A Digital Person-Centered Population Health Management Infrastructure for a Community

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Video of the Vision

[Personal Grid Computing for Health
A Solution Prototype](#)

The technology exists to do this now.

Vision

Personal Grid Computing for Health

Ultra secure personal grid accounts

for you, your healthcare systems and your community.

Key points from video of solution prototype:

- *Person-Centered*
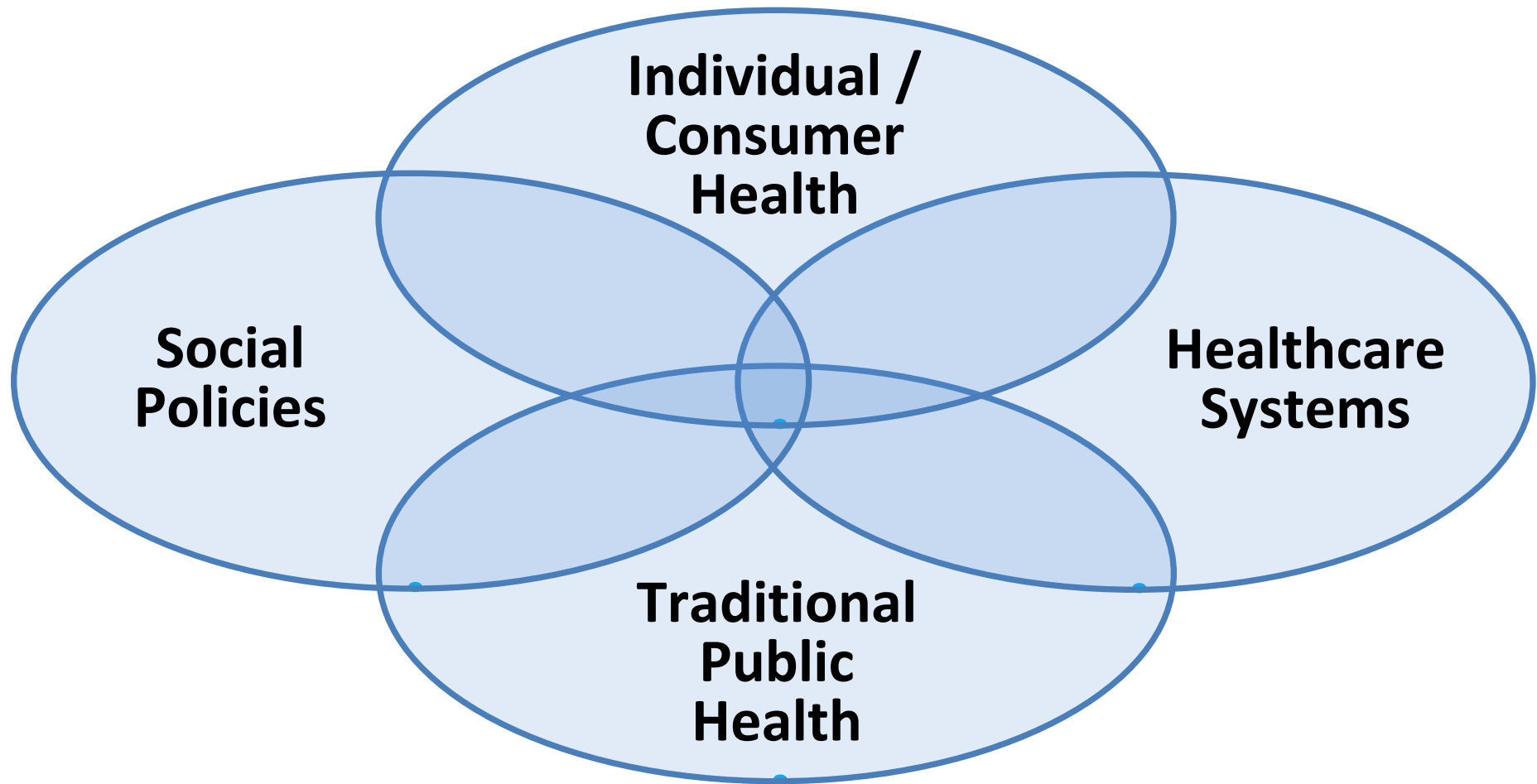
– but also –

- *Consent-Driven*
- *Provider-Sponsored*
- *Community-Engaged*
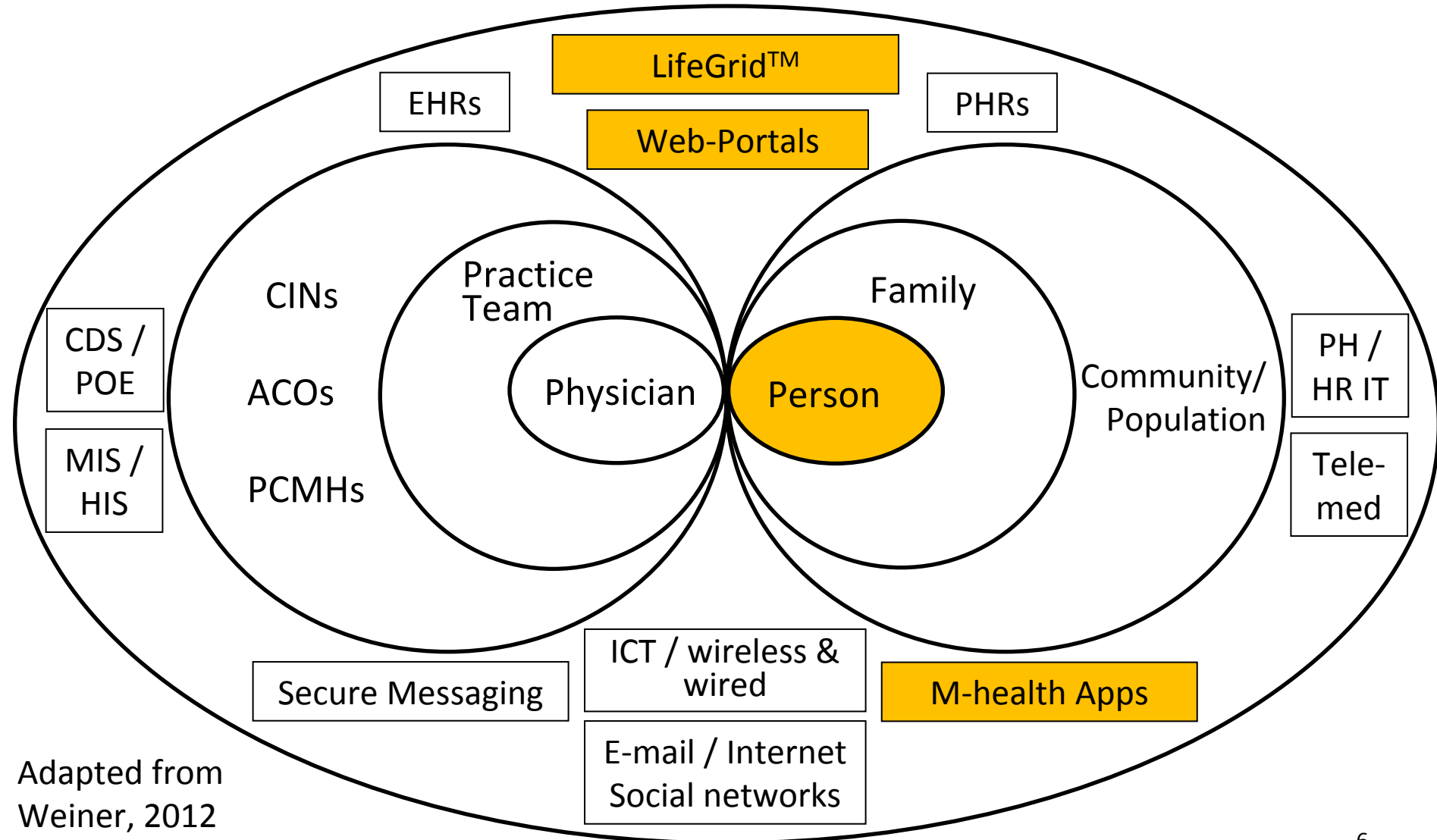
What is Person-Centered Health?

- Idea of the individual / consumer being at the center of the population health ecosystem
- Population health ecosystem
  - Individual / consumer health and wellness
  - Healthcare systems
  - Traditional public health
  - Social policies

Population Health Ecosystem[1]

1. Esterhay RJ, Bohn HJ: Introduction to Population Health. In Population Health: Management, Policy and Technology. Esterhay RJ, Nesbitt LS, Taylor JH, and Bohn HJ (Eds.), Convurgent Publishing, Virginia Beach, Virginia, 2014, pp 1-28.

Population Health Informatics Ecosystem (Where are the Data?)

LifeGrid™

EHRs

Web-Portals

PHRs

CDS / POE

MIS / HIS

CINs

Practice Team

ACOs

Physician

Person

Family

Community/ Population

PH / HR IT

PCMHs

Tele-med

Secure Messaging

ICT / wireless & wired

M-health Apps

E-mail / Internet Social networks

Adapted from Weiner, 2012
http://www.ijhpr.org/content/1/1/33

What is Consent-Driven?

My Data Sources
- My Personal Accounts
- My Payer Accounts
- My Physician Accounts
- My Pharmacy Accounts
- My Lab Accounts
- My Procedure Accounts
- My Hospital Accounts
- My Apps

My Consent

View & Download

Download ← Personal Authorization

My Personal Health Record Account

View

Personal Authorization → Transmit

View and Transmit

My Consent

My Data Uses
- For My Family/Friends
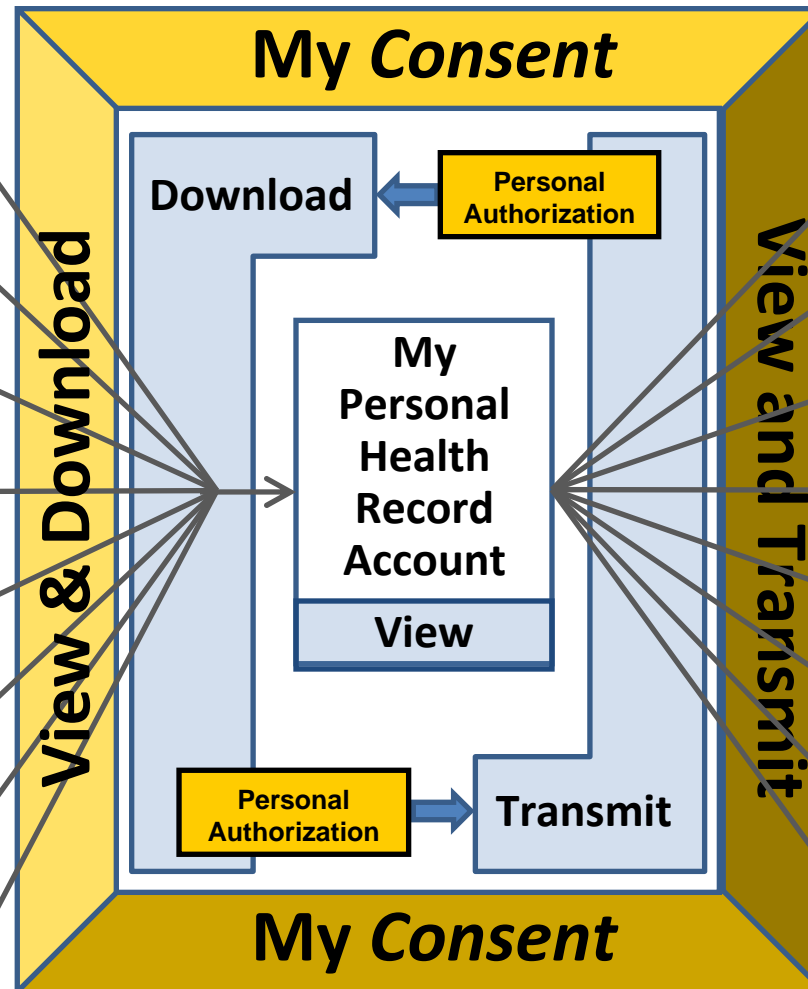- For Physician Visits
- For ER/Urgent Care
- For Hospitalizations
- For Payers
- For Health Research
- For Public Health
- For my Apps

Person-Centered Health Information Goals

- Comprehensive electronic patient records when and where needed
  - Individual (for health and wellness and patient care)
  - Aggregate (research, population health)
- Basic Requirements
  - All information must be electronic and all providers must use EHRs
  - Mechanism to bring together scattered information for each person ("Health Information Exchange" or HIE)

Person-Centered Health Information Challenges

- Privacy
  - Authorized access only
  - Authorized by whom?
- Stakeholder Cooperation
  - All providers must submit records
- All Digital Records
  - Paper records won't do
  - Financial Sustainability
- Security
  - Minimize hacking vulnerability

Institution-Centric HIE Architecture[1]

- However, current efforts have problems
  - Trying to replicate manual process of contacting other providers directly for records
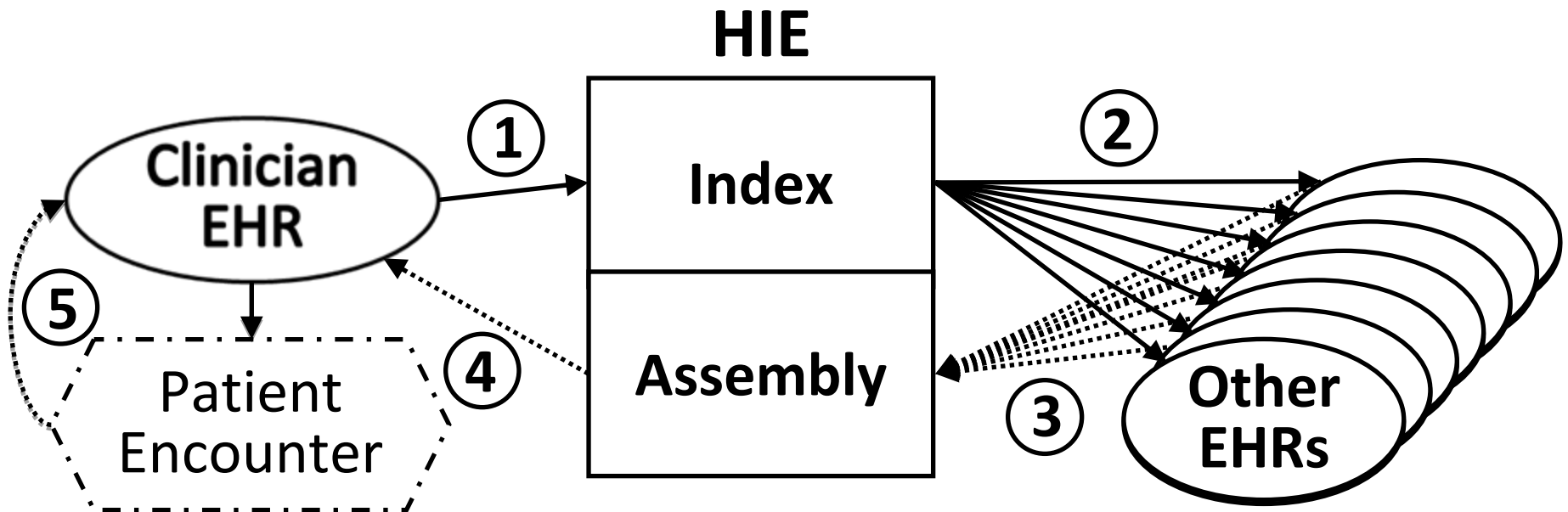
1. Yasnoff W: Advancing the Use of Personal Health Data. In Population Health: Management, Policy and Technology. Esterhay RJ, Nesbitt LS, Taylor JH, and Bohn HJ (Eds.), Convurgent Publishing, Virginia Beach, Virginia, 2014, pp 402-434.

Current HIE Efforts

- **Complex and expensive**
  - All EHRs must be online 24/7 to respond to queries
  - Real-time reconciliation of records
  - Requires unique patient identifier
    - Politically impractical
    - Privacy threat
  - Must have expensive 24/7 network operations center to monitor all contributing EHRs

Current HIE Efforts (continued)

- Unable to facilitate robust data searching
  - Distributed records requires assembly for sequential search
  - Sequential search is too slow to be practical
- Lack of sustainable business model

Solution: Health Record Bank (HRB)

- Secure community-based repository of complete health records

- Access to records completely controlled by patients (or designee)

- "Electronic safe deposit boxes"

- Information about care deposited once when created (required by HIPAA)

- Allows EHR incentives to physicians to make outpatient records electronic

- Operation simple and inexpensive

What is a Health Record Bank?

http://www.healthbanking.org/video1.html

Patient-Centric HRB Architecture[1] (an "HIE of One"[2])
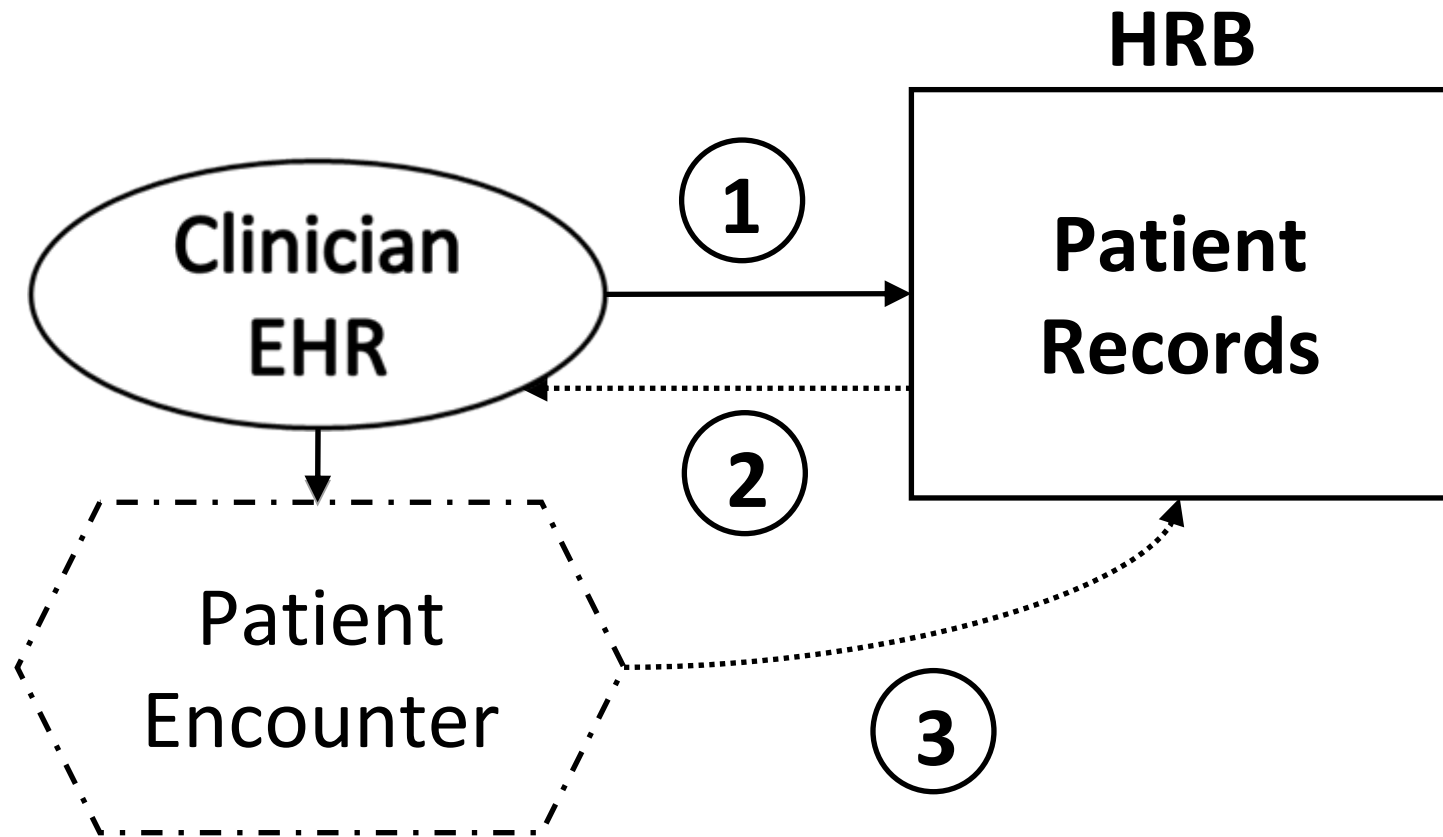
1. Yasnoff W. Advancing the Use of Personal Health Data. In Population Health: Management, Policy and Technology. Esterhay RJ, Nesbitt LS, Taylor JH, and Bohn HJ (Eds.), Convurgent Publishing, Virginia Beach, Virginia, 2014, pp 402-434.
2. Gropper A. HIE of One: How can we strengthen the Internet for free expression and innovation? https://www.newschallenge.org/challenge/2014/submissions/hie-of-one

HRB Rationale

- Operationally simple
  - Records immediately available
  - Deposit new records when created
  - Enables value-added services
  - Enables research queries
- Patient control
  - Trust & privacy
  - Stakeholder cooperation (HIPAA)
- Low cost facilitates business model
  - Can fund EHR incentive options
    - Pay for deposits
    - Provide Internet-accessible EHRs

HRB Business Model

- Costs (with 1,000,000 subscribers)
  - Operations: $6/person/year
  - EHR incentives: $10/person/year
- Revenue
  - Advertising: ~$3/person/year (option to opt out for small fee)
  - Reminders & Alerts: >= $18/person/year (30% penetration x $60/year)
    - "Peace of mind" alerts ($20/year)
    - Preventive care reminders ($20/year)
    - Medication reminders ($20/year)
  - Queries: >$3/person/year
- No need to assume/capture any health care cost savings (!!)

HRB Security Challenge

- Centralized data best way to ensure security[1]
  - Distributed data less secure: multiple transmission for each use
- Inherent vulnerability of central database
  - Single point of failure
  - Potential loss of all data in one incident
- Multiple security breaches have resulted in the widespread belief that nothing is secure
  - Perception is now reality
- Challenge: Efficient search without central database

1. Turn R, Shapiro NZ, Juncosa ML. Privacy and Security in Centralized vs. Decentralized Database Systems. Policy Sciences 1976;7:17-29
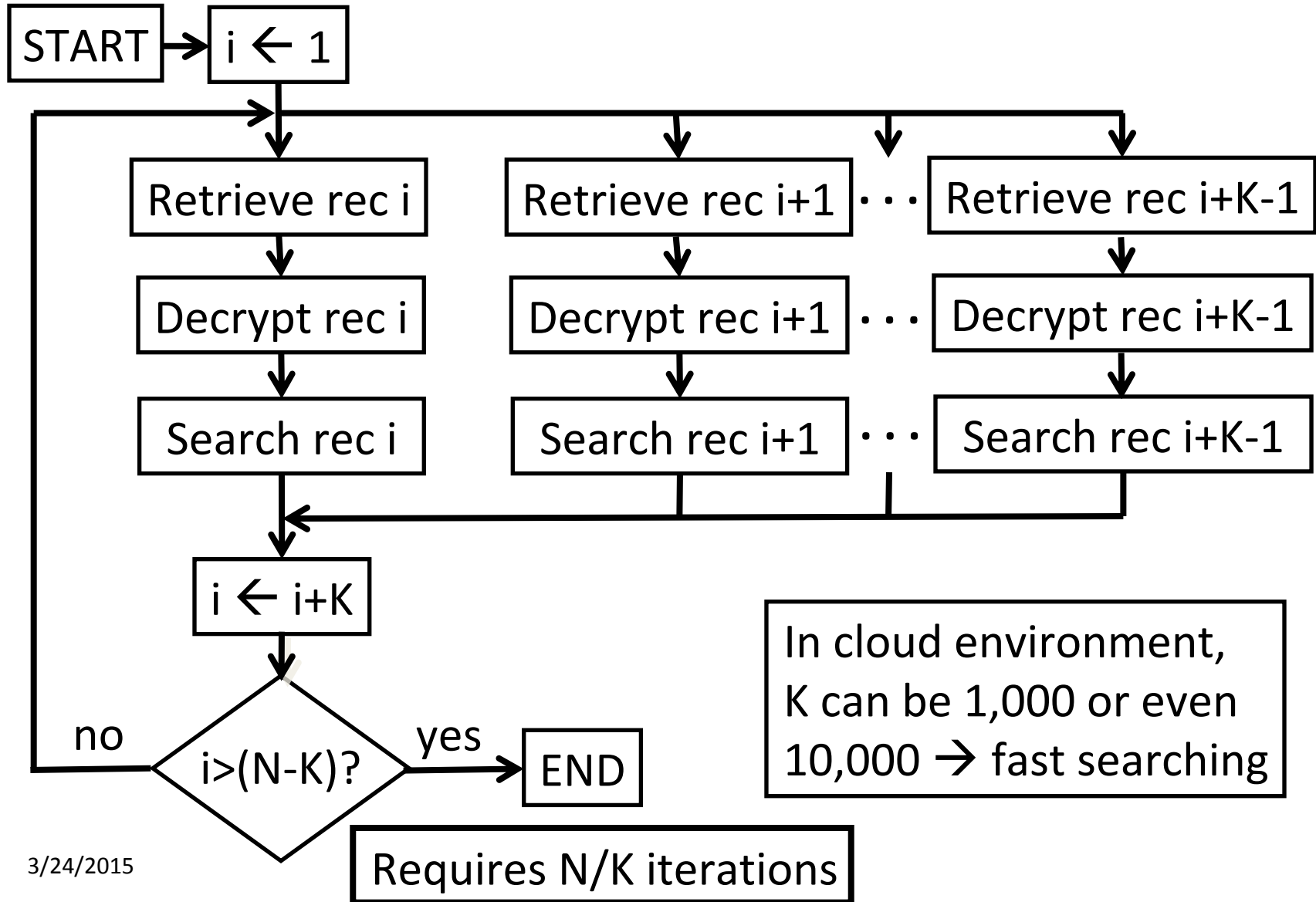
Avoiding Total Data Loss
with Personal Grid Computing

- Each patient's data stored in central location
  - Separate database for each patient
  - Separate encryption
- Pro: **no single point of access to all data**
- Con: Sequential searching

Pt record 1*
Pt record 2
.
.
.
Pt record N
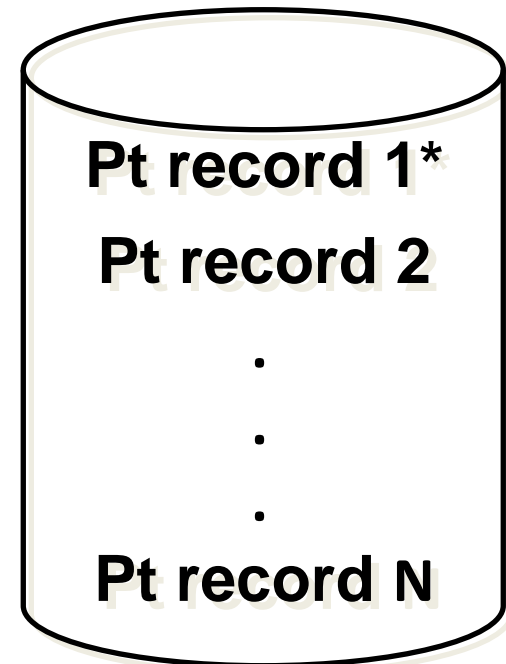
***each record** stored and encrypted separately

Searching: Separate Records with K Processors

START → i ← 1

Retrieve rec i · · · Retrieve rec i+1 · · · Retrieve rec i+K-1

Decrypt rec i · · · Decrypt rec i+1 · · · Decrypt rec i+K-1

Search rec i · · · Search rec i+1 · · · Search rec i+K-1

i ← i+K

i>(N-K)?   no / yes → END

In cloud environment, K can be 1,000 or even 10,000 → fast searching
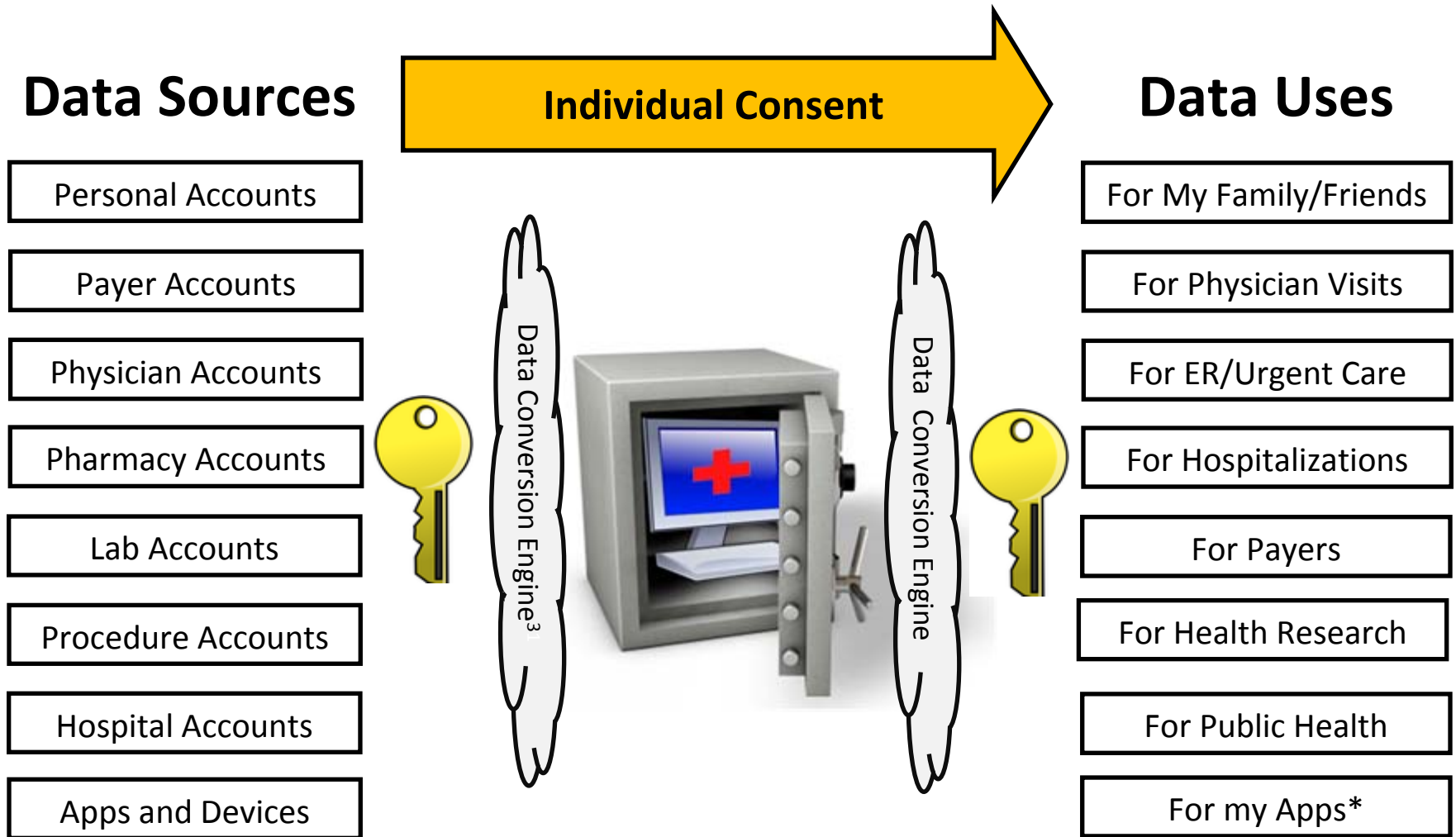
Requires N/K iterations

Personal Grid Computing with LifeGrid™ *

- Each patient's record stored in separate database with separate encryption
- Efficient massively parallel searching using virtual processors in cloud and/or network (which may include mobile phones)
- No access point for all patients' data
  - Even for operator of service
    - Eliminates "database in the sky" security vulnerability

*Medica Nexus LifeGrid™, Patent pending (January, 2015)

LifeGrid™ Data Flow

Data Sources

Personal Accounts

Payer Accounts

Physician Accounts

Pharmacy Accounts

Lab Accounts

Procedure Accounts

Hospital Accounts

Apps and Devices

Individual Consent

Data Conversion Engine[3]

Data Conversion Engine

Data Uses

For My Family/Friends

For Physician Visits

For ER/Urgent Care

For Hospitalizations

For Payers

For Health Research

For Public Health

For my Apps*

A Population Health Solution

Health and Prevention Promotion Initiative (HAPPI)

- Combine Community Prevention Organization with Health Record Bank
- Health Record Bank
  - Provides needed information
    - Ensures all-electronic records
  - Generates revenue (apps, ads, data)
  - Provides funds for itself and more
- Excess funds from HRB pay for prevention and population health
- Aligns all stakeholder interests

HRB + LifeGrid™ + HAPPI = VISION

Personal Grid Computing for Health

Ultra secure personal grid accounts

for you, your healthcare systems and your community.

- Privacy – patient control
- Stakeholder cooperation – patient control with provider support
- All digital information – provide ongoing incentives
- Financial sustainability
  - Apps for patients
  - Apps for other stakeholders
- Security – personal grid architecture avoids potential for loss of all data

Changing Communication Landscape from Patient to Person[1]

- "Patient 1.0" – about patients "complying" with and "adhering" to physician orders

- "Patient 2.0" – patients becoming better-informed, as through web searches and other means

- "Patient 3.0" – patients as persons who co-create their own plans for improving their health, in true collaboration with their providers

1. Tang, P. At iHT2-San Diego 2015 "Patients 3.0 What's the Job of a Patient?" http://www.healthcare-informatics.com/article/paul-tang-md-iht2-san-diego-patients-30-what-s-job-patient

Do You Need a Digital Unified Health Record Account?

1. Do you currently keep copies of your health records (either on paper or your computer) or would like to?

2. Do you want comprehensive health information to be readily available in an emergency?

3. Do you manage or monitor your child's or parent's healthcare or want to be more involved in it?

4. Do you want to be notified if a loved one visits an emergency room?

5. Do you have a chronic illness?

6. Are your medical records scattered among several doctors' offices?

7. Do you electronically track wellness and/or disease management?

8. Do you believe that if your doctor had more comprehensive health information about you and your family that the treatment plan and outcomes would be better?

Key Points of Agreement

- In the U.S. today, individuals' health information is fragmented, scattered and locked away in silos
  - The result is $300 billion a year in avoidable costs and lost opportunities
- Why? Individuals lack a trusted way to gather, store and share their unified health information.
- Key reasons have included:
  - Lack of laws that enable sharing data
  - Lack of financial incentives for institutions to share
  - Lack of trust in centralized repositories

Unified Health Records for Life:
A Centerpiece for Population Health Management

Why now? Three forces have recently converged to open a new path to the vision of **Personal Grid Computing for Health**:

1. New laws enabling sharing of health data between institutions and individuals / consumers

2. New value-based care incentives for providers

3. The spread of online mobile devices powerful enough to handle unified health records with no centralized repositories

The End