- About the Adult and Child Consortium for Health Outcomes Research and Delivery Science (ACCORDS) at CU Anschutz Medical Campus:
  - Health services, outcomes, and implementation research
  - Methodological cores and programs focused on service including consultation, training, and grant development

- Today: **Learning Health Systems 2021: Where We've Been and Where We Need To Go**
  - *Presented by:* Katy Trinkley, PharmD, PhD and Heather Gilmartin, PhD, NP

ACCORDS Upcoming Events

Workshops and Seminars for 2021-2022:

Sep 22 **12:00-1:00 PM MT**	▪ **CCTSI/ACCORDS Community Engagement Forum**
Oct 11 **12:00-1:00 PM MT**	▪ **Learning Health Systems Seminar Series 2021- 2022** ▪ Marc Williams, MD from Geisinger
Nov 11, 12, 17, & 19 **8:30-1:00PM MT**	▪ **Qualitative and Mixed Methods Research Workshop**
May 23, 24, & 25 **8:30-1:00PM MT**	▪ **COPRH Con 2022**

Previously recorded seminars can be found on our ACCORDS Education website

CU | ACCORDS
UNIVERSITY OF COLORADO
CHILDREN'S HOSPITAL COLORADO

Learning Health Systems in 2021:
Where We've Been & Where We Need To Go

Katy Trinkley, PharmD, PhD

Heather Gilmartin, PhD, NP

Learning Objectives

Describe the facts and fiction regarding learning health systems

Explain the historical context and aspirational goals of learning health systems

Illustrate persistent implementation challenges of learning health systems

Discuss a framework to achieve the aspirational goals of a fully mature learning health system

There is one definition for a Learning Health System

Fact or Fiction

FACT

Learning Healthcare System

A system in which,

"science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience".

IOM 2015

Institute of, M. The Learning Health System Series. 2015 [cited 2015 4 June]; Available from: http://www.nap.edu/ catalog/13301/the-learning-health-system-series.

For Grants and Papers

A learning health system, per the Institute of Medicine…

"harnesses data and analytics to learn from every patient and feed the knowledge to clinicians to implement with high-reliability (i.e., error free)"

Institute of, M. The Learning Health System Series. 2015 [cited 2015 4 June]; Available from: http://www.nap.edu/ catalog/13301/the-learning-health-system-series.

Learning Health Systems are a new idea

Fact or Fiction

FICTION

Lean & Six Sigma

Team Science

Systems Science

Pragmatic Trials/Mixed-Methods

Community-based Participatory Research

Continuous Quality Improvement

Decision Support

Informatics

Dissemination & Implementation Science

Behavior Change

Value-based Care

Improvement Science

THE LEARNING HEALTH SYSTEM SERIES

IOM ROUNDTABLE ON EVIDENCE-BASED MEDICINE

THE LEARNING HEALTHCARE SYSTEM

Workshop Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE LEARNING HEALTH SYSTEM SERIES
ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

DIGITAL INFRASTRUCTURE FOR THE LEARNING HEALTH SYSTEM
The Foundation for Continuous Improvement in Health and Health Care

Workshop Series Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE LEARNING HEALTH SYSTEM SERIES
ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

DIGITAL DATA IMPROVEMENT PRIORITIES FOR CONTINUOUS LEARNING IN HEALTH AND HEALTH CARE

Workshop Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE LEARNING HEALTH SYSTEM SERIES
ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

OBSERVATIONAL STUDIES IN A LEARNING HEALTH SYSTEM

Workshop Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE LEARNING HEALTH SYSTEM SERIES
ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE
and FORUM ON DRUG DISCOVERY, DEVELOPMENT, AND TRANSLATION

LARGE SIMPLE TRIALS AND KNOWLEDGE GENERATION IN A LEARNING HEALTH SYSTEM

Workshop Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE LEARNING HEALTH SYSTEM SERIES
ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

PATIENTS CHARTING THE COURSE
Citizen Engagement and the Learning Health System

Workshop Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

Learning Health Systems researchers are a real thing

Fact or Fiction

FACT

Learning Health Systems Researcher

"An individual who is **embedded** within a health system and **collaborates** with its stakeholders to produce novel insights and evidence that can be **rapidly implemented** to improve the outcomes of individuals and populations and health systems performance."

Agency for Health Research and Quality, 2017

There are model Learning Health Systems

Fact or Fiction

FACT

Accelerating implementation of research in Learning Health Systems: Lessons learned from VA Health Services Research and NCATS Clinical Science Translation Award programs

Amy M. Kilbourne[1,2], Patricia L. Jones[3] and David Atkins[1]

[1]Health Services Research and Development, Veterans Health Administration, U.S. Department of Veterans Affairs, Washington, DC, USA; [2]Department of Learning Health Sciences, University of Michigan Medical School, Ann Arbor, MI, USA and [3]Division of Clinical Innovation, National Center for Advancing Translational Sciences, National Institutes of Health, Bethesda, MD, USA

Moving From Discovery to System-Wide Change: The Role of Research in a Learning Health Care System: Experience from Three Decades of Health Systems Research in the Veterans Health Administration*

David Atkins,[1] Amy M. Kilbourne,[1,2] and David Shulkin[1]

Quality Enhancement Research Initiative Implementation Roadmap
Toward Sustainability of Evidence-based Practices in a Learning Health System

Amy M. Kilbourne, PhD, MPH,*† David E. Goodrich, EdD,‡ Isomi Miake-Lye, PhD,§ Melissa Z. Braganza, MPH,* and Nicholas W. Bowersox, PhD, ABPP‡

Accelerating learning healthcare system development through embedded research: Career trajectories, training needs, and strategies for managing and supporting embedded researchers*

Elizabeth M. Yano, PhD, MSPH [a,b,c,*], Adam Resnick, MPH [a,b], Michael Gluck, PhD [d], Harry Kwon, PhD, MPH, MCHES [e], Kamila B. Mistry, PhD, MPH [e]

[a] VA HSR&D Center for the Study of Healthcare Innovation, Implementation and Policy, VA Greater Los Angeles Healthcare System, 16111 Plummer Street, Sepulveda, CA 91343 USA
[b] Department of Health Policy and Management, UCLA Fielding School of Public Health, Los Angeles, CA, 90095, USA
[c] Department of Medicine, UCLA Geffen School of Medicine, Los Angeles, CA, 90095, USA
[d] AcademyHealth, 1666 K Street NW, Suite 1100, Washington, DC, 20006, USA
[e] Agency for Healthcare Research and Quality, 5600 Fishers Lane, Rockville, MD, 20857, USA

There is one standard model for Learning Health Systems
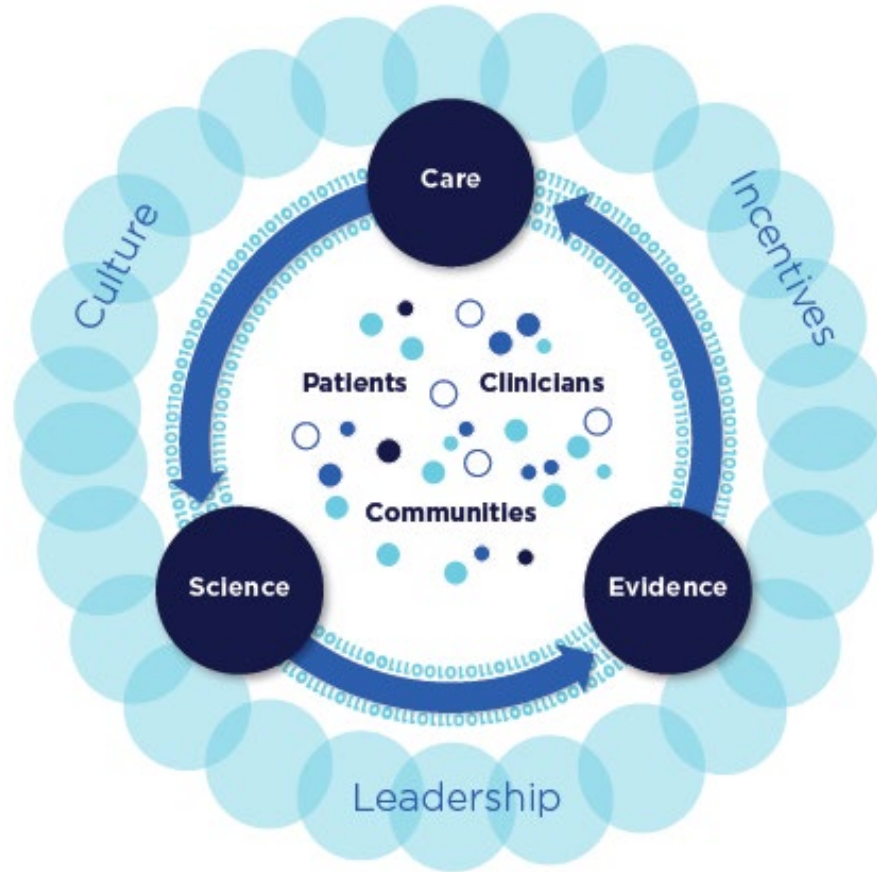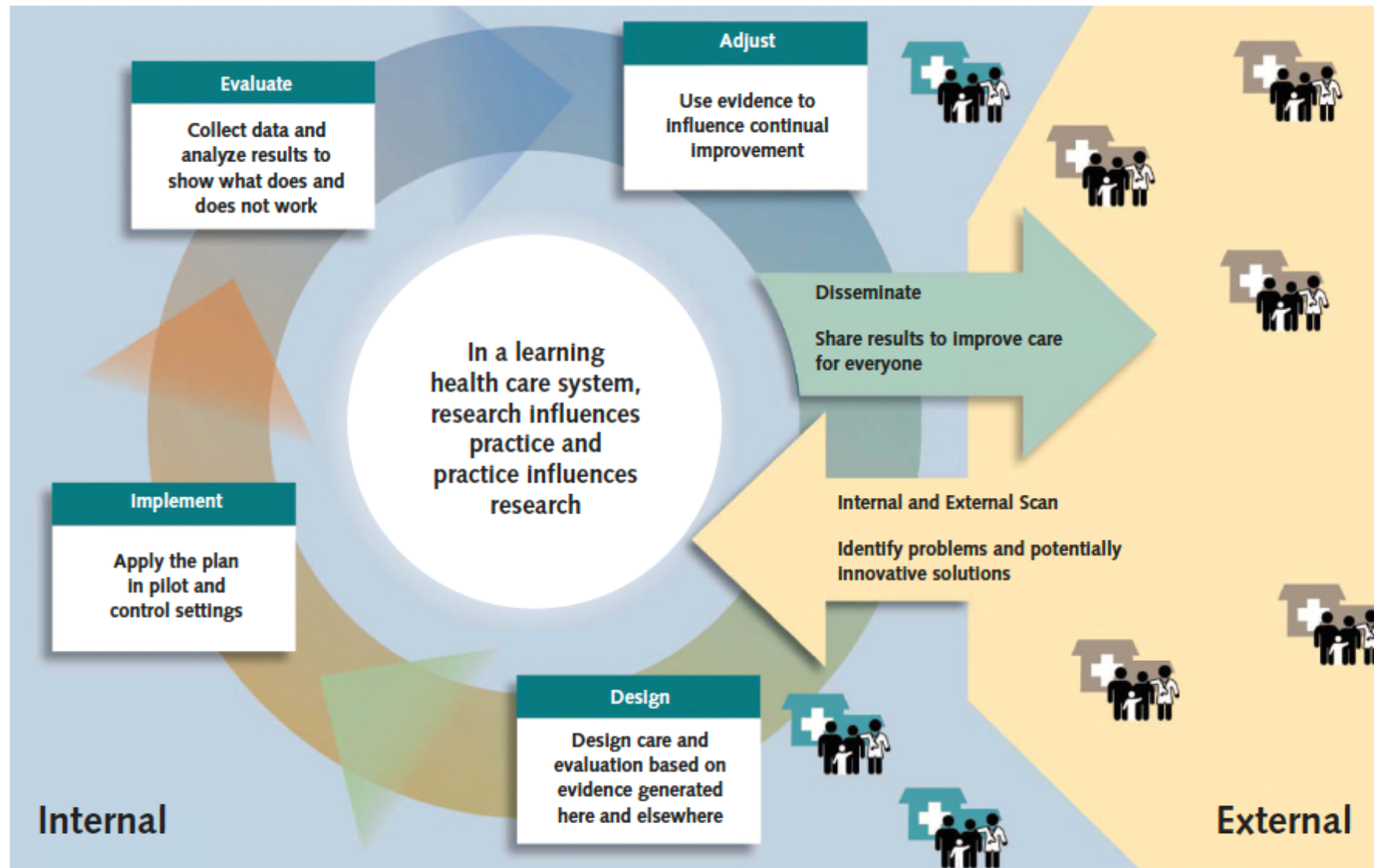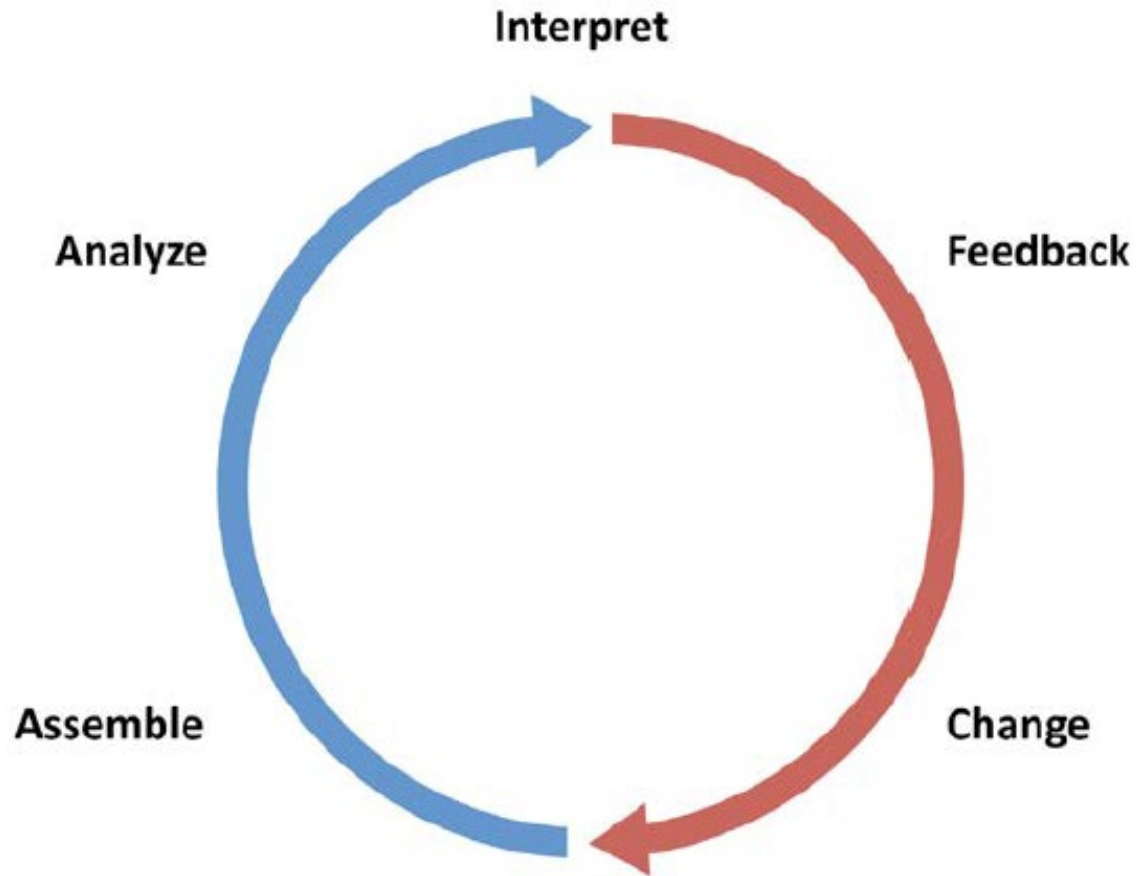
Fact or Fiction

FICTION

FIGURE S-3 Schematic of the continuously learning health care system.

Institute of, M. The Learning Health System Series. 2015 [cited 2015 4 June]; Available from: http://www.nap.edu/ catalog/13301/the-learning-health-system-series.

Figure. The 6 phases of the rapid-learning health care system, from scanning to dissemination.

Evaluate
Collect data and analyze results to show what does and does not work

Adjust
Use evidence to influence continual improvement

Disseminate
Share results to improve care for everyone

In a learning health care system, research influences practice and practice influences research

Internal and External Scan
Identify problems and potentially innovative solutions

Implement
Apply the plan in pilot and control settings

Design
Design care and evaluation based on evidence generated here and elsewhere

Internal

External

Greene, S. M., Reid, R. J., & Larson, E. B. (2012). Implementing the learning health system: From concept to action. *Annals of Internal Medicine, 157*(3), 207-210.

Learning Health System Model of Change

Figure 2. The Learning Health System Cycle. Reproduced from [43]

Learning Health Systems

"Practice generating research"

Research informs practice ⟷ Practice informs research

- It's hard
  - Complex, dynamic systems

Where We've Been: Well-Known Challenges

- System- and policy level support
  - Financial support, training programs
- Resource availability
  - Methodologic and analytic expertise
  - Accessibility of actionable and inclusive data
- Engagement of stakeholders
  - Patients, community members
- Shared mission across research and clinical enterprises

Borsky et al. Jt Comm J Qual Patient Saf. 2019;45:772
Damschroder LJ et al. Healthc. 2021;8 Suppl 1:100455
Etheredge LM. Health Aff. 2014;33:1155

Many Existing LHS

- Diverse models
  - **Centralized** governance within a health system

    VANDERBILT UNIVERSITY
    MEDICAL CENTER

  - **Consultancy**-like

    M UNIVERSITY OF MICHIGAN

    GW School of Medicine & Health Sciences

  - **Decentralized** data network

    PEDSnet
    A Pediatric Learning Health System

    DARTNet Institute
    Informing Practice Improving Care

    pcornet®
    The National Patient-Centered Clinical Research Network

Spectrum of LHS Maturity

- It's NOT all or nothing

A maturity grid assessment tool for learning networks

Carole Lannon[1,2,3] | Christine L. Schuler[3,4] | Michael Seid[1,3,5] |
Lloyd P. Provost[6] | Sandra Fuller[1] | David Purcell[1] | Christopher B. Forrest[7]
Peter A. Margolis[1,3]

Where We Need to Go

A Fully Mature Learning Health System

- Aspirational
  - Innovations in data, technology and best practices
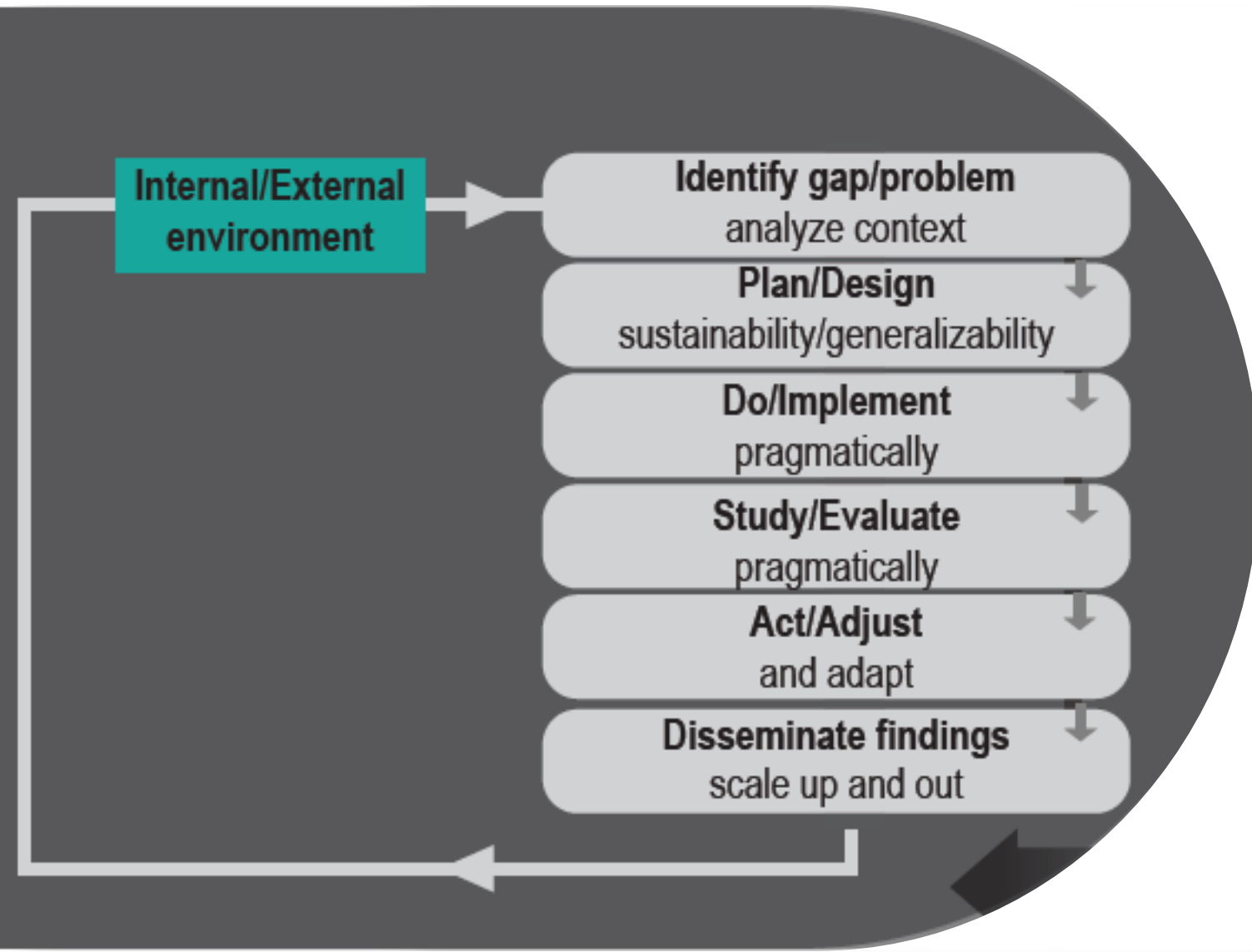
- Commitment to excellence
  - Quality, value, efficiency, equity

Davis FD et al. Learn Health Sys. 2021;5:e10221

An Aspirational Framework for a Mature LHS

Systems Thinking Approach to Complex Problems
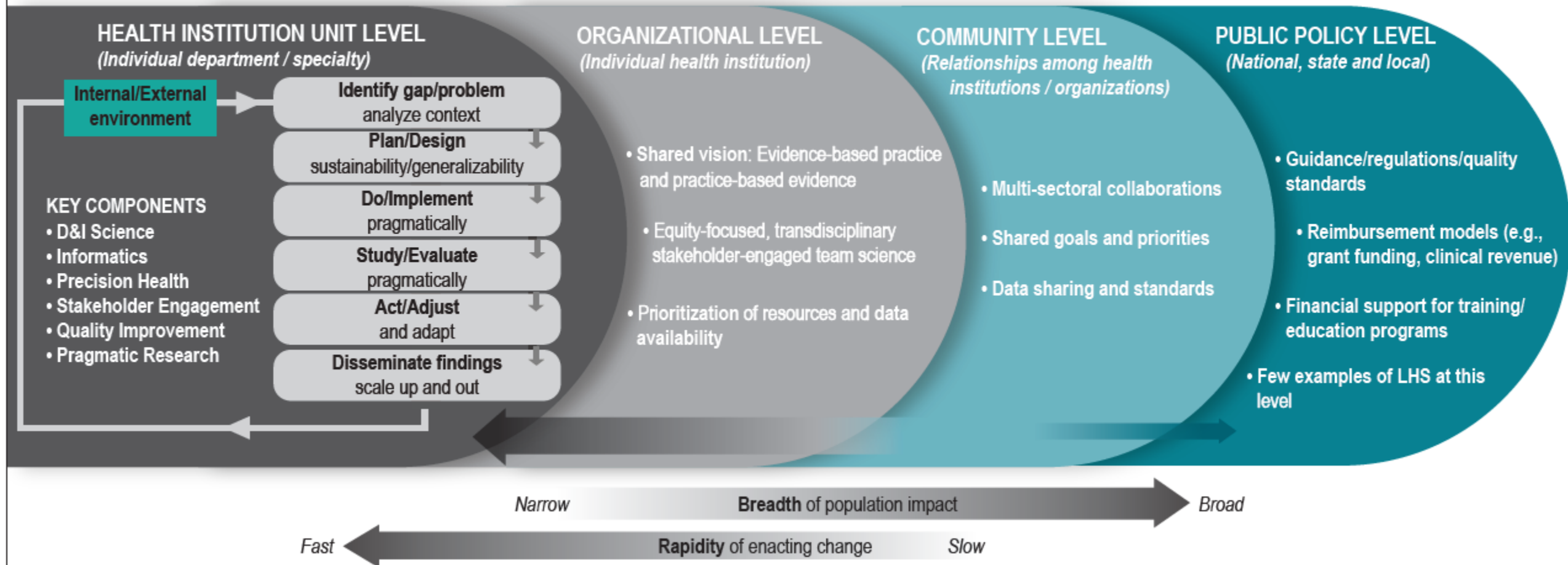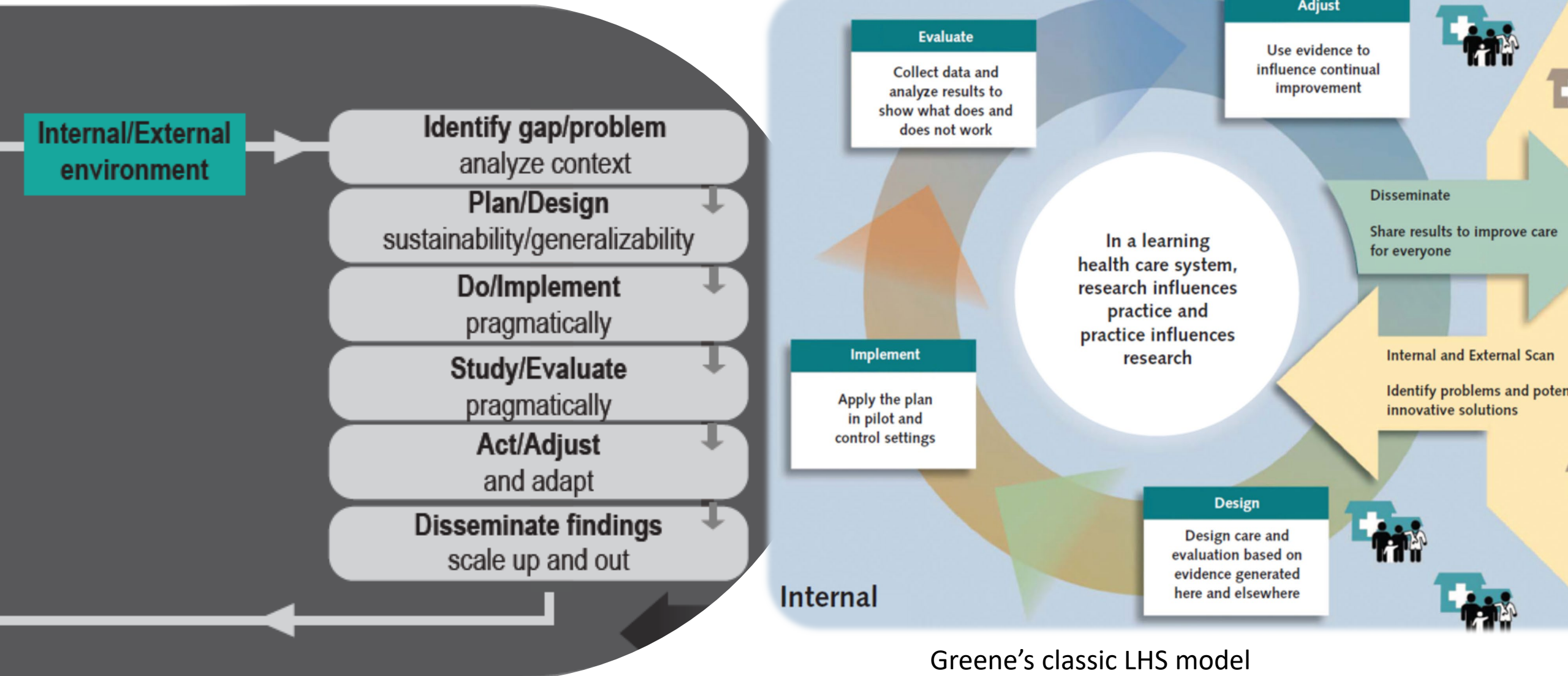
Collaborators: Amy Huebschmann, Russ Glasgow, Mike Ho

An Aspirational Framework for a Mature LHS
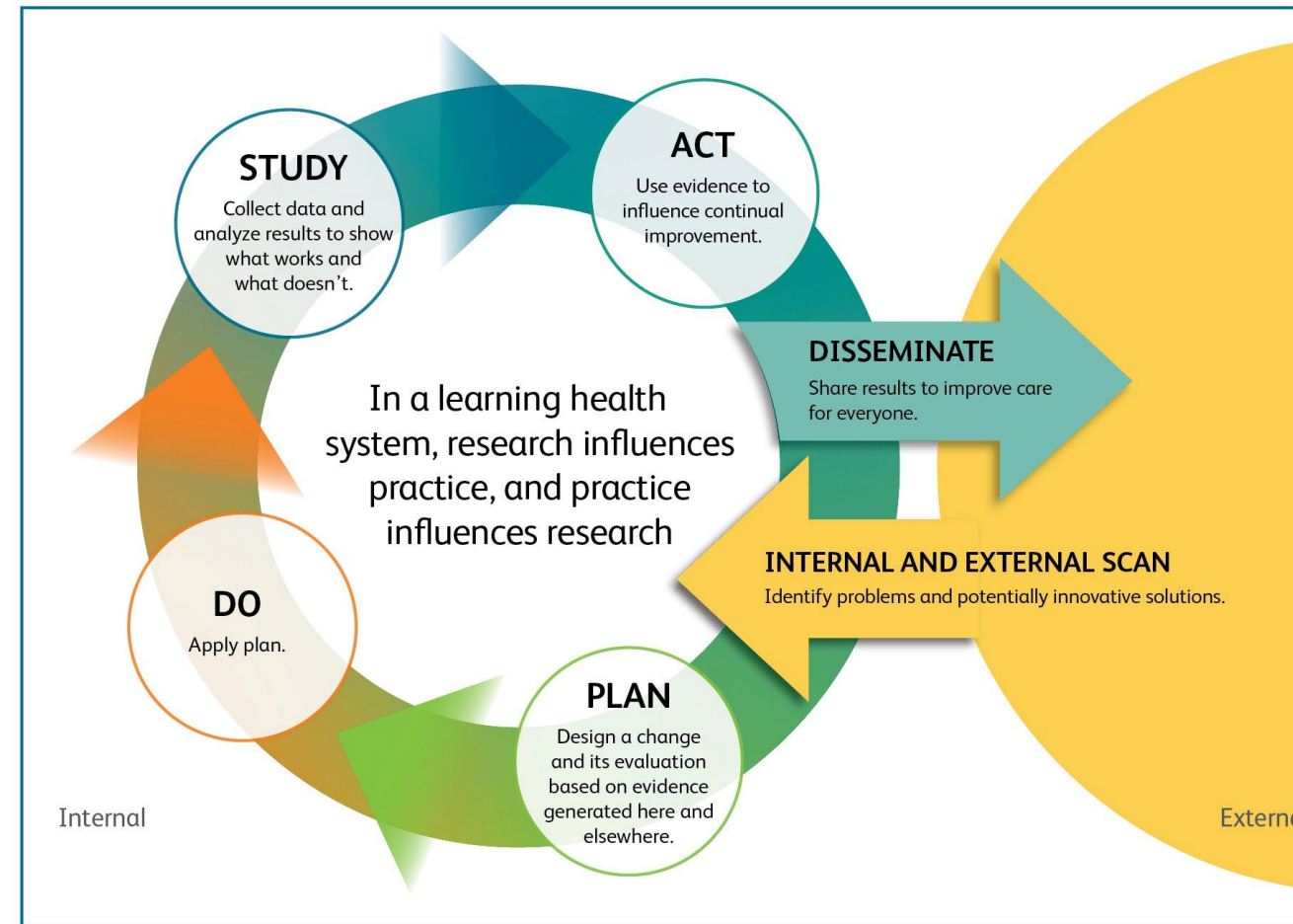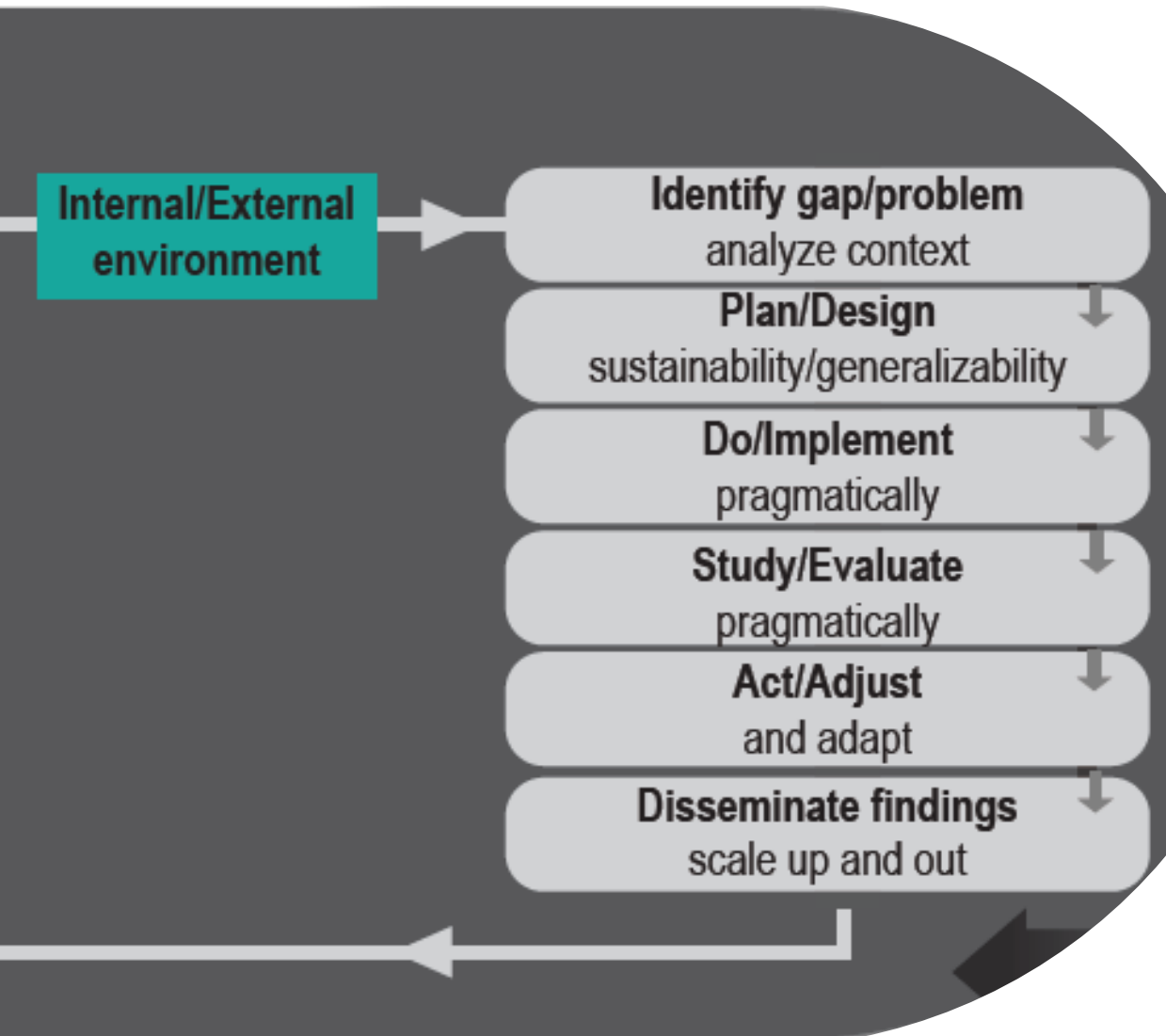

Learning cycles
-Iterative
-Rapid

An Aspirational Framework for a Mature LHS

Greene's classic LHS model

An Aspirational Framework for a Mature LHS

'PDSA' concept from quality improvement (*KP Washington*)

An Aspirational Framework for a Mature LHS

Systems Thinking Approach to Complex Problems

HEALTH INSTITUTION UNIT LEVEL
(Individual department / specialty)

ORGANIZATIONAL LEVEL
(Individual health institution)

COMMUNITY LEVEL
(Relationships among health institutions / organizations)

PUBLIC POLICY LEVEL
(National, state and local)

Davis FD et al. Learn Health Sys. 2021;5:e10221
Boes S et al. Learn Health Sys. 2018;2:e10059

An Aspirational Framework for a Mature LHS

Systems Thinking Approach to Complex Problems

| HEALTH INSTITUTION UNIT LEVEL *(Individual department / specialty)* | ORGANIZATIONAL LEVEL *(Individual health institution)* | COMMUNITY LEVEL *(Relationships among health institutions / organizations)* | PUBLIC POLICY LEVEL *(National, state and local)* |

Engagement/support across all levels of stakeholders

Builds on the socio-ecologic model

An Aspirational Framework for a Mature LHS

ORGANIZATIONAL LEVEL
(Individual health institution)

- Shared vision: Evidence-based practice and practice-based evidence

- Equity-focused, transdisciplinary stakeholder-engaged team science

- Prioritization of resources and data availability

An Aspirational Framework for a Mature LHS

COMMUNITY LEVEL
(Relationships among health institutions / organizations)

- Multi-sectoral collaborations

- Shared goals and priorities

- Data sharing and standards

An Aspirational Framework for a Mature LHS

PUBLIC POLICY LEVEL
(National, state and local)

- Guidance/regulations/quality standards

- Reimbursement models (e.g., grant funding, clinical revenue)

- Financial support for training/education programs

- Few examples of LHS at this level

An Aspirational Framework for a Mature LHS

Systems Thinking Approach to Complex Problems

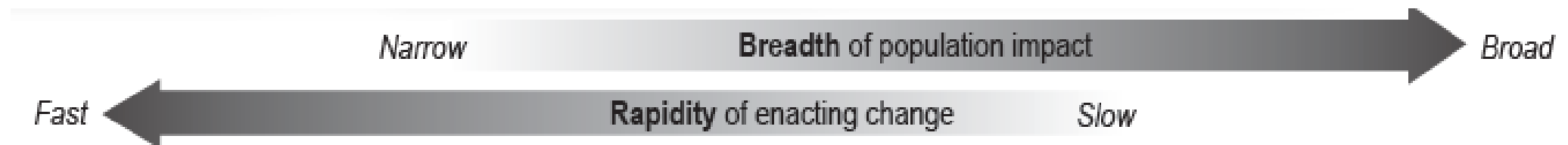| HEALTH INSTITUTION UNIT LEVEL *(Individual department / specialty)*	ORGANIZATIONAL LEVEL *(Individual health institution)*	COMMUNITY LEVEL *(Relationships among health institutions / organizations)*	PUBLIC POLICY LEVEL *(National, state and local)*

Geisinger, Vanderbilt, University of Michigan, VA, Kaiser

ADAPT

Swiss model PCORnet

LHS can occur at any of these levels
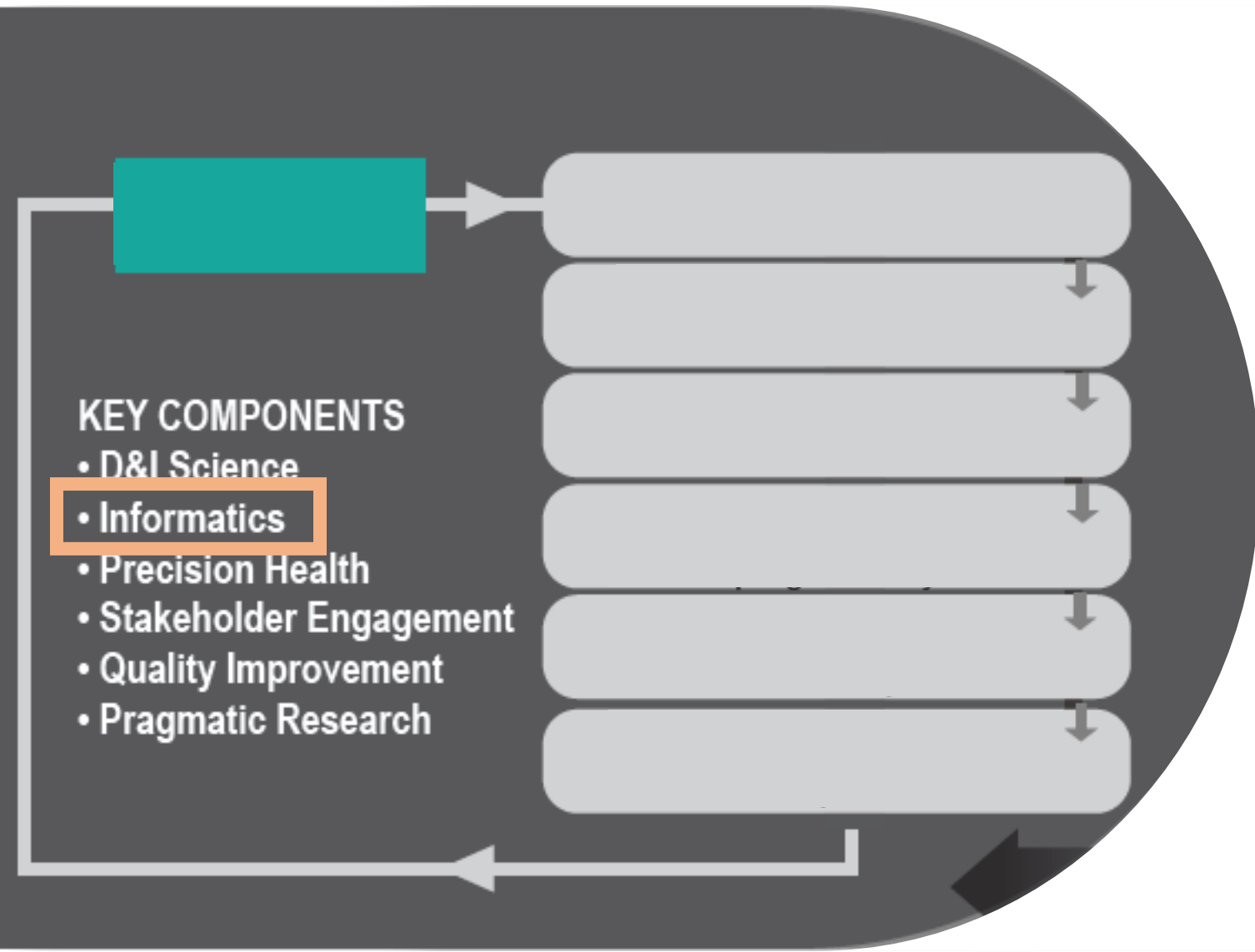
Narrow ← **Breadth** of population impact → Broad

Fast ← **Rapidity** of enacting change → Slow

Davis FD et al. Learn Health Sys. 2021;5:e10221;   Lindsell CJ et al. Acad Med. 2021;96:1291;   Kilbourne AM et al. Med Care. 2019;57 Suppl 3:S286;
Greene et al. Ann Intern Med. 2012;157:207;   https://medicine.umich.edu/dept/learning-health-sciences
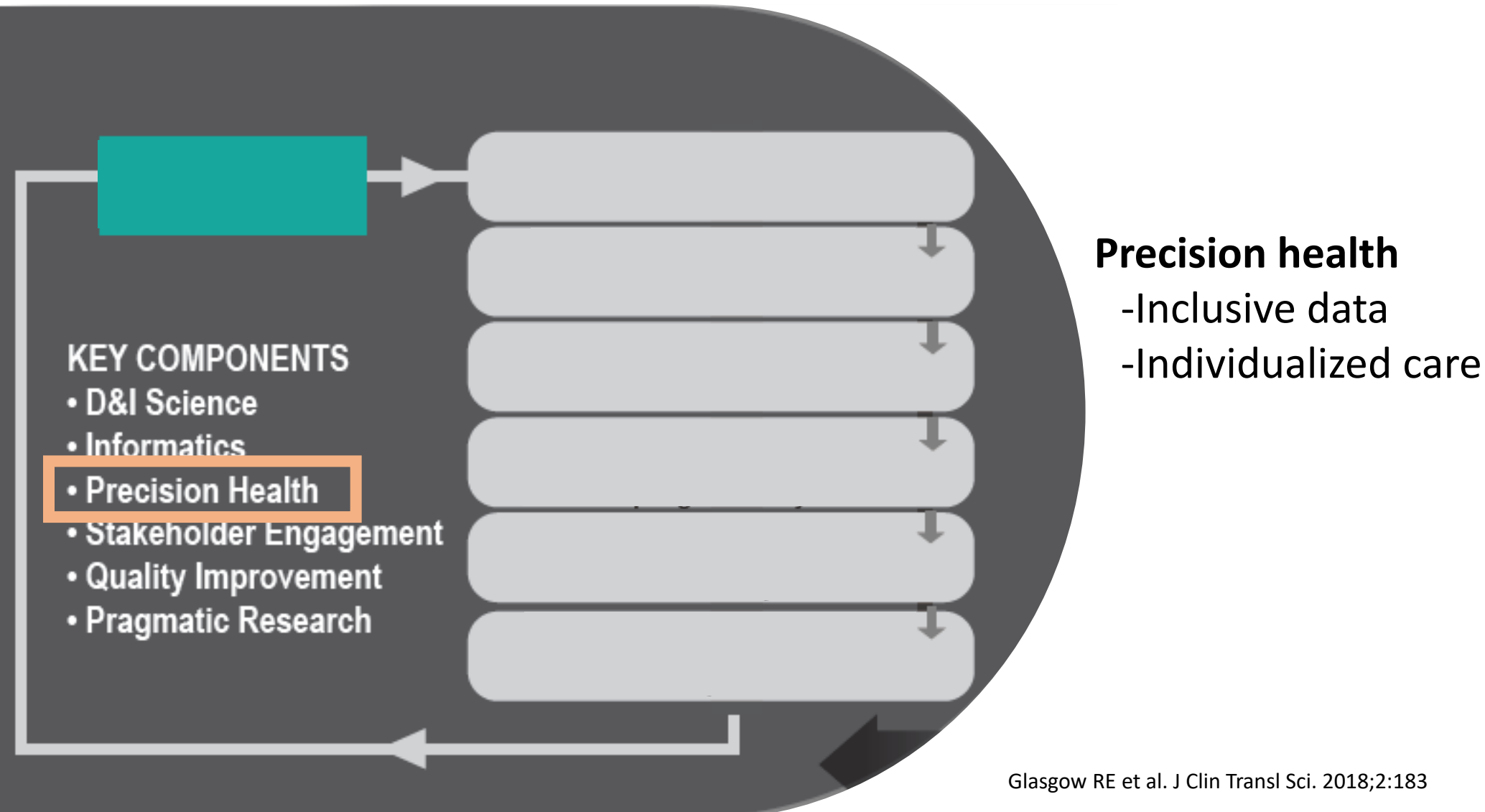
An Aspirational Framework for a Mature LHS

KEY COMPONENTS
- D&I Science
- Informatics
- Precision Health
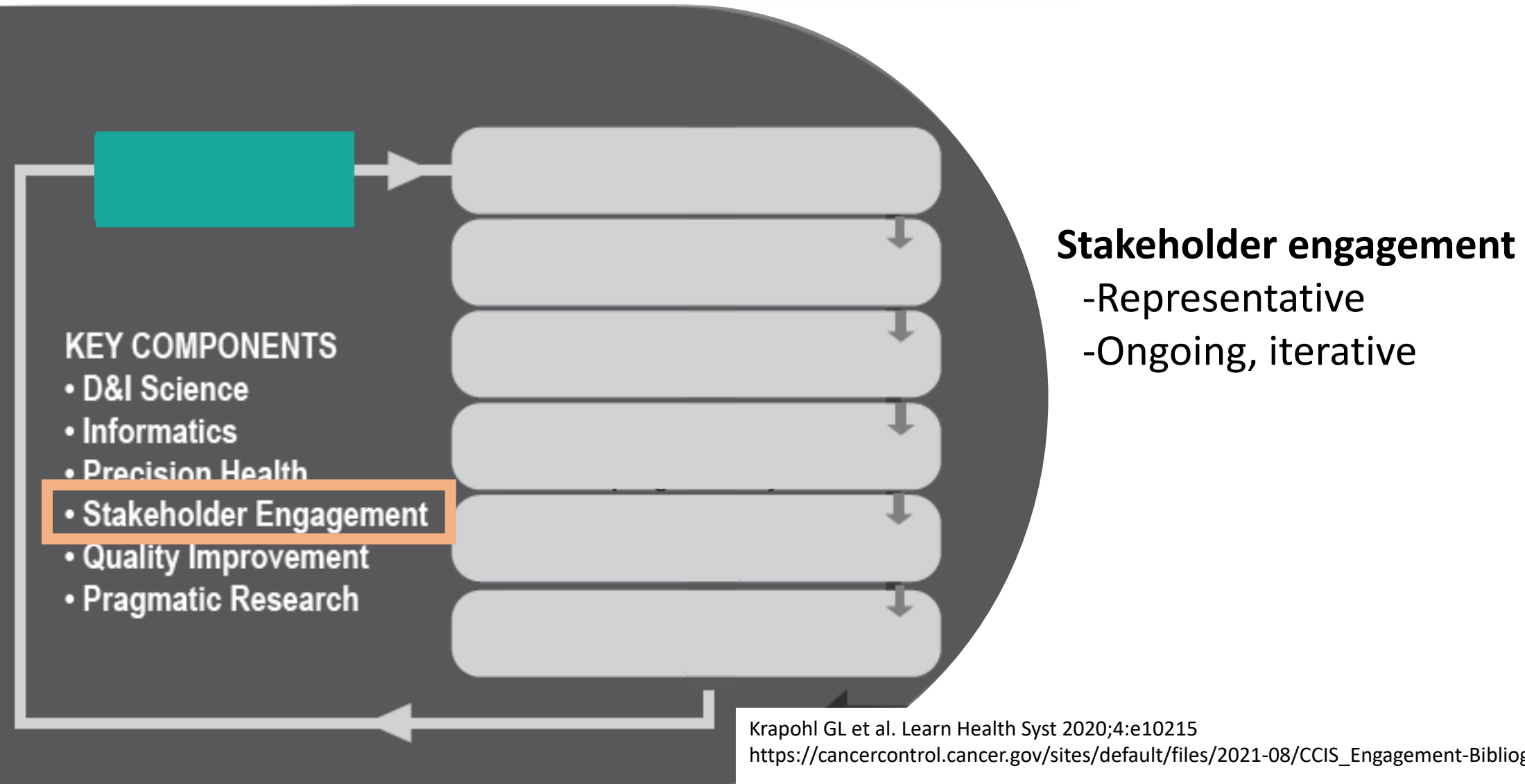- Stakeholder Engagement
- Quality Improvement
- Pragmatic Research

Informatics
- Data, software, technology
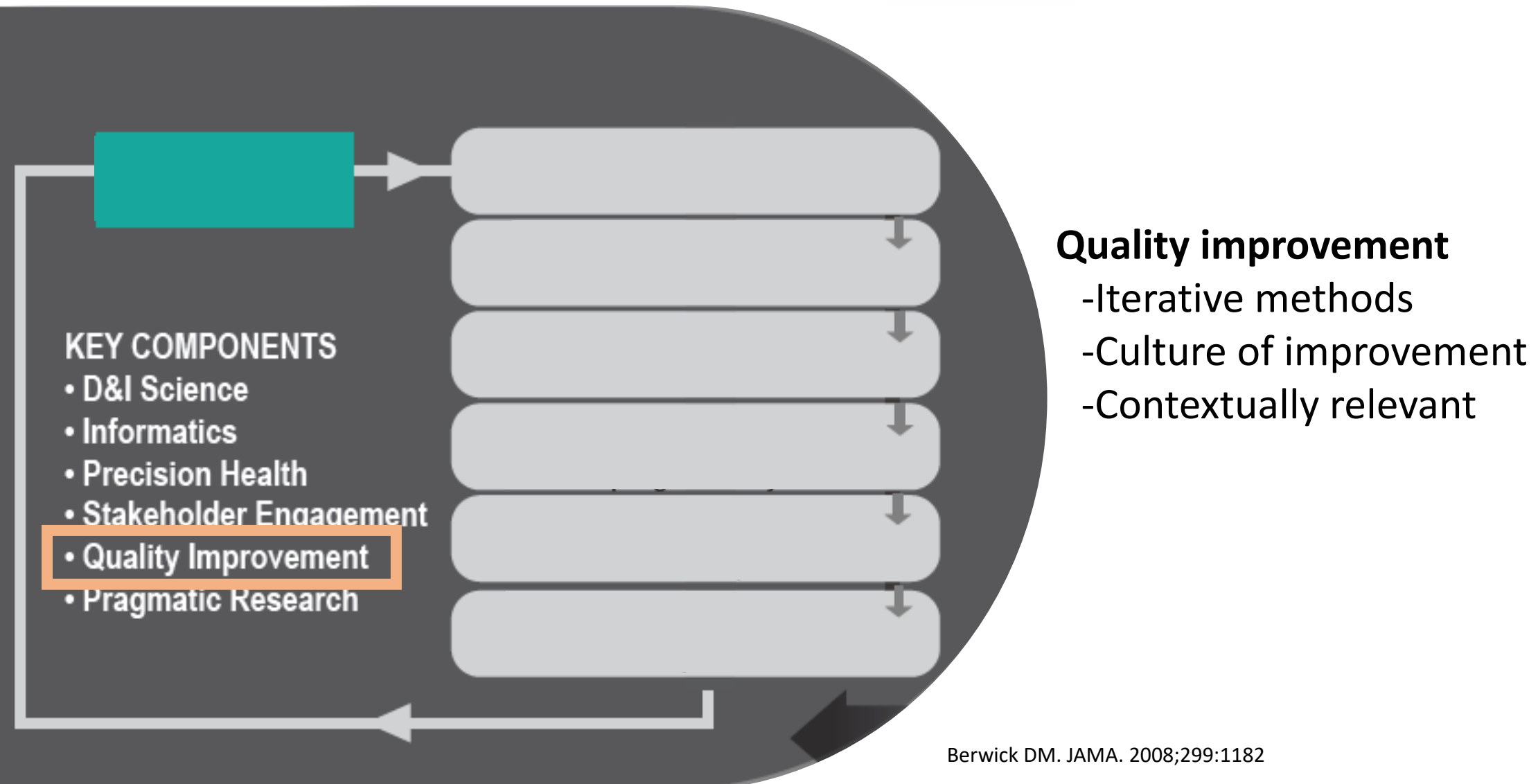- Analytic tools, expertise
- Standards and ontologies
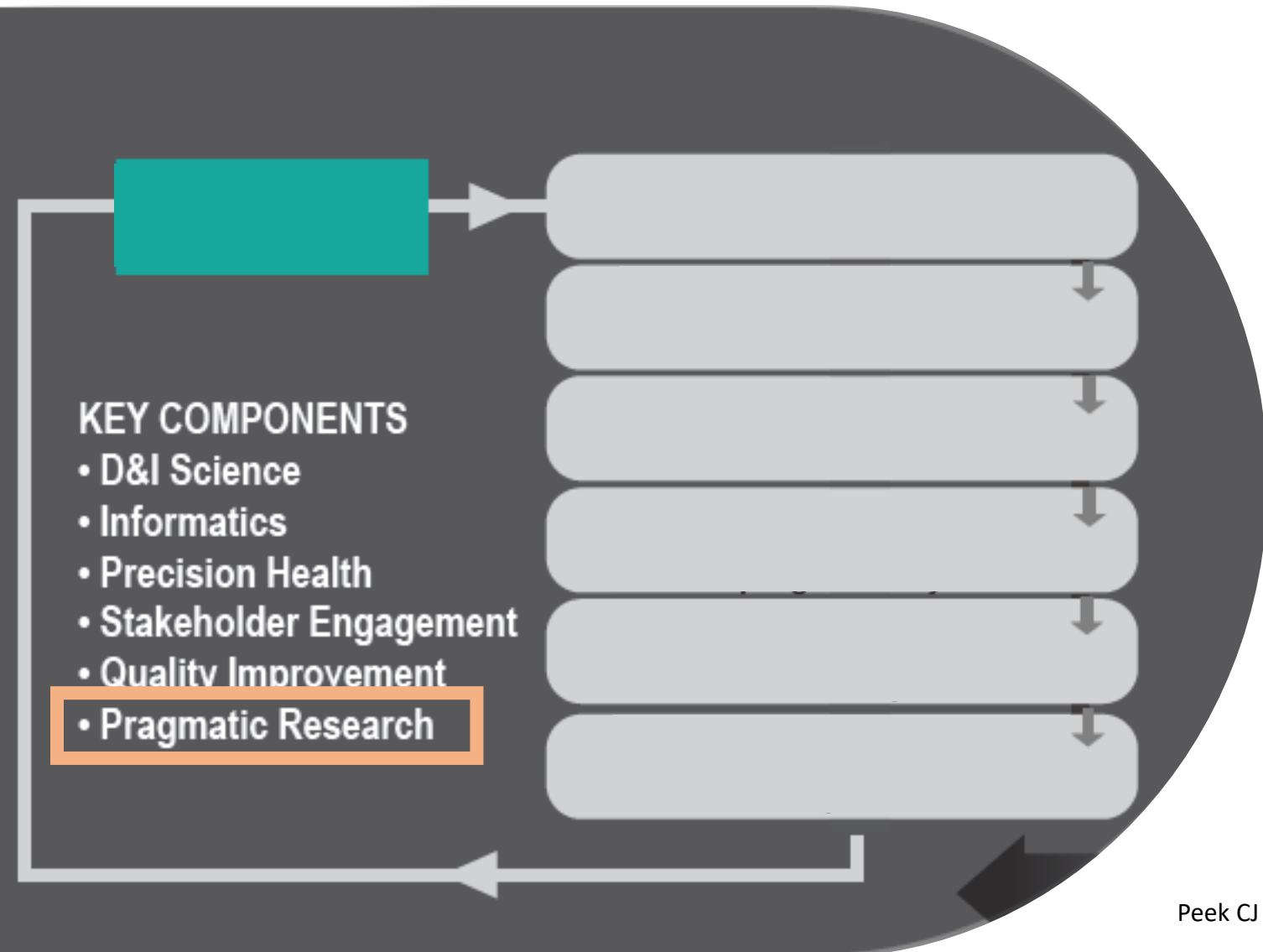
An Aspirational Framework for a Mature LHS
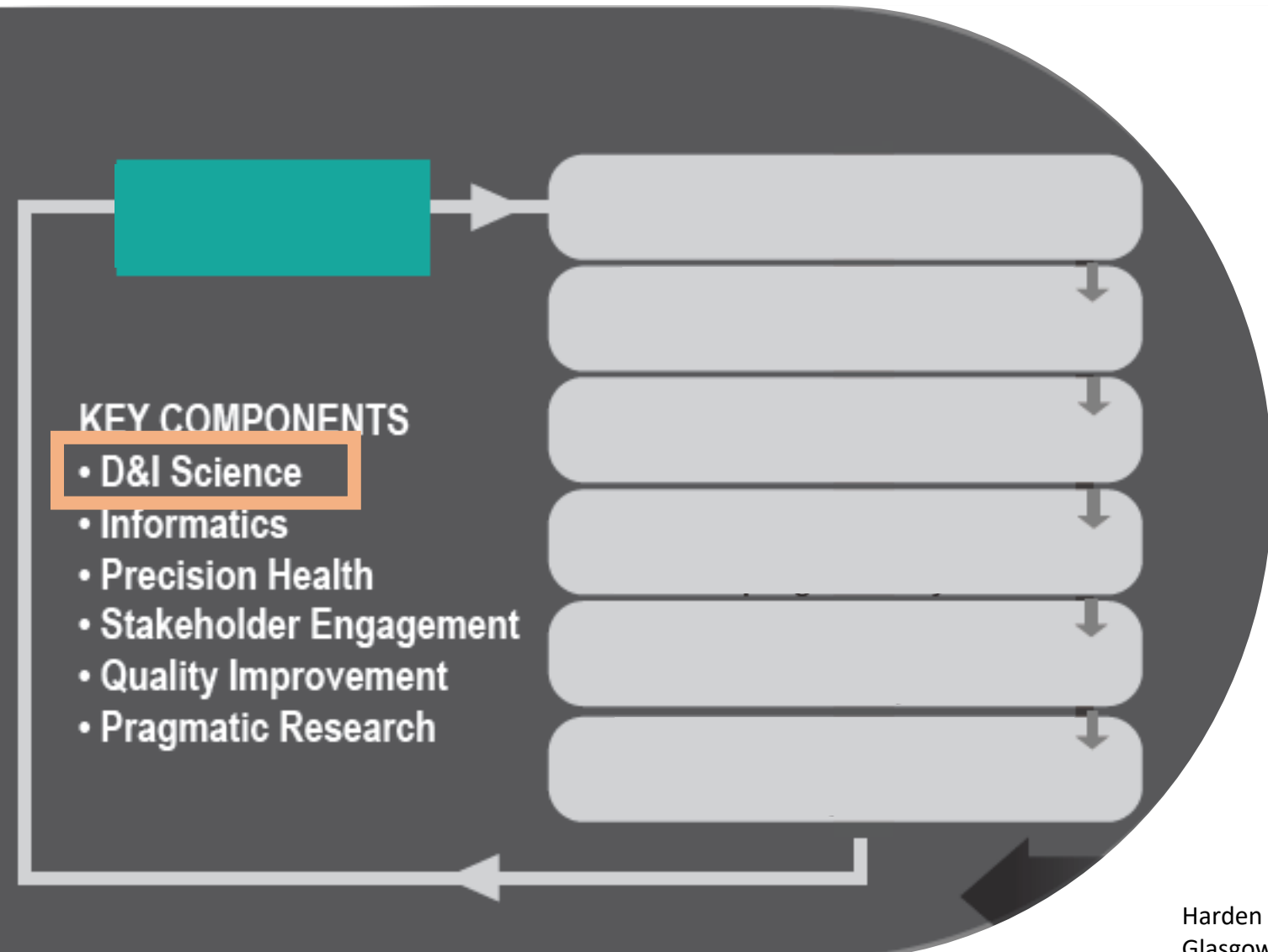

Precision health
-Inclusive data
-Individualized care

KEY COMPONENTS
• D&I Science
• Informatics
• Precision Health
• Stakeholder Engagement
• Quality Improvement
• Pragmatic Research

Glasgow RE et al. J Clin Transl Sci. 2018;2:183

An Aspirational Framework for a Mature LHS

Stakeholder engagement
-Representative
-Ongoing, iterative

Krapohl GL et al. Learn Health Syst 2020;4:e10215
https://cancercontrol.cancer.gov/sites/default/files/2021-08/CCIS_Engagement-Bibliography_080931_508.pdf

An Aspirational Framework for a Mature LHS

Quality improvement
-Iterative methods
-Culture of improvement
-Contextually relevant

Berwick DM. JAMA. 2008;299:1182

An Aspirational Framework for a Mature LHS

Pragmatic research methods/outcomes
-Relevance to stakeholders
-Rapidity and recursiveness of findings
-Replicability by others
-Rigor in real-world
-Resources required

KEY COMPONENTS
• D&I Science
• Informatics
• Precision Health
• Stakeholder Engagement
• Quality Improvement
• Pragmatic Research

An Aspirational Framework for a Mature LHS

Dissemination & Implementation (D&I) Science
  -Translating evidence to practice
  -Sustainability, scalability
  -Dissemination

Harden SM et al. Prev Chronic Dis. 2021;18:E32
Glasgow RE. Health Educ Behav. 2013;40:257

The Aspirational Mature LHS Framework

- Integrates others' work/ideas

- D&I science

- Prioritizes under-recognized challenges
  - Sustainability and generalizability

- Emphasizes methods to maximize equity
  - **Inclusive** precision health
  - **Representativeness** of stakeholders
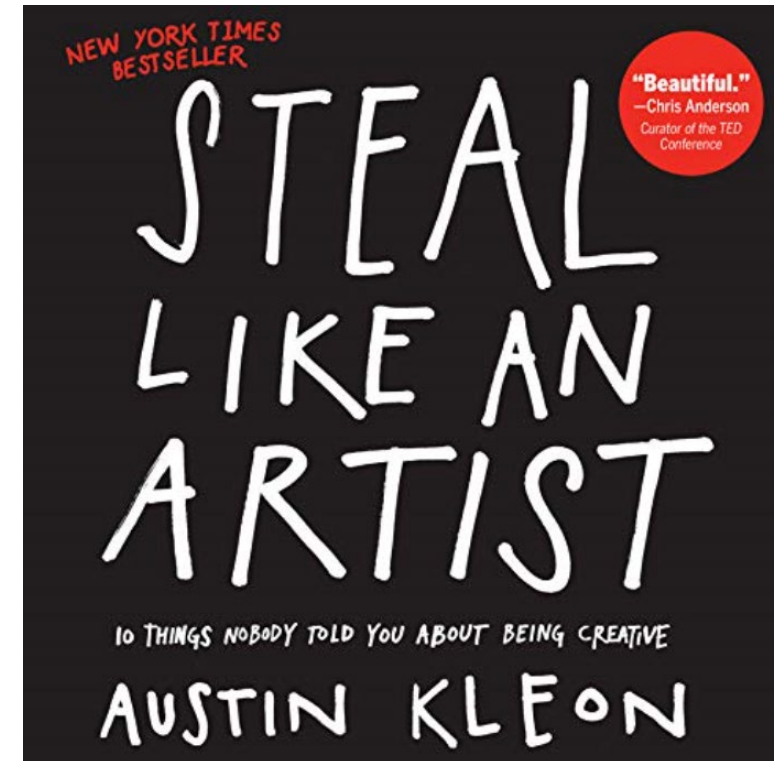
LHS Summary

- An aspirational goal

- Many examples along the maturity spectrum

- Challenges present opportunities
  - Cultural and policy level changes
  - Transdisciplinary engagement
  - Integration of many methods/concepts/perspectives

- Tune in to future seminars to learn more!

Thank You!