Disruptive Innovation in Health Care: Challenges for Engineering

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Matching Efforts for Research and Development

**Medical Science**

Basic Multidisciplinary Efforts → Translational Medicine → Limited Implementation

- Biology
- Bioinformatics
- Bioengineering
- Product development
- **Clinical trials**
- Analysis
- **But no redo**

**Delivery Science**

Basic Multidisciplinary Efforts → Translational Delivery → Limited Implementation

- Design/engineering
- Engineering
  - Systems engineering
  - Computer science
  - Communications/microsystems
- Organizational research
- Behavioral research
- Health Professionals
- System and service Development
- **Simulation**
  - Evidence based medicine advances
  - Algorithms
- **Workforce Design**
- Analysis
- **And redo**
An Example of the Transition to a New National Business Model to Create a “Sustainable” Innovative System

**Informed Portable Consumer Choice**

**Markets**

**Business**

**Government**

**Individuals**

**Responsibility**

- Behavior prevention adherence
- Informed choice (performance)

**An Independent Self-Funded Regulatory Agency**

**Health Federal Reserve**

- Affordability/inflation targets
- Analysis and reporting at regional/national level

**Health SEC**

- Oversee markets
- Set rules for listing on market

**Standardized “Production” Models**

**Rules for “Listing”**

**Disclosure**

- Outcomes
- Reliability
- Service satisfaction

**Value**

- Safety
- Documented IT System
  - Dynamic PHR/EMR
  - Dynamic decision support system
  - Dynamic work flow system
- Governance and financial reporting

**Conduct**

- Dynamically risk equalized

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Examples

Value Networks
• Full service: Kaiser, Mayo
• Focused networks: children, cancer

Value Chains
• Single specialty
• Diagnosis to outcome
• Retail clinics
• Limited range of services

Value Shops
• Difficult non-standard patients
• Monitoring, analysis, new techniques, improve processes
Predictive, Personalized, Preventive and Participatory Medicine (P4 Medicine)

**Predictive:**
- Probabilistic health history--DNA sequence
- Biannual multi-parameter blood protein measurements
- Biannual blood cell measurements--dynamic
- In vivo and single cell molecular imaging

**Personalized:**
- Unique individual human genetic variation mandates individual treatment
- Patient is his or her own control
- Perturb blood cells for dynamic measurements
- Go directly to patient and skip doctor--patient will have all medical information

**Preventive:**
- Strategies for re-engineering the behavior of disease-perturbed networks with drugs
- Vaccines
- Focus on wellness

**Participatory:**
- Patient understands and participates in medical choices

Courtesy of Lee Hood