The Learning Health System: Pointing to a New Science

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Disclosure

I am the past chair and current member of the Interim Steering Committee of the Learning Health Community, a grassroots not-for-profit organization.
The Learning Health System

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...
Three Ways to Think About It

• An inspiring idea

• An emerging reality

• A portal to a “new science”
Inspiration

• I believe that people are naturally drawn to visionary that stimulate imagination

• LHS = the “Big Idea” we have needed for a long time
A Few Reasons Why We Need an LHS

• Highest GDP per capita spent on health (~18%)
• Mediocre population health indicators
• 100,000+ deaths per year from medical errors (3rd leading cause of death)
• 25% of $3 Trillion annual expenditure is “waste”
• A culture of blame rather than safety (<10% of “misadventures” reported)
# Commonwealth Fund Rankings 2013

<table>
<thead>
<tr>
<th>Country Rankings</th>
<th>AUS</th>
<th>CAN</th>
<th>FRA</th>
<th>GER</th>
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<tr>
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LHS Themes

• 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)!
The Actual Idea: 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 consenting 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

- All-Inclusive
- Trusted
- Decentralized
- Reciprocal

Governance
Engagement
Data Aggregation
Analysis
Dissemination

Insurers
Pharma
Patient Groups
Tech Industry
Universities
Government/Public Health
Research Institutes
Healthcare Delivery Networks

View from the Ground
How Learning Happens: “Virtuous Cycles” of Study and Change

A Problem of Interest

Assemble Experience Data
Analyze Data
Take Action
Tailored Messages to Decision-Makers
Interpret Results
Decision to Study
Example of A Virtuous Learning Cycle

Reducing Falls in Nursing Homes

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

Take Action:
Current Practice:
In whole or part...

Analyze Data:
What practices associate with lower fall rates?

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

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

Decision to study falls
The LHS and Big Data

- The **LHS** is bigger than **Big Data**
- Better health = BD2K + K2P
Better Health Requires This

1. Assemble Relevant Data
2. Analyze Data
3. Interpret Results

A Problem of Interest

4. Take Action to Change Practice
5. Deliver Tailored Message

6. Decision to Study
Learning at Scale Requires an Infrastructure/Platform

Different Problems

Rapid Cycle

Slower Cycle

SUPPORTING PLATFORM

People

Technology

Policy

Process
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Progress: Writings and Policies

• Institute of Medicine/National Academy of Medicine books and monographs
• Articles: 1,530 results in Google Scholar
• Federal Policy Goal: A Learning Health System by 2024
Progress: Learning “Islands”

- Organizations that have become Learning Health Systems at their level of scale.
- All (their) patients; all conditions
- But don’t routinely connect with other islands.
Progress: Inter-organizational Data Federations and Networks
Progress: A “Grassroots” Community
(99 Endorsers of the LHS Core Values)

*To be included on the www.LearningHealth.org website.
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Good News and Bad News

• The Good News: There is clear progress toward a much-needed LHS “Version 1”.

• The Bad News: We really don’t (yet) know what we’re doing.
In Recognition of this: A 2013 Workshop

- A vision of a high-functioning LHS
- The LHS seen as a science, not a project
- 106 research questions organized into 4 broad categories and 19 sub-categories
- A sense that a research community, and even a “new science” might form around the LHS

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 Etheridge,5 Carl Gunter,6 Mark Musen,7 Richard Platt,2 William Stead,3 Kevin Sullivan,8 Douglas Van Houweling1
HICSS 2015 Workshop

• Crystallized the idea of a “new science”
• Identified a nascent scientific community

Overarching Challenge: The LHS requires multiple scientific “revolutions”

<table>
<thead>
<tr>
<th>Scientific Frame</th>
<th>Biomedical &amp; Health Sciences</th>
<th>Learning Health System</th>
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<tbody>
<tr>
<td>Philosophy</td>
<td>Reductionist</td>
<td>Emergent</td>
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<tr>
<td>Discovery lifecycle</td>
<td>Sequential</td>
<td>Spiral development</td>
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<tr>
<td>Control mechanism</td>
<td>Hierarchical</td>
<td>Networked</td>
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<tr>
<td>Performance</td>
<td>Incremental</td>
<td>Rapid doubling</td>
</tr>
</tbody>
</table>
CCC Workshops 2016-17: Transcending Domains

• Toward a science of Cyber-Social Learning Systems

• Evolution in two directions:
  – Crossing domains
  – Beyond cyber-physical systems

• “Wicket” Model: cross-cutting science and three domains
  – Health
  – Education
  – Smart and Connected Communities
Thanks & Write to Me

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