Health Analytics in the Real World:

Insights from 15 years of pan Canadian Health Information Data Warehousing and Digital Health perspectives
Why are we here?

**Objective:**
Share Clinical Data Warehousing long-term lessons learned and Health Analytics insights

Share real-world experiences:

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<td>Clinical Data Warehousing Lessons learned</td>
<td>Mark</td>
<td>10 min</td>
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<tr>
<td>Health Analytics – Architecture and Canadian Deployment Framework</td>
<td>Alex</td>
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<td>Conclusions</td>
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“Hub and Spoke Architecture” (Inmon)

- “Subject-oriented, integrated, time-variant and non-volatile collection of data”

“Data Mart Bus Architecture with Linked Dimensions” (Kimball)

- “A copy of transaction data specifically structured for query and analysis”
Data Warehousing in Healthcare:

- A trusted source of truth of comprehensive healthcare data structured for query and analysis purposes.

**Clinical Data Warehouse (CDW)**

- A grouping of data accessible by a single data management system, possibly of diverse sources, pertaining to a health system or sub-system and enabling secondary data analysis for questions relevant to understanding the functioning of that health system, and hence supporting proper maintenance and improvement of that health system - ISO/TS 29585
Setting the stage…

Data Warehousing/BI

Clinical Data Warehousing

Data Warehousing = Business Intelligence
Setting the stage...

Health Analytics

The systematic use of data, information technology and methods to create insights in context that inform clinical and business decision making around the planning, delivery, management and measurement of health care.

Source: HIMSS Clinical and Business Intelligence Community of Interest, 2013
Lessons learnt

Setting the stage…

Health Analytics =

Clinical Data Warehousing

Lessons learnt

Data Warehousing

Clinical Data Warehousing

Extend CDW to include Clinical functionality & Big Data approaches
Clinical Data Warehousing Lessons learned
(aka Health Information Data Warehousing)

Mark Fuller, Director, Health Information Applications,
Canadian Institute for Health Information
What makes Healthcare data unique…

Compared to other industries, Healthcare in Canada is:

- Complex
- Often involves Non-Standard Processes
- Highly Privacy Sensitive
- Federated
CIHI’s Data Warehousing & BI

Canadian Institute For Health Information (CIHI)

- Efficient
- Consistent
- Self Service
- Integrated

Health System Management
Comparative Data, Analysis and Information

Pan Canadian Analytical Environment

CDW

History:

Perceived EDW Need
Initial CDW (Kimball)
CIHI Portal (Self Service)
eReporting Program
Spoke & Hub, Source of Truth (Inmon)
Integration, Standardization, Master Data Mgmt & corporate positioning

2000 '03 '06 '11 '12 '15
CDW Lessons learned:

• Establish strong executive support
• Define data and information governance
• Implement data quality strategy where data precision matches data purpose
• Quantify business value and ROI
CDW Lessons learned:

• Establish enterprise-wide information & data requirements based on corporate goals
  • Master Data Management
  • Global business questions: who asks, when and why

• Remember that building a CDW is an enterprise program (not a project)

• Engage users and recognize usage patterns
  • Build it and they will come… or not!
  • Develop mechanism to foster trust in data sources and tools

• Use Self Serve BI to address capacity bottlenecks
Evolution of CDW

- Evolve CDW maturity to anticipate Big Data

- Big Data considerations:
  - Semi/Unstructured Data
  - Exploratory Analytics
  - Complex Data Integration
  - New Technologies
  - Real Time Data
  - Predictive Analytics

- Guide shift with architectural framework:
  - Define Data Warehouse Architecture, Data Model Approach, Binding Time (when to bind data to standards),
  - Architecture needs to support a full range of data depth, integration and functionality from ad-hoc, exploratory to dashboards etc,
  - 80/20 mix?: Traditional Analytics Infrastructure (80) plus New Approaches (e.g.: semi structured) (20)
Health Analytics Architecture and Deployment Framework for Canada

Alex J Mair, Director, Architecture, Health Analytics, Emerging Technology Group
Canada Health Infoway
Who and what is Infoway?

With our partners, Infoway helps accelerate the development, adoption and effective use of digital health solutions across Canada.
Infoway Emerging Technology Group
“Nexus of Forces” Represents the Arrival of Digital Health

These enablers are intertwined, creating a new computing ecosystem which is user-driven. One that is beginning to accelerate in health. One that will transform health delivery.
Arrival of Big Data Analytics

Volume, velocity and variety of types of data

Systemic processes that examine large amounts of data to deliver new insights that can enable decisions in real or near real time
Clinical Data Warehouse (CDW)

Traditional data sources and centralized platforms, distributed on Mobile

Diagnostics

Point of Service Applications

Mobile Apps

Analytics

Variety of factors will dictate if a specialized platform or services are required.

Mobile Apps

2015 Canada Health Infoway
Digital Health Analytics

Variety of factors will dictate if a specialized platform or services are required.
Considerations for Health Analytics

HIT Vision, Business Plan, IT Strategy
(Processes, initiatives and priorities - Clinical and business questions)

Source  Acquire  Persist  Analyze  Provision

Information management and utility services
Privacy and Security

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Draft Health Analytics Maturity Model

Level 4: Advanced
- Prescriptive and predictive patient-centric analytics

Level 3: Mature
- Data standardized, sophisticated and robust enterprise data warehouse

Level 2: Planned
- Repeatable and automated descriptive analytics

Level 1: Ad-hoc
- Basic descriptive analytics (canned reports) on some data that has been standardized

Level 0: Primitive
- Data not standardized, limited analytics or not planned for

2) HIMMS Analytics - DELTA Powered™ Analytics Maturity Suite, 3) TDWI Analytics Maturity Model
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Architecture and Deployment
Conclusions for Health Analytics

• Start with your existing data
• Plan for acquisition and linkage of new data
• Start with descriptive analytics
• Think “in context” for big data
• Re-use building blocks
• Address gaps with new technologies and toolkits
• Experiment with new types of analytics
• Assess your maturity, plan to increase capabilities, monitor
Clinical Data Warehouse/Health Analytics:

- Is critical to managing a healthcare system or an organization’s healthcare delivery
- Plan CDW/Health Analytics as part of a broader Digital Health strategy
- Is a Disruptive ‘Technology’
- Realizes full value of data via data linkage & integration
- Self Service – Allows appropriate Data, Information and Insights access to the greatest numbers of people – Supports Open Data concept
Questions?
Thank you

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Appendix
Types of Health Analytics

- **Descriptive**
  - What is happening now?
  - When did it happen? Why did it happen?
  - Standardized, static views into the data, drill down and "slice and dice" data to understand root cause.

- **Predictive**
  - What if? What’s next?
  - Simulation models, learning models, data mining on various data points to predict patterns.

- **Prescriptive**
  - How?
  - Identifying personalized treatment options best suited for the patient.

Timeline and maturity dependent
Type of Health Analytics Examples

**Prescriptive**
- Algorithms that continuously simulate, assess and learn from past treatments and outcomes and recommends treatment options that are best suited for the individual patient

**Predictive**
- A risk model that uses various data points (e.g., demographics, social supports, lifestyle, other medical conditions, test results, etc.) to predict if a patient’s disease condition may worsen.
- Real-time alerts to detect influenza and potential viral outbreaks

**Descriptive**
- Reports that profile patients with a chronic disease condition requiring intervention (e.g., diabetics that have not had a visit in past year)