

Successful Patient Matching without a Unique ID

A Framework for Cross-Organizational Patient Identity Management

Seth Selkow, Director HIE, Kaiser Permanente (CCC)

Eric Heflin, CTO, The Sequoia Project

Sid Thornton, Director, Intermountain Healthcare

March 2, 2016



In collaboration with



The Sequoia Project and Care Connectivity Consortium (CCC) Strategic Alliance



- **CCC is a collaborative of 5 prominent healthcare organizations:**
 - Geisinger (PA)
 - Intermountain Health (UT)
 - Kaiser Permanente (CA, OR, WA, VA, MD, HI, GA, CO)
 - Mayo Clinic (MN, FL, AZ, GA, WI)
 - OCHIN (17 states)
- **CCC enhances capabilities of current HIE technologies and allows for sharing between organizations and health IT systems**
- **The CCC aids eHealth Exchange growth by:**
 - Serving as a test bed for new technologies
 - Contributing innovations to the eHealth Exchange community
- **The CCC participates in Carequality and serves on its:**
 - Steering Committee
 - Trust Framework Work Group
 - Query Work Group
 - Operations Work Group

The Blind Spot: Cross Organizations Patient Matching

Why is Patient Matching still an unsolved problem?

All organizations perform patient matching and have controls in place to keep track of patient identity This is key to **providing care** while **ensuring privacy**



Matching across organizations is *different* than identifying the patients locally

- **Vastly different data characteristics**
 - Data quality
 - Data completeness
 - Data field consistency
 - Default or temporary values
 - Vocabulary adoption and versioning
- **Vastly different scope of data (specialty practice vs. large integrated delivery network)**
 - Presence/absence of an enterprise-wide active master patient index (MPI)
 - Use of multiple MPIs
 - Research Institutional Review Board stipulations
 - Legal jurisdictions and requirements (minors, reproductive health, etc.)
- **Organizational size, resource allocation, project timelines, commitment, skill levels**
 - Corporate cultures (being “friendly” to clients vs. being meticulous for registries)
 - Different tolerances in terms of matching accuracy
 - Different patient matching rules and algorithms
 - Human and system workflows (latency, variations, definitions, etc.)
 - Consent, security, sensitive data sharing, and other policies
- **Vendor engagement, version updating strategy, staffing**
 - Software (vendors, update lifecycle, configuration)
 - Change management
 - Internal enterprise software architecture
 - Services levels/response times
 - Data exchange latency

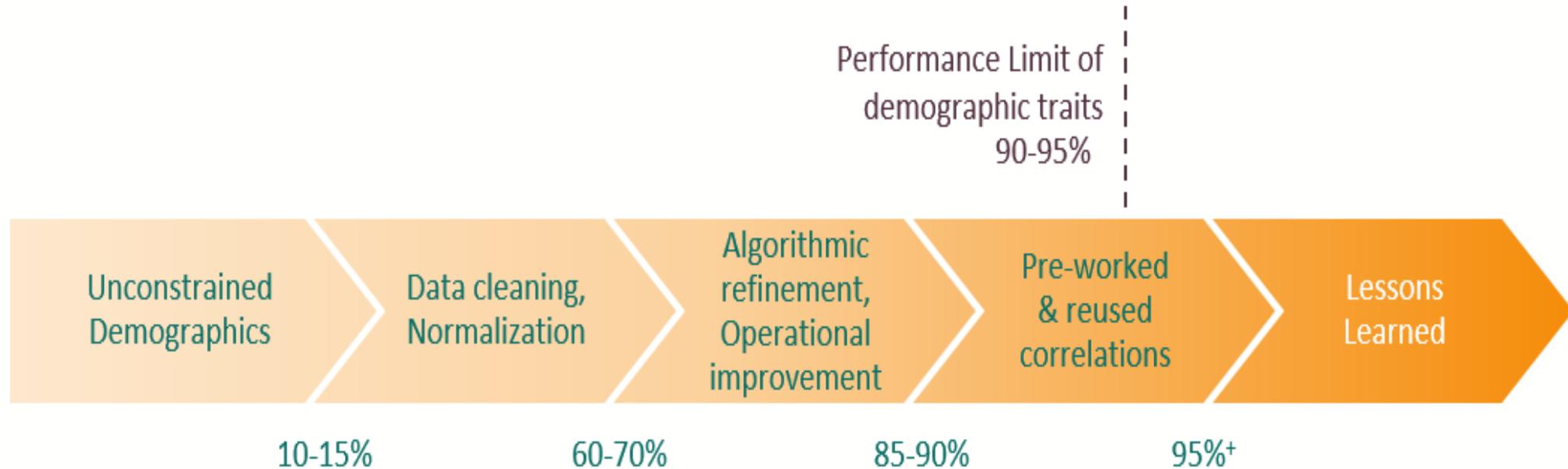
Intermountain Healthcare

Case Study



- Not-for-profit health system serving Utah and southeast Idaho
- 22 hospitals
- 1,400 employed physicians at more than 185 clinics
- 750,000 SelectHealth insurance plan members

Overview of Steps to Increase Match Rates



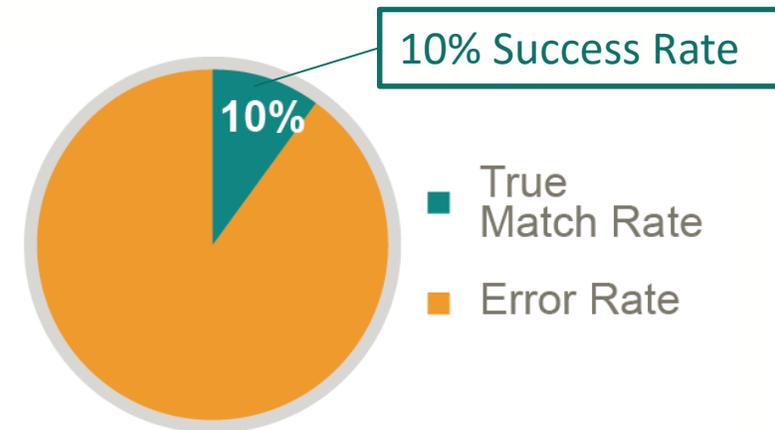
Establishing a Baseline



Benchmark Trial

- Sample selection of 10,000 patients **known** to have been treated by Intermountain and an exchange partner
- High match rate expected
- Patient analysis demonstrated only 10% true match rate

Initial Cross-Organizational Patient Match Error Rate



Data Cleaning/Normalization



Data quality is important on both sides

Having accurate, clean data is “the floor”, there are organizations who seem to be falling through it rather than standing on it

The Low-Hanging Fruit

1. Data entry errors
2. Missing values
3. Data format variations (address, phone number)
4. Representation variations based on local context
5. Duplicates



Identifying Best Patient Match Attribute



Patient Attributes Analysis

Attribute Name	Completeness	Validity	Distinctiveness	Comparability	Stability
EMPI	100%	--	100%	Very High	Very High
Last Name	99.85%	99.84%	5.1%	Medium	High
First Name	99.85%	99.33%	3.1%	Medium	High
Middle Name	60.54%	60.54%	2.6%	Medium	High
Suffix Name	0.08%	0.08%	0.08%	Medium	Medium
SSN	61.40%	60.92%	98.0%	High	High
Sex	99.98%	99.98	0.00008%	High	High
Date of Birth	98.18%	97.38%	0.8%	High	Very High
Date of Death	3.36%	3.36%	3.4%	High	Very High
Street Address (1 or 2)	95.00%	94.61%	44.4%	Low	Low
City	94.84%	94.83%	0.8%	High	Low
State	94.81%	94.39%	0.8%	High	Low
Facility MRN	99.90%	99.90%	99.90%	High	Low
Postal Code	92.31%	92.0%	0.6%	High	Low
Primary Phone Number	90.68%	87.26%	51.6%	High	Medium
Work Phone Number	20.28%	19.79%	51.6%	High	Low
Ethnicity	25.25%	25.25%	0.0003%	High	Very High
Race	76.25%	76.25%	0.0001%	High	Very High

Identify Best Patient Match Attributes

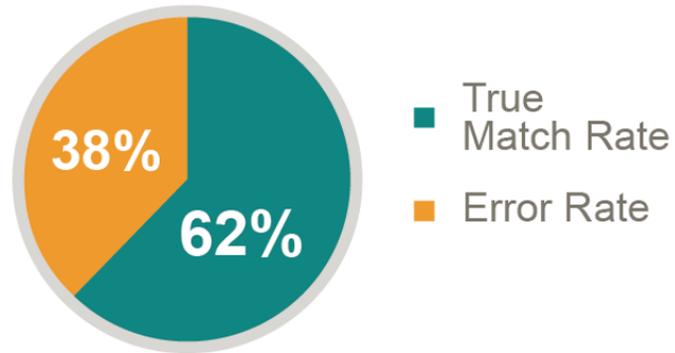


Trait Combination Analysis

Sequence	Combination of Traits	Completeness	Uniqueness
1	FN+LN+DoB	98.2%	95.7%
2	FN+LN+DoB+Sex	98.2%	95.9%
3	FN+LN+DoB+Sex+ZIP(first 5)	91.1%	99.2%
4	FN+LN+DoB+Sex+Phone	76.2%	99.5%
5	FN+LN+DoB+Sex+MN	59.9%	98.9%
6	FN+LN+DoB+Sex+MN(initial)	60.0%	97.7%
7	FN+LN+DoB+Sex+SSN(last 4)	61.9%	99.7%

Examining the Remaining Error Rate

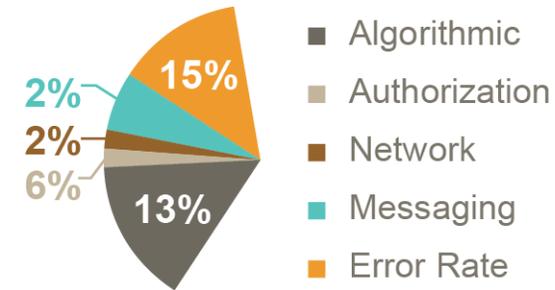
Updated Algorithm and Data Quality Cross-Organizational Patient Match Error Rate



Reflects improvements to data entry controls, data integrity checks, and transcription



Detailed Analysis of Error Rate



Optimizing Patient Matching Management



Additional Strategies

- Apply results of prior work
- Standardize data
- Determine minimal acceptable match rate
- Focus on scalable solutions
- Pre-work fragile identities
- Improve the human workflow
- Leverage CCC Shared Services

Final Cross-Organizational Patient Match Error Rate



Reviewing What we Learned



Lessons Learned

- Fragile identities
- Well-behaved group
- Knowledge re-use
- Patient engagement



Observations

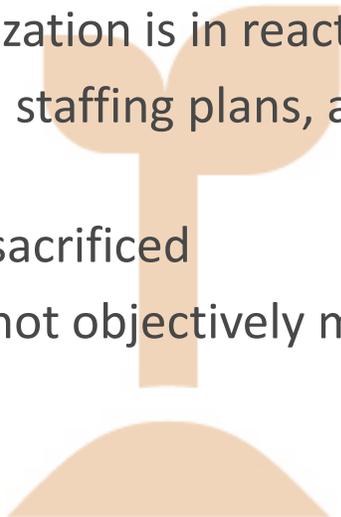
- Data cleaning/normalization is the biggest, fastest opportunity
- Operational factors can be an unexpected challenge
- Acceptable HIE data integrity (99.99%) requires a supplemental identifier

What is Identity Management Maturity?

Characteristics of Mature and Immature Organizations

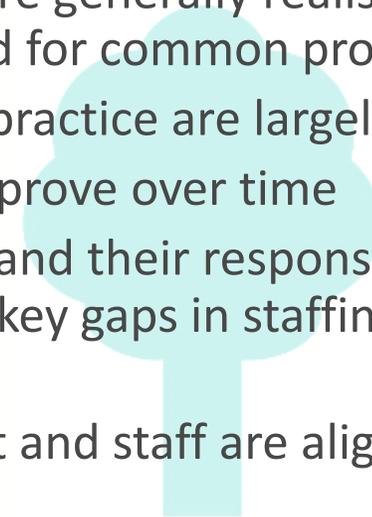
Immature

1. Process is improvised
2. Known processes are commonly ignored
3. The organization is in reactive mode
4. Schedules, staffing plans, and budgets are not fact-based
5. Quality is sacrificed
6. Quality is not objectively measured



Mature

1. Coordination, communication, and collaboration across silos
2. Work plans are generally realistic and accomplished for common project types
3. Process and practice are largely in agreement
4. Processes improve over time
5. Staff understand their responsibilities and there are no key gaps in staffing or skills
6. Management and staff are aligned



Cross-Organizational Maturity Model

A SDO-based tool to assess and adopt more advanced patient identity management in a methodical manner.



Level 0

- Ad hoc
- No oversight
- Unpredictable



Level 1

- Data quality
- basic processes
- Limited oversight



Level 2

- Increasing algorithm use
- Quality metrics gathered
- Standards use



Level 3

- Advanced technologies
- Management controls quality metrics
- Community involvement



Level 4

- Ongoing optimization
- Active management
- Leadership

Cross-Organizational Maturity Model

Overview of Characteristics by Maturity Level

Characteristic	0	1	2	3	4
External Matching Focus	○	●	●	●	●
Testing	◐	◑	◑	●	●
Use of Patient Matching Quality Metrics	○	◐	◑	◑	●
Diagnostic Approach	○	◐	◑	◑	●
System Stability	○	◐	◑	◑	●
Management Oversight	○	◐	◑	◑	●
Use of Industry Standards	○	◐	◑	◑	●
Establishment of Feedback Loops	○	◐	◑	●	●
Fragile Identities	○	○	○	○	●
Flow Down	○	○	○	◑	●
Knowledge Sharing	○	◐	◑	◑	●
Temporary (Default) Values	◐	◑	●	●	●
New Partner Onboarding	○	◐	◑	◑	●
Data Quality	○	◐	◑	◑	●

Cross-Organizational Minimal Acceptable Principles

Overview of Proposed Framework



Traits & Identifiers

- Specific identifiers
- Temporary/
default identifiers
- Assumptions



Matching Algorithms

- Normalizing
- Tracking Changes



Exception Handling

- Consent
- Revoke
- Decommissioning

Cross-Organizational Minimal Acceptable Principles

A list of rules that set the “floor”

- ✓ **Do** make clear corresponding responsibilities on both partners to an exchange of patient data
- ✓ **Do** use normalized traits
- X **Don't** use exact character-by-character matching
- X **Don't** rely on any specific identifier (such as a social security number)
- X **Don't** make assumptions about the life cycle of a patient identifier

Language to elevate the “floor”



At Level 1 rules are interpreted as SHOULD or SHOULD NOT



By Level 4 rules are interpreted as stringent pass/fail standards, becoming MUST or MUST NOT

Next Steps



Questions?



www.careconnectivity.org

info@careconnectivity.org



www.sequoiaproject.org

info@sequoiaproject.org

Thank You!