Big Data: Opportunities and Challenges in Healthcare

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Big data growth

- U.S. healthcare system reached 150 exabytes in 2011
- Growing at an annual rate of 40%
- At this rate, healthcare will soon reach the zettabyte and yottabyte scales
- Kaiser Permanente is estimated to have between 26 and 44 petabytes of data from electronic health records alone
We live and work in challenging times

• Health care reform is on the agenda
• Burden of chronic illness
• More with less
• Rapid pace
• Relentless change
• Increased accountability

Naylor & Naylor 2012; Song & Lee 2013; Davidson, Daly & Hill 2013
Chronic Illness Drives Medical Care Costs

Segments within the total population

- Those with no chronic conditions: 72%
- Those with one chronic condition: 21%
- Those with multiple chronic conditions: 6%

Costs associated with each segment

- Those with no chronic conditions: 36%
- Those with one chronic condition: 31%
- Those with multiple chronic conditions: 33%

## EXHIBIT ES-1. OVERALL RANKING

<table>
<thead>
<tr>
<th>COUNTRY RANKINGS</th>
<th>AUS</th>
<th>CAN</th>
<th>FRA</th>
<th>GER</th>
<th>NETH</th>
<th>NZ</th>
<th>NOR</th>
<th>SWE</th>
<th>SWIZ</th>
<th>UK</th>
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<tr>
<td><strong>Overall Ranking (2013)</strong></td>
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<td>Health Expenditures/Capita, 2011**</td>
<td><strong>3,800</strong></td>
<td><strong>4,522</strong></td>
<td><strong>4,118</strong></td>
<td><strong>4,495</strong></td>
<td><strong>5,099</strong></td>
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<td><strong>3,925</strong></td>
<td><strong>5,643</strong></td>
<td><strong>3,405</strong></td>
<td><strong>8,508</strong></td>
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</table>

Notes: * Includes ties. ** Expenditures shown in $US PPP (purchasing power parity); Australian $ data are from 2010. Source: Calculated by The Commonwealth Fund based on 2011 International Health Policy Survey of Sicker Adults; 2012 International Health Policy Survey of Primary Care Physicians; 2013 International Health Policy Survey; Commonwealth Fund National Scorecard 2011; World Health Organization; and Organization for Economic Cooperation and Development, OECD Health Data, 2013 (Paris: OECD, Nov. 2013).
Health care: data rich

But information poor

(David Currow 2011)
Healthcare and big data

• Healthcare generates huge amounts of data
• Hard copy non standardized data elements
• Electronic storage heralds many opportunities
• Implementation and process issues
• Sociology and politics of health
What is big data in healthcare?

• “Big data in healthcare refers to electronic health data sets so large and complex that they are difficult (or impossible) to manage with traditional software and/or hardware; nor can they be easily managed with traditional or common data management tools and methods” (Frost & Sullivan)
What is big data in healthcare?

- Electronic health records
- Health insurance claims
- Biometric data
- Data input by individuals
- Multiple data to enabling patternning
Socioeconomic Status and Heart Failure in Sydney

Glenn R. Close\textsuperscript{a}, Phillip J. Newton\textsuperscript{b}, Simon C. Fung\textsuperscript{a}, A. Robert Denniss\textsuperscript{a,c}, Elizabeth J. Halcomb\textsuperscript{d}, Pramesh Kovoor\textsuperscript{a,e}, Simon Stewart\textsuperscript{f}, Patricia M. Davidson\textsuperscript{b,g}\textsuperscript{*}

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\textsuperscript{d}University of Wollongong, Australia
\textsuperscript{e}University of Sydney, Australia
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\textsuperscript{g}Cardiovascular Nursing Research, St Vincent’s, Sydney, Australia
st andard di se mortality rate ratio (nsw=100)
POVERTY
ACCESS TO CARE
ENVIRONMENTAL EXPOSURE
RACISM

WHY IS HE LOOKING AT RISK FACTORS AND BEHAVIORS WHEN THE KEY LIES IN SOCIAL DETERMINANTS?

LOOKING IN A DIFFERENT PLACE FOR THE KEY
What this means for health practice?

• Public access shifts power and decision making

• Allow healthcare professionals to:
  – make decisions based on thousands (or millions) of cases
  – assess needs for subpopulations,
  – intervene early for at-risk groups

• Better quality, cheaper healthcare
Areas of opportunity

- Clinical operations
- Research and development
- Public health
- Evidence-based medicine
- Genomics
- Fraud prevention
- Patient profile analysis
Challenges

- Ethical and policy issues
- Challenging entrenched paradigms
- Data “cleaning”
- Collection and analysis process
- Public access
- Storage
- Accessibility
Lessons from consumer IT

- Internet as a source of data
- Information coding and grouping
- Allowed companies to develop technologies to meet consumer need
- Volume, velocity, variety and veracity
- Partnerships between technical and domain expertise
Next steps for healthcare

- Paradigm shifts
- Industry commitment
- Overcome silos and ownership
- Ensure data is “structured”
- Industry wide applications
- Knowledge, awareness and capability
- Pattern recognition instead of position testing
A place where exceptional people discover possibilities that forever change their lives and the world.