Objectives

Welcome

Introductions

Clinical Informatics
To learn about clinical informatics and its intersection with systems engineering

Emerging Principles

To be aware of emerging principles of valuable healthcare innovation
At scale, you have to consider value, harms and equity. Especially in helping systems scale through automation.

Discussion

And next steps
Principles for Agile Approaches to Valuable Healthcare Innovation

• It’s not about money, it’s about **value**
• The *myth of certainty* - **agility** will be necessary
• At *scale*, you have to consider **value**, **harms** and **equity**
• Think about the biggest **impact** possible, think globally, avoid diminishing returns, and sunk cost thinking
Clinical Informatics
“Informatics is as much about computers as cardiology is about stethoscopes.”

Health informatics is the systems science of healthcare
Technology and Innovation in Healthcare
What worries me
The bad news:

most innovation projects fail*
What worries me the most
The **optimization** of a **subsystem** can result in a **degradation** of the **overall system performance**
Technology has potential for improving care
Technology is actually a big part of what is making healthcare worse
Any healthcare systems needs to be good at 3 things
1. Insure the uninsured
2. Align quality and cost
3. Manage new technologies
What am I excited about?
Informatics and Systems thinking
Innovators everywhere
Clear leverage points:

esp at point of care
esp in avoiding unnecessary care
Empowerment
Patient
Family
Community
Information
Data
Connectivity
Global
What am I most excited about?
The Best Care Possible for All
There is lots of money in healthcare, but it still seems broken, and more money seems to be making it worse.

It is not about MONEY, it’s about VALUE
How do you define VALUE in healthcare?
How much is spent on health -- now, and in the future -- and from which sources?

- Prepaid private spending
- Out-of-pocket spending
- Government health spending
- Development assistance for health

Source: Financing Global Health Database 2017

PPP = purchasing power parity

"Expected" is the future growth trajectory based on past growth.
The hidden costs*

- **Absenteeism** – $84 billion\(^1\)

- **Presenteeism** – $150 billion (surprisingly thought more costly than absenteeism or disability)\(^2\)

- **Caregiver burden** – $33 billion\(^3\)

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* very hard to calculate, so estimates with big assumptions
What are outcomes that matter?
Is it “the best care that money can buy?”
Is it “living as long as possible?”
Is it “being as healthy as possible for as long as possible?”
DALY
Disability Adjusted Life Year is a measure of overall disease burden, expressed as the cumulative number of years lost due to ill-health, disability or early death

\[ \text{YLD} = \text{YLD} + \text{YLL} \]

Years Lived with Disability + Years of Life Lost

Healthy life | Disease or Disability | Early death

What causes the most deaths?

<table>
<thead>
<tr>
<th>2007 ranking</th>
<th>2017 ranking</th>
<th>% change 2007-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic heart disease</td>
<td>1</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>Alzheimer's disease</td>
<td>2</td>
<td>Alzheimer's disease</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>3</td>
<td>Lung cancer</td>
</tr>
<tr>
<td>Stroke</td>
<td>4</td>
<td>Stroke</td>
</tr>
<tr>
<td>COPD</td>
<td>5</td>
<td>COPD</td>
</tr>
<tr>
<td>Lower respiratory infect</td>
<td>6</td>
<td>Lower respiratory infect</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>7</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>9</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Cirrhosis</td>
<td>10</td>
<td>Drug use disorders</td>
</tr>
<tr>
<td>Drug use disorders</td>
<td>19</td>
<td>Cirrhosis</td>
</tr>
</tbody>
</table>

Top 10 causes of death in 2017 and percent change, 2007-2017, all ages, number
What causes the most premature death?

Top 10 causes of years of life lost (YLLs) in 2017 and percent change, 2007-2017, all ages, number

http://www.healthdata.org/united-states
Caregiving

- Just the hours worked at $12/hr
- Most invisibly just reduces GDP
  - 22% of caregivers leave the workforce to care for a loved one
  - >$300,000 income related losses for family caregivers who leave the workforce to care for a loved one
- (most health insurance in US is employer based)

The economic value of family caregiving is as big as the world’s largest company, and bigger than Medicaid and out-of-pocket (OOP) spending on health care.

- Walmart: $477 billion
- Family Caregiving: $470 billion
- Total Medicaid: $449 billion
- OOP Spending on Health Care: $339 billion
- Total Medicaid LTSS: $123 billion

Valuing the Invaluable 2015 Update: Undeniable Progress, but Big Gaps ... (n.d.). Valuing the Invaluable 2015 Update: Undeniable Progress, but Big Gaps ...
The Best Care Possible for All
The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency.

Attributed to Bill Gates
The second is that automation applied to an inefficient operation will magnify the inefficiency.

Attributed to Bill Gates
The risk is: automation applied to a unjust system can magnify the injustice.
The feedback loop will be critical
What is not measured is invisible to the process
The Best Care Possible for All
Safer Opioid Prescribing in Primary Care
The Best Care Possible for All Patients with Pain
Principles for Agile Approaches to Valuable Healthcare Innovation

• Technology and Innovation in Healthcare
  • the bad news: why most engineering approaches to transforming healthcare fail
  • the good news: we know more now than ever before, what can be done, and most important gaps

• Principles
  • It’s not about money, it’s about value
  • The myth of certainty – agility will be necessary
  • At scale, you have to consider value, harms and equity
  • Think about the biggest impact possible, think globally, avoid diminishing returns, and sunk cost thinking

• Build solutions that increase real value in healthcare for the greatest number