Integrating Non-DICOM Images Using XDS
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Speaker Introduction

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Conflict of Interest Disclosure

Dawn Cram
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Agenda

- Objectives and STEPS
- Overview of Non-DICOM, XDS and Actors
- Innovation at University of Miami
- Benefits, Risks and Opportunities
- Next Steps
- STEPS Value Summary
Learning Objectives

• Analyze the technical data flow for integrating non-DICOM images using XDS
• Explain scalability and flexibility inherent within build
• Illustrate the workflow for encounters-based, non-DICOM images
• Illustrate the workflow for orders-based, non-DICOM images
• Recognize the standards and IHE profiles employed and future opportunities
HIMSS STEPS™

This presentation addresses the following HIMSS value STEPS™

Satisfaction improvements will be measured through increased provider satisfaction associated with availability of a holistic image record complimenting the electronic health record.

Treatment and clinical improvements will be evidenced by improvements in continuity of care and reducing risks.

Electronic secure data evidenced through availability of centrally managed and auditable image and clinical multimedia content for sharing and reporting.
Overview of Non-DICOM

• Varied ways to capture Non-DICOM content across the healthcare enterprise
• Content type output differs from device to device
• Departmental solutions are installed as a stop gap to store & retrieve information
• Published IHE profiles can:
  – add sense to the chaos
  – leverage standards providing structure to the world of non-DICOM content
DICOM & Non-DICOM Growth Forecast

• **2017 Forecast**
  - 1.4B Objects / Year
  - 51% VNA 5-YR CAGR
  - ~75% are Non-DICOM

• **Key Drivers**
  - Increased PACS to VNA Attach Rate
  - Growth in Non-DICOM

IHS report: ‘Medical Enterprise Data Storage, World 2013’
# Content Variation by Department

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<th>Most Common Devices</th>
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XDS Overview

• Original purpose for image exchange
  – Anything already stored
• Most medical imaging XDS traction in Europe*
• U.S. medical imaging XDS traction is low*
• Historically only considered largest institutions
  – Cost
  – Complexity
  – No one vendor has the XDS solutions to provide
  – Onboarding content is difficult

*http://www.ringholm.com/column/most_often_implemented_IHE_profiles.htm
XDS Gaining Momentum

• Vendors have expanded VNA technology to cover non-DICOM content
• **Leveraging** XDS is a natural expansion for a VNA
  – Aligns with core functions
  – Stores content
  – Creates manifest of stored content
  – Orchestrates content delivery to applications
• A vendor product providing XDS abilities
  – can “blend” DICOM and XDS where appropriate
  – Offers use case flexibility leveraging highest outcomes and best clinical care
Standards Evolution

• Standards evolve
• XDS profile evolve and refine
• DICOM is a long established standard that is effective and respected in the healthcare industry
• New Standards impact Fast Healthcare Interoperability Resources (FHIR)
Data Source

Conversion to XDS Tools

Enterprise Content Edge Tool

VNA

Image Source

XDS Document Repository

Manifest

Register Document Set

Retrieve Documents

XDS Document Consumer

Query for Documents

Enterprise Viewer

PIX/PDQ

Patient ID Feed

Patient Identity Source (EMR, EMPI or PIX/PDQ Manager)

• Retrieve Images
• Retrieve Evidence Documents
• WADO Retrieve

Provide and Register XDS Source
Traditional DICOM Workflow

- Orders-based
- Modality worklist (patient/exam schedule)
- Manual entry if needed
- Auto reconciliation with RIS data
- Exceptions and exceptions handling
- Manual reconciliation/intervention when needed
- Order links results in EHR, including third party systems
- ADT events auto update or merge records
Traditional Non-DICOM Workflow

- No modality worklist (patient/exam schedule)
- Manual entry sometimes available
- Electronic import or print/scan
- No exceptions handling
- Manual intervention challenging
- Link to order (if exists) challenging
- Indexing challenging
- ADT events traditional purpose to auto update or merge records
- Image content metadata challenges
Traditional XDS Workflow

• Original purpose
  – document and image content exchange
  – DICOM and non-DICOM (anything stored already)
• Standards based

Images from http://wiki.ihe.net/
New Non-DICOM Workflow

- Either orders-based or encounters-based
- Manually enter patient demographics or select from patient schedule
- Select procedure type or imaging protocol
- Grab imaging/clinical multimedia utilizing document polling rules
- Identify per capture system or group of capture systems
  - Associated location/department
  - Orders-based or encounters-based imaging workflow
  - Automatically reconcile additional associated data
- Store in same physical environment
- Provide exceptions creation and handling functionality
- Availability of manual import capabilities
- View side-by-side comparison DICOM and non-DICOM content
Workflow – Mobile, direct to VNA

SEND IMAGES DICOM TO THE VNA DIRECTLY OVER WIFI

CONTENT SENT TO THE ENTERPRISE IMAGE ARCHIVE AND MADE AVAILABLE IN THE ENTERPRISE VIEWER

ANDROID or iOS ENABLED CAMERA SMART PHONE, TABLET

PROVIDER EXAMINES PATIENT AND TAKES PICTURES AND VIDEO
Workflow – Mobile, normalization to VNA

ANDROID or iOS ENABLED CAMERA SMART PHONE, TABLET

INVOKES ENTERPRISE EDGE TOOL FROM EMR IN PATIENT AND ENCOUNTER CONTEXT

INTEGRATED TO THE EHR

CONTENT SENT TO THE ENTERPRISE IMAGE ARCHIVE AND MADE AVAILABLE IN THE ENTERPRISE VIEWER

ENTERPRISE VIEWER

PROVIDER EXAMINES PATIENT AND TAKES PICTURES AND VIDEO
Workflow – device, automated capture

Acquisition devices feed captured Videos, Documents and Pictures into conversion application

Enterprise Content Edge Tool pre-processors monitor folders for content & normalize meta data

Content sent to the Enterprise Image Repository as an XDS object and made available in the Enterprise Viewer

Proximity detection search worklist (MWL) for matching patient order or encounter

Video, Picture Files, Content Metadata XML, DAT, TXT, etc.
Benefits of XDS: New Workflow

- Pre-processors identify and index associated patient and image info
  - Info from text file, folder structure, xml file or EXIF by device’s vendor/model.*
  - *Normalization* of meta data for non-DICOM content critical for structured association
  - Industry standard ideal to support META Data + Content Pair
- Automation of content ingestion
- Content validation against EHR data
- Image management

* Standard nomenclature can replace
Benefits of XDS: Non-DICOM

• Utilizes industry file and communication standards
• Ability to orchestrate XDS + DICOM for different clinical settings
  – Diagnostic
  – Surgery
• Reduced noise in diagnostic experience – upfront content management
• Efficient support of workflows – encounter or orders
Benefits of XDS: Non-DICOM

• Can learn from Ophthalmology image archives/PACS
• Content type support/coverage
• Average cost of visible light imaging devices vs radiology imaging devices
  - OCT $70,000 vs. CT $968,600**
  - Fundus $37,500 vs. DR $207,182**
  - R&D and FDA overhead

Benefits of XDS: Clinical Impact

• Ophthalmology
  – OCR
  – XML
  – Smaller vendors

• Neurology
  – Lack of DICOM compliance
  – Same vendor, multiple device-specific systems

• Scopes
  – Variances in capabilities
  – Specialty needs
  – Video editing software

• Common Issues
  – Vendor resources to support DICOM integration
  – FDA filing
XDS Adds Value for Organizations

• XDS can cover the massive growth of non-DICOM content created in organizations
• Combined DICOM/XDS image repositories can help interoperability constraints
• XDS can address non-DICOM imaging specialties
• Completes the patient longitudinal record in the EHR
  – content produced by devices and instruments create value in care plan decisions
Risks Without Non-DICOM Strategy

• Error prone workflows
• Workflow compliance gaps
  – Manual steps = non-compliance
  – Too many steps = non-compliance
• Data security issues
• Floating content and liabilities
  – Griffith v. Aultman Hosp., 146 Ohio St.3d 196, 2016-Ohio-1138.
• Accessibility issues
XDS Challenges

• IHE and XDS
  • XML nomenclature
  • PIX / PDQ
  • Deletions and life cycle management
• Standards based upon order placer
  • DICOM MWL
  • HL7
• IHE Profiles based upon order placer
  • SWF
Next Steps

• Content and use is variable
• Understand workflow and how content should be consumed
  • Diagnostic value
    » Diagnostic viewer
  • Non-Diagnostic value
    » Enterprise viewer (XDS and/or DICOM)
• Content consumed and encapsulated as DICOM will have a limited number of formats supported
• XDS aligns better with difficult or unsupported content in the DICOM world
Next Steps

• Evaluate vendor options
• Aim for the fewest number of vendors possible to meet the objective
• Document your end state – *begin with the end in mind*
• Engage your EHR vendor
• Understand which workflows to address first
• Desktop vs. mobile
• Start small, start simple
Next Steps

- Understand the department, workflow, desires and clinical needs
- Group like departments together
- Blend mobile and desktop
- Develop a best practice
- Phased roll out

*Installing an enterprise imaging solution is not “just software” but a blend of resources, workflow, content evaluation and interface coordination.*
A Summary of How Benefits Were Realized for the Value of Health IT

Steps: Satisfaction

**Provider Satisfaction**
- Images, video, and other multimedia
  - Readily accessible
  - Located quickly
  - Can be compared

**Staff Satisfaction**
- 90% reduction in need to manually import
A Summary of How Benefits Were Realized for the Value of Health IT

Steps: Treatment/Clinical

Clinical Improvements

- Quality of care
- Efficiencies
- Safety
A Summary of How Benefits Were Realized for the Value of Health IT

Steps: Electronic Secure Data

Data Improvements

- Data reporting
- Advanced Communication
- Data Sharing
Questions

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