2016 LHS Summit
Our Collective Call to Action
Informatics and Predictive Analytics has fundamentally changed our world!

- Credit card fraud detection
- Target can predict when you are pregnant
- Traffic monitoring and prediction
- SPAM filters
- Smart meters and utility grids
- Weather forecasting
- Netflix and Amazon predict your tastes
- Mobile phones become interactive assistants
- Science’s third pillar of data and computation!
- WHAT ABOUT BIOMEDICINE?!
U.S. healthcare challenges in a slide?

• People are dying of preventable causes.
• Cost is out of control.
• Quality can’t be measured.
• Variability is local and widespread.
• New technology is exponentiating.
• Decision-making is maximally distributed.
• Data is not available routinely for learning.
Figure. The Tapestry of Potentially High-Value Information Sources That May be Linked to an Individual for Use in Health Care

Types of Data

**Structured Data**
- Electronic pill dispensers
- Medication prescribed
- Medication filled
- Dose
- Route
- NDC
- RxNorm
- HL7
- Visit type and time
- SNOMED
- ICD-9
- CPT
- Pathology, histology, and radiology
- Lab values, vital signs
- Lab values, vital signs
- Tobacco/alcohol use
- Differential diagnosis
- Chief complaint

**Unstructured Data**
- Medication taken
- Diaries
- Herbal remedies
- Out-of-pocket expenses
- Alternative therapies

**Probabilistic Linkage to Obtain New Types of Data**
- Reports
- Tracings, images
- Digital clinical notes
- Physical examinations
- Paper clinical notes
- Blogs
- Tweets
- Facebook postings
- News feeds

Examples of Biomedical Data
- Pharmacy data
- Health care center (electronic health record) data
- Claims data
- Registry or clinical trial data
- Data outside of health care system

Ability to Link Data to an Individual
- Easier to link to individuals
- Harder to link to individuals
- Only aggregate data exists

Data Quantity
- More
- Less

CPT indicates current procedural terminology; ECG, electrocardiography; EPA, US Environmental Protection Agency; GIS, geographic information systems; GPS, global positioning system; HL7, Health Level 7 coding standard; ICD-9, *Institutional Classification of Diseases, Ninth Revision*; LOINC, Logical Observation Identifiers Names and Codes; NDC, National Drug Code; OTC, over-the-counter; SNOMED, Systematized Nomenclature of Medicine; SNP, single-nucleotide polymorphism.
Trends in EHR adoption show increasing use of advanced functionality.

Figure 3: Percent of non-federal acute care hospitals with adoption of EHR systems by level of functionality: 2008-2014.

NOTES: Definitions of Basic EHR and Comprehensive EHR systems are reported in Table A1. *Significantly different from previous year (p < 0.05).
Provider, Patient & Payor Faced With Bewildering Choices: The Current Practice of “Qualitative” Medicine

Has tumor spread?  
What molecular subtype?  
What dose?  
What schedule?  
Surgery or Chemotherapy?  
What stage?  
Pre-operative Chemotherapy?  
In combination with which drugs?

From Patrick Soon-Shiong, MD
A “Fundamental Theorem” of Biomedical Informatics

"We seek the development of a learning health system that is designed to generate and apply the best evidence for the collaborative healthcare choices of each patient and provider; to drive the process of discovery as a natural outgrowth of patient care; and to ensure innovation, quality, safety, and value in health care."
Your Life, Your Health

Sharing your digital health data could save your life

JOSEPH H. KANTER
Kanter Health Foundation

• **MISSION**
  • To mobilize diverse organizations and people to collaboratively advance human health

• **VISION**
  • Every decision affecting health is informed by knowledge of what works best
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<th>Core Values of the Learning Health System</th>
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<td>Person Focused</td>
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<td>Privacy</td>
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<td>Inclusiveness</td>
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<td>Scientific Integrity</td>
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<td>Value</td>
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https://lillypad.lilly.com/entry.php?e=8284
107 Endorsements of the LHS Core Values* 
(As of 10/14/2016)

*To be included on the www.LearningHealth.org website.
The Future of Medicine is:

- Evidence based (data driven)
- Practice based (generation of data)
- Targeted and precise (ER+ Breast Cancer vs. Triple Negative Breast Cancer)
  - Personalization to individual mutations
  - Genomics for biomarkers and gene therapy
- A Learning Health System
  - “…gets the right care to people when they need it and then captures the results for improvement…” – Institute of Medicine