Using Data, Analytics & Cognitive Computing to Improve Health

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Observational effectiveness studies – 18th Century

James Lind ‘Treatise of the Scurvy’ - 1753

- 1747 – Comparative efficacy of 6 dietary supplements provided to 12 Royal Navy sailors
- 1753 – Initial publication of results
- 1763, 1771 – 2nd and 3rd revisions
- 1795 – Widespread adoption of citrus fruits by the Admiralty as a preventative measure
Statistical analysis of healthcare outcomes – 1950’s

• 1952 – Sir Austin Bradford Hill, Richard Doll

  Randomised control clinical trials
  Case-Control studies
  Retrospective & prospective cohort studies

Smoking as a risk factor in lung cancer (1952-2000)

Similar endeavours – Framingham Heart Study, Nurses Health Study, Cochrane Collaboration
Big Data: not just a matter of volume

Characteristics of Big Data

**Volume**
- Data at scale
- Terabytes to petabytes of data

**Variety**
- Data in many forms
- Structured, unstructured, text, multimedia

**Velocity**
- Data in motion
- Analysis of streaming data to enable decisions within fractions of a second

**Veracity**
- Data uncertainty
- Managing the reliability and predictability of inherently imprecise data types

Source: IBM Institute for Business Value, 2012
The changing role of analytics in healthcare

Foundational
- What happened?
- When and where?
- How much?

Advanced, Predictive
- What will happen?
- What will be the impact?

Prescriptive
- What are the potential scenarios?
- What is the best course?
- How can we pre-empt and mitigate the crisis?

Transaction reporting
- Basic reporting

Data integration
- Dashboards

Data warehouse
- Enterprise analytics
- Evidence-based medicine
- Outcomes analytics

Decision support analytics
- Personalised healthcare
- Population risk models
- Optimising care systems
The sources of data in healthcare systems are becoming more diverse
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National eHealth Infrastructure (Unique Identifier, Summary Care Record, Disease Registries, Image Archives etc)

- Acute/Secondary Care
  - EPR
  - Patient Administration
  - Clinical Departments (Radiology, Pathology, Theatre etc)
  - Community Care
  - EPR
  - Public Health
  - Case Management

- Tertiary Care
  - Tertiary Care EPR

- Primary Care
  - EPR
  - GP Systems
  - Order Entry
  - Prescriptions etc

- Community Care
  - Community Care EPR

- Home Office Mobile
  - Home Office
  - Mobile
  - Information
  - Communities
  - Health Monitoring
  - Disease Management
  - Connected Devices

- PHR
Some of the most profound insights are coming from understanding how individuals themselves are creating, sharing and using personal data. On an average day, users globally send around 47 billion (non-spam) emails and submit 95 million “tweets” on Twitter. Each month, users share about 30 billion pieces of content on Facebook. The impact of this “empowered individual” is just beginning to be felt.

However, the potential of personal data goes well beyond these promising beginnings to vast untapped wealth creation opportunities. But unlocking this value depends on several contingencies. The underlying regulatory, business and technological issues are highly complex, interdependent and ever changing.*

* Copyright World Economic Forum 2011
Exploiting Big Data can support healthcare service improvement

**New and numerous data sources**
Transactional, application, mobile, social, care provider, publications, research, and individual information

**Analytics innovations**
Advanced analytics apply Natural Language Processing and Artificial Intelligence to complement tools that surface patterns and anomalies

**New platforms**
Collaborative and mobile technology platforms facilitate a holistic view of the individual and enable new ways to coordinate care delivery

**Capturing and using data enables new insights into populations and individualized care**
Access to Big Data has the potential to enable more personalised medicine.
What is Watson?
IBM Watson – cognitive computing to transform healthcare

1. Understands natural language and physician/patient communication

2. Generates and evaluates evidence-based hypothesis to improve quality of patient care

3. Adapts and learns from user selections and responses

- Medical info is doubling every 5 years
- 81% of physicians spend < 5 hrs/month reading medical journals
- 1.5M errors in the way medications are prescribed, delivered and taken
- $750B, or 30 cents of every dollar, is wasted in US alone
COCIR Recommendations on Big Data

• Make effective use of data for healthcare a policy priority - explore applications, benefits and risks
• Continue efforts to adopt international open standards for data coding and semantic meaning
• Promote architectures to enable data aggregation
• Strengthen analytics skills in the healthcare ecosystem
• Adopt a regulatory framework that balances access to data with protection of privacy and confidentiality
THANK YOU FOR YOUR ATTENTION!