Development and use of Next Generation PACS

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Hospital Shopping

Here is a popular words in Korea.
“If you may have problem in your health, get consulting from at least 3 doctors”
Most Koreans believe it commonly.
Cause of affordable public insurance, people do.

Someone says this is one of reasons for MERS spreading out.
Why people keep moving their hospital
What would be happen if data can be shared with other facility
and be served a patient for improving treatments

You’ve got data x3 😊
Today

Since the hospital gets bigger and bigger
Medical groups faced to manage tons of data
Digitalized Evidence, not only in Radiology but also in ALL-ology
But they are not connected and utilized well yet.

“90% of world’s data generated over last 2 years”

In USA, ACO drives the healthcare services
systemically, patient-centric and affordable
using concentrated data sets

source: SINTEF. May 22, 2013
The Data Tsunami (Big Data)

Many SOURCEs

- Genomics
- Electronic Healthcare Records
- Electronic Medical Records
- Digital Pathology Imaging
- Digital Cardiology Imaging
- Digital Radiology Imaging
- Non-DICOM Contents
- Evidence Documents
- …

Source: sandia.gov & UC Berkeley, School of Information Management and Systems
Data Generation Trends

- Genomics Analysis
- Laboratory
- Digital Pathology Imaging
- Digital Neurology Imaging
- Bed-Side Monitoring
- Clinical ~ology Dept.
- Imaging Dept.
- Administration

30 years ago

Now

Near Future

Yottabytes
Zetabytes
Exabytes
Petabytes
Terabytes
Health IT – 4 Less


Text

01 Slipless

02 Filmless

Image

03 Chartless

04 Paperless

OCS
(Order Communication System)

PACS
(Picture Archiving and Communication System)

EMR
(Electronic Medical Record)

VNA
(Vendor Neutral Archive)
Vendor Neutral Archive
Managed Contents

Radiology Images
Cardiology Images

Digital Pathology,
Report Documents

Genomics,
Supporting Contents

HCM : Healthcare Content Management
VNA need to handle bellows

- **DICOM Contents**
- **Non-DICOM Contents**

There is a big difference between them

- **Manifests**

  ebXML may cover Non-DICOM Object to have manifests under XDS.b
  
  CDA can make up Non-DICOM for including lots of information
Future VNA need to handle

- **Healthcare Contents**

Obstacles

- **Un-structured / Non-standardized data**
- **Variety formats / Display**
- **Analysis / Statistic / Estimate**
American Large Hospitals’ Trends

Obama Care 2010

Meaningful Use

Certified EHR

Data Capture and Sharing

Interoperability

Analytics & Ecosystem

VNA

Departmental silo system
VNA Characteristics

Patient Centric

- Master Patient Index
- DICOM Repository / Non-DICOM Repository
- Universal Viewer and Worklist

Vendor Neutral

- Standard Interface / Non-Standard Interface
- DICOM / HL7v2 / HL7v3 / RESTful Services
- CDA Wrapper, Content Converter / Generator
- IHE XDS.b / XDS-I.b / XDR
Independent

- Disaster Recovery
- Archiving, Backups
- Standard Interface / Non-standard Interface
- Web Services, RESTful Services

Content Manageable

- Universal Viewer and worklist
- CDA Wrapper, Content Converter/ Generator, Content Filter
- Bi-directional DICOM Tag Morphing
- IHE XDM / XDS-MS / XDS-SD
VNA Characteristics

Information Life-cycle Manageable

• Backup, Retention Rule Management
• Pre-fetching / Auto-routing
• IHE Image Object Change Management
• Compressions

Reconciliatory

• IHE Scheduled Workflow
• IHE Patient Information Reconciliation
• IHE Image Object Change Management
• IHE Import Reconciliation Workflow
Scalable

- Volume/ Volume Set Management
- NAS/SAN Storage

Cross-Domain Identity Multiple Institutional

- IHE XCA
- IHE XDS,b / XDS-I.b
- IHE MHD / MHD-I
- IHE IUA / XUA / EUA
- eMPI
VNA Characteristics

Entity Specified
- OASIS ebXML / ebRS
- HL7v3 CDA
- HL7 FHIR
- DICOM Native Model

Statistical / Administrative
- Archiving Rule
- Auto-routing Rule / Pre-fetching Rule
- Performance / Turn-Around-Time Statistics
VNA Characteristics

Auditable / Security
- IHE ATNA Audit Logs
- IHE IUA / XUA
- TLS

Business Continuity
- Statistical Tool / Dashboards
- Population Health outcome
- Resource Management
IHP – Domestic Integrated Management

IHP (INFINITT Healthcare Platform)
IHP – Cross-Enterprise Interoperable Management
INFINITT Healthcare Platform (IHP)

INFINITT Healthcare Platform
PACS as VNA

Legacy DICOM
QR Store

Mobile
Post process

Universal Viewer
Dose
Statistic

Legacy Protocol Read, Search

API

INFINITT Healthcare Platform
PACS as VNA

PACS – DICOM

Clinical Documents
IHP - Interoperability
IHE – Integrating the Healthcare Enterprise

- Define technical framework for interoperability using standards
- Interoperability is the Key to Health IT
- Government Focused on Interoperability

2001
Security
SEC, CT, ATNA

2004
Radiology Imaging Service
CPI, ARI, SINR, KIN, ED, RID
SWF, PIR, RWF, PSA, PAM, PIX, PDQ, PWP, CHG, PIXv3

2010
Cardiology and Departmental Service
CATH, ECHO, STRESS, MAMMO, ED-CARD, TCE, DEC
REM, PIXv3, NMI, IOCM, PDI

2015
Continuity of Care Infrastructure
XDS.a, XDS-I, XDS.b, XDS-I.b
XDR, XDS-SD, BPPC

Cross-Community and Web Technology
XCA, MHD, IID
IHP – Key Features of Data Management

- Access (RESTful)
- Distribution (Route/Prefetch)
- Archive
- Sharing (XDS)
- ILM (Information Lifecycle Management)
- Universal Viewer (ULite)
- Reconciliation
- Tag Morphing
- Management (Monitoring /Content)
- Statistics
- Audit
Collect Big Data
- Structured / Unstructured Data
- Sampling

Analyze Big Data
- Time-series research / Estimation
- Data Mining / Logistic Regression / Artificial neural network

Applicable
- Forecasting
- Reduce Risk / Cost
- Treatment Strategy / Business Strategy
Validate propriety and estimate ROI of business
- Converge Hospital Workflow and ICT
- Prepare rapid changes in healthcare environment.
- Regards Patient Safety
- Minimize taking radiologic images
- Adopt standard based report templates
- Reduce healthcare costs

Distributed PACS sends DICOM with GPID to Center
- Patient Identification using MPI
- Connect with VPN
- XDS-I.b has been established in Center only
- Center converts DICOMs into KOS + Manifests for XDS.b providing
- GPs access central portal and see others’ images using web-based universal viewer
Summary

• Big Data
• PACS goes VNA
• from Patient Centric to Business Continuity
• Integrated / Interoperability
• New technologies / skills for management
• Analyzing Data for better outcome
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Thank you for your attention!