



*Technical Assistance for Health Information Technology
and Health Information Exchange in*
Medicaid and SCHIP

Welcome to the AHRQ Medicaid-SCHIP TA Webinar -

***The Role of Master Patient Index (MPI) and Record Locator
Services (RLS) on the Implementation of HIEs for Medicaid/SCHIP***

Wednesday, December 17, 2008 1:30 – 3:00 p.m. Eastern

Presented by:

Arthur Davidson - MD, MSPH, Colorado Regional Health Information Organization

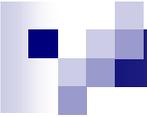
Perry Yastrov - Project Director, AHCCCS Health Information Exchange and Electronic Health Record Utility (HleHR Utility) project

Moderated by:

Walter Suarez – MD, MPH, Institute for HIPAA/HIT Education and Research; Co-Chair, HITSP Security, Privacy and Infrastructure Technical Committee

* Please note all participants were placed on mute as they joined the session.

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Overview

- n **Welcome** – Walter Suarez – MD, MPH, Institute for HIPAA/HIT Education and Research; Co-Chair, HITSP Security, Privacy and Infrastructure Technical Committee
- n **Before We Begin** – Walter Suarez
- n **Introduction** – Walter Suarez
- n **Presentations**
 - .. *Overview of Master Patient Index and Record Locator Services*
 - n Presented by Arthur Davidson, MD, MSPH, Colorado Regional Health Information Organization
 - .. *AHCCCS MPI Strategy: A federated approach to patient identification*
 - n Presented by Perry Yastrov, Project Director, AHCCCS Health Information Exchange and Electronic Health Record Utility (HleHR Utility) project
- n **Question and Answer** – Walter Suarez
- n **Closing Remarks** – Walter Suarez



Before we begin...

- n Please note all participants were muted as they joined the Webinar.
- n If you wish to be un-muted, choose the “raise hand” option to notify the host.
- n If you have a question during the presentation, please send your question to **all panelists** through the chat. At the end of the presentations, there will be a question and answer period.
- n Please e-mail Nicole Buchholz at nbuchholz@rti.org if you would like a copy of today’s presentation slides.
- n We are currently in the process of posting all of the TA Webinar presentation slides to the project website:
<http://healthit.ahrq.gov/Medicaid-SCHIP>



n Listserv Registration

- “ Please register for the listserv to receive announcements about program updates and upcoming TA Webinars.
- “ To register go to <http://healthit.ahrq.gov/Medicaid-SCHIP>
- “ Click on “Medicaid-SCHIP Fast Facts” on the left-hand side of the screen
- “ There are two ways to register for the listserv:
 - n 1. Click the link “[Click here to subscribe to the listserv](#)” which will open a pre-filled email message, enter your name after the text in the body of the message and send.
 - n 2. Send an E-mail message to: listserv@list.ahrq.gov.
On the subject line, type: **Subscribe**.
In the body of the message type: **sub Medicaid-SCHIP-HIT** and **your full name**. For example: sub Medicaid-SCHIP-HIT John Doe.
You will receive a message asking you to confirm your intent to sign up.

Overview of Master Patient Index and Record Locator Services

Presented by:

Arthur Davidson - MD, MSPH, Colorado Regional
Health Information Organization

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Objectives

- Review the purpose, features, and functionality of:
 - An enterprise Master Patient Index (eMPI) and potential approaches for Medicaid/SCHIP
 - a Record Locator Services (RLS) used within health information exchanges (HIE)
- Present and discuss experiences from the field.



Feature (software design)

- A distinguishing characteristic of a software item
 - e.g., performance, portability, or functionality
 - ***eMPI = Identity management***
 - ***RLS = Data aggregation***
- A software product's capabilities must meet:
 - user requirements,
 - resource limitations, and
 - business objectives



Functionality (software design)

- how features are actually implemented



Why Health Information Exchange?

n eHealth Initiative 2008 Survey*

- 69% of fully operational exchange efforts report reductions in health care costs
- 52% report positive impacts such as:
 - n Decrease in prescribing errors
 - n Improved access to test results
 - n Improved compliance with chronic care and prevention guidelines
 - n Better care outcomes
 - n Improved quality of practice life

*<http://www.ehealthinitiative.org/HIESurvey>

Problem (s)

Identity Management

- No sure method to know and uniquely identify a client/patient with “record scatter”.
 - National patient identifier (NCVHS hearings, 1998)
 - Patient controlled systems (voluntary health ID – <http://vuhid.org/index.php> ASTM medical standards organization E 31)
 - Biometrics (finger print, retinal scan)
- Absence of effective identity management means incomplete or inaccurate history gathering from multiple sources of data.

Data aggregation



Definitions

Duplicate Entry/File: *(undesirable and propagated)*

- more than one entry/file for the same patient or person (Rates around 9-15% ?, 7-40% ?)
 - *Mickey Mouse incorrectly has both record numbers 001 and 100 at Disneyland Clinic*
- may represent information capture errors

Overlay Entry/File: *(undesirable and propagated)*

- more than one distinct individual assigned to the same record or identification number in a facility's MPI. (Among 2 hospital [n=5000] samples: 1 or 2 = rate of 0.02 – 0.04%)?
 - *Mickey Mouse and Donald Duck incorrectly share record 001 at Disneyland Clinic*

Overlap Entries/Files: *(function of EMPI)*

- more than one MPI entry/file for the same patient in two or more facilities within an enterprise
 - *At Disneyland Clinic, Mickey Mouse has record 001 and record 100 at Disneyworld Clinic*
- algorithm works to identify and resolve overlaps without creating overlays



Identity Management - Functions

- Regular automated receipt of patient/client identifying information from multiple partners
- Data are standardized for storage in the enterprise master patient index (eMPI)
- Quality assurance is performed on data with feedback to the partners (e.g., remove duplicates)
- Process to disambiguate records is carried out (e.g., resolve potential overlaps across institutions)
- Tools are available for managing these processes and feedback to/from the partner organizations



Disambiguation

A process of establishing a single semantic or meaning

- Matching process
- Resolves multiple potential matches
- Uses attributes of individuals registered at multiple healthcare facilities/organizations

GOAL: find all matches for one target individual view



Results of Mismatching

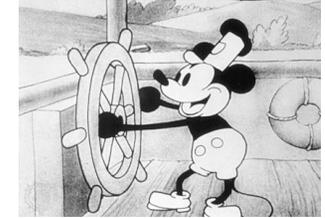
Incorrect match (false positives)

- Establishes a link to the wrong patient's record(s)
 - very dangerous and must be avoided
 - accidental record overlay (more than one distinct individual assigned to the same record)
 - threshold set too low such that set of personal attributes used in the search are inadequate for unique identification

Failed match (false negatives)

- Incomplete linkage based on available attributes
 - not all of a patient's records are found
 - much less dangerous

Deterministic vs. Probabilistic



Deterministic indexing: perfect but inflexible matching

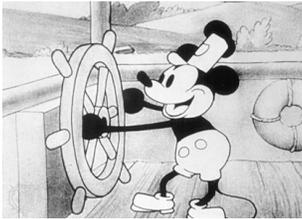
- *False positives: none* *False negatives: high*
- search based on an exact match of some combined factors (e.g., name, social security number, date of birth, and/or sex).
 - *Mickey Mouse, 11/18/28, M = Mickey Mouse, 11/18/28, M*

Probabilistic: improves match by anticipating data entry errors/variance

- *False positives: adjustable* *False negatives: adjustable*
- rules-based search mechanism with some subset of exact matching
 - *Mickey Mouse, 11/18/28, M = **Mick** Mouse, 11/18/28, M*
 - *Mickey Mouse, 11/18/28, M = Mickey Mouse, 11/18/29, M*
 - *Mickey Mouse, 11/18/28, M = **Micky** Mouse, 12/18/28, M*

Errors in Linking

n Electronic Linking Cause:



Mickey Mouse
DOB: 11/18/28



Mickey Mouse
DOB: 11/18/28

Records ***seem*** to match

Resulting error: **false positive** (overlay)
2 records linked under 1 MRN



Minnie Mouse
DOB: 05/15/28



Minerva Mouse
DOB: 05/15/82

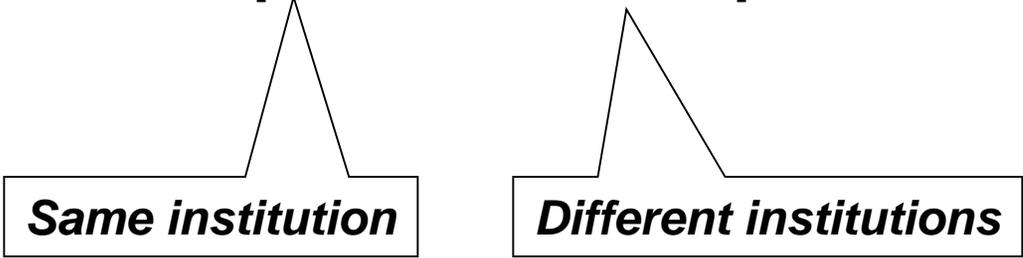
Records ***should*** match

Resulting error: **false negative** (duplicate)
2 MRNs created



Algorithm

- a step-by-step procedure for solving a mathematical problem that frequently involves repetition of an operation especially using a computer
 - mathematical formula using a combination of weighted MPI data elements to determine the probability of MPI **duplicate** or **overlap**

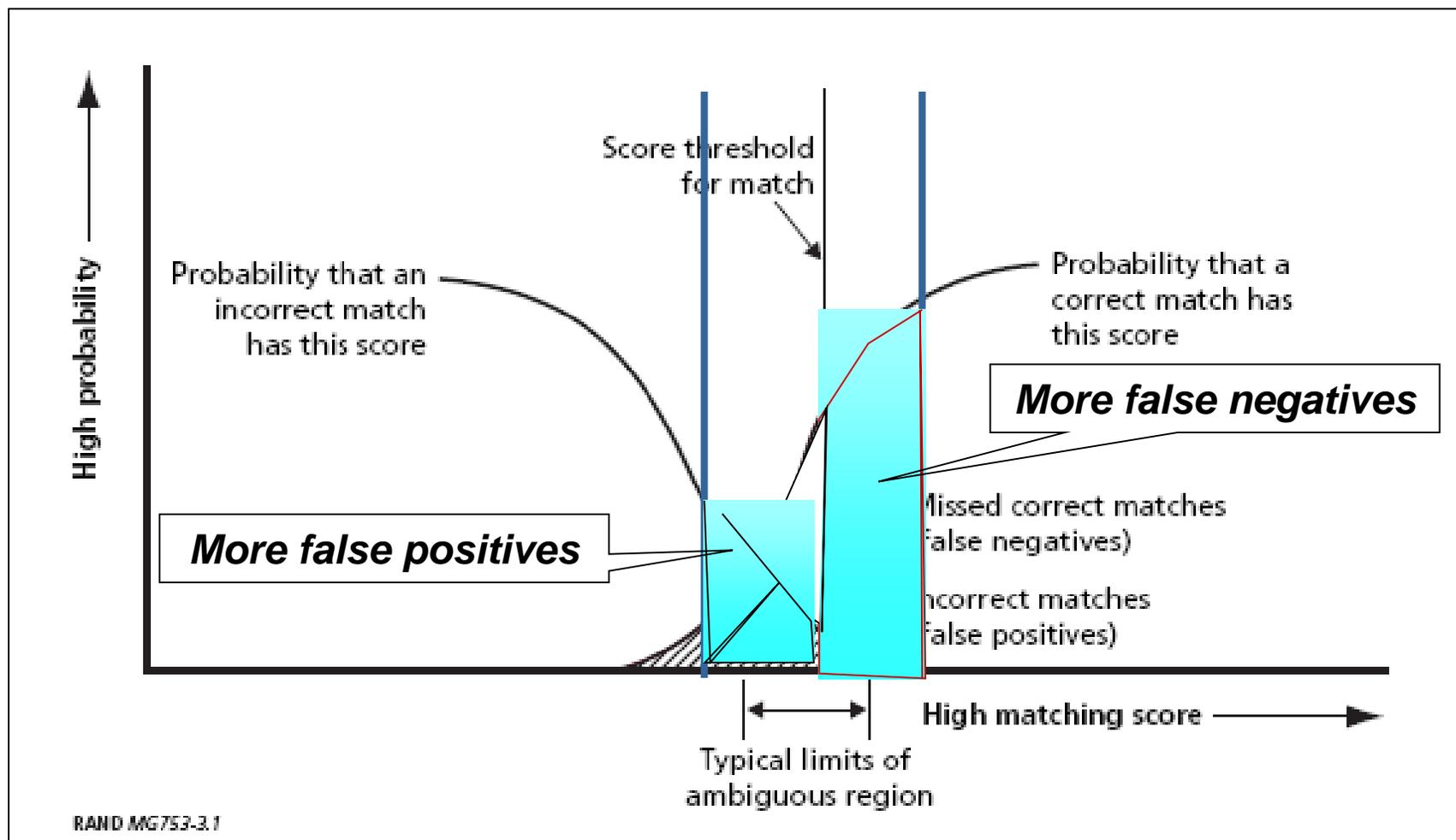


Same institution

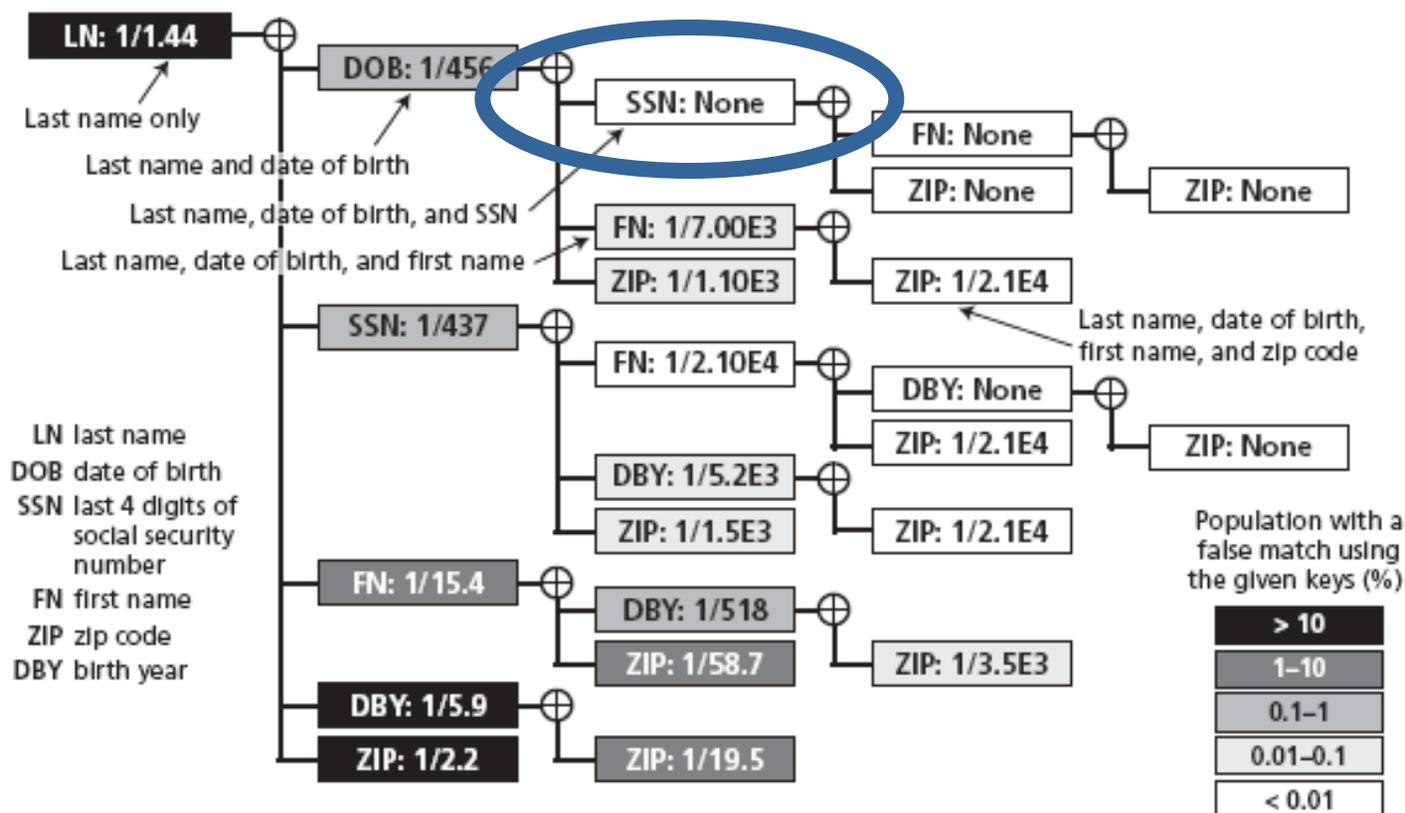
Different institutions

Errors and Algorithm Thresholds

Matching Patients and Records



Chance of False Positive Matches Small Demographic Database (42K)

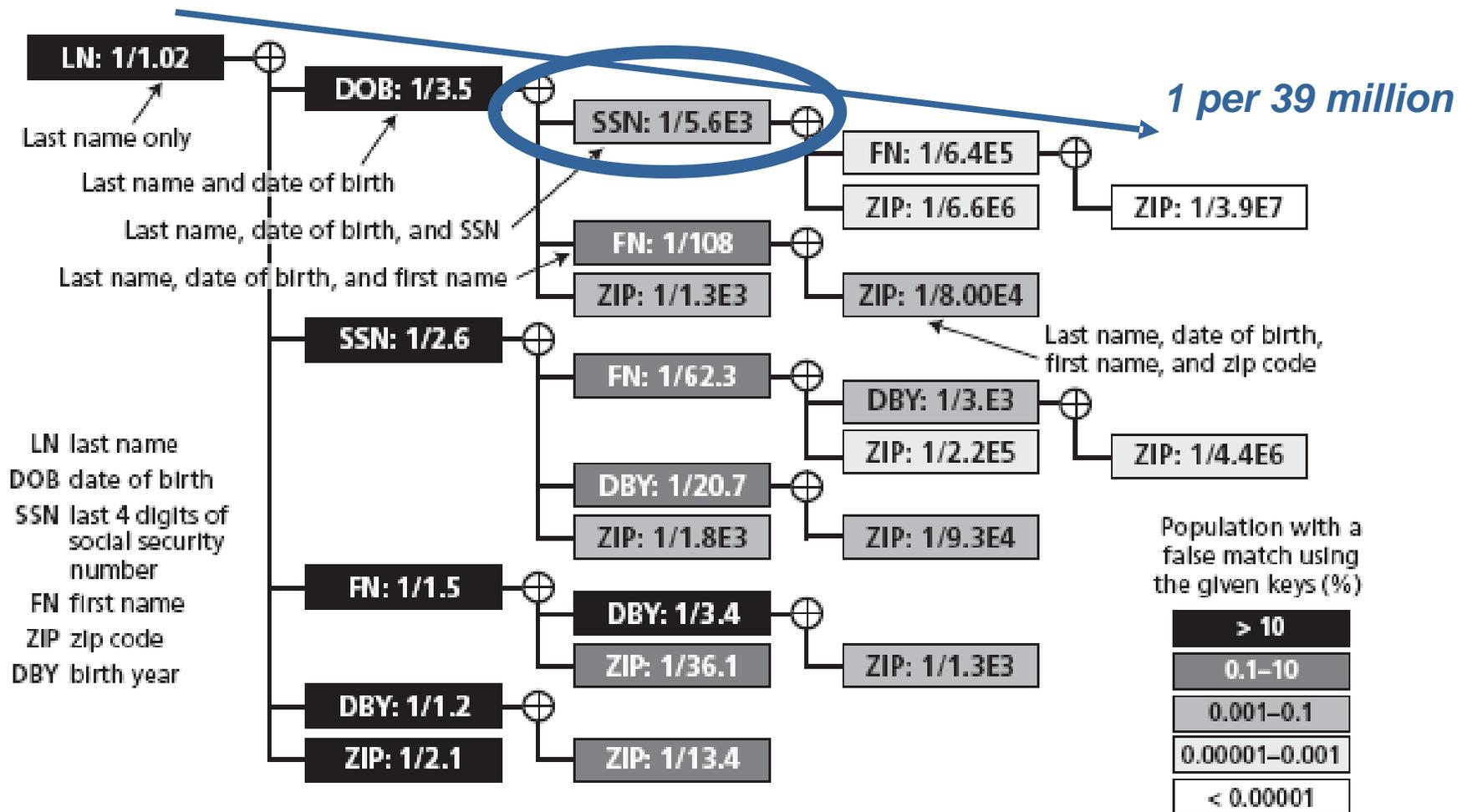


SOURCE DATA: SSA, Social Security Death Master File (updated quarterly).

NOTE: The numbers in the blocks, such as the 1/1.44 in the leftmost dark block, mean that there is one chance in 1.44 tries of a false-positive match in this database when this type of key (LN, or last name) is used. Moving to the right in the diagram, the next block, "DOB: 1/456" means that there is one chance in 456 tries of a false-positive match when both last name and date of birth are used.

Chance of False Positive Matches

Large Demographic Database (80M)





Social Security Number (SSN) vs. Unique Patient/Person Identifier (UPI)

1936

- Federal government assured public – SSN use limited to Social Security programs such as calculating retirement benefits

1962

- Internal Revenue Service adopted the SSN as its official taxpayer identification number

1999

- Congress suspended federal funding for non-SSN (e.g., UPI) standard due to privacy concerns; States/other entities not prohibited from implementation

2005

- Real ID Act, establishes State driver's license and identification security standards; States required to confirm SSN for issuance of driver's license or identity card

Today

- SSN has become the *de facto* national identifier, highly linked to financial history



eMPI Summary

- SSN was extremely important to reducing false positives
- Password protection and encryption for a UPI is relatively easy
- A UPI for health care is highly desirable but will be delayed. A hybrid approach for the meantime would improve the likelihood of proper matching
- Security and privacy concerns would actually be improved by a UPI
 - Separation of the medical UPI from the SSN would reduce risk of identity theft



RLS: Data Aggregation - Functions

- n Retrieve clinical data from multiple sources
- n Standardize the data for a more valuable summarized view for busy clinicians
- n Offer added value by linking with decision support tools
- n Provide mechanisms for feedback and quality improvement
- n Use the standardized data as a method to promote ever expanding interoperability



Clinical Data Exchange

§ Models

§ **Federated:** (decentralized)

§ Approach to coordinated sharing and electronic information interchange that emphasizes *partial, controlled sharing among autonomous databases* within a RHIO

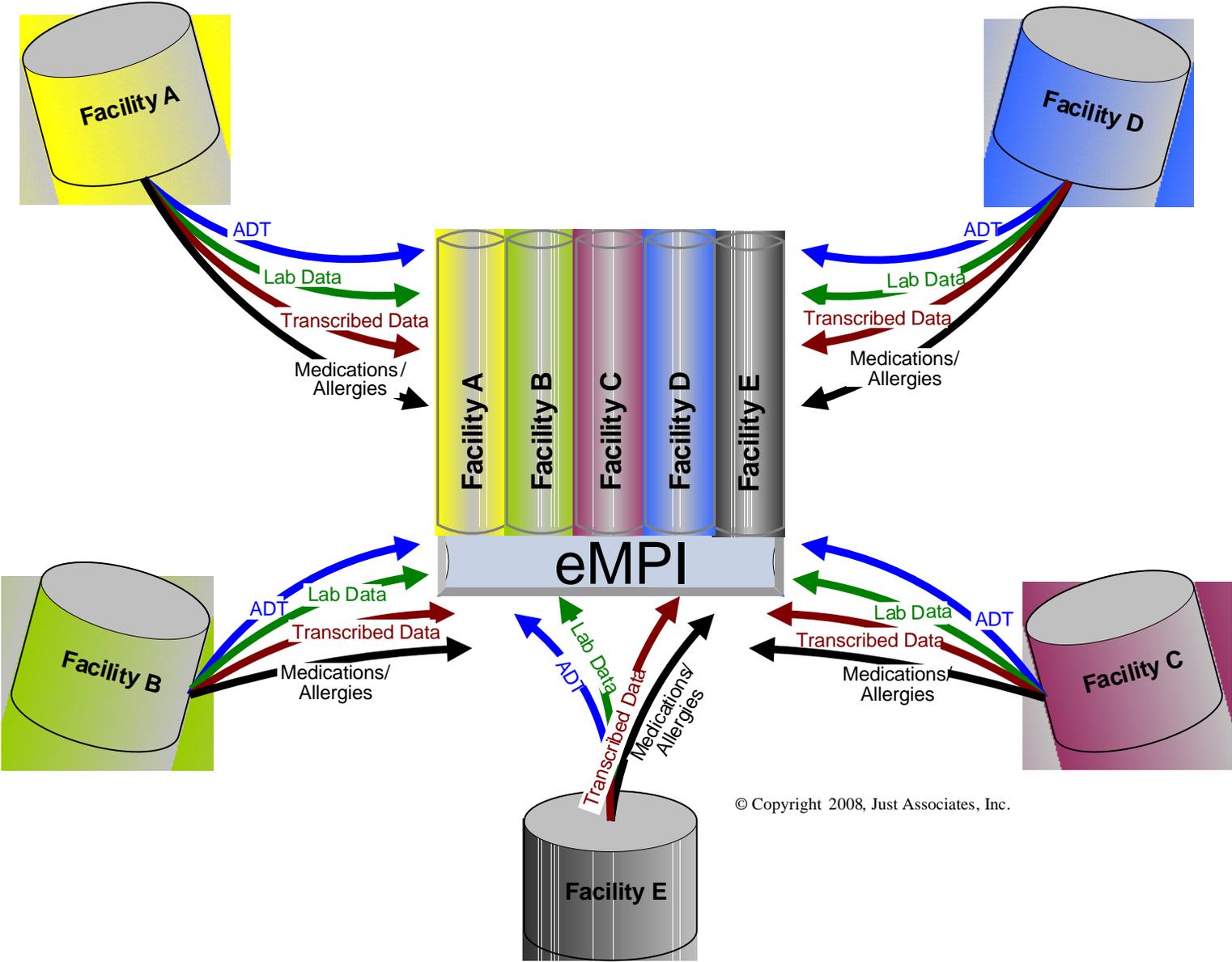
- § shares data and transactions using messaging services
- § combines information from several components
- § coordinates activities among autonomous components
- § no clinical data stored centrally

§ **Centralized**

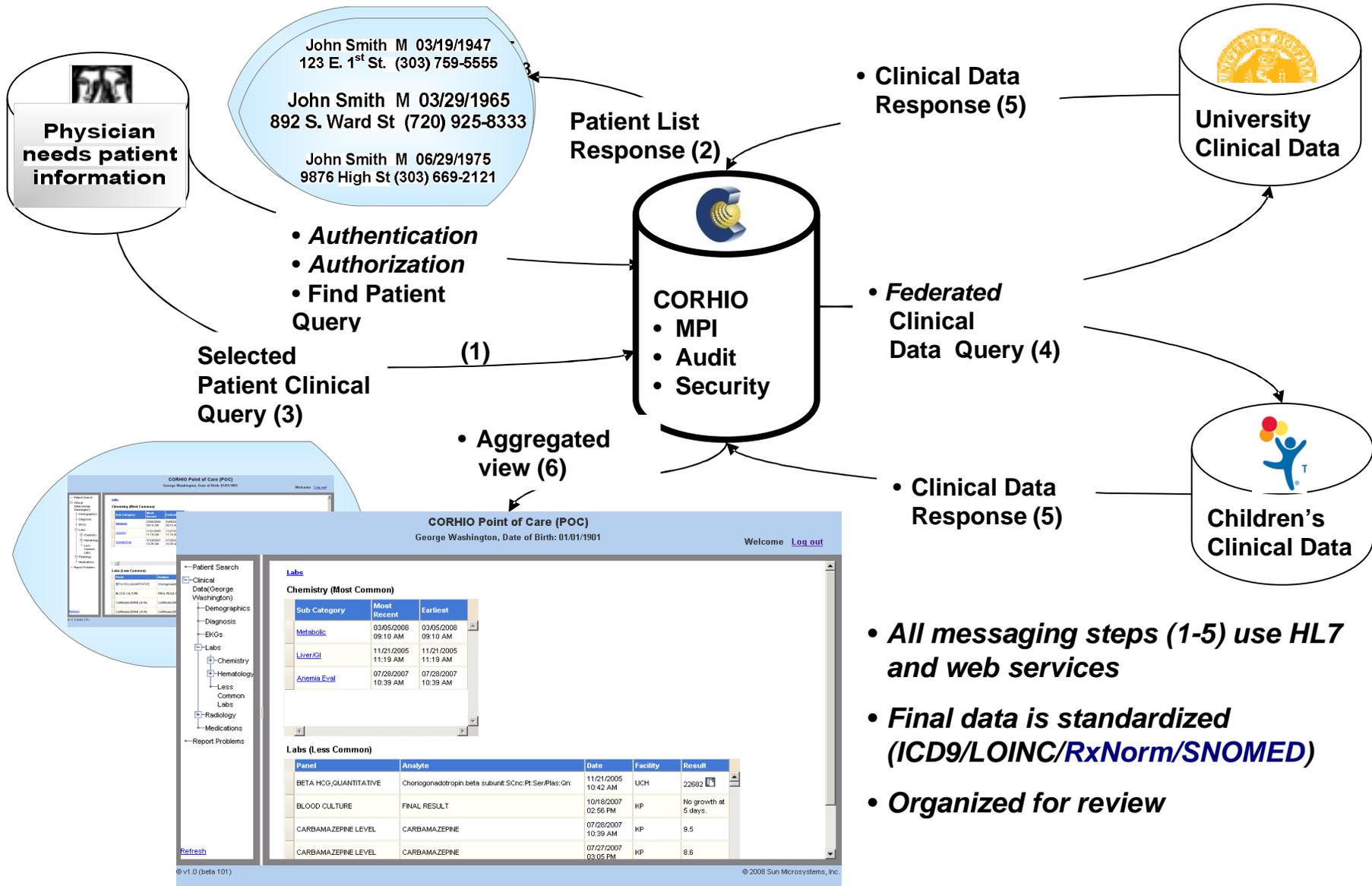
§ Clinical information stored centrally and user provisioning (often), authorization and authentication is centralized

§ **Hybrid**

Centralized Architecture



Federated Health Information Exchange



- **All messaging steps (1-5) use HL7 and web services**
- **Final data is standardized (ICD9/LOINC/RxNorm/SNOMED)**
- **Organized for review**

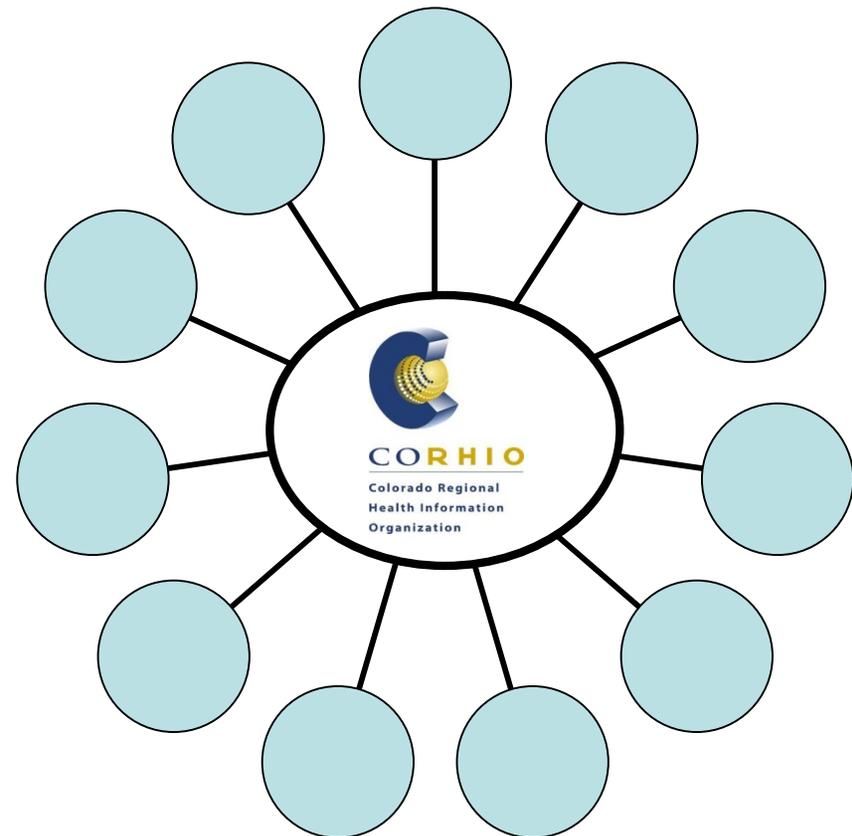


Record Locator Service

- § Key infrastructure component of the ‘Common Framework’,
 - § Connecting for Health (CfH) effort www.connectingforhealth.org
 - § enables access and integration of patient healthcare information from distributed sources without national patient identifiers or centralized databases
- § Principles:
 - § Patient privacy protection
 - § Decentralized and federated architectures
 - § Open standards
 - § Vendor neutral
 - § Best practices
 - § Promote widespread adoption
 - § Flexible implementation models

CORHIO Mission

- n Implement and sustain statewide **interoperable** health information exchange through a non-profit organization that provides services and facilitates the application of **standards** and **shared investments** in technology for the benefit of all Coloradans.



Enterprise Master Patient Index



- § Historic (i.e., past 10 years) registration data from 4 participating organization
 - § Key demographic data loaded

- § 2.5 million records loaded

- § Several (i.e., 3) loads to analyze and tune the algorithm -> data quality improvement

Matching and SSN

- § Privacy and security concerns by participating organizations regarding providing full SSN
- § Compromise achieved
 - § Data stewardship agreement
 - § Data Use agreement
 - § Opt-In/**Opt-Out** policy -> flag to RLS “opted out”
- § Added value of SSN:
 - § 62% of records submitted had “valid” last 4 digits of SSN
 - § <1% of these records had the same value in different records – sample review indicated these records belonged to different people; most were default values
 - § Last 4 digits of SSN: ***significant help in matching records***

Matching Process and Challenges



§ Database stores:

§ FN, LN, MN, Suffix, DOB, G, Address1&2, City, State, Zip, Phone1&2, County, MRN, Facility, Mother's Name, Guarantor FN/LN/ Address, Death Indicator, Opt In/Out, Guardian, AKA, Last 4 SSN

§ Last 4 of SSN stored

§ only used for algorithm's linking; not for front-end search or display

§ Adjusts for common-errors

§ Nick-names,, data quality and completeness, hyphenated names (e.g., Latinos), suffix, parsing of names – “LN, FN” vs “LN” and “FN”

§ missing data, formatting (e.g., phone, DOB), codes (e.g., gender, race)

§ Similar data: Guarantor vs. guardian (vs. not available)

§ Algorithm uses an accumulation of field weights

§ Common last name “Smith” - > field match weight is adjusted lower

§ **Thousands of records reviewed by Patient Identity Experts to validate algorithm's record matching and scoring**

§ Auto-linking of “overlap” records, but not intra-facility duplicates

Results and Review Process



- n 2,471,441 records input into eIndex from four partners:
 - § 636,568 Kaiser Permanente
 - § 653,544 Denver Health
 - § 442,837 University of Colorado Hospital
 - § 738,492 The Children's Hospital

- n 192,230 pairs of records across the four partners' data were auto-linked using the algorithms
- n No required human work to perform these matches.
- n 15.6% auto-link rate ($(192,230 \times 2) / 2,471,441$)
- n ~ 20% more linked via manual review
- n Designed program to facilitate a very efficient process
- n Algorithm tested and improved

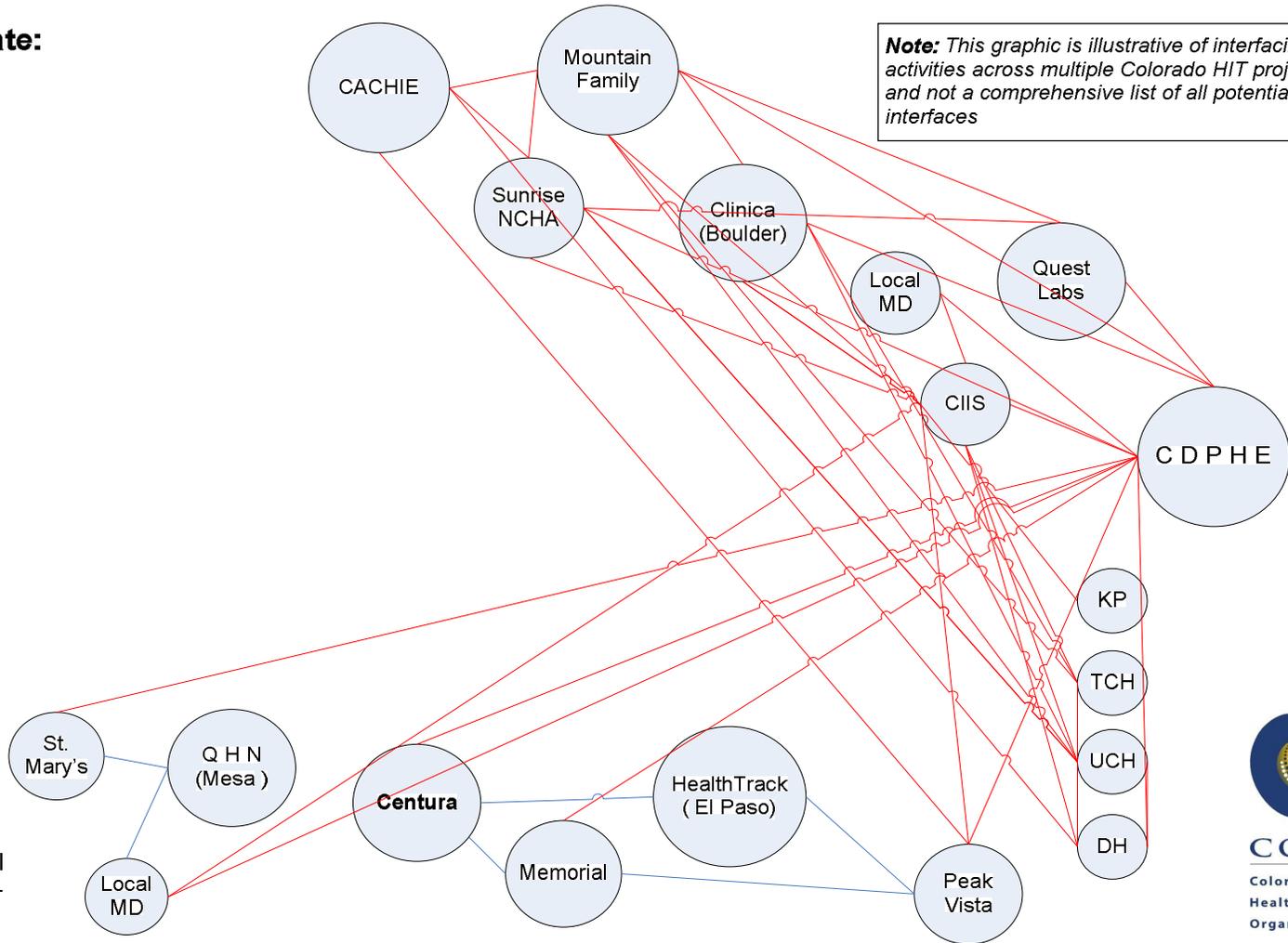
Health Information Exchange Services



- § **Point of care clinical data exchange (for patient and/or provider)**
 - § Aggregation of patient's clinical health record
 - § Information from variety of provider sources
 - § visits, medication lists, allergies, laboratory, radiology, procedures, EKGs
 - § Decision support to apply clinical guidelines
- § **Clinical messaging (from provider to provider)**
 - § Laboratory test orders/results exchange (e.g. to/from CDPHE, commercial labs)
 - § e-Prescribing
 - § Reportable disease/condition case reporting, electronic laboratory reporting
 - § Ancillary/referral service results (e.g., radiology, consultant reports)
- § **Population/public health (for provider, payer and/or public health)**
 - § Analysis of quality, disparities, morbidity monitoring, pay for performance
 - § Registry development and support
 - § Bio-surveillance
 - § Community health assessments
- § **Administrative (for provider and payer)**
 - § Claims submission
 - § Eligibility, credentialing

Example Current Colorado Interfaces Across

Current State:



Note: This graphic is illustrative of interfacing activities across multiple Colorado HIT projects and not a comprehensive list of all potential interfaces

CORHIO Architecture

CORHIO Central includes:

Hardware (computers):

- Hosted secure facility with technical support,
- Redundant servers
- Server maintenance

Telecommunications (connections):

- Redundant internet access

Software (functionality):

- Secure/audited web messaging services
- Common Vocabulary Engine
- Rules Engine (clinical decision support)
- Functions to manage all services

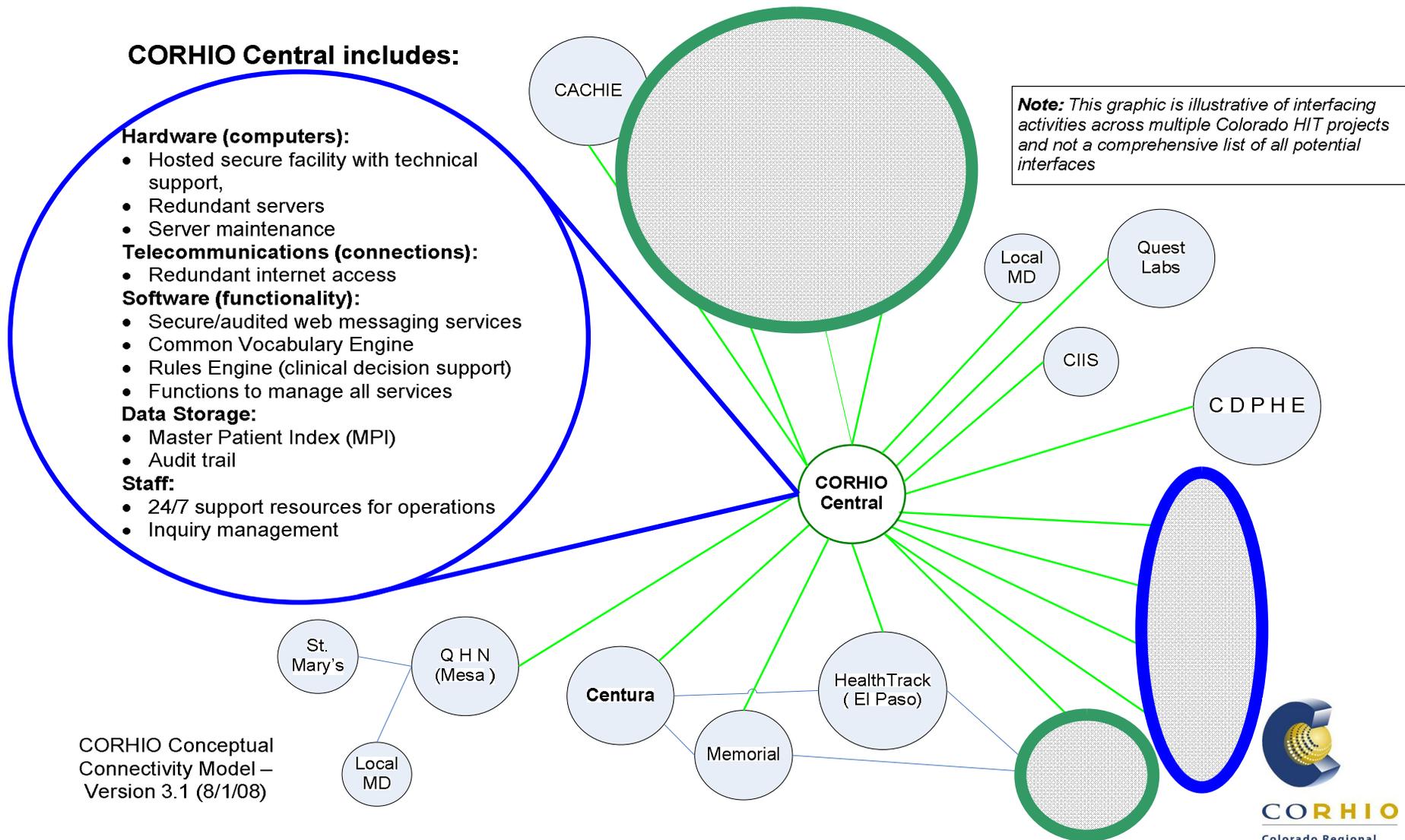
Data Storage:

- Master Patient Index (MPI)
- Audit trail

Staff:

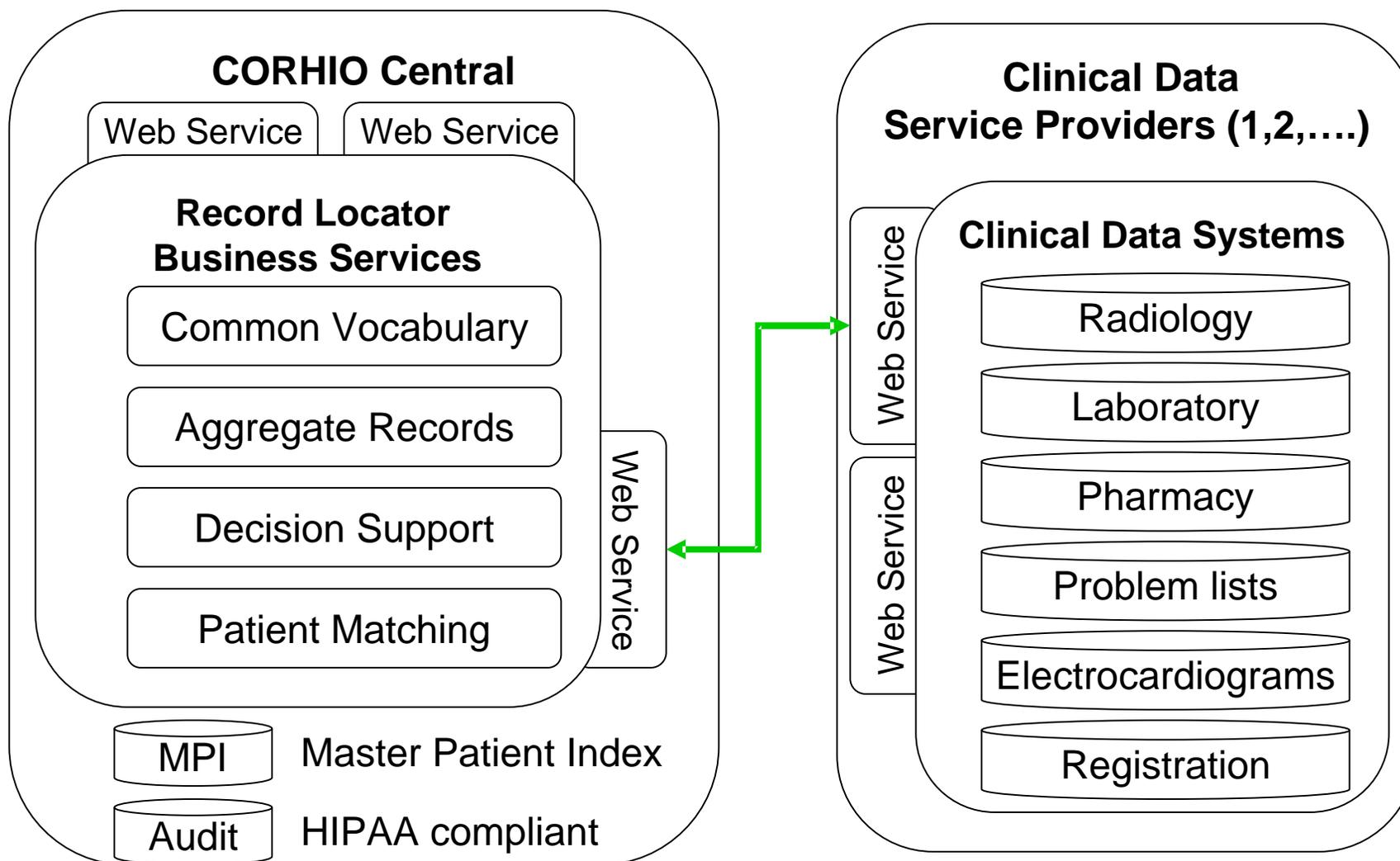
- 24/7 support resources for operations
- Inquiry management

Note: This graphic is illustrative of interfacing activities across multiple Colorado HIT projects and not a comprehensive list of all potential interfaces



CORHIO Conceptual
Connectivity Model –
Version 3.1 (8/1/08)

Record Locator Service



HIE Governance Framework

- § Offer useful solutions for all HIE services throughout the state
- § Interoperability across Colorado
- § Open/Transparent/Consensus Approach



CORHIO Policy Development



- § Policy Workgroup formed in June 2007
- § Policies approved Oct 2007 (using Common Framework as guideline):
 - § CORHIO Principles
 - § Laws & Policies
 - § Appropriate Use & Disclosure
 - § Patient ID
 - § User Authentication
 - § Privacy Practices, Patient Participation & Control of Information
 - § Access Auditing & System Accountability
 - § Security Protocols
- § Consumer Fact Sheet – 8th Grade Reading Level



Lessons for Success

- § Involve health information management personnel early and often
- § Ensure data to be shared is accurately collected and/or transmitted:
 - § Are all of the correct messages (adds, updates, deletes, deactivations, merges, etc.) being sent?
 - § How is the patient ID and clinical data being translated?
 - § Is the receiving system able to process the message?
 - § Is the receiving system processing the transaction correctly?
- § Focus on privacy and security
- § Set a plan to measure success:
 - § Linking records – validate algorithm, work duplicate lists, conduct some manual evaluation
 - § Reductions in duplicate tests, medication errors or higher quality outcomes, others.....



eMPI Maintenance

- Need mechanisms to maintain eMPI accuracy
 - Cost-effective use of staff time and effort
 - Established procedures:
 - Process for dealing with duplicate records
 - Ready remediation for incorrectly matched records
 - Flag for “never match”
 - Routines to rapidly identify family members (twins, multi-generation name sharing)
 - Periodic audit to ensure data quality

“good stuff in, good stuff out”



RLS Maintenance

- Evaluate how data are most effectively used
- Study most valued presentation methods and refine for faster more valued delivery of clinical results
- Assess what are most valuable data
- Strive to improve interoperability
- Assure RLS add value to customers and contributes to the business model and HIE sustainability



Conclusions

- A unique personal identifier for health care is highly desirable but will be delayed
- A hybrid approach (e.g., last 4 SSN) for the meantime will improve likelihood of proper match
- Security and privacy concerns would actually be improved by a unique personal identifier
 - Separation of the medical UPI from the SSN would reduce risk of identity theft
- RLS offers real-time access to important information for clinical and potentially administrative services
- Federated environments are likely to be key to future HIE and will enhance interoperability

Contact Information

- § Art Davidson, MD, MSPH
 - § Interim Chief Medical Information Officer
 - § adavidson@dhha.org
- § Phyllis Albritton
 - § Interim Executive Director
 - § palbritton@pcubedpartners.com



www.corhio.org



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AHCCCS MPI Strategy

A federated approach to patient identification

Presented by:

Perry Yastrov - Project Director, AHCCCS Health
Information Exchange and Electronic Health Record Utility
(HleHR Utility) project

Funded by the Agency for Healthcare
Research and Quality



AHCCCS HIE

- n Arizona Medical Information Exchange (AMIE)
- n Clinical Information Only
- n More than Medicaid
- n Federated



Sources

- n 3 Hospital Systems
 - .. Discharge Summaries
- n Commercial Lab
 - .. Lab Test Results
- n Pharmacy Claims Aggregator
 - .. Only Medicaid Claims



AMIE MPI

- n AHCCCS MPI (Unique Identifier)
- n AMIE Patient Merge and Matching
 - SOA Built on MA-SHARE
 - Originally used Initiate
 - Built our own algorithm



Patient Merging and Linking

- n Consolidate into single entry (merge)
- n Link high probability matches
- n Patient entries link to multiple clinical record pointers



Merging Rules

n Matching Fields

- .. Rule 1

- n AHCCCS ID, First Name, Last Name, Gender, Date of Birth

- .. Rule 2

- n AHCCCS ID, Last Name, Gender, Date of Birth

- .. Rule 3

- n AHCCCS ID, First Name, Last Name, Gender

- .. Rule 4

- n First Name, Last Name, Gender, Date of Birth



Linking Rules

n Matching Fields

- .. Rule 1

- n AHCCCS ID, First Name, Last Name

- .. Rule 2

- n AHCCCS ID, First Name, Date of Birth

- .. Rule 3

- n AHCCCS ID, Last Name, Gender

- .. Rule 4

- n AHCCCS ID, Gender, Date of Birth



Search Scenarios

- n The following information is in the Patient Index:
 - .. AHCCCS Id = A123456
 - .. First name = John
 - .. First name = Jack
 - .. Last name = Smith
 - .. Gender = Male
 - .. Date of Birth = Jan 1, 1980
 - .. Link to: A123456, Jane, Smith, Female, Jan 1, 1980
 - .. Link to: A123456, John, Nelson, Male, Feb 1, 1980

- .. AHCCCS Id = A123456
- .. First name = Jane
- .. Last name = Smith
- .. Gender = Female
- .. Date of Birth = Jan 1, 1980
- .. Link to: A123456, John, Smith, Male, Jan 1, 1980

- .. AHCCCS Id = A123456
- .. First name = John
- .. Last name = Nelson
- .. Gender = Male
- .. Date of Birth = Feb 1, 1980
- .. Date of Birth = Jan 1, 1981
- .. Link to: A123456, John, Smith, Male, Jan 1, 1980



Search Scenario 1

n Patient Query:

- .. AHCCCS Id = A123456
- .. Last Name = Smith

n Results:

- .. A123456, Smith, John, Male, Jan 1, 1980
- .. A123456, Smith, Jane, Female, Jan 1, 1980
- .. A123456, Nelson, John, Male, Feb 1, 1980



Search Scenario 2

n Patient Query:

- .. AHCCCS Id = A123456
- .. Date of Birth = Jan 1, 1981

n Results:

- .. A123456, Nelson, John, Male, Jan 1, 1981
- .. A123456, Smith, John, Male, Jan 1, 1980



Search Scenario 3

n Patient Query:

- .. Last Name: Smith
- .. Gender: Female
- .. Date of Birth: Jan 1, 1980

n Results:

- .. A123456, Smith, Jane, Female, Jan 1, 1980
- .. A123456, Smith, John, Male, Jan 1, 1980



Scenario 4

n Patient Query:

- .. First Name: John
- .. Last Name: Nelson
- .. Date of Birth: Jan 1, 1980

n Results:

- .. No Results

n Question and Answer

- n Please type your question into the chat box
- n If you wish to be un-muted, choose the “raise hand” option to notify the host.



Evaluation

- n Immediately following the webinar, an evaluation form will appear on your screen.
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- n If you do not have time to complete the evaluation immediately following the webinar or would rather receive the form via e-mail, please contact Nicole Buchholz at nbuchholz@rti.org.
- n As always, thank you!



Comments and Recommendations for Future Sessions

- n Please send your comments and recommendations for future sessions to the project's e-mail address:

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Project Information

Please send comments and recommendations to:

Medicaid-SCHIP-HIT@ahrq.hhs.gov

or Call Toll-free:

1-866-253-1627

<http://healthit.ahrq.gov/Medicaid-SCHIP>