Development of Health Informatics in Asia

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HL7 Korea
APAMI
ISO/TC 215
eHSCG
Without health, there is no happiness.

Thomas Jefferson
Topics

1. Health informatics Development in Asia
2. Health informatics Research in Korea
3. Issues in Asia
4. Conclusion
Health Informatics Development In Asia
Japan

- MEDIS-DC (Medical Information System-Development Center) – Government Research Funding + Industry Funding + Academia
  - Manages standardization and developments
  - National EMR Project
- Prefectures(43) and Medical Association manage regional HI projects such as ePrescription, etc
- Oncology telemedicine project
- UMIN project – 10 Nat’l Univ. hospitals share patients’ records
Japanese experience of telemedicine in oncology

Network of 14 Cancer Centers throughout Japan

130 teleconferences per year with 16,000 participants

High-resolution image transfers – 2000 x 2000 pixels

(source: H Mizushima)
Bioinformatics
(IBM: Individual-Based Medicine)
Japan-Korea Joint Project

- Oncology Surgery tele-consultation using Grid between Osaka university Hospital and Korea National Cancer Center
Hong Kong SAR

- Government Health Authority manages all hospital electronic medical records and hence records can be shared
  - Standardized to some extent
Malaysia

• THIS (Total Hospital Information System) with tele-health clusters
  - 26 new regional governmental hospitals function as the center of specialty tele-health center
  - National super corridor
Taiwan

• Insurance card and physician e-signature card
• National Health Information Infrastructure (NHII) Project – 4 yrs of development from 7.2004 US$260 million
Bureau of National Health Insurance in Taiwan introduces 22 million Sun-powered health cards

Santa Clara 05 September 2002 Sun Microsystems has successfully deployed the Java Card technology and Sun network solutions by the Bureau of National Health Insurance of Taiwan (BNHI). The BNHI has started to roll out 22 million Java Card technology-powered Integrated Circuit (IC) health cards to Taiwan citizens in July, replacing its original paper-based system. This new smart card will bring substantive time and cost savings to the BNHI.

The IC health card rollout marks a major milestone in the technology advancement of health services in Taiwan. There are multiple stages in this project such as ongoing infrastructure upgrades, public education and acceptance of the new card system. "We will employ the latest technology to ensure a smooth transition and operation for both health professionals and card users", stated Louis Liu, General Manager of Department of Planning and Evaluation of BNHI. "To this end we are working closely with the public and health care providers to anticipate the future needs of card users and to respond quickly to different user scenarios", added Mr. Liu.

TECO Electric & Machinery Co. Ltd. (TECO), a smart card system integrator in Taiwan, implemented the USC145.
Vietnam

- Established Director of National HI in MoH in 2004 – Prof. Nguyen Phuong
  - Setting up national policy
  - Planning to train and educate and develop experts

* Needs help!
Oriental Medicine

- OM is strong in Asia
- International “Oriental medicine” standardization activity begun.
  - WHO WPRO OM consultant
  - Informal strategic planning meeting is scheduled in May 17-19, 2005 in Beijing
  - Semantic content and some other issues
  - Integration of OM to sharable EHR
Other Standards

- APAMI (Asia Pacific Association of Medical Informatics)
  - WG Standard: Character problem, Nursing terminology, Insurance claims
  - WG Developing Countries: Requirements
- Asia IC Card Forum – China, Japan, Korea, Singapore
  - Implementation of IS for health use
- HL7 tutorial road show in SE Asia in 2005
- 6th HL7 Int’l Affiliates Mtg in Taiwan
In recent years, many Asia Pacific countries have ventured into telemedicine to help them jumpstart medical informatics
Regional Tele-Health Activity

- China – military initiated due to vast territory
- India – scarcity of specialty
- Indonesia – many islands, scarcity of specialty
- Korea and Japan – care of island residents
- Korea – home care
Issues of Health Informatics Development In Asia
Issues

1. IT Gap
2. Leadership
3. Lack of experts
4. Lack of standardization
5. National Financial Support
6. Consumer Focused Support
Vision

• Application of eHealth with individual EHR
• CDSS and Clinical Knowledge Support System to be integrated to EHR
• For providing equitable, safe, error free, cost effective health maintenance and healthcare
To realize this dream Standards are must!

INTEROPERABILITY
Health Informatics Research In Korea
Ministry of Health and Welfare

- Health Informatics Research
  - Health information sharing and CDSS
  - EHR
  - Web ontology
  - Integration of bio- and health information
  - Terminology coding standard

- Bio-medical Engineering Research
  - Tele-emergency care
  - Biosensor devices for home care

* Total of EUR4 mill/year for several years
Ministry of Commerce, Industry and Energy

- E-Health Forum
  - Device development concerns
- Wireless Health Informatics Forum
  - Healthcard, EDI applications, and Mobile systems related standards concerns
  - Promote related industry
- Korea Agency for Technology and Standard
  - National Member Body of ISO and IEC
  - Supports ISO/TC 215, Health Informatics delegates activities
Ministry of Information and Telecommunication

• U-Health (Ubiquitous Health) Project Forum
  - Smart home network internet node connecting health appliances and applications
ISO/ TC 215, Health Informatics needs to evolve
- Restructuring
- Capture global marketplace requirements
(HI Summit in Hamamatsu, Japan in Sept., 2005)
Restructuring ISO/TC 215
Conclusion

- International cooperative and collaborative activities are necessary to bridge the “ICT gap” within the region.
  a) Provide information
  b) Assist training
  c) Implementation guide of standards
- Change management is necessary to bring eHealth to community.
  a) Ethical, Legal, Social Impact study
Thank you
(yskwak@mail.knu.ac.kr)

Life Saver
Right Information, Knowledge at Right time and Right place
Intelligent Health Information Sharing System Development Center at Kyungpook Nat’l Univ. (IHIS)

Director: Prof. Il Kon Kim

(www.ihis.or.kr)
Rationale

Life Saver
Right Information, Knowledge at Right time and Right place
Project Outline

  - Phase 1 (3yrs) – Develop system
  - Phase 2 (3yrs) – Implement, commercialize
- System to share health and healthcare data/information securely
- All clinical documents, images, bio-signals (wave form), and sounds
- CDSS
Section 01. Info. Sharing Interface

Engine Development

Kyungpook National Univ. Sch. Med.
Daegu, Korea
Architecture of HL7 Toolkit System

HL7 Engine Toolkit

Composer
- Metafile Generator
- Accessor Code Generator
- Engine Code Generator

Accessor’s Metafile

Validator’s Metafile

HL7 Interface Engine

Validator
Controller
Optimizer

Med-e-Tel Conference
# RIM Analysis

<table>
<thead>
<tr>
<th>Type of Discharge (*distype)</th>
<th>Hospital Infection (*hospinfec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Regular</td>
<td>1. Post Operation</td>
</tr>
<tr>
<td>2. Against medical advice</td>
<td>2. Post Procedure</td>
</tr>
<tr>
<td>3. Absence without leave</td>
<td>3. Urinary Tract</td>
</tr>
<tr>
<td>4. Transfer</td>
<td>4. Respiratory Tract</td>
</tr>
<tr>
<td></td>
<td>5. Central-IV Line</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition of Discharge (*discond)</th>
<th>Death (*expitype)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Completely Recovered</td>
<td>1. Under 48hr of admission</td>
</tr>
<tr>
<td>2. Improved</td>
<td>2. Over 48hr of admission</td>
</tr>
<tr>
<td>3. No change</td>
<td>3. During operation</td>
</tr>
<tr>
<td>4. Not treated</td>
<td>4. During anesthesia</td>
</tr>
<tr>
<td>5. Diagnosis only</td>
<td>5. Maternal</td>
</tr>
<tr>
<td>7. Expired (Autopsy(y/n))</td>
<td>7. Other</td>
</tr>
</tbody>
</table>

Note: on Discharge Summary

RIM: Reference Information Model
DS R-MIM

DMC R-MIM

Discharge Condition
classCode*: <= ACT
moodCode*: <= EVN

Discharge Type
classCode*: <= ACT
moodCode*: <= EVN

Death
classCode*: <= ACT
moodCode*: <= EVN

Hospital Infection
classCode*: <= ACT
moodCode*: <= EVN

Component

1..1

Discharge Condition choice
legalAuthenticator

referenceRange

DS : Discharge Summary, R-MIM : Refined Message Information Model

April 7, 2005

Med-e-Tel Conference
DS Schema

- Basic structure of Application
- Essential part of clinical data sharing
- Integrated and patient centered EHR

Example 1, when “birthTime”

DS Schema
<xs:element name="birthTime" type="TS"/>

DS CDA
<birthTime value="19520924"/>

Example 2, when “dischargeCondition”

DS Schema
<xs:element name="dischargeCondition" type="dischargeCondition"/>

DS CDA
<.. ID="discond">Recovered</item>
<.. ID="expitype">None</item>
<.. ID="distype">None</item>
<.. ID="hospinfec">None</item>

EHR: Electronic Health Record

April 7, 2005

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CDA Generation

Fig. 1 DS interface
CDA Viewing

Signature
<legalAuthenticator>
  <time value="2004051812323"/>
  <signatureCode code="S"/>
  <assignedEntity>
    <id/>
    <assignedPerson>
      <name>
        <given>Hong</given>
        <family>Park</family>
        <suffix>MD</suffix>
        <prefix>87488482</prefix>
      </name>
    </assignedPerson>
  </assignedEntity>
</legalAuthenticator>
Section 02. CDA Builder, Viewer and CDSS Development

Seoul National Univ. Hospital

Seoul, Korea
System Architecture

CDSS Server
- MLM in Arden Syntax
- MLM Vocabulary
- ECA Engine

CDA Server
- CDR Interface
- CDA Studio

ADE System
- ADE Rule Base
- Data Sources

VMR Server
- CDA Retriever
- CDA Local Repository

CDR Documents

April 7, 2005
Med-e-Tel Conference
# Objectives

<table>
<thead>
<tr>
<th>Team</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDA Studio</td>
<td>CDA Studio prototype</td>
</tr>
<tr>
<td>VMR</td>
<td>CDA Index System</td>
</tr>
<tr>
<td>CDSS</td>
<td>Clinical decision support based on Arden Syntax</td>
</tr>
<tr>
<td>ADE</td>
<td>Adverse Drug Effects watch and report System</td>
</tr>
</tbody>
</table>
Arden Syntax

- Arden Syntax is an HL7/ANSI standard specification for defining and sharing medical knowledge-base information.
  - Designed for modular independent knowledge bases and done by Medical Logic Modules (MLMs)
  - Make medical knowledge and logic explicit
  - Allow knowledge sharing within and between institutions
  - Standardize the way medical knowledge is integrated into hospital information systems
Sample Arden Syntax MLM

maintenance:
  title: Check for penicillin allergy;
  filename: pen_allergy.c;
  version: 1.00;
  institution: Columbia-Presbyterian Medical Center;
  author: George Hripcsak, M.D.;
  specialist: ;
  date: 1991-03-18;
  validation: testing;
library:
  purpose:
    When a penicillin is prescribed, check for an allergy. (This MLM demonstrates checking for contraindications.);
  explanation:
    This MLM is evoked when a penicillin medication is ordered. An alert is generated because the patient has an allergy to penicillin.
    recorded. ;
  keywords: penicillin; allergy;
  citations: ;
knowledge:
  type: data-driven;
data:
  / * an order for a penicillin evokes this MLM */
  penicillin_order := event (penicillin order@dic);
  / * find allergies */
  penicillin_allergy := read last [penicillin@dic];
  
  evoke:
    penicillin_order;
logic:
  if exist (penicillin_allergy) then
    conclude true;
  endif;
action:
  write "Caution, the patient has the following allergy to penicillin documented: " || penicillin_allergy;
  urgency: 50;
end:
Section 03. Info. Sharing Clinical Document Repository (CDR) Development

Kyungpook National Univ. Sch. Med.
Daegu, Korea
What is CDR?

• **Clinical Document Repository**
  – CDR is a repository of CDA.

• **A framework**
  – To store and manage the clinical data as form of CDA and utilize the data.

• **Utility of CDR**
  – To provide a system for constructing the individualized life-long health records.
  – To be used for abstracting clinical knowledge to provide better healthcare, for clinical research and accurate health statistics for policy making.
Software Architecture

Registry Service Manager

SOAP Binder  HL7/ CDA Handler  Security Manager

Life Cycle Manager  Query Manager

Application Server

Persistent Manager

Registry

Repository
CDR Framework -
Distributed Registry/Repository

Medical staff
Patient/Guardian
Corporation/Government

Repository List

Client Search Application

Registry

Regional Repository

Hospital 1
Hospital 2
Hospital 3
Hospital 4
Hospital 5
Section 04. Image and Wave Form
Info. Sharing Interface
Engine Development
Medical Engineering, Hanyang Univ., Sch. Med., Seoul, Korea
System Architecture

ECG Equipment

HIS

Other System

Server

Data Save

DICOM Create

JPEG Create

CDA Transfer

File Transfer

Database

Worklist

Examination list

Edit Patient info.

File transfer (ECG, CDA)

Viewer

(ECG View, CDA Store View)

Signal

Examination Info.

CDA Document

Search

diagnosis

File transfer (ECG, CDA)
Result List and CDA Report

Confirmed result list

User can make interpretation from normalized code

It executes CDA report viewer program
XML-form and CDA doc.
Tele-Emergency Care
Regional Remote Trauma Care
Information System Development
Center at Biomedical Engineering,
Yonsei Univ. Sch. Med.
Seoul, Korea

Director : Prof. Yoo
Project Outline

- **Period:** 2002.12 ~ 2005.11
- To develop a system to transfer and share emergency data, images, and waveform data between accident site and emergency care center.

This is a spin-off of the system used to support World-cup game held in Korea in 2002.
Bio-sensor Device for Homecare

Bio-sensor Devices for Homecare
System Development Center at
Biomedical Engineering, Yonsei
Univ. Sch. Med. at Wonjoo Campus
Wonjoo, Korea

Director : Prof. Yoon
Project Outline

- Bio-sensor-based portable medical devices to be used for homecare and self monitoring.

This project will lead to e-health system development and implementation.
Electronic Health Record
EHR Development Center at Seoul Nat’l Univ. Hospital
Kyunggi, Korea
Director: Prof. Suh
Project Outline

- Period: 2004.12 ~ 2012.11
  - Phase 1 (3yrs) – Develop system
  - Phase 2 (3yrs) - Exportable package
  - Phase 2 (3yrs) – Implement, commercialize
- Institutional EHR, Sharable EHR, Personal EHR, and Public Health EHR to be developed and implemented nationwide eventually.
- Three Univ. Hospitals joint project
Ontology

Web Ontology for EHR and CDSS
Development Center at Seoul Nat’l Univ. Dental Sch.

Seoul, Korea

Director : Prof. Kim
Project Outline

- Period: 2004.12 ~ 2009.11
- Web medical ontology to be developed for use in EHR and clinical decision support.
- This will assist development of EBM (evidence based medicine) support system.
Integration of Bio and Health Information

Integration of Bio-information and Health Information System
Development Center at Sejong Univ
Seoul, Korea

Director : Prof. Kim
Project Outline

- Period: 2004.12 ~ 2007.11
- A pilot project to identify what information and data to be integrated Bio-information and Health information. And develop a system for integration.
- This will lead to IBM (individual-based medicine) system.