Envisioning the Learning Health System

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LHS and Me

POLICY

Achieving a Nationwide Learning Health System

Charles P. Friedman,* Adam K. Wong, David Blumenthal,

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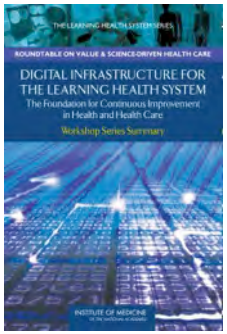


- 2009-2011: Encountered the LHS as ONC's Chief Science Officer
- 2011-2012: Organized LHS National Summit

- 2013: Organized NSF workshop on LHS research challenges

Research and applications

Toward a science of learning systems: a research agenda for the high-functioning Learning Health System

Charles Friedman,[1] Joshua Rubin,[1] Jeffrey Brown,[2] Melinda Buntin,[3] Milton Corn,[4] Lynn Etheredge,[5] Carl Gunter,[6] Mark Musen,[7] Richard Platt,[2] William Stead,[3] Kevin Sullivan,[8] Douglas Van Houweling[1]

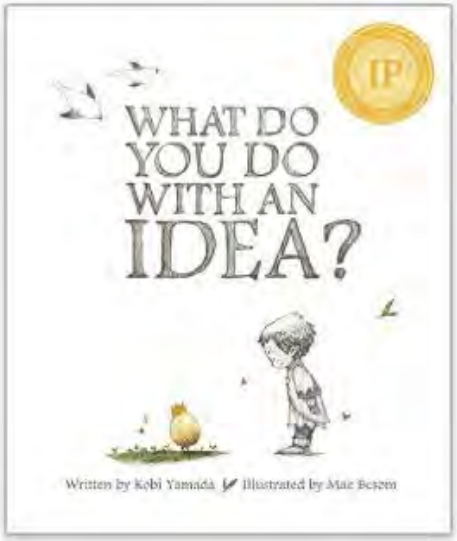
- 2014: Chair of first academic department of LHS

University of Michigan Medical School

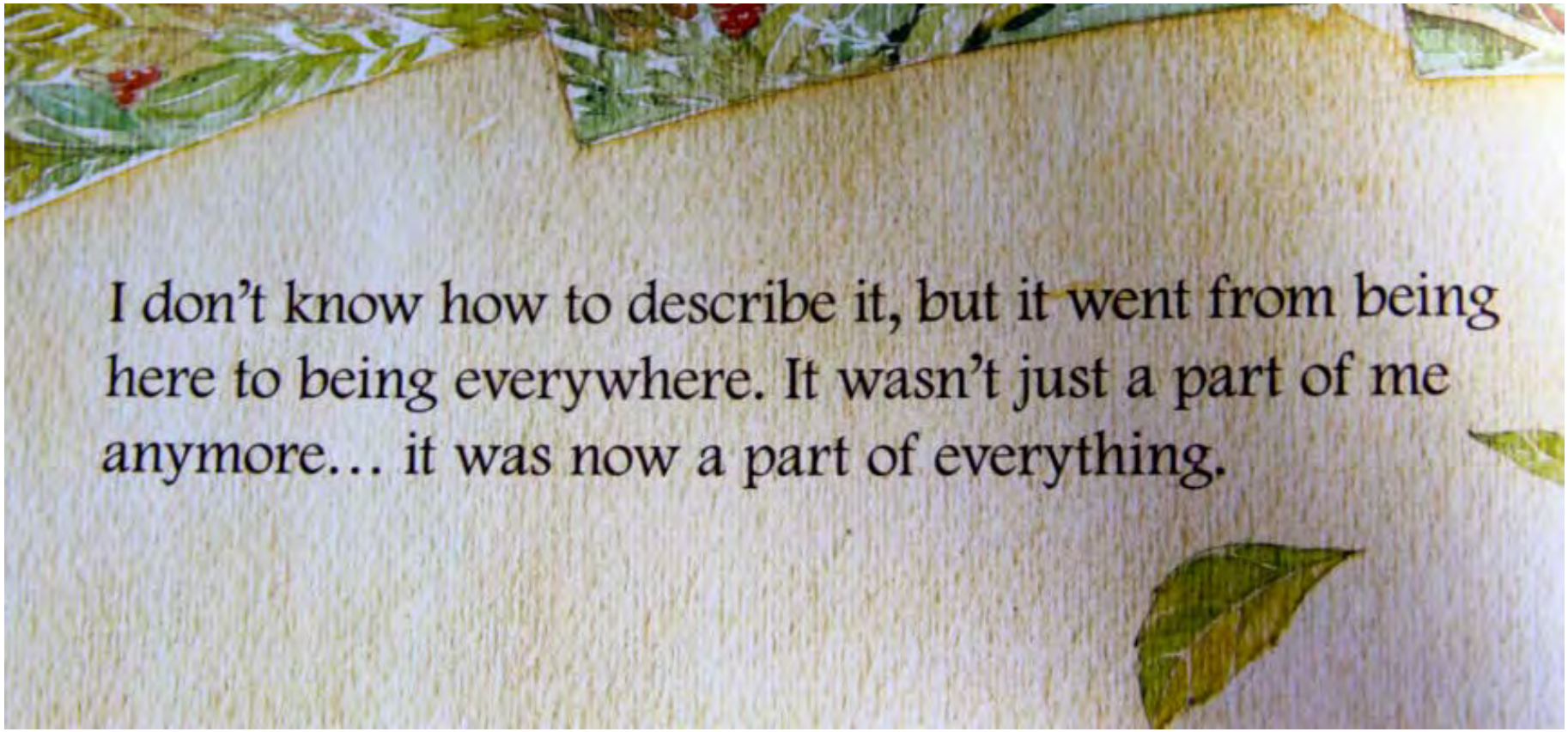
- 2016: Launched LHS Journal and HILS graduate program

Inspiration

- People are naturally drawn to visionary ideas that stimulate imagination
- LHS = a "Big Idea" that attracts people and opens doors



The Power of a Big Idea



Main Menu for Today

- The Essence of Learning Health Systems (LHSs)
- The Key Concept of Infrastructure
- Becoming Part of Everything

Learning Health Systems

Health systems--at any level of scale--become learning systems when they can, continuously and routinely, study and improve themselves

The NEW ENGLAND JOURNAL of MEDICINE

Perspective: Jan 3, 2013
"Code Red and Blue — Safely Limiting Health Care's GDP Footprint"
Arnold Milstein, M.D., M.P.H.

…U.S. health care needs to adopt new work methods, outlined in the Institute of Medicine's vision for a learning health system…

LHS "Anthems"

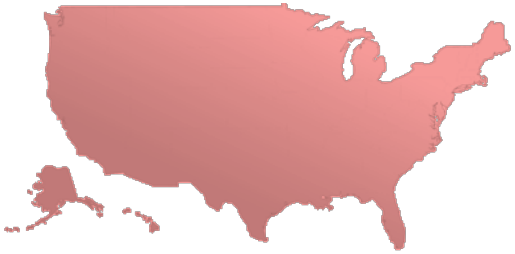
- Learn from every patient!
- A system problem needs a system solution!
- 17 years to 17 months
  - to 17 weeks to 17 days (to 17 hours)!

What is an LHS?

Three Views:

- Checklist

- Macro view from earth orbit

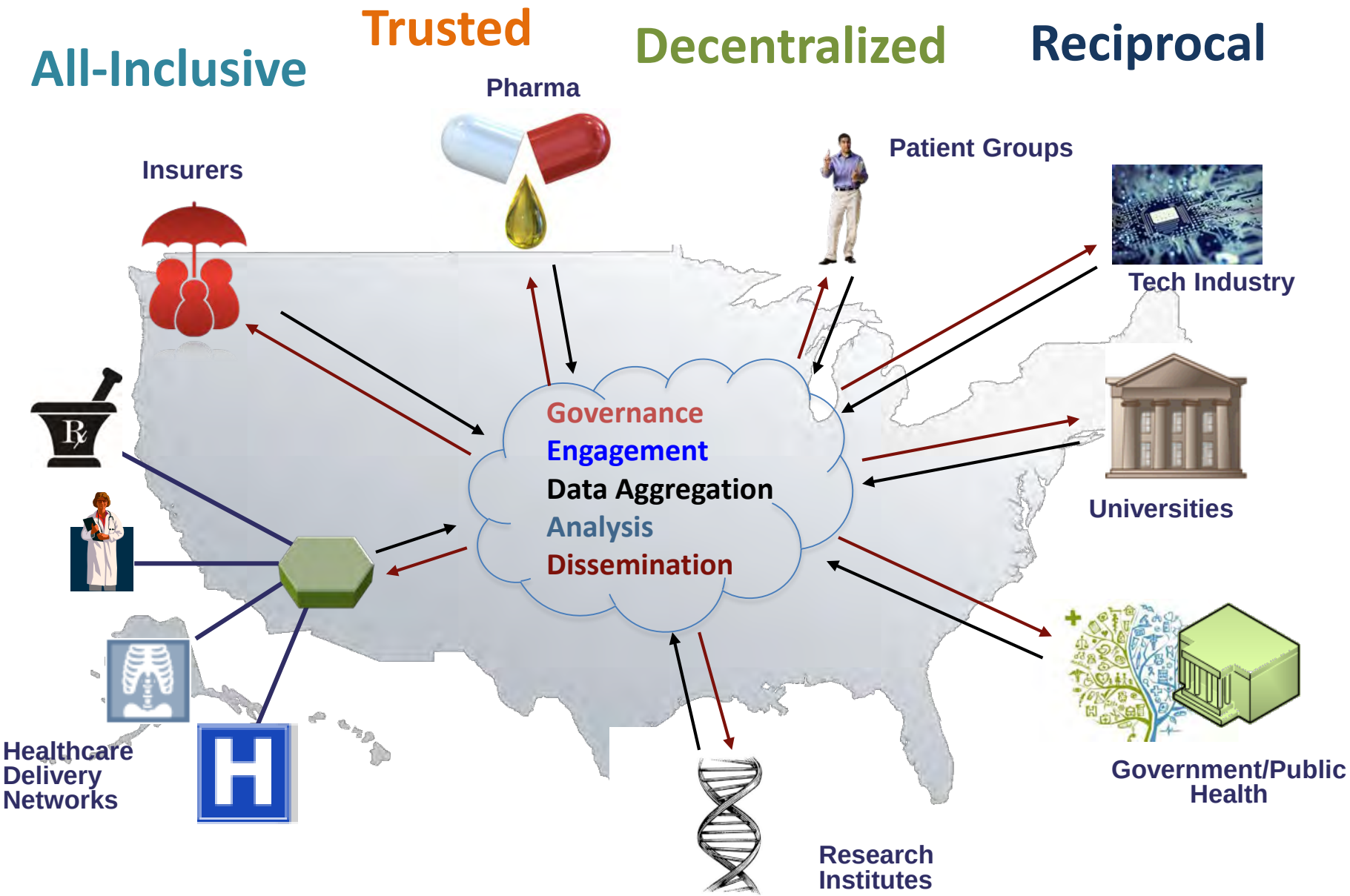


- Micro view from the ground

Checklist View: Properties of a Health System That Can Learn

- ✓ Every participating patient's characteristics and experience are available to learn from
- ✓ Best practice knowledge is immediately available to support decisions
- ✓ Improvement is continuous through ongoing study
- ✓ An infrastructure enables this to happen routinely and with economy of scale
- ✓ All of this is part of the culture

View from Earth Orbit: An Ultra-Large Scale System



Learning Systems Can Exist at Any Level of Scale

Single Organization

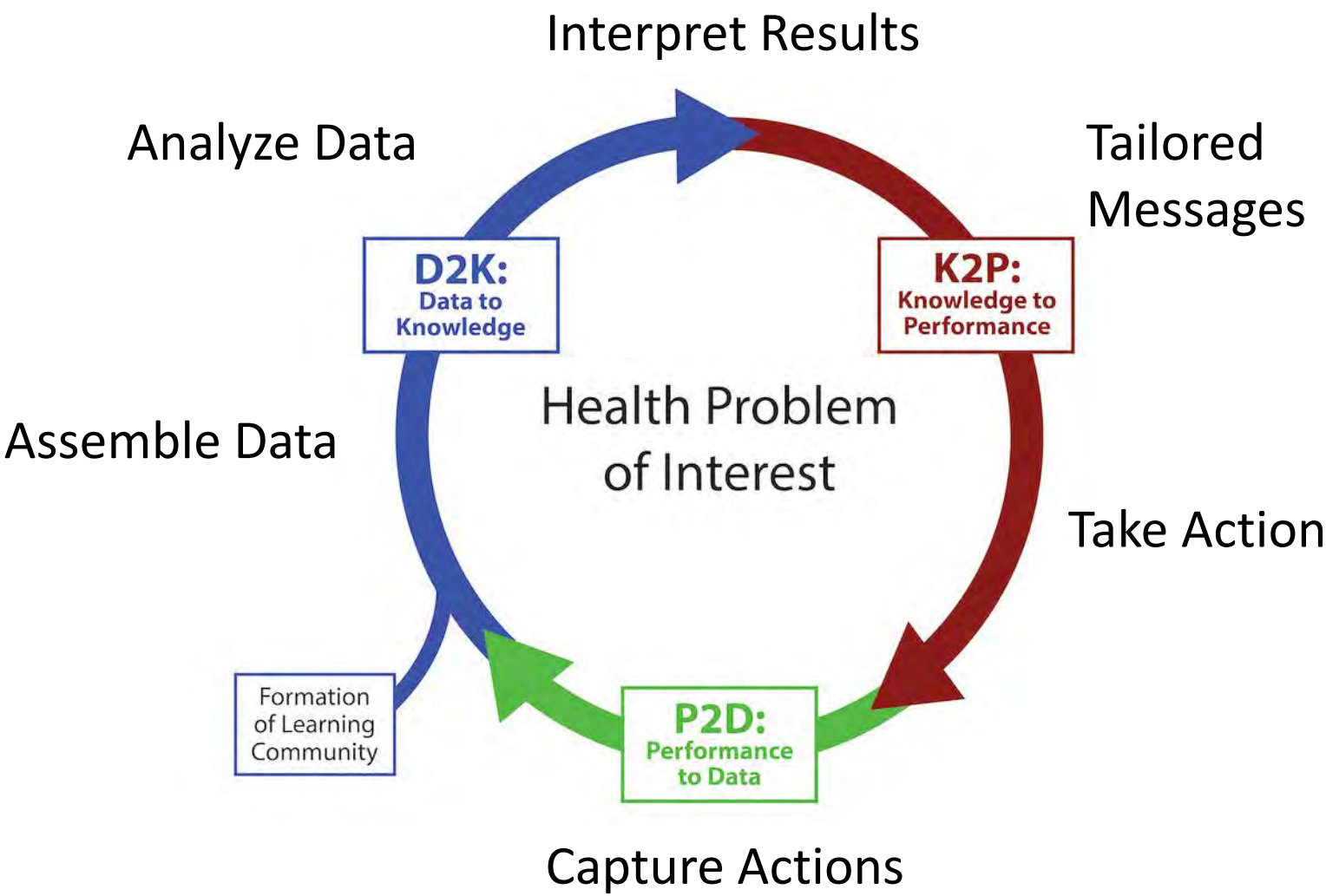
Network of Organizations

State/Territory/Region

Nation

Planet

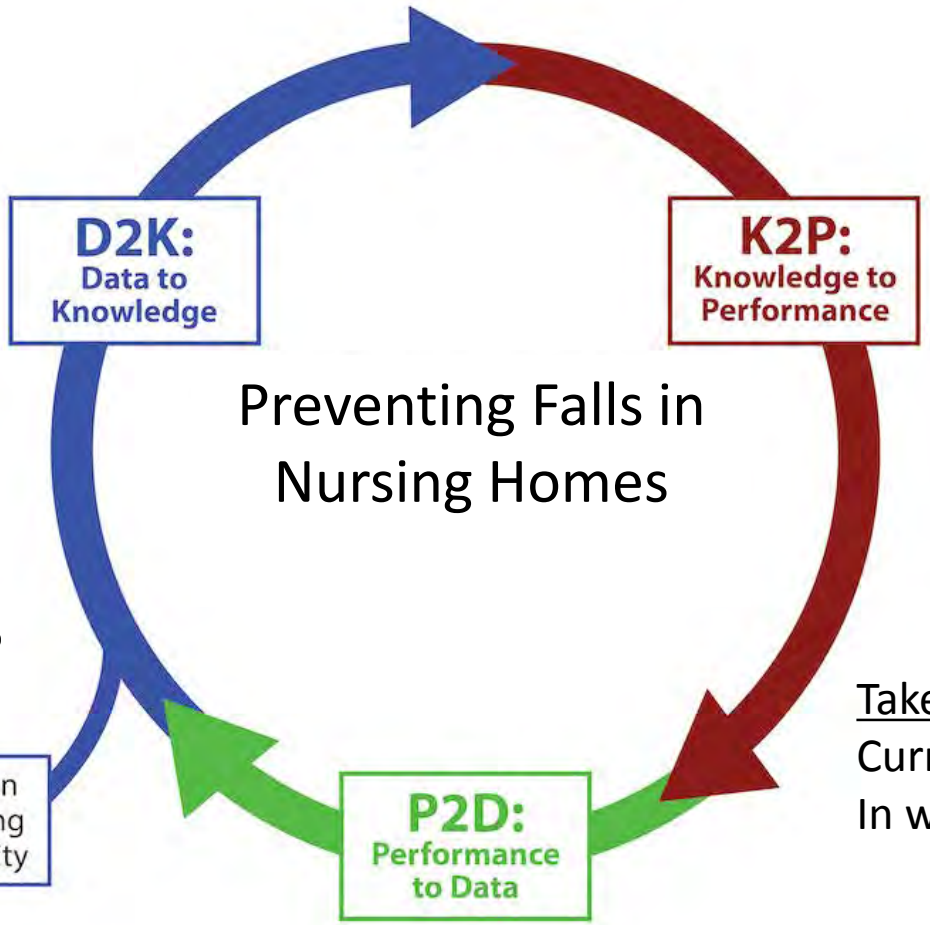
View from the Ground: "Virtuous Cycles" of Study and Change



Example of A Virtuous Learning Cycle

Interpret Results:
Are the results credible?
What advice should be given?

Analyze Data:
What practices associate with lower fall rates?



Tailored Messages:
Based on your current practice, you might want to consider…

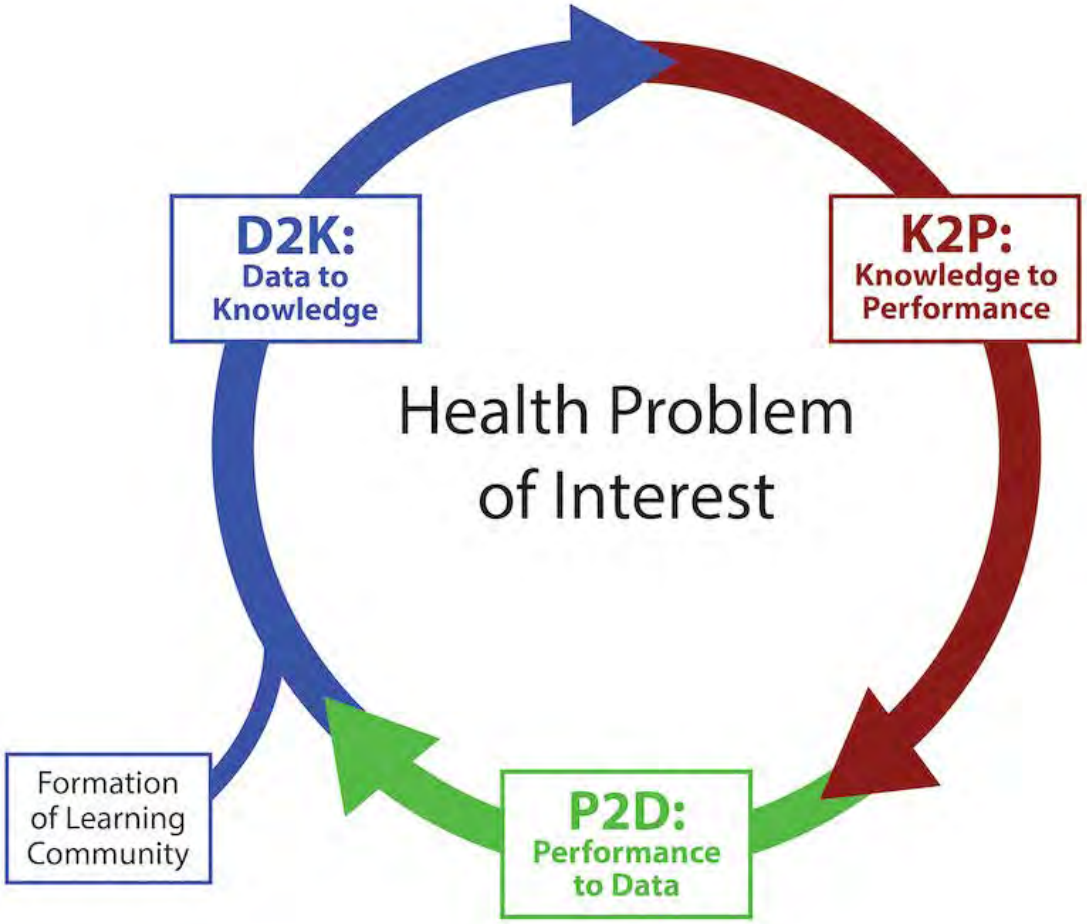
Assemble Data:
How do we prevent falls?
What is the fall rate?

Take Action: Change Current Practice:
In whole or part…

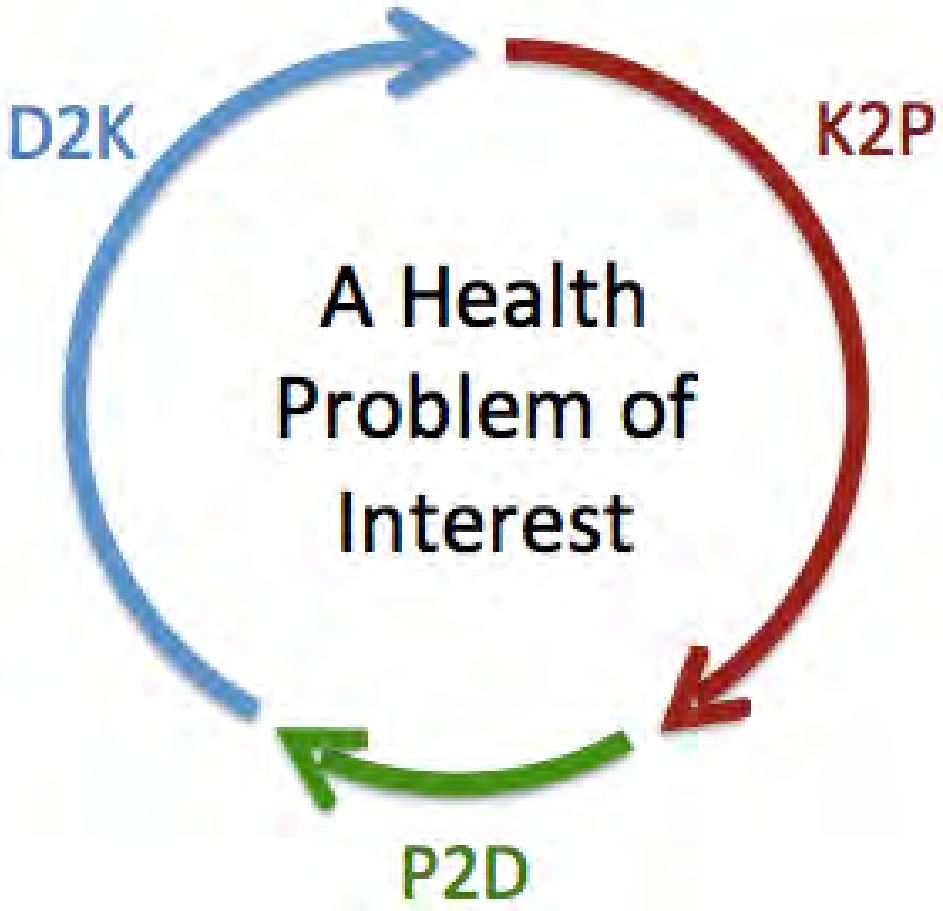
Capture Actions: Discover what changes occurred and why.

The LHS Connects Discovery to Practice

Better Health = D2K + K2P + P2D

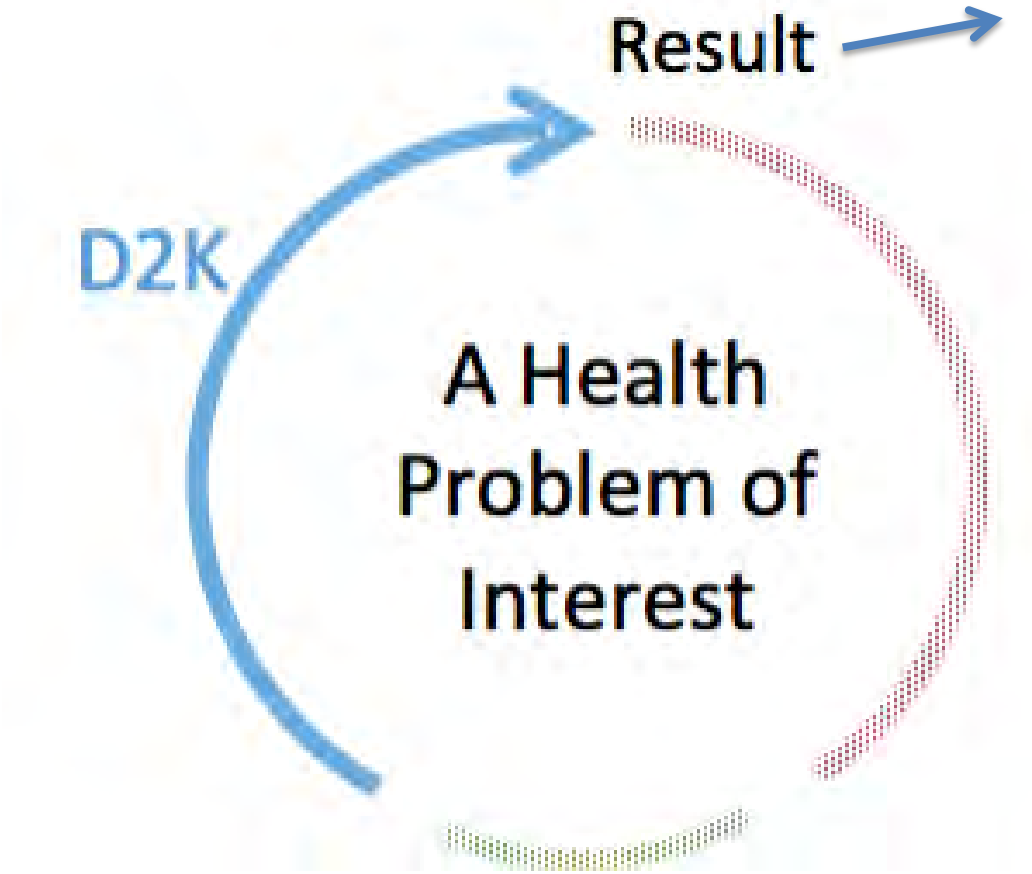


Better Health Requires This



Not This

Journals



A Learning ***Health*** System

NOT

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Infrastructure!

Virtuous cycles enable learning but do not create a Learning Health System

- If you want to get 350,000 people per day across a river, do you build 350,000 rowboats?

- No, you build a:

Emphasis on Infrastructure is a Differentiator

Differentiates the LHS from:

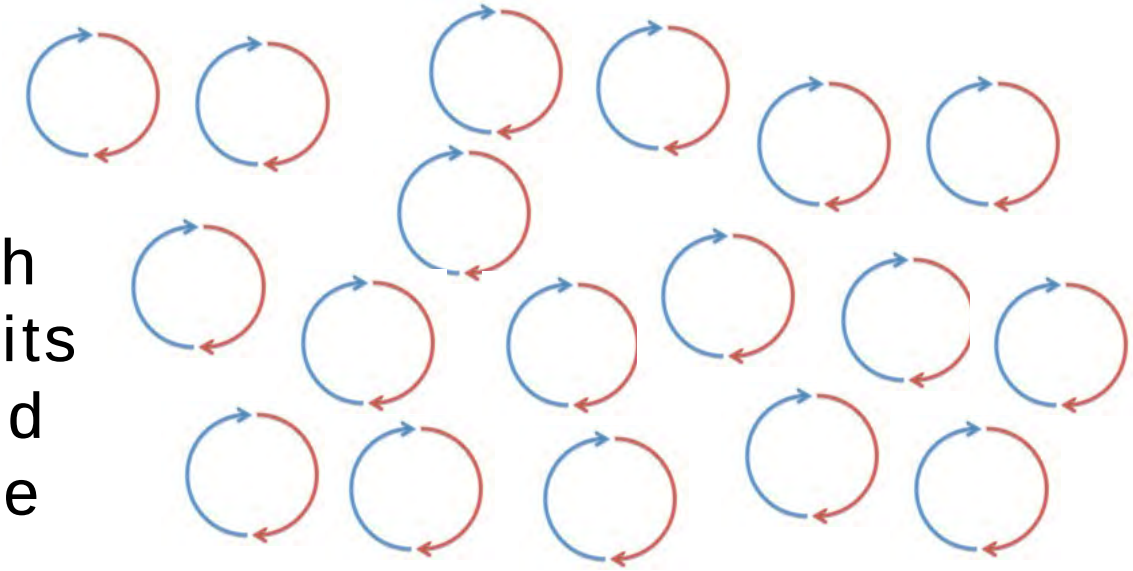
- Lean
- PDSA, PDCA cycles
- Proprietary approaches

Crudely:

LHS = Cycles + Infrastructure

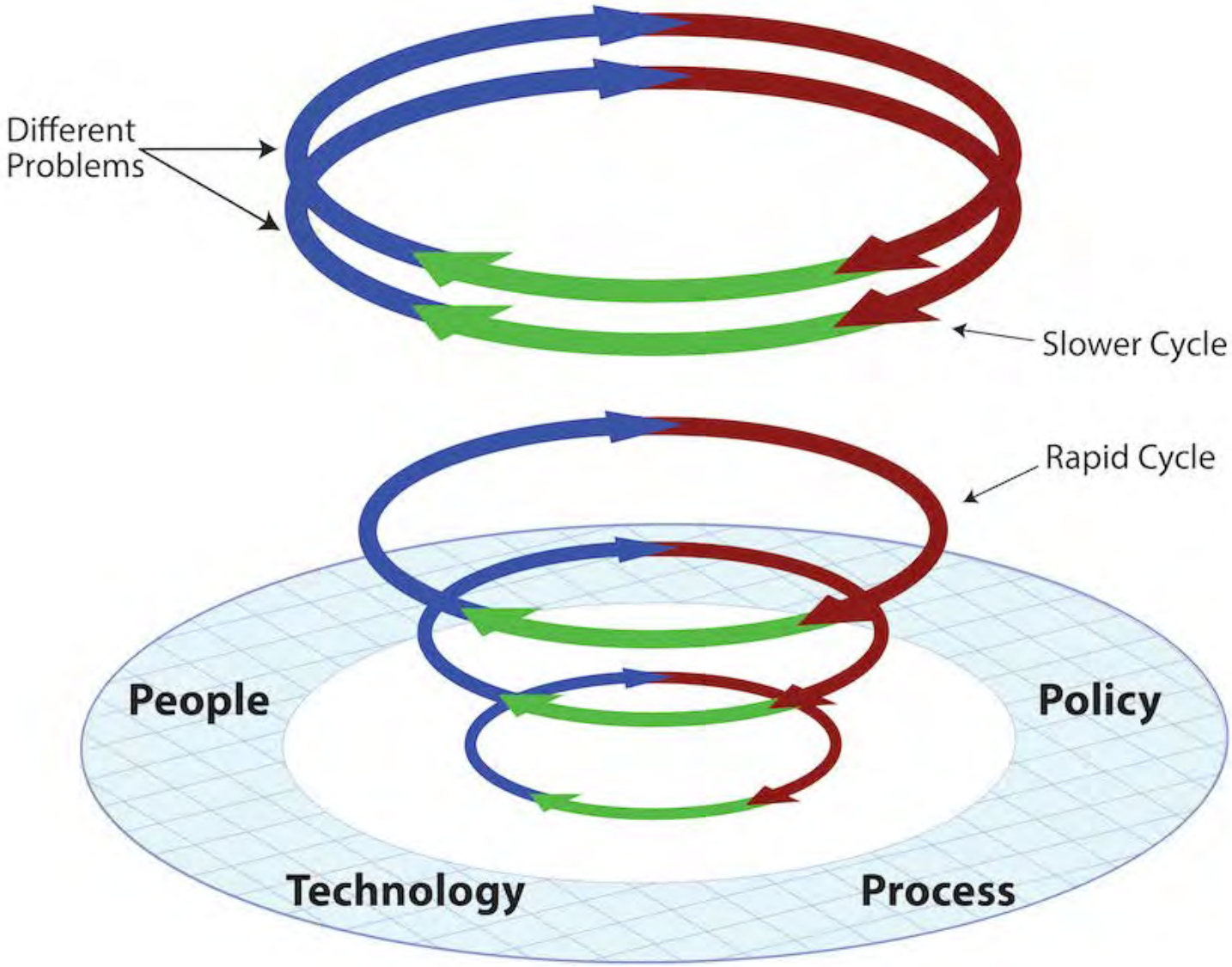
The LHS as Infrastructure: So How Do We Convert?

- A large set of simultaneous learning loops, each under the aegis of its own community and addressing a unique problem:



- Into an efficient ultra-large scale system:

A Cyber-Social Platform Supporting Multiple Simultaneous Learning Cycles



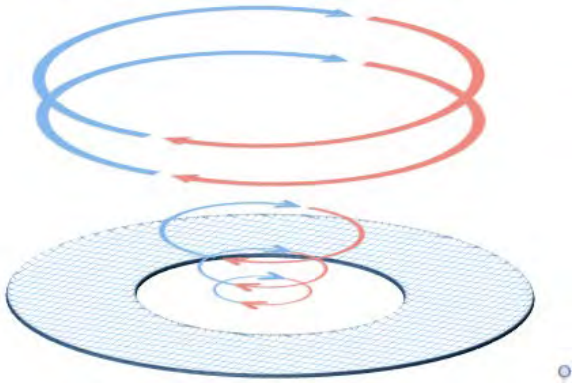
Why an Infrastructure?

- Without an infrastructural platform:
  - Every cycle requires its own agreements, technology, staffing, analytics, dissemination mechanism
  - No economy of scale

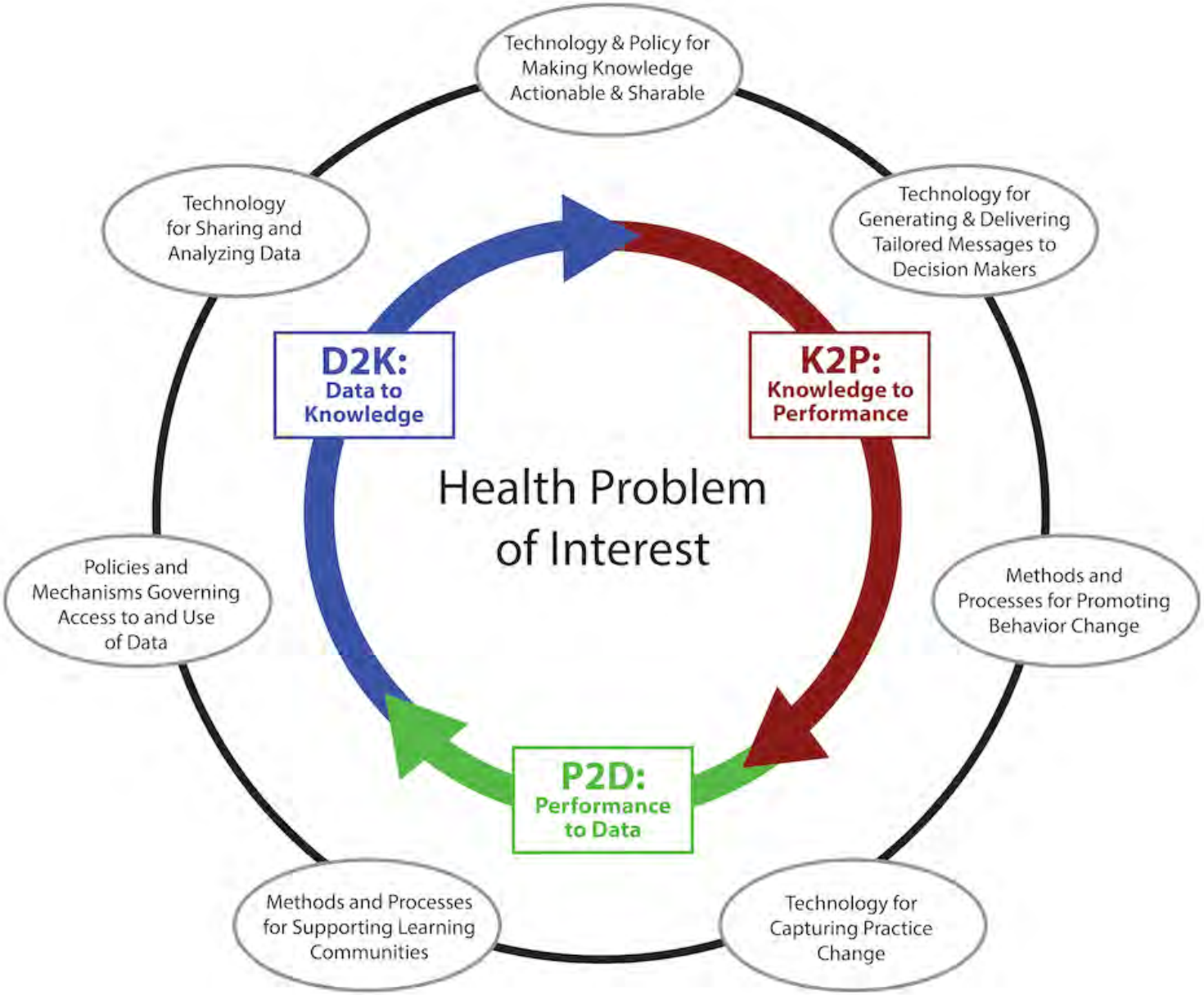
  Cost of 100 cycles = 100 x (Cost of one)

- With a platform:
  - All cycles are supported by the infrastructure
  - Big economy of scale

  Cost of 100 cycles << 100 x (Cost of one)



Infrastructure: A Set of "Building Block" Services



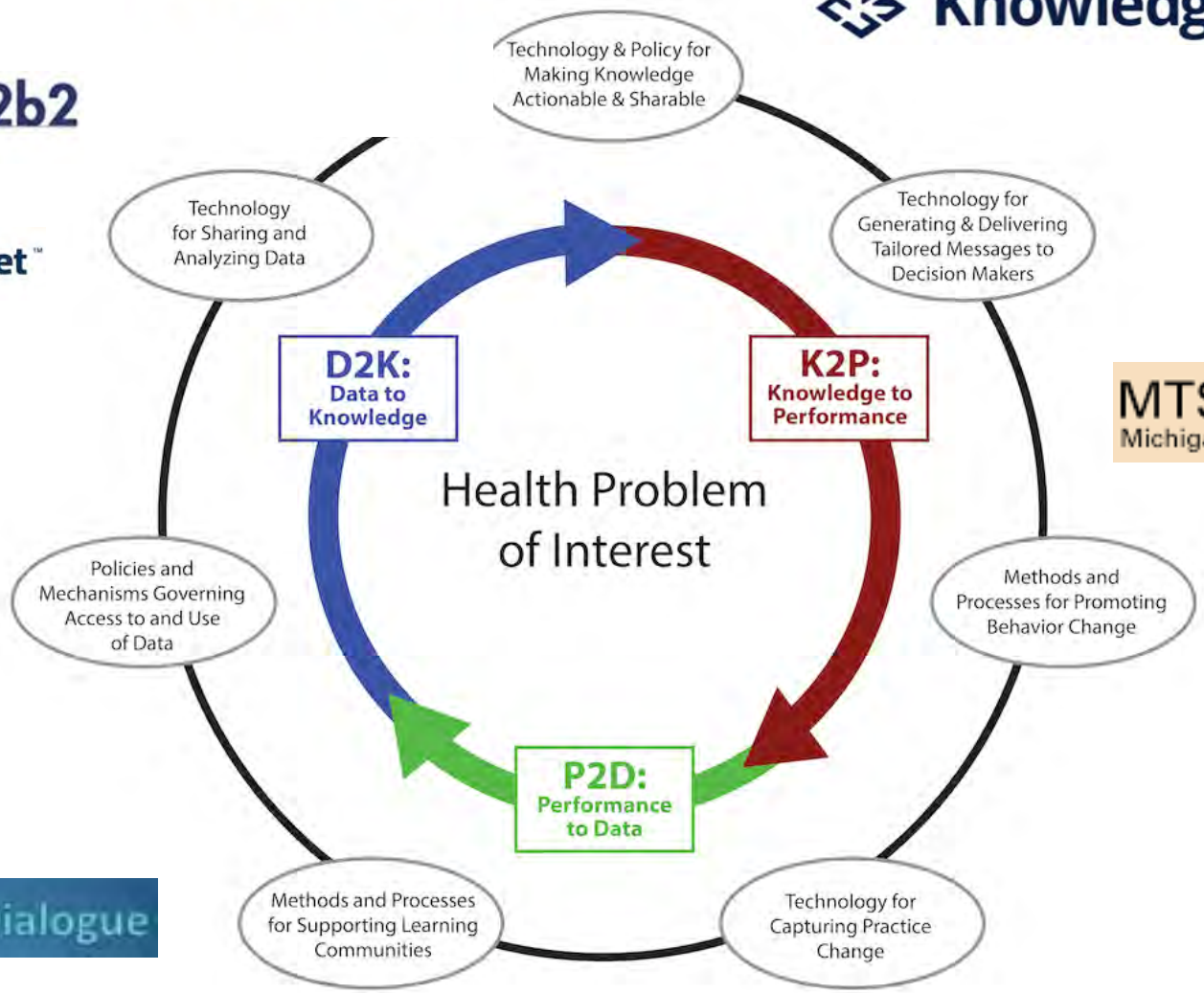
Examples of Existing Building Block Components

TRANSFoRm

Knowledge Grid

i2b2

PopMedNet™



MTS
Michigan Tailoring System

Deliberative Dialogue

Building Block Services – D2K

Data and analytical infrastructure

Data resources

- Registries identifying patients with specific conditions
- Elaborated registries containing data about registry patients
- Multipurpose data marts containing data about individuals without regard to conditions
- Standardization for representing data
- Qualitative or quantitative information on context including resources, team function, etc.

Analytical resources

- Mechanisms for aggregating data from disparate sources
- Mechanisms for conducting statistical analyses

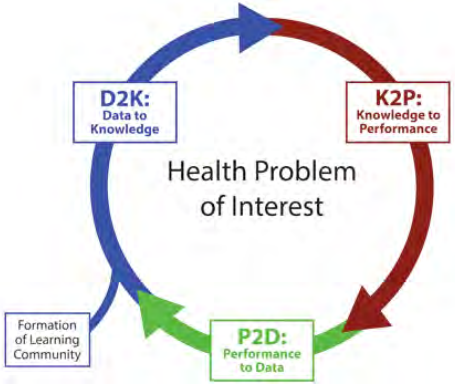
Policies

- Data sharing agreements
- Individual consent policy (opt in/opt out)

Building Block Services – **K2P**

Knowledge sharing and change management infrastructure

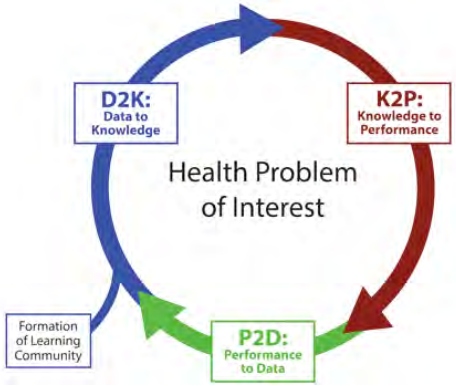
- Mechanisms for deliberating the validity and applicability of analytical results
- Mechanisms for "persisting" analytical results deemed to be valid
- Mechanisms for communicating results as advice to specific stakeholde
- Supports and processes for behavior change



Building Block Services – P2D

Evaluation and learning culture and supports

- Mechanisms to collect information on practice change
- Mechanisms to collect and analyze outcomes related to practice change
- Methods and supports for ongoing learning, both individually and in communities



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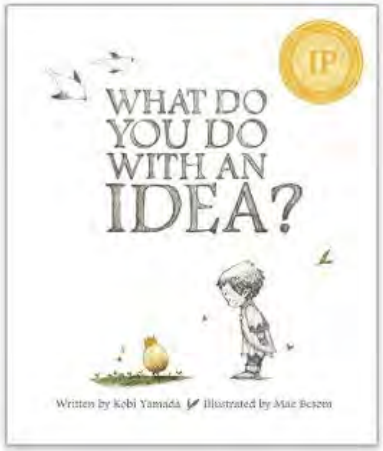
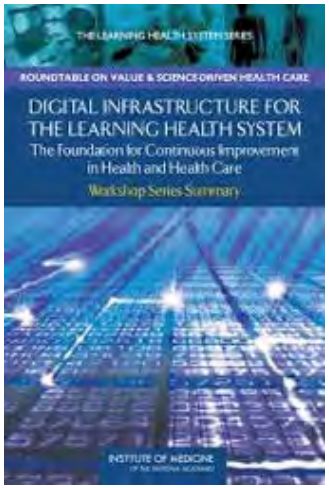
Becoming Part of Everything…



- Literature
- Initiatives at Varying Scales
  - Single Organizations
  - Networks
  - Regions
  - Nations
  - Multi-nations
- Science and Infrastructure

Literature



- Institute of Medicine/National Academy of Medicine books and monographs
- Articles: > 1,900 results in Google Scholar
- A new journal

Progress: Organizations

Progress: Inter-organizational Federations and Networks

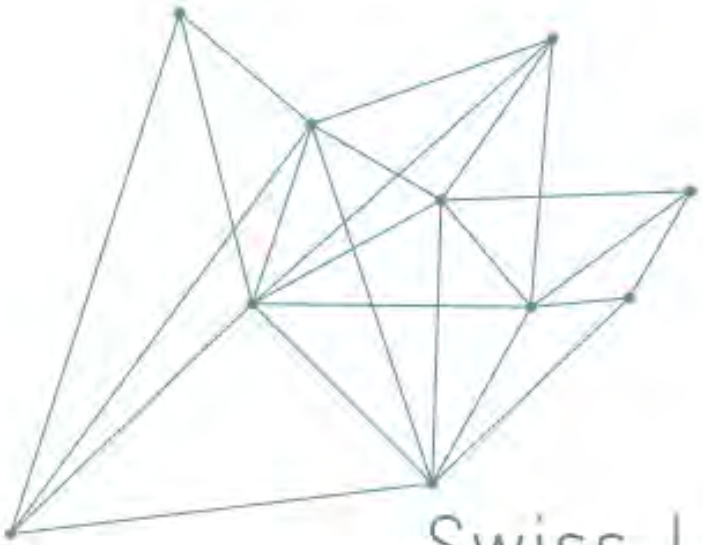
Regions

British Columbia

Northern England

Michigan

Switzerland: First Official National Initiative



Swiss Learning Health System

A National Platform for Health Systems and Services Research, Policy and Practice

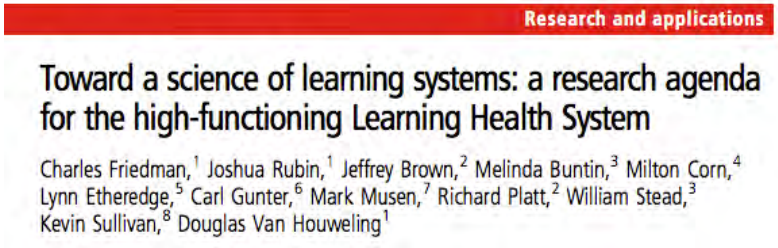
Multi-National: European Institute for Innovation Through Health Data

A Grassroots Movement: 129 Endorsements of the LHS *Core Values*

NCHICA
North Carolina Healthcare Information and Communications Alliance, Inc.
NantHealth
NATE
UC San Diego Health
Lewin and Associates LLC
Ursus Technologies (SDVOSB)
NNDC National Network of Depression Centers
Health e-Research Centre
Fair
Veterans Health Administration
Office of Informatics & Analytics
CRITICAL PATH INSTITUTE
HRBA
UNIVERSITY OF SAN FRANCISCO
CHANGE THE WORLD FROM HERE
Program in Health Informatics, SONHP
Diogenec Group
Booz | Allen | Hamilton
patientslikeme
Duke Clinical Research Institute
DUKE UNIVERSITY MEDICAL CENTER
The Center for Learning Health Care
The National Dental Practice-Based Research Network
Memorial Sloan-Kettering Cancer Center
Billings Clinic
ACP
LAMBDA SOLUTIONS
AHIMA
American Health Information Management Association
interpreta
CAHIE
ThotWave
MedDATA FOUNDATION
Quantia
Cerner
COHRI Consortium for Oral Health Research and Informatics
KING'S College LONDON
AMGA
CODA
MANCHESTER 1824 The University of Manchester
keep livin'
HealthCatalyst
Open mHealth
GEISINGER HEALTH SYSTEM
MiHIN Shared Services
Division of Health and Social Care Research
e-Patient Dave A Voice of Patient Engagement
American Academy of Pediatrics
oz systems
Genetic Alliance
the diary
TM FLOYD COMPANY
TRUVEN HEALTH ANALYTICS
FACE
HL7 INTERNATIONAL
OHC Our Health Data Cooperative
MOSAICA PARTNERS
2311
SANOFI
Peachy
SecureHealthHub, LLC
JOHNS HOPKINS MEDICINE
STEWARDS OF CHANGE THE BUSINESS OF PUBLIC BENEFIT
COUNT US IN
Harvard Pilgrim HealthCare
ALTARUM INSTITUTE
ANA AMERICAN NURSES ASSOCIATION
AcHN
Biovista
OPEN SOURCE HEALTH
INHS
AZZLY One Click Patient Care Management
Learning Health COMMUNITY
DANA-FARBER CANCER INSTITUTE
ONS Oncology Nursing Society
Lilly
ROBINSON & ASSOCIATES CONSULTING, LLC
GPII GLOBAL PATIENT IDENTIFIERS INC.
SIEMENS
Siemens Health Services
CDISC
ASCO
gsk GlaxoSmithKline
RightCare+ SOLUTIONS
QHC ADVISORY GROUP, LLC quality in health care
VUHID VOLUNTARY UNIVERSAL HEALTHCARE IDENTIFIER
THINKWISE HEALTH
National eHealth Collaborative
ANI
Open Health Tools
TEXAS eHEALTH ALLIANCE
eHI eHEALTH INITIATIVE
Intermountain Healthcare
HIMSS transforming healthcare through IT
University of Pittsburgh
INTERNET 2
GE Healthcare IT
chip
THE CDI GROUP
Kani Consulting Group LLC
ADVANCED HEALTH INSTITUTE
sas
Minnesota e-Health
Rhode Island Quality Institute
NorthShore University HealthSystem
vitaphone e-health solutions
KFFX
Imperial College London
Department of Primary Care and Public Health
MINNESOTA MDH DEPARTMENT of HEALTH
Epic
SCILHS
vitaTrackr
AMIA INFORMATICS PROFESSIONALS. LEADING THE WAY.
HEALTH
galileo analytics
HealthCare WELLPOINT
Stanford Children's Health
Medical Advocacy Mural Project
Let's change the "face" of healthcare.

Progress: Recognition of an Underlying Science

- A 2013 national workshop to explore the *research challenges* inherent in realizing a high functioning LHS


Research and applications

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- TRANSFoRm: European digital infrastructure for the LHS

- AHRQ-PCORI: Training grants for ”LHS Scientists”

Agency for Healthcare Research and Quality and Patient-Centered Outcomes Research Institute Learning Health Systems Mentored Career Development Program (K12)

Summary

- The Essence of Learning Health Systems (LHSs)

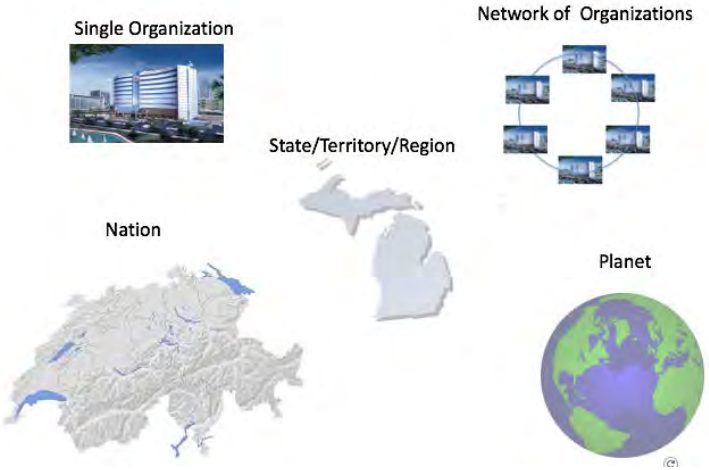
→Better Health = D2K + K2P + P2D

- The Key Concept of Infrastructure

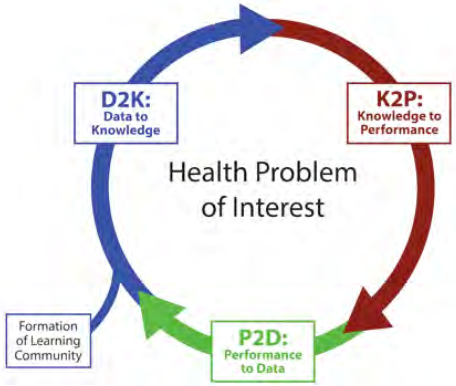
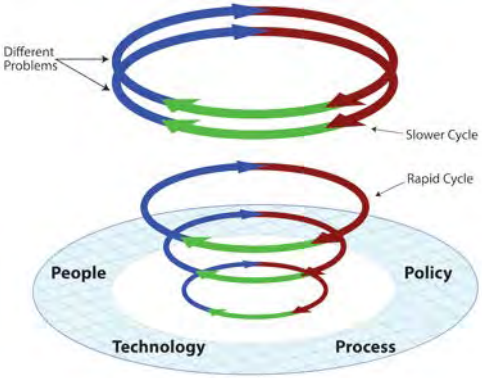
→ Build Bridges Not Rowboats

- Becoming Part of Everything

→ Real Progress at All Levels of Scale



Thanks and Write to Me

cpfried@umich.edu

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