Models for Regional Health Information Organization (RHIO) Systems

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Agenda

• RHIO Definition
• Integration Framework
• Data Integration Models
• Application Integration Models
• RHIO-Public Health Issues
What is a RHIO?

- No single definition – in the eye of the beholder
- A collaborative organization focused on health data exchange
- Participants: Physicians, labs, hospitals, pharmacies, patients, public health, payers
- Primarily driven by the private sector, but often has public health involvement (and may be driven by the public sector)
- Usually focused on clinical data exchange, but may focus on health services data in addition or instead (Health Information Exchange Networks - HIEN)
- Can span a metropolitan area, region, or a state
Enablers of RHIO Development

- **Interest and Momentum** – Is it enough?
- **Standards** – March continues on
- **Public Health Expertise** – Leverage possible
- **The Internet** – Pervasive and ubiquitous
Barriers to RHIO Development

- **Financial** – Need strong business case
- **Standards** – Not fully developed
- **Identification** – No national patient identifier
- **Authentication** – Of participants
- **Organizational** – Public-private boundaries
- **Vocabulary and Terminology** – Language
- **Technology** – Limited interoperability

The RHIO Conundrum:

*Should you develop a discreet technical architecture first, then solicit proposals to build it?*

*Or should you leave the architecture up to the vendors who propose solutions to meet your needs?*
The RHIO Conundrum

Favor pre-determination:
- Concerned about ability to weigh alternatives
- Less confident about funders’ commitment
- Unique opportunity to leverage technology
- More certain about COTS
- Participants less flexible for data sharing

Favor more open-ended:
- Concerned about perceptions of bias
- Consensus around clearly-articulated requirements
- More interested in innovation than mitigating technical risk
- Less certain about existing solutions
- Participants more capable for data sharing

Types of Integration
Two Types of Integration

- **Data Integration**: forming valid relationships between data sources

- **Application Integration**: presenting a unified view of data to a user through a computer application

Data versus Application Integration

- **Data Integration**: Participating Data Sources
- **Application Integration**: Direct Access Application, User Access Through Existing Local Application
- "The System"
Data and Application Integration

The message:

– These are two parts of the same puzzle
– Perceptions about “ease of access” and “ease of use” have to be viewed based on assumptions about these two types of integration
– Issue of timely access to/submission of data is critical to all strategies

Data Integration Models
Model 1: Smart Card

Features:
• Extreme in distributed databases: no central database at all!
• Providers of data store information directly onto a patient’s smart card which is carried from site to site
• Authorized users have smart card readers which permit access to records
• Patient controls access to data through possession of the card
• Patients do not typically have card readers of their own

Strengths:
• Allows incremental deployment as participants are ready
• Relatively inexpensive technology
• No burden of central coordination
• No dependence on a central database
• No difficult requirements for data consolidation
• May be less expensive to deploy

Limitations:
• Patient must be physically present (or the card must be present) to access data
• Data is replicated from provider system to smart card and can become unsynchronized
• Provider system must be able to accommodate smart card; high integration cost
• Does not facilitate system-wide data analysis
Model 2: Peer to Peer

Features:
- 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
- Queries between systems could be targeted or “broadcast”
- Standard for communications (e.g., HL7) both for data formats, message types, and communications techniques
- Can support real-time messaging or batch communications depending on the capabilities of the participating systems

Strengths:
- Allows incremental deployment as systems are ready
- No replication of data required (though it is possible)
- Any system can participate (even geographically peripheral) if they adopt the standards
- Lower burden of central coordination
- No dependence on a central database (except for Facilitated)
- May work well when number of participants is small
- May be less expensive to deploy

Limitations:
- In some implementations, need to know the destination system for your information request, or be patient while “the network” is searched
- Might allow some systems to fall behind and not support inter-system communication
- Will not scale well to many, many systems
- Does not facilitate system-wide data analysis
- Performance may be slow
Model 2: Peer to Peer (continued)

Typical Information Flow: Facilitated Model

Features:
- Physician initiates query for records knowing other relevant providers
- Physician’s EMR sends query to Directory to obtain electronic addresses of other providers
- Directory provides necessary electronic contact information
- Physician’s EMR uses contact information to query other providers systems directly

Features:
- Central hub operated by regional authority, public or private
- Hub contains master index of all patients contained in all participating systems but does not contain any actual clinical records
- Each participating system is flagged in the index as possessing data for a particular patient
- A participating system queries the hub to identify where parts of a patient’s record exist elsewhere, then either queries those systems directly. Alternatively, a user accesses patient records through a central “hub application.”
- Community-wide standard for communications (e.g., HL7) both for data formats, message types, and communications techniques
- Can support real-time messaging or batch communications
**Model 3: Information Broker**

**Strengths:**
- System can discover where relevant records are housed community-wide
- No replication of clinical data; data remains close to its source
- System as a whole better protected from inappropriate disclosure (systems can refuse a query)
- Scales well
- Facilitates system-wide data analysis
- May be easier to incrementally add participating systems

**Limitations:**
- Strong central coordination required
- Dependence on the central hub for inter-system communications
- Harder for individual systems to participate
- Requires two steps (and more time) to get data: query to the hub, then second query to the authoritative system
- Potential for large effort to keep demographic records free from duplication
- Other systems may be unavailable at query time
- More difficult to present a coherent, unified view of the patient

**Example:**
*New York City MCI MA-SHARE*

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**Model 4: Partitioned Warehouse**

**Features:**
- Central database operated by the regional authority which assembles complete, consolidated record of people and their medical data (similar to Model 3), but assembled “on the fly” from separately-maintained “vaults”
- Central database contains master index of all patients contained in all participating systems (similar to Model 2)
- Systems required to periodically supply data to the central database cluster
- Standard for communications (e.g., HL7) both for data formats, message types, and communications techniques
- Can support real-time messaging or batch communications depending on the capabilities of the participating systems
Model 4: Partitioned Warehouse (continued)

**Strengths:**
- Less real-time dependence on other participating systems
- Implements a stricter “need to know” policy for data access
- Facilitates system-wide data analysis
- Scales well so long as appropriate investments made in central resources

**Limitations:**
- Strong central coordination required
- Dependence on large central database for inter-system queries
- Queries may take longer to fulfill due to “on the fly” data consolidation
- Data timeliness issue: data submission from participating systems to central database may lag
- Potential for large effort to keep people and clinical records free from duplication
- Harder to implement incrementally
- Requires timely submission of data to be effective
- Unclear how to implement large number of vaults for small providers
- Likely fairly expensive option

*Example:* Indianapolis Network for Primary Care

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Model 5: Central Warehouse

**Features:**
- Central database operated by the regional authority which contains complete, consolidated record of all people and their medical data: a "union catalog"
- Systems required to periodically supply data to the central database
- Standard for communications (e.g., HL7) both for data formats, message types, and communications techniques
- Can support real-time messaging or batch communications depending on the capabilities of the participating systems
Model 5: Central Warehouse (continued)

**Strengths:**
- Querying system’s response to a data request is quicker
- Less real-time dependence on other participating systems
- Facilitates system-wide data analysis
- Scales well so long as appropriate investments are made in central resources
- Economies of scale due to use of large-scale central resources
- Likely better expertise in managing central resources
- Supports existing systems well

**Limitations:**
- Strong central coordination required
- Dependence on large central database for inter-system queries
- Data timeliness issue: data submission from participating systems to central database may lag
- Potential for large effort to keep people and clinical records free from duplication
- Potential for inappropriate disclosure as medical data from unrelated system joined together in advance of specific query or need
- Harder to implement incrementally and provide complete data
- Requires timely submission of data to be effective
- Likely fairly expensive option

**Example:**
- Arizona HealthQuery
- TN MidSouth
- eHealth Alliance

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Relative Model Strength

Ease of use is in the eye of the beholder!
**Date Source vs Data Use Profile**

- **Aggregate/Population-based/Macro Reporting**
  - Good candidate for Central Warehouse
  - Less capable/Descriptive systems/Low reliability and connectivity

- **Individual/Patient-centric/Point-of-care**
  - Opportunity for Partitioned Warehouse or Local Integrator
  - More capable/Enterprise systems/High reliability and connectivity

**Strategy Comparison**

- **Central Warehouse**
  - Less common
  - - Flexibility
  - - Ownership
  - - Upfront cost, functionality

- **Distributed Information Broker/Peer-to-peer**
  - Opportunity for growth
  - - More common
  - - Upfront cost, functionality
  - - Flexibility, ownership
Application Integration Models

Model 1: Independent Application

- Users access data through a new computer application provided as part of the system, sometimes referred to as a “portal”
- No concerns about interoperability with other applications

But
- Users may become confused about which application to use
- Some organizations may not want to support this additional, non-institutional application, and may discourage its use or ban it altogether
Model 2: Data Exchange/Local Application

- User’s local system queries the central system through a standard protocol (e.g., HL7) and data is displayed within the user’s local application.
- No concern about user confusion – all data accessed through familiar, supported local applications.
- But
  - Systems must support agreed-upon method for query and response.
  - Network interruption or latency can interfere or degrade performance.

Model 3: Direct Access through Local Application

- User’s access patients in the local system which initiates a login to the central system through a standard protocol (e.g., CCOW) and logs the user into the central system with existing credentials and query parameters.
- User access data both with local system and central system but does not have to re-query or re-authenticate.
- But
  - Network interruption or latency can still interfere or degrade performance.
Model 4: Data Access via Smart Card

- Data stored directly on smart card which then has consolidated record
- Providers may not be able to readily write to the card nor integrate data easily into their other applications

RHIO-Public Health Issues
What Can Public Health Contribute to a RHIO?

- “Quick start” by leveraging existing activities
- Data, including consolidated data
- Expertise: registries, 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
- Childhood health data somewhat more contained and manageable than adult health data
National Scene

• American Health Information Community (AHIC)
• Office of the National Coordinator for HIT (ONC)
• Health Information Technology Standards Panel (HITSP)
• Certification Commission for Healthcare Information Technology (CCHIT)

Selected Sources

• CCHIT: http://www.cchit.org/
• Connecting for Health (Markle Foundation): http://www.connectingforhealth.org/
• eHealth Initiative: http://www.ehealthinitiative.org/
• HITSP: http://www.hitsp.org/
• HL7: http://www.hl7.org/
• HLN: http://www.hln.com/resources/rhio.php
• ONC: http://www.hhs.gov/healthit/
Questions?