Models for Regional Health Information Organization (RHIO) Systems

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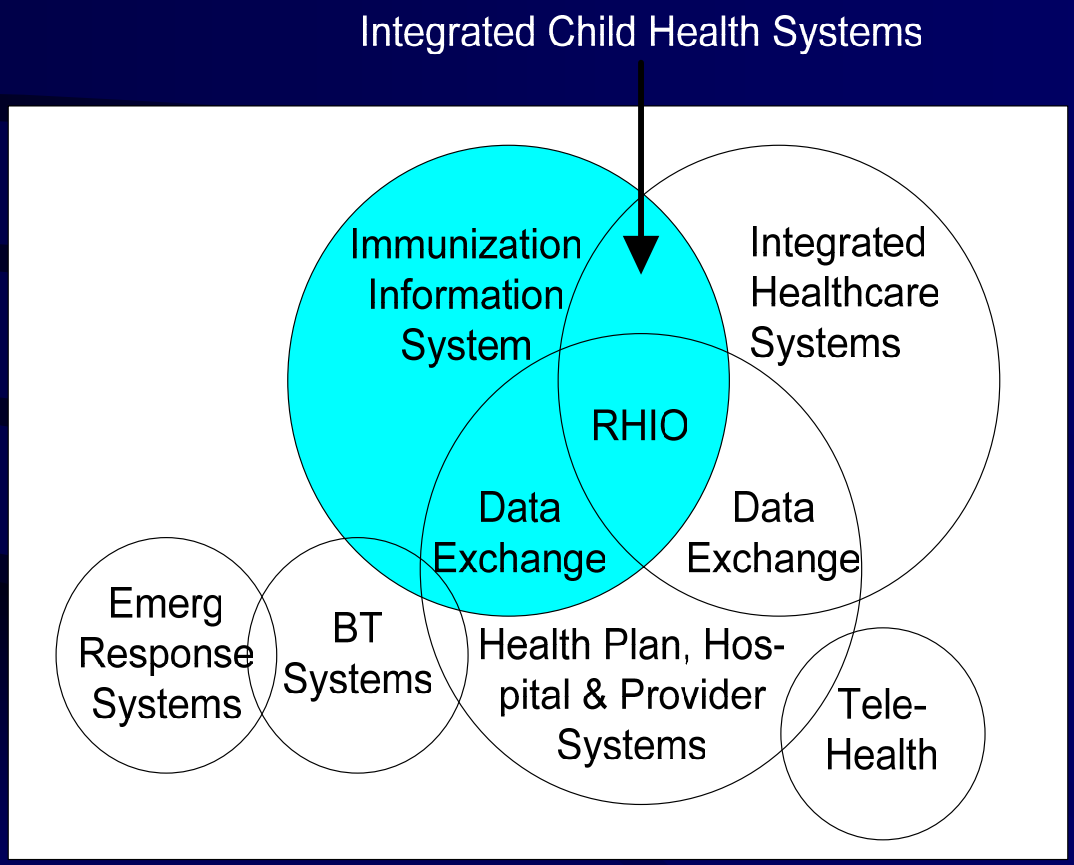
What is a RHIO?

- A collaborative organization focused on health data exchange
- Participants: Physicians, labs, hospitals, pharmacies, patients, public health, payors
- 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
- Can span a metropolitan area, region, or a state

Integration Roadmap: Public Health Perspective



What Can Public Health Contribute to a RHIO?

- "Quick start" by leveraging existing activities
- Data, including consolidated data
- Expertise: de-duplication, database management, web applications, data exchange including HL7
- Existing relationships with many relevant stakeholders: providers, hospitals, payors, professional associations
- Governance: experience in negotiating and implementing data sharing agreements
- Childhood health data somewhat more contained and manageable than adult health data

RHIO Challenges

- Function
- Funding
- Governance
- Technical Architecture
- Identity Management
- Legal Issues

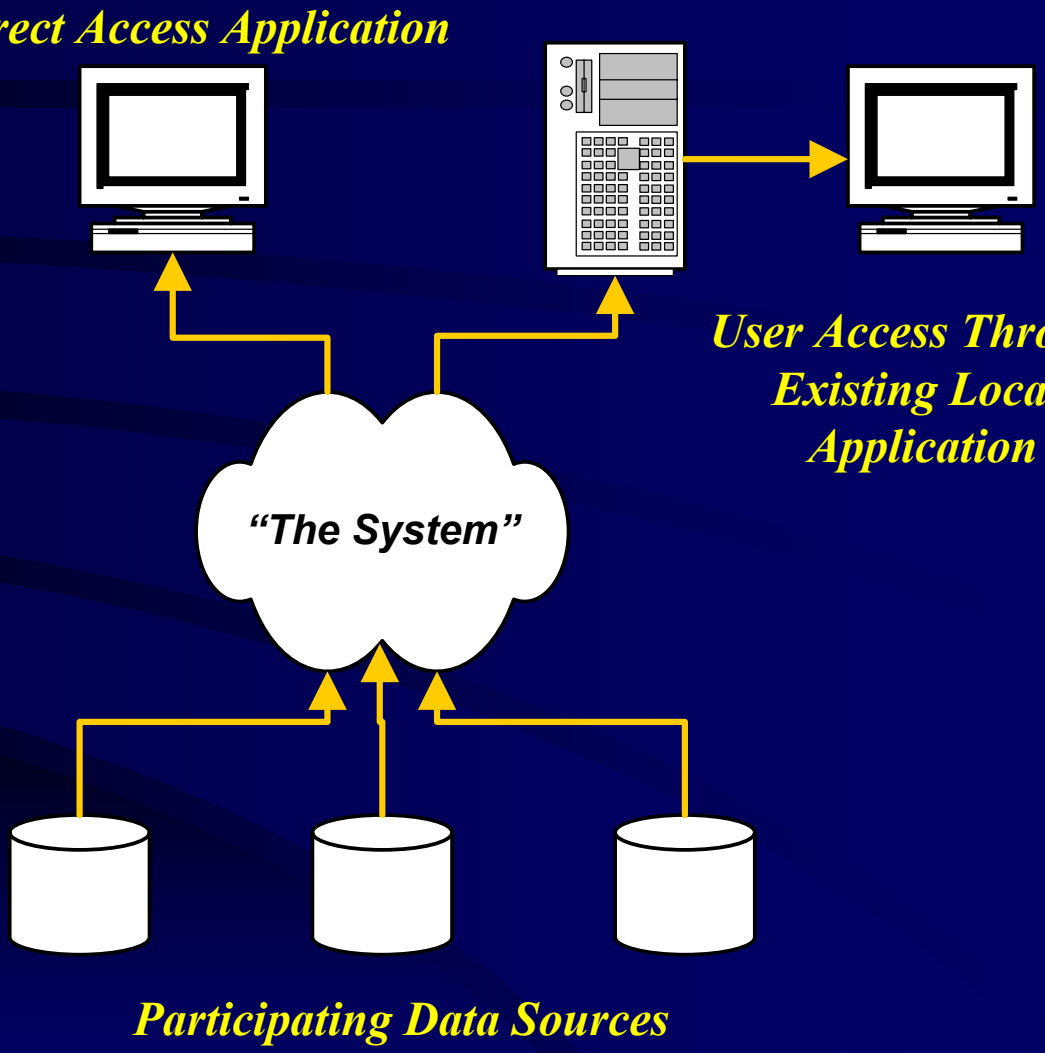
RHIO Challenges

"Will hospitals and other providers be required to store patient information into a centralized database?"

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



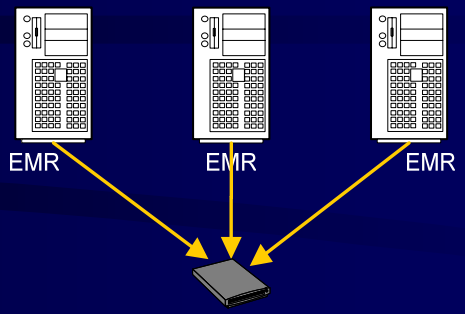
Data and Application Integration

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

Model 1: Smart Card *(continued)*

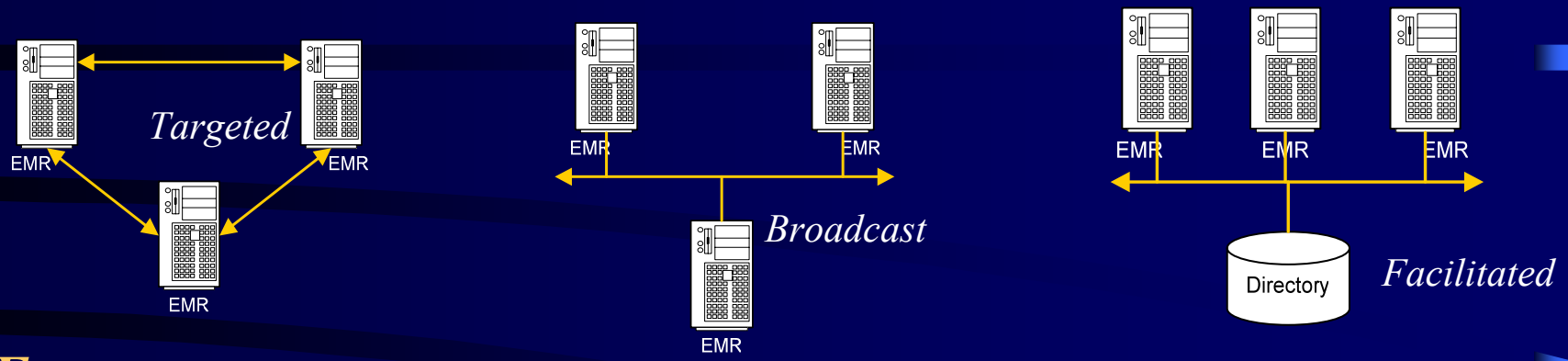
Strengths:

- 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

Model 2: Peer to Peer *(continued)*

Strengths:

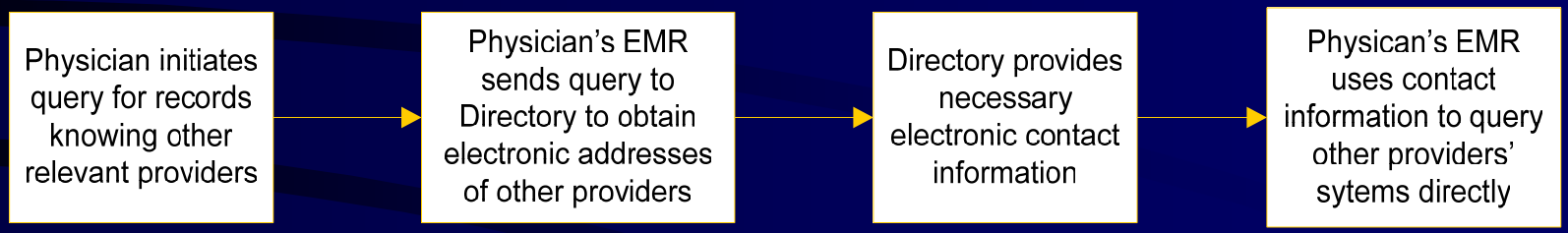
- Allows incremental deployment as systems are ready
- No replication of data required (though it is possible)
- Any system can participate (even geographically peripheral) if they adopt the standards
- Lower burden of central coordination
- No dependence on a central database (except for Facilitated)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

Limitations:

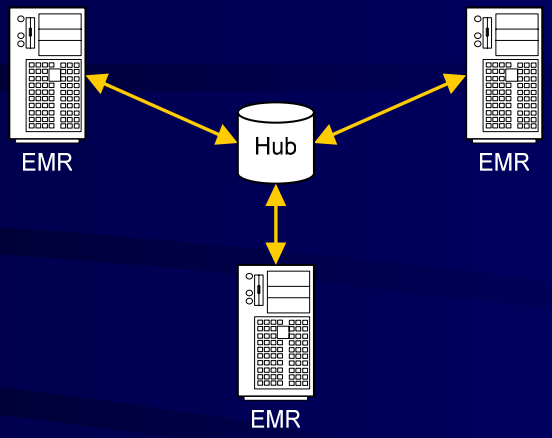
- In some implementations, need to know the destination system for your information request, or be patient while "the network" is searched
- Might allow some systems to fall behind and not support inter-system communication
- Will not scale well to many, many systems
- Does not facilitate system-wide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

Model 2: Peer to Peer *(continued)*

Typical Information Flow: *Facilitated Model*



Model 3: Information Broker



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 *(continued)*

Strengths:

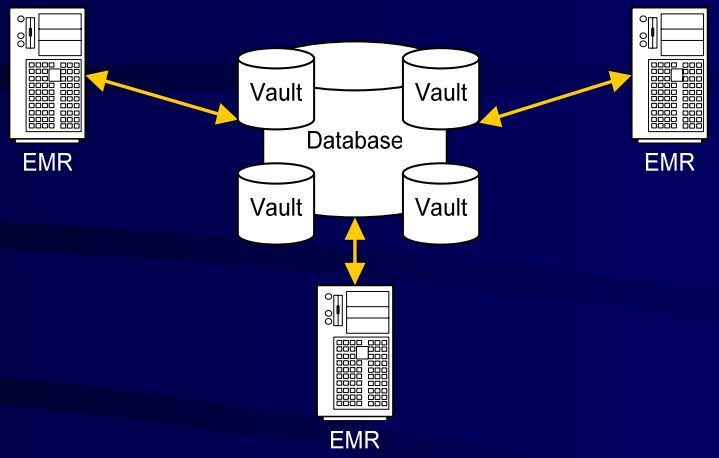
- System can discover where relevant records are housed community-wide
- No replication of clinical data; data remains close to its source
- System as a whole better protected from inappropriate disclosure (systems can refuse a query)
- Scales well
- Facilitates system-wide data analysis
- May be easier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

Example:
New York City MCI

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

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:

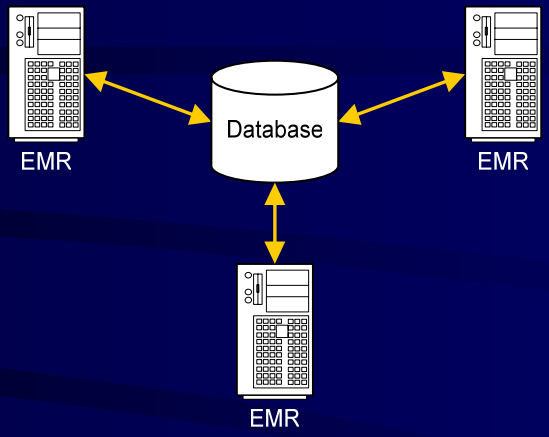
- Less real-time dependence on other participating systems
- Implements a stricter "need to know" policy for data access
- Facilitates system-wide data analysis
- Scales well so long as appropriate investments made in central resources

Example:
Indianapolis Network for Primary Care

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

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:

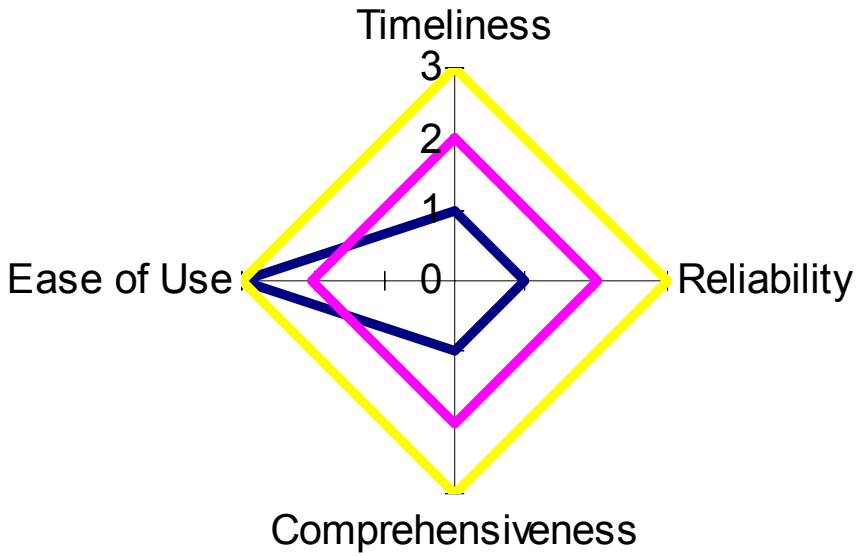
- Querying system's response to a data request is quicker
- Less real-time dependence on other participating systems
- Facilitates system-wide data analysis
- Scales well so long as appropriate investments are made in central resources
- Economies of scale due to use of large-scale central resources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

Example:
Arizona HealthQuery

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

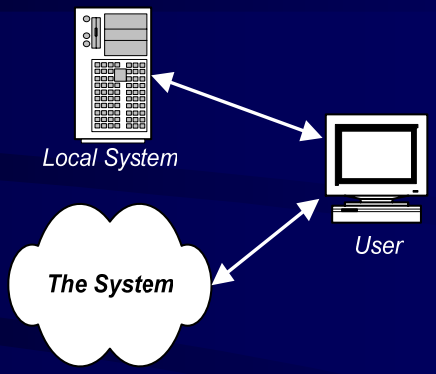
Relative Model Strength



Ease of use is in the eye of the beholder!

Application Integration Models

Model 1: Independent Application

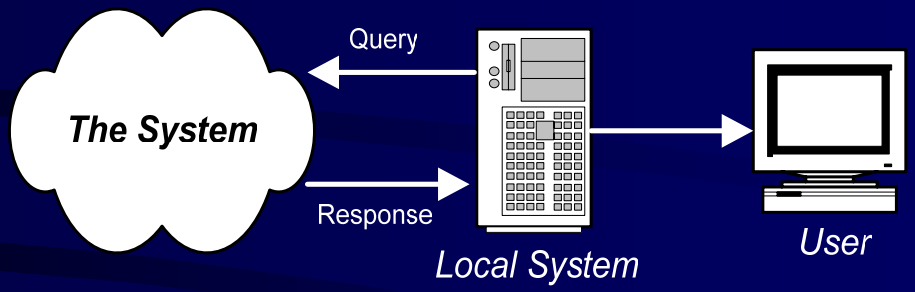


- Users access data through a new computer application provided as part of the system, sometimes referred to as a "portal"
- No concerns about interoperability with other applications

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

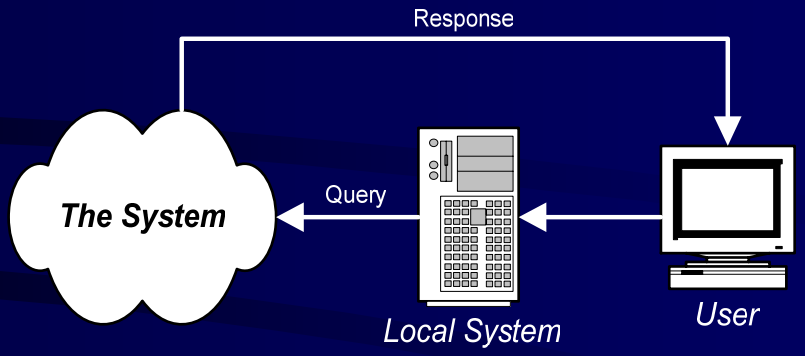


- User's local system queries the central system through a standard protocol (*e.g.,* HL7) and data is displayed within the user's local application
- No concern about user confusion – all data accessed through familiar, supported local applications

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

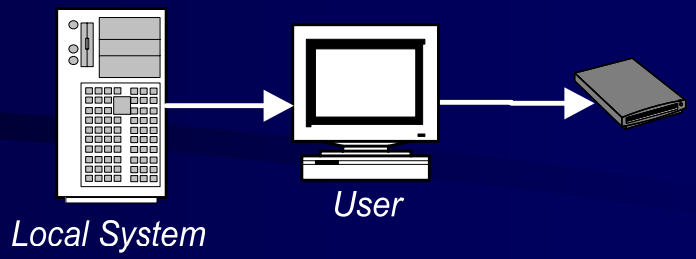


- User's access patients in the local system which initiates a login to the central system through a standard protocol (*e.g.,* CCOW) and logs the user into the central system with existing credentials and query parameters
- User access data both with local system and central system but does not have 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

But

- Providers may not be able to readily write to the card nor integrate data easily into their other applications

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