A Rapid-Learning Healthcare System

Using *in silico* research

Adopting “best practices”

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A Rapid-Learning Health System

- **Objective:** a health system that learns as rapidly as possible about the best treatment for each patient
  - Addresses personalized medicine, major health system problems: clinical practice variations, poor quality, lack of comparative effectiveness research (CER), high & rising costs, ineffective markets, inefficient regulation. Produces better value.

- **Key concept:** *in silico* research -- using large computerized databases and research networks for 21st century science
  - Complements *in vitro* (lab) and *in vivo* (experimental) methods
  - Enables study of many more patients, richer & longitudinal data, many more researchers, more, different & faster studies
  - Researchers: multi-year data collection → log-on to world’s evidence base
The Need for Rapid Learning

• There are major gaps in the evidence base for clinical care
  – RCTs typically use younger populations, with single diagnoses, and brief study periods
  – Procedures not well-studied, off-label Rx use
  – New technologies overwhelm learning capacities
• The evidence base is weakest for Medicare and Medicaid populations (seniors, disabled, pregnant women, children, patients w/ multiple chronic illnesses)
  – Medicare & Medicaid are the largest healthcare programs—85 million enrollees & $785 B federal costs (2011); $11 T (2011-2021)
A Slow-Learning Health System

• Advancing evidence-based medicine is now much slower and costlier than it could be
  – Much of what could be learned from the individual experiences of tens of millions of patients (and $2.5 trillion/year of health expenditures) is now lost. Diffusion of best practices: 10-15 yrs.
  – Research data are difficult, time-consuming and expensive to acquire; many databases are non-comparable.

• The health system lacks an organized, effective strategy for learning “best practices” -- and for accelerating their dissemination and implementation.
A Rapid-Learning Health System

- RL = \( R + C + D \)

- We have: \( R \) (great researchers), \( C \) (very fast computers)

- \( D \) (databases) = a national system of high quality, clinical research registries & databases, pre-designed, pre-built, and pre-populated for RL
  - Most RL questions are *applied* research – treatment “A” vs treatment “B” for (sub) population “C”: can specify data that will answer the question
  - Electronic health records (EHRs) enable RL databases & registries, a data-rich environment, a computable evidence base
A Rapid-Learning Health System

Figure 1: The learning cycle in rapid-learning health care.
Source: Institute of Medicine (2010)
Dissemination & Implementation

• Rapid-learning systems – with a research mission
  – Kaiser-Permanente
  – Geisinger
  – Veterans Health Administration
  – Mayo
  – HMO Research Network
  – Denver Health
  – Project ECHO

• Aim: national dissemination & Implementation of “best practices”
  – All healthcare becomes a rapid learning system!
Toward A Learning Healthcare System

• Recent national initiatives:
  – Comparative effectiveness research ($1.1B including database(s) and network development);
  – Independent CER agency (PCORI);
  – A national EHR system for all Americans ($40B+);
  – A Medicare/Medicaid Innovation Center for national pilots and implementation of best practices ($10 B);
  – FDA Sentinel Network (100 M patient records);
Toward A Learning Healthcare System

Recent national initiatives:

- A national biobank + bio-repository (Kaiser, NIH, RWJF), 500,000 patient EHRs w/ genetic & environmental database, bio-specimens;
- NIH “Collaboratory” with HMO Research Network (16 HMOs, 14 M patients (→28M) w/ EHRs, Virtual Data Warehouse w/ standardized core data elements);
- VA “one million veterans” initiative w EHRs, genetic information; QUERI system;
- A national system of “gap-filling” registries and networks for sub-populations usually not included in clinical trials: children, pregnant women, seniors, minorities, persons with multiple chronic conditions, rare diseases, surgery...
Health Reform: Learning Agenda

• Models to be tested by CMS & rolled-out, if successful (examples): accountable care organizations, pay-for-performance, medical home, bundled payment, community-based care transitions, independence at home, hospital re-admission reductions, global safety net system payment, national quality reporting system, all-payer systems, integrated care for “dual eligibles” payment incentives for evidence-based cancer care, improved post-acute care through continuing care hospitals, comprehensive payments for “innovation zones”, payment reforms to advance care coordination, collaborations of high-quality, low-cost health care institutions, patient decision-support tools, etc.
HHS – A National Learning Strategy

• HHS new $1B Medicare initiative to produce $50B in 10 yr savings from improved safety, fewer re-admissions
  – Partnership For Patients uses research to identify “best practices”, followed by pilots, demonstrations and national roll-out
  – 60,000 lives saved over next 3 years
• Many more rapid learning initiatives will follow, from
  – $1.1 B for comparative effectiveness research (CER)
3 New D & I Strategies

• **Comparative effectiveness research:** Require clinical research to include standardized comparative data so CER is automatically part of clinical research. Introduce into rapid-cycle learning and rapid-learning systems.

• **New technologies learning system:** Expand FDA Sentinel network. Create national research registries and research programs for new technologies. Use “coverage with evidence development”.

• **CMS Innovation Center collaboration:** Pilot & demos with $10B innovation funds, national rollout using Medicare/Medicaid (85 million enrollees, $785 B/yr).
Key Messages

• US national policy is adopting a new way of thinking -- a learning healthcare system

• The key idea is to learn, as quickly as possible, about “best practices” – and then to have these adopted throughout the healthcare system. And to create a continuous learning cycle, and a continuously learning system

• All parts of this new system are now open for discussion & creation – a great time for researchers and innovators!!