From Integration to Interoperability: The Role of Public Health Systems in the Emerging World of Health Information Exchange

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American Public Health Association
Annual Meeting
Session 3219.2
October 27, 2008

Presenter Disclosures

(1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose

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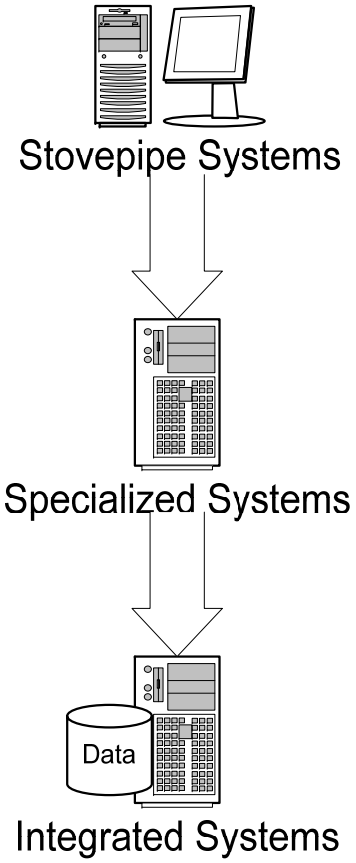
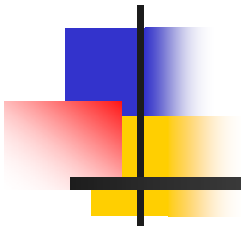
Public Health Systems Evolution



- Began as program-specific, stovepipe systems, often PC- or mainframe-based
- Evolved into more robust specialized systems
- In some cases became integrated systems, either patient-centric or case-centric

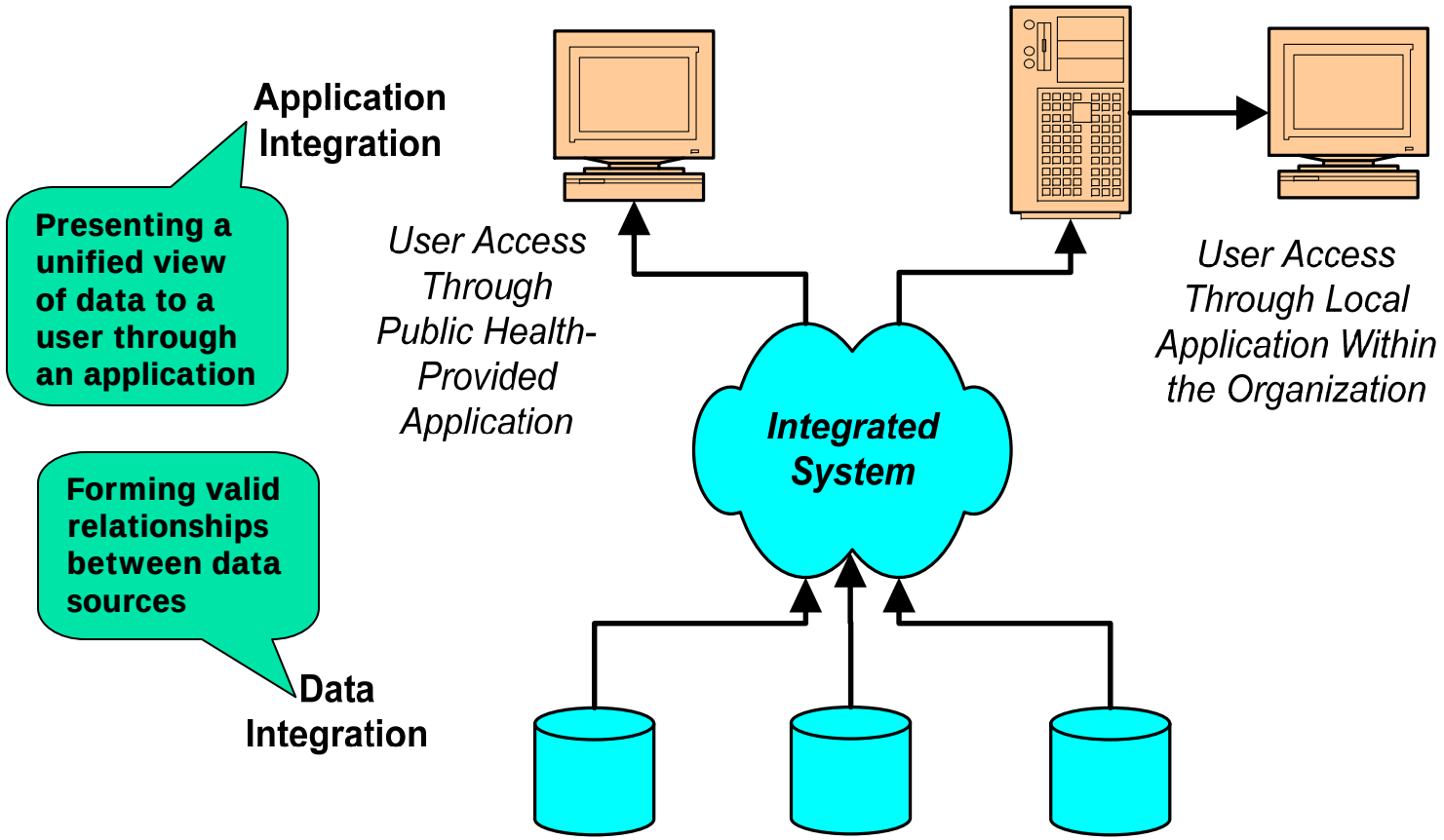
Sample CDC Applications

CASA	Clinic Assessment Software Application (1992)
LIMS	Laboratory Information Management System
PHLIS	Public Health Laboratory Information Systems (1989)
VACMAN	Vaccine Management System

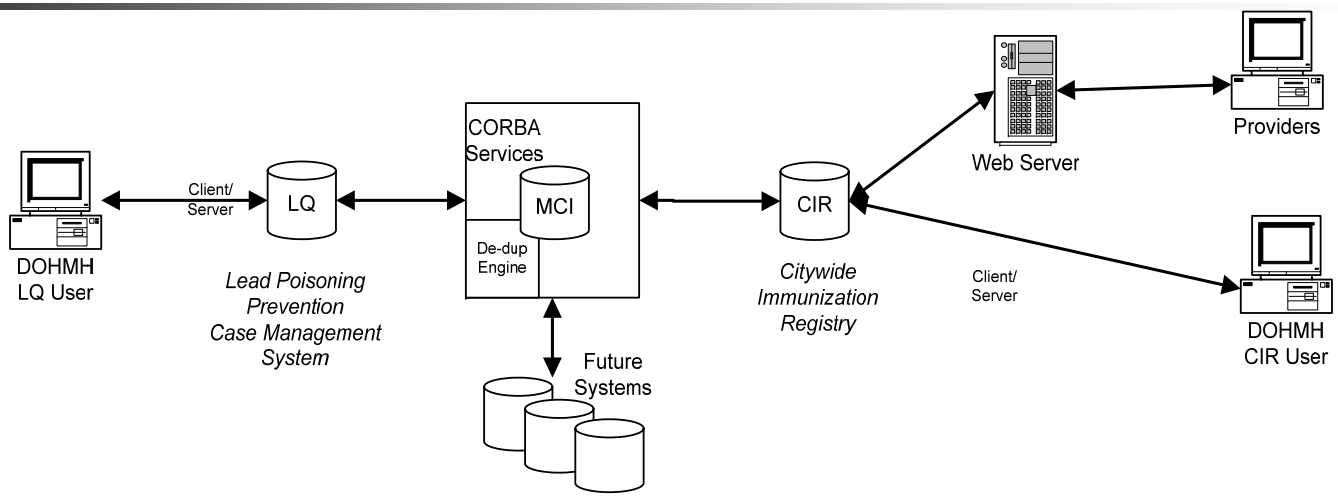


Integration and Interoperability

Two Types of Integration



Case Study: NYC MCI



- LeadQuest and CIR developed independently
- Integrated by sharing a Master Patient Index
- Other systems may join in the future
- Both Data and Application Integration

Improvement in NYC

TABLE 1 ● Number and percentage of matching results of the "initial load" data by system

	Within system		Between system	Within and between system
	CIR	LQ	MCI	CIR, LQ, and MCI
Pre-MCI, *N*	2,426,369	2,184,216	4,086,865*	4,610,585
Post-MCI, *N*	2,065,230	2,021,635	2,977,290	2,977,290
Merged, *N*	361,139	162,581	1,109,575	1,633,295
Merged, %	14.9	7.4	27.1	35.4
Human review, *N*	74,798	56,747	95,886	227,431
Human review, %	3.1	2.6	2.3	4.9

*This number represents the sum of records in each data system after MCI's internal de-duplication, ie, 2,065,230 + 2,021,635 = 4,086,865.
CIR = Citywide Immunization Registry; LQ = Lead Quest; MCI = Master Child Index.

TABLE 2 ● Number and percentage of Lead Quest records merged with Citywide Immunization Registry or vital records

Birth cohort	CIR	LQ	Integration merges	LQ records merged with CIR records, %
<1996 (no vital records)	851,460*	1,235,734*	494,595†	40.0
1996	157,818	133,368	105,280	78.9
1997	159,194	126,373	100,336	79.4
1998	154,415	124,180	99,236	79.9
1999	146,339	116,795	94,532	80.9
2000	150,899	107,048	87,802	82.0
2001	151,601	95,044	79,979	84.1
2002	148,015	74,892	63,228	84.4
2003	142,675	7,985	6,437	80.6
1996–2003	1,210,956*	785,685*	636,830†	81.1

Source: Tables are from Papadouka, Vikki et al, "Integrating the New York Citywide Immunization Registry and the Childhood Blood Lead Registry, *Journal of Public Health Management and Practice*, November 2004 (Supplement), p. S77.

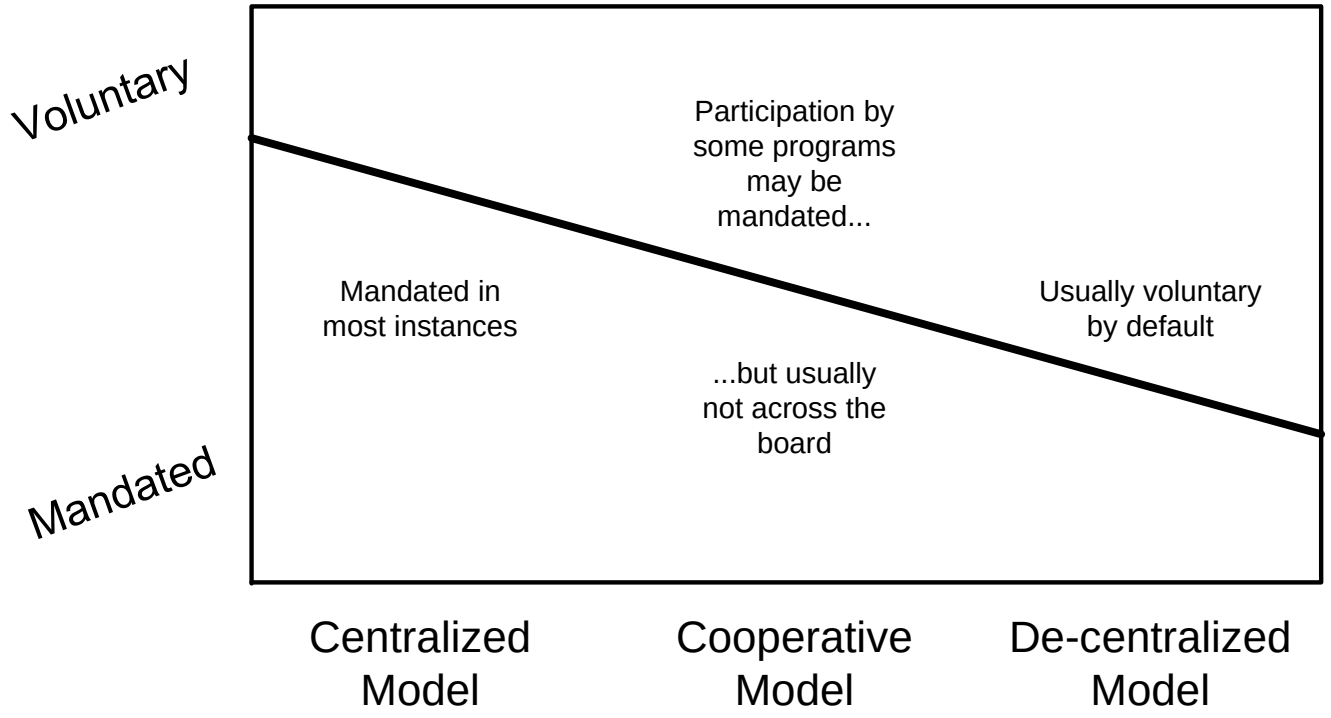
Enterprise-wide Integration

- Three models: Centralized (RI, MO), Cooperative (NYC, UT), Distributed (*de facto* for most)
- Can be implemented agency-wide or on a sub-organizational level
- Success will vary by Organizational, Technical, and Process attributes

Key Challenges

- Central Model: Security, privacy, and ownership concerns
- Distributed Model: Technical readiness and data use limitations

Enterprise-wide Integration



From Integration to Interoperability

"Interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged."

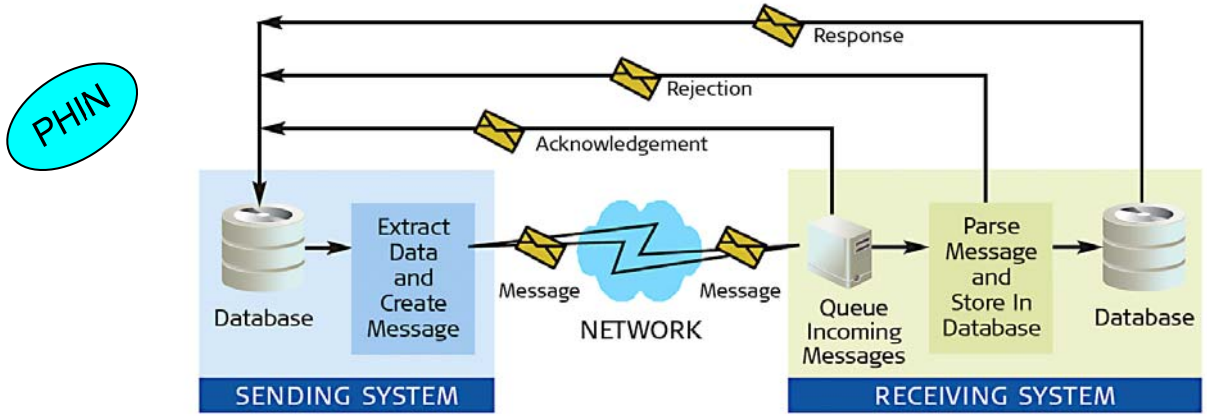
HL7 EHR Interoperability Working Group

HL7 Definition Key Aspects

- Technical Interoperability
  - Structure, syntax, reliable communication
- Semantic Interoperability
  - Full meaning preserved
- Process Interoperability
  - Integration of systems into work flow

Technical Interoperability: System-to-system Messaging

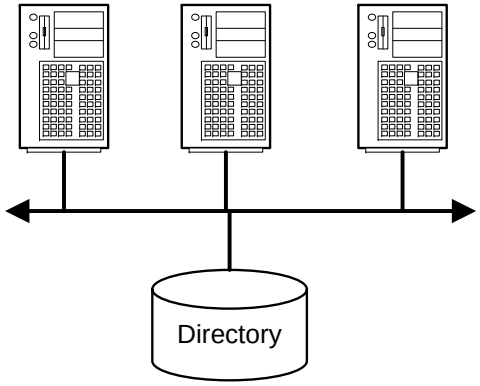
- Public health systems have been engaged in data exchange for years (mostly *to* them)
- Though flat file formats still dominate, HL7 messaging is beginning to gain steam



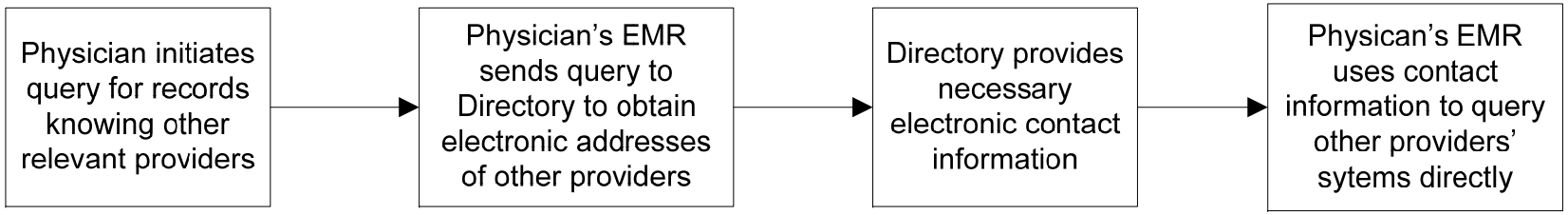
Semantic Interoperability: VT Health Info Tech Plan

Standard	Description
CMS' Healthcare Common Procedure Code System (HPCPCS)/American Medical Association (AMA) Current Procedural Terminology (CPT®) Fourth Edition (CPT-4)	This is the standard coding for procedures widely used in the healthcare community: Level I: Hospital Outpatient Procedures (CPT4) Level II: Products, supplies and other services
Centers for Disease Control and Prevention (CDC) Race and Ethnicity Code Sets	These code sets are based on current federal standards.
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, Ninth Edition, Clinical Modifications (ICD-9-CM)	This is the standard coding used for diagnoses and procedures by hospitals: Volume 1 & 2: Hospital diagnoses Volume 3: Inpatient hospital procedures
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 Library of Medicine (NLM) Unified Medical Language System (UMLS) RxNorm	This is the standard for coding the names of drugs and dose forms.
National Drug Code (NDC)	This is a universal product identifier for human drugs.

Process Interoperability: Peer-to-Peer EHR Exchange



- No central data server required, but directory server (of providers, not patients) can be used to facilitate communications
- Each system communicates as needed with neighboring systems
- Data is displayed within each users “local” system, or stored locally



Data-centered or Document-centered?

- Data Storage Strategy:
  - Data-centered: systems store data in a conventional relational database (RDBMS) with tables and rows; use SQL to access
  - Document-centered: data stored in a formatted document for retrieval as a unit; meta-data saved to facilitate search and retrieval

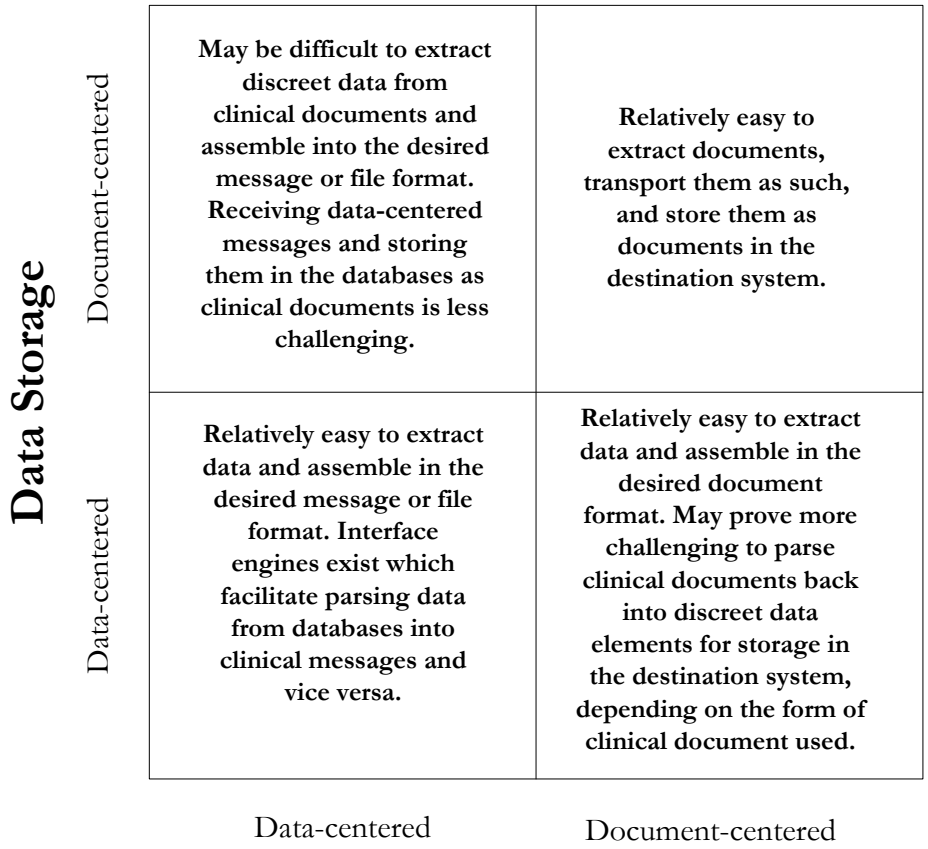
Data-centered or Document-centered? *(continued)*

- Interoperability Strategy:
  - Data-centered: traditional structures to represent the data set being transported (a row in a file for a record; delimited or fixed length fields within the record)
  - Document-centered: data is pre-arranged in a document format which is structured

***e.g.,* X12 or HL7 messages**

***e.g.,* CCR, CCD**

Data-centered or Document-centered? *(continued)*



Impact on Public Health

- Data-centered approaches still dominate in intra-organization interoperability but this may change
- Public health/PHIN still seems to be message-centric (i.e., data-centric)
- EHR-S/HIEN world seems to be moving to document-centric (IHE, CDA)
- By default, HITSP ISs are document-centered

Implications for Public Health

Benefits to Public Health of HIE Participation

- Many of public health's data trading partners will choose to interoperate with an HIEN and reduce (or eliminate!) superfluous connections
- Public health can gain access to data and trading partners who previously might not have participated in its initiatives
- Better to be an insider than an outsider: Public health risks being left out as the medical community moves ahead

What Can Public Health Contribute to HIE?

- "Quick start" by leveraging existing activities, including interfaces to labs
- Existing data, including consolidated data and population-based data
- Expertise: de-duplication, database management, web applications, data exchange including HL7
- Existing relationships with many relevant stakeholders: providers, hospitals, payers, professional associations
- Governance: experience in negotiating and implementing data sharing agreements

Risks to Public Health

- Public health applications targeted at these users may have slower uptake as organizations encourage (or require) users to stay with institutionally-supported applications
- Pressure will build for providers to interoperate solely through HIENs
- Public health systems run the risk of becoming focused as data repositories as users over time lose access to their distinctive features
- While many specialized features are part of the approved HL7 EHR specification they are not *required* for CCHIT certification

Three Imperatives for Public Health:

1. Embrace emerging national standards for system interoperability

2. Enable “special functions” of public health systems to be accessed directly by user systems

3. Organize an informatics focus in the agency to engage in and support local, regional and national initiatives.

Additional Information

HLN's "Insights" at
http://www.hln.com/resources/index.php

HLN's "Evolution of Public Health Information Systems: Enterprise-wide Approaches" at
http://www.hln.com/assets/pdf/UT-White-Paper-Final.pdf

HLN's "Guide to Immunization-related Electronic Data Exchange" at
http://www.hln.com/assets/pdf/IZ-DataX-Guide.pdf

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