Semantic interoperability is it achievable or should we just stop trying?

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Singapore: a small country.....

- 4.59 million people on 707.1 sq km (6,489/km²)
- Ethnically diverse:
  - Chinese: 75 per cent
  - Malays: 14 per cent
  - Indians: 9 per cent
  - Others: 2 per cent
- 35,000+ healthcare providers
- 11,580 hospital beds
- 429,744 hospital admissions (2007)
- Public sector out-patient visits (2007)
  - Specialist Outpatient Clinics 3,687,910
  - A&E 752,122
  - Polyclinics 3,797,953
Achieving Positive Health Outcomes with Low Expenditure

Affordable healthcare expenditure at about 3-4% of GDP (1% is government spending)

Top-ranked overall healthcare system by WHO (6th overall)
- World Health Report 2000

1st for infant mortality, 8th in life expectancy, 20th for health and primary education and 15th in terms of social parity in health care quality
- The Global Competitiveness Report 2006-07 (by WEF)

3rd in health infrastructure; 4th in terms of impact of health problems (AIDS, drug, alc abuse etc) on companies
- The World Competitiveness Yearbook 2007 (by IMD)

1/3 of JCI-accredited hospitals in Asia are from S’pore
- All 7 public hospitals achieved JCI accreditation

Clinical expertise recognized internationally with many “Firsts’’

Attracted internationally known partners such as Johns Hopkins, St Jude Children’s Research Hospital, Duke University and JCI regional HQ
Challenges in Healthcare

- **Aging population** - By 2030, 1 in 5 Singaporeans over age 65 (three-fold increase)
- **Changing diseases** – more chronic and emerging infectious diseases
- **Increasing public expectations**
- **Rising prices** of drugs and equipment
- Yet, **limited resources**
  - Global shortage of healthcare professionals;
  - Lack of facilities

Information Technology has the potential to enable solutions to address pressures
Patients have freedom of choice to choose any providers of care in various sectors.
Singapore’s Public Health Care Sector

MOH Holdings

National Health Group

SingHealth Group

National University Hospital

Tan Tock Seng Hospital

Institute of Mental Health

Alexandra Hospital

National Healthcare Group Polyclinics

The Cancer Institute

The Heart Institute

National Skin Centre

The Eye Institute

JOHNS HOPKINS – NUH International Medical Centre

SingHealth

Singapore General Hospital

Changi General Hospital

KK Women’s and Children’s Hospital

National Dental Centre

National Heart Centre

Polyclinics

SingHealth

National Neuroscience Institute

National Cancer Centre Singapore

Singapore National Eye Centre
New Directions: Systems of Integrated Care

How do we integrate care “horizontally” across systems?

• Information Technology
• Manpower
• Platforms for Coordination
Strategic Imperatives

- Sharing of clinical information
- Drive clinical excellence and patient safety
- Integrated care for patients with chronic disease
- Streamline access to outpatient clinics
- Enable ‘Self Help’
- Enable mobility of workforce
- Develop strong research analytics capabilities
Current Health IT Environment

- Multiple EMR systems in place at Cluster, Polyclinics and Specialist Clinics

- Minimal EMRs at GP and across Community Hospitals

- EMRX – over 100,000 clinical documents shared monthly – not structured data

- Culture of information sharing across clusters, not across all providers
1. Singapore requires a national integrated electronic health information system based on a common enterprise architecture, data standards and privacy and security guidelines.

2. A shared electronic health record (EHR) can be delivered by 2010.

3. Broad stakeholder engagement is needed. The EHR is not an IT project but a business and clinical transformation project.

4. Governance and accountability is necessary to align strategic intent with implementation.
   - National strategy and implementation plan
   - Funding mechanisms to encourage consistent, coordinated and continuous investment in health IT
   - Skilled resource capacity

5. Measuring of success of the national EHR with regards to health care quality, safety, and productivity.
But EHR raises new challenges…

Beyond the EMRX, EHR is envisaged to…

- Cover the entire healthcare continuum
  - Ministry of Health has fewer controls over private sector & Voluntary Welfare Organisations

- Cover the entire populace including non-resident foreigners

- Capture the full data complement
  - Including sensitive health information e.g. STD, mental health indications

- Support secondary uses
  - National health planning & resource allocation
  - Quality assurance
  - Public health regulation
  - Health research etc
Clinical data included in the national project set meets defined quality standards and therefore can be:

- Relied upon by health service providers and users for monitoring the health status of and providing care to individuals;
- Meaningfully used for secondary purposes, including the production of clinical knowledge;
- Reliably and safely shared/exchanged.

“Enter once use many times”
Standards Vision

The Standards Work group will provide Singapore with a suite of standards that:

- Are clinically driven
- Are swift to develop and easy to use
- Fully support the development of the electronic health record and national health projects
- Promote rapid deployment and development of the EHR functionality;
- Provide a platform for long term semantic interoperability and research informatics
- Are internationally recognised
Workplan

- Infrastructure
  - National Standards Framework
  - National Standards Portal
    - National Data Dictionary
  - National Terminology and Classification Centre

- Development and Implementation
  - EHR Standards
    - Interoperability
    - Semantic Interoperability
  - Singapore Drug Dictionary
  - National Standardization of Disease and Diagnosis Coding
    - ICD 10 AM and AR DRG V 6
    - SNOMED and Discharge summary
National Standards Framework

- Standards Governance
- Conformance Strategy
- Capacity Building
- Implementation Support
Standards Lifecycle

Ensuring business benefit
- Identification/articulation of business need
  ✓
- Inclusion
- Requirement Analysis
- Option Analysis

Ensuring standardisation
- Maintenance
- Conformance
- Implementation

Implementing the standard
- Change Management
- Implementation Planning
- Testing
- Strategy Selection
- Adoption, Adaptation or Development
Standards Programme - Infrastructure

- Request Submission
- National Standards Framework
- Conformance Strategy
- Implementation Support and Capacity Building
- Terminology and Classification Release Centre
- Standards Catalogue
  - 1. EHR Exchange Format
- Terminology Subset
- Data Dictionary & Library
- MOH Data Dictionary
- Data Dictionary
- Security Standards
- Interoperability Standards
- Standards Portal
  - National
  - Local
  - Wiki
EMR
Specific to an facility (institution, private office); the equivalent of its paper predecessor and includes everything that is recorded by that organization about a given patient. It has “depth” but lacks “breadth”.

EHR
Specific to an individual; captures a key subset of health information from multiple point of service systems. It is available electronically to authorized healthcare providers and the individual anywhere, anytime in support of high quality care. This record is designed to facilitate the sharing of data across the continuum of care, across healthcare delivery organizations and across geographies.
Standards in the context of an EHR (UK)

- Terminology
  - CUI, openEHR, SNOMED CT
  - SNOMED CT, LOINC
  - ICD 9 CM, ICD10 AM, Data Dictionary

- Classifications
  - openEHR, HL7 RIM, CDA

- Information Model
  - HL7 V3, CDA, SNOMED CT

- Registration and Location Models
  - NEHRA

- Search and Retrieval Models
  - HL7 V3, openEHR, SNOMED CT

- Collection Models
  - HL7 V3, openEHR, SNOMED CT

- Recording
  - Decision Making

- Communication Models
  - Interoperability

- Utility
  - Categorisation
  - Secondary use

- Expressiveness
  - Precision/rigour
  - Searchability
  - Comparability
  - Best Practice

- Notify, Find

- Structure
  - Detail
  - Search
  - Storage

This material contains information that is confidential to MOH Holdings Pte Ltd (MOHH) and should not be circulated beyond MOHH without permission.
The UK Data Standards Solar System

- SCG
- UML
- HL7 V3
- HL7 V2
- ICD10
- SNOMED
- LRA
- IHE
- UML
- DS&P
- OHT
- CDS
- OPCS
- Data Dictionary
- ISO Data Types
- openEHR
- EHR
## Interoperability and standards levels

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### Machine Transportability
- communication protocols

### Machine Readability
- Point to Point
- Technology based and Operational workflows focused
- Standard message formats, Identifiers, Authentication, Authorisation

### Machine Interpretability
- Regional Connectivity
- Agreed structure and meaning
- Logical Information Model, Data Library
- Messages bound to terminologies and terminology constraints

### Co-operability
- Business transformation and Shared Care
- Clinician Driven leading to agreed process eg care planning
- Policy driven and agreed Business rules
EU Semantic Health

- Level 0: no interoperability at all
- Level 1: technical and syntactical interoperability (no semantic interoperability)
- Level 2: two orthogonal levels of partial semantic interoperability
  - Level 2a: unidirectional semantic interoperability
  - Level 2b: bidirectional semantic interoperability of meaningful fragments
- Level 3: full semantic interoperability, sharable context, seamless co-operability
Standards when is enough enough

EU Semantic Health
Standards Challenge

Reference Model

Business Requirements

Interchange Formats

Research Requirements

Medication Recon Requirements

Problem List Requirements

Medication Recon Exchange

Problem List Exchange

Event summary Requirements

Event summary Exchange

OpenEHR

SNOMED CT

Data Dictionary

HL7 RIM
What is the problem we are trying to solve?

Diagnosis: “Acute Asthma Suspected”
Severity: “Acute”
Status: “Suspected”

Diagnosis: “Asthma”
Status: “Suspected”

Diagnosis: “Asthma”
How big is the problem?
The Promise of the EHR

- Well-managed chronic illness
- Improved access to care
- Fewer adverse drug events
- Better prescribing practices
- Reduction in duplicate or unnecessary tests
- Reduced wait times
- Increased patient participation in care

A young boy waiting at A&E, Tan Tock Seng Hospital
Thank You

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