Radiology Informatics

Christopher Roth, MD, MMCI      @ChrisRothMD
Vice Chairman of Radiology HIT & Informatics
Director of Imaging Informatics Strategy

DISCLAIMER: The views and opinions expressed in this presentation are those of the author and do not necessarily represent official policy or position of HIMSS.

www.himssconference.org
Conflict of Interest

Alexander Towbin, MD
Salary: unrestricted grant, Guerbet, Siemens
Royalty: Elsevier
Consulting fees: Guerbet, Applied Radiology
Ownership Interest: Merge Healthcare

Christopher Roth, MD, MMCI
No real or apparent conflicts of interest
Agenda

• Framing the problem

• Challenges
  – Workflow
  – Patient identification
  – Mobile
  – Image quality
  – Study identification
  – Reports

• Order-based vs. encounter-based workflows
  – Definitions
  – Pros and cons
  – Lessons learned

• Enterprise imaging governance
  – Focus areas
  – Models
  – Lessons learned
Learning Objectives

• Describe three challenges of implementing a clinical multimedia archive

• Summarize the advantages and disadvantages of requiring an order for clinical multimedia objects

• State the importance of requiring a report to be associated with each multimedia study

• Describe potential models for enterprise clinical multimedia governance
Enterprise Imaging Workflow and Governance

1) Operational **Savings** from consolidation of support, storage

2) Provider **Satisfaction** from clinical multimedia in the EMR

3) **Treatment** efficiencies having longitudinal access to **Clinical** multimedia

[Image: Enterprise Imaging Workflow and Governance diagram]

http://www.himss.org/ValueSuite
The Problem

- Marked increase in number of images obtained for each patient

- Radiology
The Problem

• Marked increase in number of images obtained for each patient

• Radiology
The Problem

• Marked increase in number of images obtained for each patient

• Radiology
Marked increase in number of images obtained for each patient

Radiology
The Problem

• Marked increase in number of images obtained for each patient

• Radiology

• Beyond radiology

http://www.dovergrammar.co.uk/Gems/geography-iceberg.htm
Marked increase in number of images obtained for each patient

Beyond radiology

Image used with permission: http://www.scottcamazine.com/
The Big Problem

There is no systematic method for storing images across the hospital

http://www.boomcalifornia.com/2012/08/california-damming/

The Good News

Enterprise imaging is becoming mainstream

http://www.itnonline.com/content/agfa-debuts-enterprise-imaging-exchange-program-siim-2015
Still lots of issues to solve

- Workflow!!!
- Patient identification
- Mobile
- Image quality
- Study identification
- Reports

http://www.amazon.com/Bad-News/dp/B0000032RP
PROBLEM
Workflow
Problem: No Defined Workflow

• No standard imaging workflow in most specialties

“And this is where our ED workflow redesign team went insane”

http://capital-it.blogspot.com/2013/04/and-this-is-where-our-ed-workflow.html
Radiology Workflow

Order  RIS  Worklist  Image  PACS
Pathology Workflow

Ideal Workflow

Specimen → LIS → Worklist → Image → PACS

Actual Workflow

Specimen → LIS → Image → Hard Drive
Dermatology Workflow

Ideal Workflow

Schedule → DIS → Worklist → Image → PACS

Actual Workflow

Schedule → Image → Hard Drive
Workflow Solutions

• Examine radiology workflow

Radiology Workflow

• Key elements
  – Order
  – Worklist
Radiology Workflow

• Orders
  – Historical

• Mature electronic workflow in radiology
  – Drives workflow
Are Orders Needed?

Advantages

• Provides a clear entry point

• Allows assignment of unique ID

• Provides contextual information

Disadvantages

• Orders not required
  – Extra workflow step(s)
Workflow Solutions

Order-based

• Orders tied to workflow
  – Procedure order sets
  – Anesthesia

• May work best for DICOM modalities
  – Modality perform procedure step
Workflow Solutions

Order-based

• Orders tied to workflow
  – Procedure order sets
  – Anesthesia

• May work best for DICOM modalities
  – Modality perform procedure step

Encounter-based

• Image creates the order
  – Unsolicited procedures
  – Encounter creates worklist

• May work best for non-DICOM modalities
PROBLEM
Patient Identification
Problem: Patient Identification

- Everyone has a camera
- Smallest memory card holds 1000s of images

Problem: Patient Identification

• Solutions
  – Identifiers in image
    • Sticker
      – Name
      – Medical record number
      – Birthdate
    • Barcode
  – Modality worklist
PROBLEM
Mobile Devices
Problem: Mobile Devices

• 7.2 billion mobile devices worldwide

• Ubiquitous in medicine
Problem: Mobile Devices

• Challenges
  – Privacy
  – Safety

• Advantages
  – Smart devices
  – Can be used to create a worklist

http://sorendreier.com/why-i-ditched-my-smartphone/
Problem: Mobile Devices

- Solutions
  - Mobile app

Screen capture from iPad App store. Search term: DICOM Camera
Problem: Mobile Devices

- App requirements
  - Query for demographics
  - Take photos or video
  - Edit photos and videos
  - Tag images
  - Securely upload images
  - Images not store to device’s library
  - iOS, Android, and Windows compatible
PROBLEM
Image Quality
Problem: Image Quality

- How to standardize image acquisition for later comparison
  - Image quality
  - Lighting
  - Color
  - Size
Problem: Image Quality

• Solutions
  – Ruler in image
  – Color wheel
  – Standard cameras
  – Photo studio
PROBLEM
Image Identification
Problem: Image Identification

- How do you find a dermatology image in the middle of 150 chest x-rays
Problem: Image Identification

• Solution
  – Image tags
  • Division
  • Study type
  • Body part

http://www.google.com/doodles/discovery-of-x-rays
PROBLEM
Reports
Problem: Reports

• A picture is worth a thousand words…
  only if you can interpret the picture

http://linchikwok.blogspot.com/2012/08/a-picture-is-worth-thousand-words.html
Problem: Reports
Problem: Reports

Reports give contextual information for images

What is a report?
Problem: Reports

- Identifying report
- Associating report with images
- Including link to images from EMR

https://gomeshkar.files.wordpress.com/2012/10/project.jpg
Conclusions

• Many challenges to solve

• Opportunity to provide better care
Conclusions

• Lots of images in the hospital

• Very few hospitals manage images beyond radiology and cardiology

Image used with permission: http://www.scottcamazine.com/
Agenda

• Framing the problem

• Challenges
  – Workflow
  – Patient identification
  – Mobile
  – Image quality
  – Study identification
  – Reports

• Order-based vs. encounter-based workflows
  – Definitions
  – Pros and cons
  – Lessons learned

• Enterprise imaging governance
  – Focus areas
  – Models
  – Lessons learned
Order Based Workflow

- Order placed (MD/NP/PA/RN/student/MA)
  - Order automatically finalizes & schedules
- At modality, operator selects order from DICOM-modality worklist
- Images captured at the modality
  - Images sent by modality, received by storage
  - Storage associates images with placed order
  - Storage sends message to EHR that patient images are available
  - EHR populates with order & image hyperlink to default viewer storage

Manual user step

Shared workflow
Encounter Based Workflow

- At modality, operator selects patient from ADT
- Images captured at the modality
- Images sent by modality, received by storage
- Storage sends message to EHR that patient images are available
- Order instantiated at EHR from ADT metadata and images received
- EHR populates with order and image hyperlink to default viewer storage
## Pre-Procedure User Workflow Impact

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Order Based</th>
<th>Encounter Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order placement</td>
<td>Required, intrusive on workflow</td>
<td>Not required</td>
</tr>
<tr>
<td>Build required</td>
<td>Large, all encounter based + orders build and maintenance</td>
<td>Medium, including new and varied workflow accommodation</td>
</tr>
<tr>
<td>Bodypart, procedure, laterality, anatomy defined</td>
<td>Inherent in the order</td>
<td>Not readily available in ADT</td>
</tr>
</tbody>
</table>
# Post-Procedure User Workflow Impact

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Order Based</th>
<th>Encounter Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Viewing</td>
<td>Third party viewer launch</td>
<td>Varies, EHR viewer or third party</td>
</tr>
<tr>
<td>EHR record search</td>
<td>Order defined</td>
<td>Generic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not specialty specific</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ie. Ultrasound images</td>
</tr>
<tr>
<td>Trackability</td>
<td>Order audit trail defines whom to seek out</td>
<td>Difficult to identify responsible person for images captured</td>
</tr>
</tbody>
</table>
# Analytics Impact

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Order Based</th>
<th>Encounter Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metadata search</td>
<td>Orders content and context metadata</td>
<td>Object context image metadata only</td>
</tr>
<tr>
<td>Metadata location</td>
<td>Partially EHR, partially storage</td>
<td>Less EHR, Some storage</td>
</tr>
<tr>
<td>Metadata capture</td>
<td>Configurable hardstop/ no stop within order</td>
<td>Speed of workflow contrary to additional data collection</td>
</tr>
</tbody>
</table>
Order vs. Encounter Based Differences

• Order:
  – User places order ahead of procedure
  – Order metadata downstream
  – Happy EHR users, unhappy order placers

• Encounter:
  – User selects patient from ADT
  – ADT metadata downstream
  – Unhappy EHR users, happy (non)order placers
# Resulting Impact

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Order Based</th>
<th>Encounter Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of reporting</td>
<td>Orders based or clinic note workflow</td>
<td>Clinic note only</td>
</tr>
<tr>
<td>Image incorporation with clinical text</td>
<td>Typically hyperlink only</td>
<td>Hyperlink or direct inclusion of text &amp; images</td>
</tr>
</tbody>
</table>

©HIMSS 2016
Order vs. Encounter: Lessons Learned

• Dermatology in particular is a problem for both
  – Top negatives for Orders = Big orders build and image hyperlink rather than thumbnail incorporation into note text
  – Top negatives for Encounters = Incomplete metadata capture for analytics and EHR usability
Order vs. Encounter: Lessons Learned

• Worthwhile considering process re-engineering
  – Order placement before imaging sounds horrible, until you incorporate it into non-MD responsibilities

• Many will perceive effort as “extra work”
  – Strong guidance and governance especially necessary given systematic image management foreign to many specialties
Enterprise Imaging Governance: Definition & Goals

• HIMSS:SIIM Enterprise Imaging workgroup, Governance subcommittee definition:
  – “The decision-making body, framework, and process to oversee and develop strategies for the enterprise imaging program, technology, information, clinical use, and available financial resources”

• Bring together lots of smart people who don’t talk

• Long term strategic enablement
## Governance: Models

<table>
<thead>
<tr>
<th>Composition</th>
<th>“Top Down”</th>
<th>“Inside Out”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C-Suite and Leadership heavy</td>
<td>EHR Governance Committees, including MDs</td>
</tr>
</tbody>
</table>

### Wins

**“Top Down”**
- Broad oversight and sponsorship
- Strategy development
- Communication
- Finance
- Health policy

**“Inside Out”**
- Understand user pain points, technology and infrastructure shortcomings
- Local workflow development
- Ground forces awareness
- Cross team line of sight
Enterprise Imaging Governance: Focus Areas

1) Program Governance
2) Technology Governance
3) Information Governance
4) Clinical Governance
5) Financial Governance

IT C-suite, MD Leadership

EHR Governance Committees
Program Governance

• Align oversight, strategy, execution, resources, finance and awareness

• Prioritize compliance, cost & reimbursement:
  – Compliance: Keep the appropriate images
  – Cost: Decommissioning storages & PACS viewers, redistributing effort, limiting interfaces, limiting CDs, enabling image lifecycle management
  – Reimbursement: Revenue for previously unbilled ultrasound, telemedicine growth
Technology Governance

• Ensure effective image capture and archiving
• Scale your imaging platforms and technology
• Unite disparate imaging support services
  – EHR analysts, PACS/archiving analysts, service desk, clinical engineering, interfaces, operations, clinical
• Commit to this-day-forward procurement and potentially legacy modality standardization
• Provide controlled projects for innovation
Information Governance

• What metadata is necessary for capture, how it is accessed, who owns it, definitions of terms
  – SNOMED vs. unified RadLex/LOINC
  – Sensitive images
  – Analytics
  – Clinical and HIM, but also patient safety, compliance, legal, $, risk management

• Coordinate EHR and imaging content
Clinical Governance

• Educate stakeholders on the clinical value of enterprise imaging
  – Assess and select enterprise media viewer
  – Richer patient record, easier access, $ justification, MU menu objectives, legal

• Stomp out politics

• Don’t make imaging its own workflow silo

• Develop cross specialty nomenclature and workflow standards
Financial Governance

• Decide your internal imaging cost model:
  – Plumbing/cost of doing business vs. per TB/study

• Plan for people:
  – Project managers, product managers, storage & image management, modality engineering, contractors, provider time

• Develop local and specialty-specific imaging ROI & ROH calculations
Enterprise Imaging Governance: Lessons Learned

• Overcommunicate, be transparent
• Service line agnostic
• Govern like clinical documentation, not labs
  – Most clinical specialties creating images
• Manage imaging scope creep
• Give clear authority to make and communicate (unpopular) decisions
Enterprise Imaging Workflow and Governance

1) Operational **Savings** from consolidation of support, storage

2) Provider **Satisfaction** from clinical multimedia in the EMR

3) **Treatment** efficiencies having longitudinal access to **Clinical** multimedia
QUESTIONS?

Alexander J. Towbin, MD
Alexander.towbin@cchmc.org
@CincyKidsRad
facebook.com/CincyKidsRad

Christopher J. Roth, MD, MMCI
christopher.roth@duke.edu
@ChrisRothMD