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Harnessing the Power of Big Data to Make Better Health Care Decisions in the Asia-Pacific Region

Convergence disruption: Current challenges for utilizing big data to improve health care decision making

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What are you afraid of?

Information is ....
What do we want?

Demonstrating real value
Historical view of Big Data

- Aggregation of information at scales that allows disruptive processing

Big Data is.....

......data sets that are too large and awkward to collect, store and analyze using traditional database management tools
Changing & convergent landscape

1. Explore possibilities
2. Decide what to do

Divergent thinking  Convergent thinking

Convergence: .... of technology
Convergence: .... of technology

• Wearable technologies & smart devices
  – 2014 = 27 million units
  – 2015 = 97 million
  – 2016 = 110 million so far
  – 2020 estimated 237 million
Convergence: Software as a medical device

Clinical monitoring Standards
FDA

Convergence of data and data sources

- De-identified linkage data ..... 
- ......to specific larger sources of granular data (clinical information systems) ...... 
- ...to opportunistically collected data... 
- ....to ??????
Data Sources

1. Size
2. Digital convergence
3. Collection from diverse sources (HloT / monitoring)
4. Analysis – Skill in analytics and semantic understanding in health
5. Presentation
6. Integration - Information flow and clinical workflow
7. Security and privacy

Challenges - aka the things to be worked out to make the outcomes practical
Challenge 1: Size matters!

In 2010 we humans generated more bits of information than there are stars in the knowable universe.

In 2009 humanity created more data than we have in all of human history.

Challenge 1: ...byte-sized

Today data scientist uses **Yottabyte** to describe how much government data the NSA or FBI have on people altogether.

In the near future, **Brontobyte** will be the measurement to describe the type of sensor data that will be generated from the IoT (Internet of Things)
Challenge 2: Digital Convergence

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**Volume**
- Data at Rest
  - Tens of petabytes to exabytes of existing data to process

**Velocity**
- Data in Motion
  - Streaming data, milliseconds to seconds to respond

**Variety**
- Data in Many Forms
  - Structured, unstructured, text, multimedia

**Veracity**
- Data in Doubt
  - Uncertainty due to data inconsistency, incompleteness, and irregularities, leading to deception, model approximations

**Visibility**
- Data in the Open
  - Open data is generally open to anyone, with varying degrees of privacy, security and provenance

**Value**
- Data of Many Values
  - Range of data value from free to high value monetisation

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Challenge 3: Collecting & integrating

- Duplication of data
- Discoverability, Integration, Interoperability
- Data quality, reliability, and completeness
- Data heterogeneity

- Structured data found inside databases and
- Unstructured data flowing from new sources like social networks, mobile device sensors, radio-frequency identification (RFID) etc.
HlIoT and monitoring

Challenge 4: Analysis

- Uncontrolled data collection
- Reliability of inferences
- Algorithmic illusion
- People skill (lack of) - > false conclusions

...it really is like......
Big Data and Analytics for Health - skills

Challenge 5: Presentation
Challenge 6: Integration
- Information flow and clinical workflow


• In using big data:
  – Correct clinical correlations for decision making.
  – Does aggregation go over the line of personal privacy?
  – Erosion of trust?
  – Data provenance

• In providing big data:
  – geo-location information
  – intriguing inferences
     • inferred or derived information?
  – Misuse and abuse?

Challenge 7: Security and privacy
Waves of possibility – convergence disruption

Future – your part.....

Paradigm Shift:
Fundamental change in an individual's or a society's view of how things work in the world.
Convergence disruption

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