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S&I = STANDARDS AND INTEROPERABILITY FRAMEWORK
PHRI = PUBLIC HEALTH REPORTING INITIATIVE

Wednesdays With PHRI…

An Informational Webinar Series
Session 2
March19, 2014

http://wiki.siframework.org/Public+Health+Reporting+Initiative

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An Informational Webinar Series

Session 2:

Interoperability: Semantic (Data), Technical (Transport), Functional (Users' Business Rules, Workflow and Dataflow)

Agenda

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Topic	Time Allotted
Welcome/Introductions, *Anna Orlova, Moderator*	4:00 – 4:05
Interoperability Overview: Semantic, Technical, Functional, *John Ritter* **Supporting Data Exchanges through Interoperability**, *Noam Arzt* **Building Interoperability for Public Health**, *Richard McCoy*	4:05 – 4:50
Questions and Answers	4:50 – 4:59
Adjourn	5:00

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John Ritter

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HL7 EHR Work Group co-chair

Three Types of Interoperability

- **Technical (physical conveyance of a 'payload')**
- **Semantic (communication of consistent meaning)**
- **Process (integration into an actual work setting assuring the systems' usability and usefulness)**

What is "Interoperability"?

- **Interoperability allows us to talk in broad terms about systems interacting with one another. It can refer to inter-institutional interactions, as well as intra-institutional interactions, and even intra-system interactions.**
- **Interoperability Definition modified for Health Care – IEEE/USA 2005:**
  - Interoperability generally refers to "the ability of two or more systems or components to exchange information and to use the information that has been exchanged…."
  - "In healthcare, the ability 'to use the information that has been exchanged' means not only that healthcare systems must be able to communicate with one another, but also that they must employ shared terminology and definitions."

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*A "Puzzle" metaphore**

- **Technical interoperability describes the actual, physical puzzle pieces and their ability to be linked.**
- **Semantic interoperability describes the image printed on the puzzle and the picture's ability to convey information to people.**
- **Process interoperability describes the methods and strategies used by those assembling the puzzle, perhaps grouping pieces with straight sides, grouping pieces by color, etc.**

HHS Secretary Michael Leavitt, at the first meeting of the American Health Information Community

"Puzzle" metaphore (explained)

- **Technical interoperability. The puzzle manufacturers do not care about the meaning of the map – it might as well be a picture of a bird since they do not intend to use the map to navigate the subway. Nor do they do not need to concern themselves with which approach is used to assemble the map or how long it takes to do so. Rather, they are concerned with ensuring that the pieces are cut properly, that all the pieces are placed in the box, and that the box is sealed and shipped correctly.**

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"Puzzle" metaphore (explained)

- **Semantic interoperability. The people assembling the puzzle do not care how it was manufactured, packaged, shipped, or assembled. They are concerned with viewing the map to understand how the subway may be used to travel from "here" to "there."**
- **Process interoperability. The process of putting the puzzle together requires working with characteristics of both the physical pieces of the puzzle and the picture printed on it. The assemblers may change their workflow process depending on their goals. For example, the assemblers may the concentrate on the red puzzle pieces if they are in a hurry to discover the red-colored subway route.**

When Interoperability Fails

- ***To illustrate failure with respect to the three types of interoperability, we will use examples taken from an imaginary school bus accident:***

- **<u>Technical interoperability failure:</u> An Emergency Department physician receives an electronic message from the primary care physician of a critically injured student stating that the student has no allergies to drugs. However, an electronic bit was inadvertently flipped during transmission; the patient dies from an allergic reaction to the drug.**

When Interoperability Fails

- **Semantic interoperability failure: An Emergency Department physician sends an electronic message to an overseas physician asking whether there were any warnings about a visiting student's health. The foreign doctor sends the message code "N/A" that asserts that the information regarding allergies was never gathered. The ED physician interprets the response as "Negative for Allergies" and gives an antibiotic drug; the patient dies from an allergic reaction to the drug.**

When Interoperability Fails

- **Process Interoperability failure: The busload of injured schoolchildren overwhelms the capacity of a remotely located Emergency Department. The hospital information system and the overwhelmed staff each fail to notice that the hospital's antibiotic supply is depleted. A student dies from failure to receive antibiotic drugs.**

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Simply said…

- **Technical interoperability neutralizes the effects of distance.**
- **Semantic interoperability communicates meaning.**
- **Process interoperability coordinates work processes.**

Together, these three types of interoperability are all required to the consistent and timely achievement of what has come to be called "Best Practice."

NEXT: "Interoperability" enablers in the Public Health arena…

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How do these three facets of interoperability translate into the standards necessary to enable them?

For more information see:
http://www.hln.com/expertise/hit/hie/hie-standards.php

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Technical Interoperability

- **Defines structure, syntax and reliability**
- **Ensures that data sent is received without tampering, alteration, or interception**
- **Standards fall into three areas:**
  - Structure and syntax
  - Transport
  - Privacy and Security
- **Apologize in advance for the "alphabet soup"**

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Technical: Structure and Syntax

- **Health Level 7 (HL7): Several flavors…**
  - Version 2 messages
    - Most dominant today (v3 used in some other countries)
    - Multiple, evolving versions not always compatible with each other
    - Text files with “pipe” delimiters
    - Cover lots of clinical areas and demographics
    - Implementation Guides define nuances is a particular setting
  - CDA → CCD, C-CDA
    - Clinical documents used for many purposes
    - May summarize an encounter/discharge or an entire history
    - Structured XML file with machine-readable and viewable content
    - “Profiles” define nuances for a particular use (IHE most notable)
  - FHIR
    - Emerging standard aimed at simplicity and the 80/20 rule
    - Expressed in XML (but could be JSON); uses REST
    - Document-centered (like CDA) or data-centered (like a v2 message)

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Technical: Transport

- **Parties need to agree for interoperability to take place**
- **Reliability largely a function of transport**
- **Most strategies use Internet encryption standards (IETF TLS 1.2/SSL 3.0)**
- **Some transport strategies of interest:**
  - Direct: ONC sponsored, Open Source, "push" technology
  - CONNECT: ONC sponsored, Open Source, mostly built on IHE profiles, used by HealtheWay
  - Web services: Supports service-oriented architecture (SOA)
  - HTTP POST: Simpler, secure, underlies RESTful approach
  - Virtual Private Network (VPN): Transport solution runs *on top of* a VPN

For more information see:
http://www.syndromic.org/storage/Architecture_Report_ISDS_Final.pdf

Technical: Privacy and Security

- **Guided by various Federal and state/local laws, including HIPAA, FERPA, 42 CFR Part 2**
- **Data Use and Sharing Agreements help identify expectations of data exchange partners in understandable language**
- **Consent to share data is a big deal in interoperability**
- **Various IHE profiles (*e.g.*, BPPC) help define mechanisms for recording and sharing consent directives using various tools (*e.g.*, XACML)**
- **Data Segmentation for Privacy (DS4P) efforts also try to manage control to more sensitive data**
- **Authentication and authorization continue to be an issue aided by SAML, CCOW, and directory services**

Semantic Interoperability

- **Often embedded in technical standards (*e.g.*, IG or Profile)**
- **PHIN VADS promotes standard vocabularies**
- **USHIK maintains a central repository of data elements**

Standard	Description
Centers for Disease Control and Prevention (CDC) Vaccines Administered (CVX) and Manufacturers of Vaccines (MVX) Codes	These are widely-used codes for vaccines and manufacturers.
College of American Pathologists Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT®)	This is the standard coding used for a wide variety of medical and health care terms.
International Classification of Diseases, 10th revision, Related Health Problems (ICD-10 CM)	This revision to ICD-9-CM contains a number of important improvements. This standard is not yet widely implemented.
Logical Observation Identifiers Names and Codes (LOINC®)	This is the standard coding for laboratory and clinical observations used by health care systems and messaging (like HL7).
National Drug Code (NDC)	This is a universal product identifier for human drugs.

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Process Interoperability

- **Defines how health data should be used within the workflow of the organizations participating in interoperability**
- **Functionality for interoperability is often described in use cases, user stories, and use narratives. Various samples:**
  - American Health Information Community (AHIC) Use Cases (2006-9)
  - Direct Project User Stories (2010)
  - Standards & Interoperability (S&I) Framework Use Cases
    - Public Health Reporting Initiative (PHRI)
    - Laboratory Results Interface
    - Longitudinal Coordination of Care
    - Provider Directories
    - Query Health
    - Data Access Framework (DAF)
    - Structured Data Capture (SDC)

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Public Health & Semantic Interoperability

- **Healthcare Information and Management Systems Society (HIMSS) adopted an excellent definition of "interoperability" in April 2013.**
- **Semantic Interoperability is the third part of their adopted definition.**
- **Speaks clearly on how these technology changes relate to the data collection, analyses, and reporting that are core to health surveillance and public health programs.**

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- **"Semantic" interoperability provides interoperability at the highest level, which is the ability of two or more systems or elements to exchange information and to use the information that has been exchanged.[1]**
  - "Use the information" are the key words. Delivery of information has little value if it cannot be integrated and utilized by the receiver.
  - Integration and application of the information needs to be seamless.
  - The exchange must minimize or remove any manual intervention steps in order to improve upon today's health surveillance processes and create enhanced value for public health programs.

[1] Institute of Electrical and Electronics Engineers, *IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries*, New York, NY: 1990.

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- **"Semantic" interoperability takes advantage of both the structuring of the data exchange and the codification of the data including vocabulary so that the receiving information technology systems can interpret the data.[2]**
  - Extremely advantageous to public health:
    - "Structure" data in the same manner/format. Think in terms of how an orchestra positions each section in a predictable, agreed-upon manner from venue to venue, allowing the parts to interact with the whole every time.
    - "Codification of the vocabulary" – an Everest goal for public health. Achieve standardization of data with common, accepted definitions that are accepted across health domains, allowing for easy exchange and integration for analyses and metrics.

[2] ***HIMSS Dictionary of Healthcare Information Technology Terms, Acronyms and Organizations***, 2nd Edition, 2010, Appendix B, p190, original source: HIMSS Electronic Health Record Association.

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- **This level of interoperability supports the electronic exchange of patient summary information among caregivers and other authorized parties via potentially disparate electronic health record (EHR) systems and other systems to improve quality, safety, efficiency, and efficacy of healthcare delivery.[2]**
  - "…other systems to improve quality, safety, efficiency, and efficacy of healthcare delivery."
  - Public health systems are an important part of patient information, contributing directly to safety and efficacy.

Syndromic Surveillance	Lab Reporting	Immunization Registry	Cancer Registry	Birth Defects Registry
Vital Records – Births, Deaths, Fetal Deaths		Metabolic Screening	Diabetes Registry	Blood Lead Testing

[2] ***HIMSS Dictionary of Healthcare Information Technology Terms, Acronyms and Organizations***, 2nd Edition, 2010, Appendix B, p190, original source: HIMSS Electronic Health Record Association.

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What are the potential benefits?

- Birth reporting (birth certificates) to Health Departments
- Three specific examples

What are the potential challenges?

- Standards / Vocabulary
- Resource Allocation
- Two specific examples

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Vital Records (Birth Certificates)

Collects a variety of clinical information about the mother and child; data entered into a state's Electronic Birth Registration System (EBRS).

Challenges

1) Medical records clerk uses worksheets, gathers all the data, and then data enters. Time consuming, duplicative, potential for transcribing errors.

2) Some data not available at the time when birth certificate information must be submitted via the EBRS.

Interoperability has the potential to vastly improve the quality and timeliness.

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Example #1: Vital Records (Birth Certificates) and Lab Reporting

- Some of the items currently on the certificate are questionable accuracy or left as unknown because they rely on lab testing, but the lab data isn't always available at the time of EBRS data submission. For example:

- Congenital Anomalies of the Newborn: Down Syndrome (confirmed / pending); Suspected chromosomal disorder (confirmed / pending).

- With interoperability, electronic lab results could be available much sooner and "exchanged" with the EBRS (either via the EHR or directly).

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Example #2: Vital Records (Birth Certificates) and Electronic Prescribing

- Electronic prescribing data can help confirm conditions on the birth certificate, such as diabetes (if there is a prescription for insulin), or if fertility treatments were received.
- Also, could provide data for various birth certificate items, such as:
- Abnormal Conditions of the Newborn: Antibiotics received by newborn
- Infections Present and/or Treated During This Pregnancy: entire list
- Data from the electronic prescribing may provide greater completeness and accuracy than a clerk gathering the information on paper and then entering into EBRS.

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Example #3: Vital Records (Birth Certificates) and Medical Hardware

- An alternative to searching through a medical record for a specific measurement from one point in time will be direct communication of the measurement data to public health systems.
- For example, the birth certificate requires collection of “assisted ventilation required for more than six hours” for the newborn.
- This would be known to the exact minute in the EHR based on the data feed from the medical equipment.

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Potential challenges

- **Standards / Vocabulary**
  - How do you bring all public health domains together and agree on common vocabulary?
  - If achieved, how do you move the healthcare providers to modify existing systems that may be utilizing different definitions for data elements and different standards for measurement?
- **Resource Allocation**
  - Who will address duplicate persons and records when "exchanged" from different sources? Who in public health will reconcile conflicting information?
  - How do you pay for the technical work that may need to be done on public health systems? Or find the necessary knowledge and skill levels?

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Example #1: State Immunization Registry and HIE

- Significant de-duplication work required by the Registry staff every week
- Duplicate persons (entities) received within the Registry from the HL7 messages flowing through the HIE
- Vaccinations coming from multiple sources: multiple provider offices; hospitals; insurers; pharmacies; local clinics; etc.
- Name changes – adoptions; marriage; divorce
- Legal name versus Common name (Robert vs. Bob)
- Similar names (Annabelle vs. Annalynne)
- Misspellings (Richard vs. Ricard vs Ricardo)
- Date of Birth errors (9/1/1970 at Practice A and 9/1/1978 at Practice B)
- Persons with the same name and born on same day
- Twins given the same or similar names (George…and his twin brother George or his twin sister Georgie).

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Example #2: Vital Records and Hospital EHR Systems

- Differences in vocabulary and measures between what Vital Records is requiring compared to legacy EHR systems.

  a) Breastfeeding – successful attempt? Any attempt? During stay? At time of discharge?
  b) Race / Ethnicity – OMB list? NCHS list? State expanded lists (ex: MA)?
  c) Tobacco use – yes or no? Number of cigarettes per week, month, trimester?
  d) Pregnancy risk factors
  e) Characteristics of labor and delivery

- Cross-mapping of data elements between systems ("close enough") without agreed-upon definitions and vocabulary can result in quality problems and poor public health planning and interventions.

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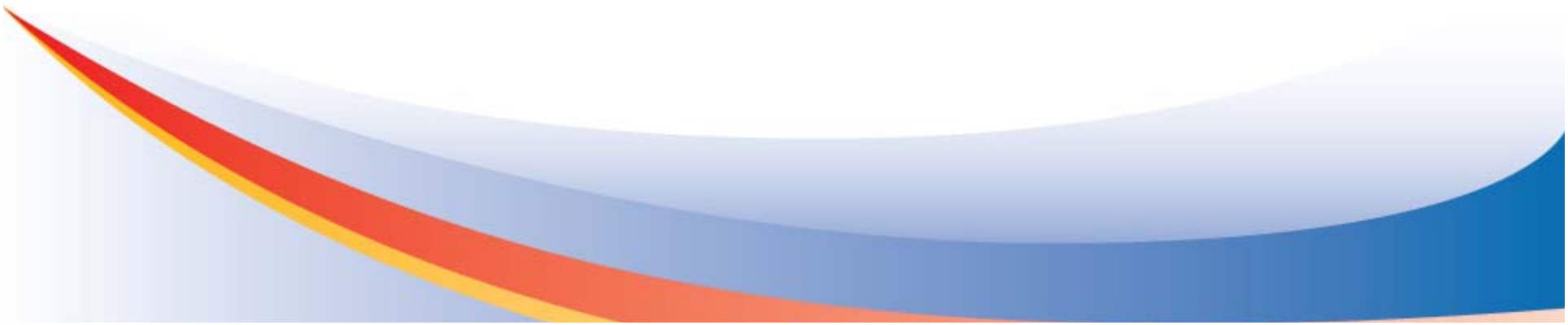
Questions?



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Resources

"Coming to Terms: Scoping Interoperability for Healthcare"

- **www.hln.com/assets/pdf/Coming-to-Terms-February-2007.pdf**

Healthcare Information and Management Systems Society

- **http://www.himss.org/library/interoperability-standards**

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Questions?