5 Analytic Imperatives for 21st Century Population Health

Graham Hughes, MD
SAS Center for Health Analytics & Insights
LEARNING OBJECTIVES

Describe the difference between traditional healthcare business intelligence and a more comprehensive view of the spectrum of analytics

Discuss the importance of having an appreciation for how other industries leverage advanced analytics and how the same techniques can rapidly be applied to healthcare

Identify the 5 key analytic areas that healthcare organizations need to consider in their Population Health management initiatives
SAY BIG DATA
ONE MORE TIME
“YOU’RE PREGNANT?....”

TARGET STORES

NYT Feb 2012

Marketing analytics

Consumer Data

Pregnancy

Likelihood Score

Identified Pregnant Teen
ZULILY

“YOU HAVE NO SENSE OF FASHION…”

Online Retailer

“Daily Deal”

Page Layout Optimization

Millions of Layout Combinations

Mass Personalization
”HERE’S LOOKING AT YOU KID….”

Analysis of Posts

Analysis of Likes

Predict IQ, Race, Political Leaning

Gender orientation

Influence emotion
“IT’S A CHOCOLATE RIVER…”

Figure 1. Correlation between Countries’ Annual Per Capita Chocolate Consumption and the Number of Nobel Laureates per 10 Million Population.

NEW ENGLAND JOURNAL OF MEDICINE
Mission: Go to Gap, buy a pair of jeans

My Better Half
Time: 3 hrs. 26 min.
Spent: $676 (value to Mall)

My Better Half

Me

Time: 6 min.
Spent: $43 (value to Mall)

Messages to Prompt Mall Visit:
- Luxury food court
- More sales events vs. other Malls
- “Spend the Afternoon”
THAT’S INTERESTING BUT WHY SHOULD I CARE?
Patient

From Stan Huff, Intermountain Healthcare
2014 ONE PERSPECTIVE ON HEALTHCARE “BIG” DATA.....

Hypertensive
Obese
Non-compliant
Diabetic &
Asthmatic

David
Moves to USA
HONDA
POPULATION HEALTH STARTS WITH THE INDIVIDUAL

- Genetic Profile
- Genetic Markers
- Demographics
- Mediations
- Co-Morbidities
- Drug Response
- Broad Groups
- Individuals
- Subscriptions
- Adherence
- Social Media
- Credit Information
- Website Traffic
- Purchasing Patterns
- TV Habits
- Geography

Precision Medicine

Every disease becomes a rare disease

Patient Engagement = next blockbuster?

Real World Data enables learnings from N=1
MARKET DYNAMICS

Shared Risk & Reward

Population Health

New Delivery Models

Providers

Accelerated Insights

Value Based Contracting

Person Centric Care

Life Sciences

Real World Evidence

Health Plans
Value Based Healthcare

New Business Opportunities / Growth

Establish Robust Analytics Foundation

- Manage Financial Risks and Incentives
- Proactively Manage Quality and Outcomes
- Improve Efficiency Of Care Delivery
- Population Health and Engage Patients

MOVING FROM REACTIVE TO PROACTIVE
Value Based Healthcare

New Business Opportunities / Growth

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Establish Robust Analytics Foundation
“ARE MY METHODS UNSOUND….”

**Business Problem**

Preparing to solve the problem

**Business Decision**

Solving the problem

20+% error rate in EHR coding – How much uncertainty can you tolerate?

80% of EHR data in free text – NLP & Text Analytics Essential
“AH, MR. SPOCK – THE MIND OF THE ENTERPRISE....”

**Access & Social Collaboration Layer**
UI, Authenticate, Submit & Request Data, Navigate & Access Applications, Collaborate & Share Insights

**Packaged Analytic Applications Layer**
Predictive Models, Benchmarks, Actions/Alerting – Clinical, Administrative, Operations, Financial, Quality, Gaming Theory

**Analytic Tools Layer**
Data Connectivity, Data Quality, Visualization, Segmentation, Data Mining, Forecasting, Audit Trails, NLP, Machine Intelligence

**Information Management Layer**
Bladed Environment - EDW, ODS, Marts, Hadoop + Customer Data, In-Memory Databases, Virtual Data Marts

**Users**
- Patients
- Clinicians
- Managers
- Analysts
- IT Staff

**Secure Cloud**

**Interact**
- Patients
- EHR
- Call Center
- Visualization
- MS Office
- Regulatory reporting
- Partners

**Export**
- Patients
- EHR
- Lab
- Patient Sat.
- Billing
- Claims
MORE POWER

In Database

Streaming Data

In Memory

Massively Parallel

Hadoop

“I CANNAE CHANGE THE LAWS OF PHYSICS CAP’N……”

Increase Throughput → Increased Insight
Value Based Healthcare

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Establish Robust Analytics Foundation
Creating a Payer-Provider Bridge

Value Based Payment Analytics
- Episode Based Payments
- Bundled Payment Pilots
- Shared Savings ACOs

Analytics Solution:
- Episode Grouper
- Assess performance
- Identify variance
- Prospectively model contracts

Markets
- Health Plans
- Healthcare Providers / ACOs
PORTFOLIO OPTIMIZATION

“SHOW ME THE MONEY….”

Fee for Service    Capitated

Predicted Revenues
Predicted Costs
Margin Analysis
Balanced Portfolio
HEALTHCARE ANALYTICS

MOVING FROM REACTIVE TO PROACTIVE

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WE ALL HAVE 23 PAIRS OF CHROMOSOMES

Predict

Prevent

Treat
B cell with surface antigens

CD20 antigen
Corey Wood  
Dx: Stage 4 NSCLC Lung Cancer ROS1 Mutation  
Rx: Crizotinib (Xalkori) – ALK / ROS1 inhibitor

Emily Whitehead  
Dx: Resistant ALL  
Rx: CAR-T Immunotherapy
“MY DENSITY BROUGHT ME TO YOU....”

<table>
<thead>
<tr>
<th>Treatment Sequence</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery Only</td>
<td></td>
</tr>
<tr>
<td>Surgery - Radiation</td>
<td></td>
</tr>
<tr>
<td>Surgery - Chemo</td>
<td></td>
</tr>
<tr>
<td>Surgery - Hormone</td>
<td></td>
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<tr>
<td>Surgery – Radiation - Hormone</td>
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<tr>
<td>Surgery – Chemo - Radiation</td>
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<td>Surgery – Chemo - Hormone</td>
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<td>Surgery – Chemo – Radiation - Hormone</td>
<td></td>
</tr>
<tr>
<td>Surgery – Chemo – Hormone - Radiation</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
VISUALIZATION

FROM NARRATIVE TO COHORT TO INSIGHT
MULTIDIMENSIONAL TEMPORAL ANALYSIS
“GET BUSY LIVING OR GET BUSY DYING....”

Framingham Study

12,000 Patient

32 Years

BMI

Network Effects

57% Risk Increase

Nicholas A. Christakis, M.D., Ph.D., M.P.H., and James H. Fowler, Ph.D.
Value Based Healthcare

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“THESE GO TO 11…”

SimNICU

68 bed NICU

Discrete event simulation model

Probability of volume & acuity of patients

Time based morbidity estimations by type (Sepsis, NEC, PDA,...)

Simulation of flow / staffing needs

“What If” Analyses
IMPROVING CARE TRANSITIONS

6481 Discharge Summaries

Compare Manual to Automated

Leverage Text Mining

> 96% concurrence

Sensitivity 96.8%

Specificity 96.3%

"I’LL BE BACK...."
Scoring is:
• Rule and analytic-based
• Top Down
• Bottom Up
• Identify relationships in fraud networks
• Track evolution over time
• Predict fraudulent activity

“DO YOU FEEL LUCKY, WELL DO YA?...”
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CHAI EXAMPLE:
NATIONAL COLLABORATIVE FOR BIO-PREPAREDNESS
MEMBER RISK STRATIFICATION
RISK SCORING FOR NEWLY INSURED – NO CLAIMS DATA

CONSUMER DATA

CLAIMS DATA +

Engagement pattern
Psychographic
Buying pattern

EHR DATA +

Low/ Medium/ High clusters
Detailed unique sub-clusters
Consumer characteristics

New Member Risk

Engage
Attract
Retain

Multi Dimensional Member View
“While the individual man is an insoluble puzzle, in the aggregate he becomes a mathematical certainty”

Sherlock Holmes
Move from Piecemeal Analytics to Enterprise Analytics

Consider a mixed delivery approach – on premise & cloud

Think of CDSS as a continuum

Rethink the end to end process

Develop an analytics COE
Value Based Healthcare

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