Big Data Hope and Hype

Using Big Data PRM, CRM and Marketing Automation to Drive Growth, BI and Population Health Objectives

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We Create Vast Amounts of Information

90% of the world’s data has been generated over the last 2 years*

*May, 2013
Agenda

- Introduction
- Big Data
- Bigger Data
- Practical Applications
- Summary

Trinity Mother Frances and East Texas

- In 1937, as America was struggling through the Great Depression, the Catholic order of the Sisters of The Holy Family of Nazareth were committed to bring a modern hospital to Tyler, Texas.
- Mother Frances Hospital was scheduled to open on March 19. The opening day dedication that was planned never happened. Mother Frances was called on to open one day early to care for victims of the New London School Explosion
- Nearby, the staff of the Bryant Clinic, which later became Trinity Clinic, also responded to treat the injured.
- Almost 300 children, teachers and townspeople were killed by the blast and hundreds of the wounded were brought to Mother Frances Hospital for treatment.
About Mother Frances Hospital

- Numerous expansions and additions over the last seven and one-half decades have turned the once modest hospital and small clinic into the region’s largest employer.

- TMF is rated consistently as one of the highest rated integrated health systems in the United States.

- In 1995, Trinity Clinic and Mother Frances Hospital merged to form one of the nation’s first integrated healthcare systems – Trinity Mother Frances Hospitals and Clinics.

- Today:
  - Employs over 5,000
  - Includes six hospitals
  - 36 clinics
  - Over 350 physicians and mid-level providers located throughout the region.

My Path

Brown & Root Petroleum & Chemicals

Business Unit Strategy Europe/Africa/FSU

December, 1995 - Rev 01

Brown & Root Petroleum and Chemicals

Europe / Africa / FSU Strategy 1995

December 1995, Rev 01
The Historic Shift in Reimbursement

Traditionally focused on Volume based care

Value Based: You are now rewarded, or penalized based on performance

3 Areas of Business Growth

Disparate Data Systems and Strategies

Integrated Systems

High-Value Employers
- Bottom line expenses
- Employable coverage
- Consumer volume

High-Value Consumer
- Always connected
- Educated and savvy
- Picking up more of the costs

High-Value Physicians
- Great service at a fair price
- Available and accessible
- Convenience
Big Data Isn't New

- Predicted in 1940
  - Freemont Rider, Librarian. Wesleyan University
  - “By 2020 I will need 6,000 miles of shelves”

- Recognized in 1990
  - Peter Denning, Scientist
  - Saving all the Bits, American Scientist Fall 1990

- Implemented Commercially?
  - It depends on how you define BIG
  - By 1998 major consumer retailers began using Big Data for growth, and later retention

But its New To Us!
The Analytics Driven Healthcare Enterprise
And Its More Pervasive Than We Think

Who is Measuring Outcomes?
Who Uses What?

Federal | Pharma/Hospitals | Payers

Data Blends
- In-House
  - Clinical
  - Financial
  - Collected (Risk assessments, self reported & touch points)

- External
  - Utilization (*Comparion*, *Truven*, *iVantage*)
  - Quality and Efficiency (*Comparion*, *Healthgrades*)
  - Claims (*IMS*, *Health Market Science*)
  - Quality and Satisfaction (*CMS*, *Press Gainey*)
  - Preference (*NRC*, *Press Gainey*)
  - Consumer activity (*Experian/Equifax*, the list grows)
How It Comes Together

The Bench Tool

Big Data in Action

Clinical Analytics
Unifying clinical, financial, and operations data for clinical decision support systems, transparency of medical data, aggregating and synthesizing patient, create the reports they are required to create, analyzing their operational and financial data for efficiency gains.

Outcomes Analytics
Unifying all patient related data (structured and unstructured) to get a 360-degree view of patient to measure and predict outcomes, manage patient population. And for payer, provider scoring and outcomes-based incentive calculation.

Drug discovery analytics
Integration of clinical, healthcare, patents, medical journals, compound info, public research data, safety data to enable contextual, integrated access to correlated information around disease, target, and compound to provide key insights into decision-making for target selection, compound selection, safety vs. efficacy issue discovery, lead optimization, clinical issue discovery, and so forth.

Genomics Analytics
Combining patient genomic data with clinical data. Genomic data is becoming critical to the complete patient record, rather than an isolated self-sufficient data set.

Fraud Waste and Abuse Analytics
Analyzing claims and benefits of OEF/OIF veterans benefits and education fraud. Potential to do this real-time using Streams and Big Insights

Device analytics
Capturing the vital signs from babies to detect advanced warning of the onset of complications.
From *Datas* to *Data*

Today’s Data Pools Lack Integration

Four distinct big data pools exist in the US health care domain today with little overlap in ownership and low integration.

**Data pools**
- Pharmaceutical R&D data
  - Owner: Pharmaceutical companies, academia
  - Example datasets: clinical trials, high-throughput screening (HTS) libraries
- Clinical data
  - Owners: providers
  - Example datasets: electronic medical records, medical images
- Activity (claims) and cost data
  - Owners: payers, providers
  - Example datasets: utilization of care, cost estimates
- Patient behavior and sentiment data
  - Owners: various including consumer and stakeholders outside health care (e.g., retail, apparel)
  - Example datasets: patient behaviors and preferences, retail purchase history, exercise data captured in running shoes

SOURCE: McKinsey Global Institute analysis
Siloed Data is An Obstacle to Us ALL

A key reason why caregiver and health systems have trouble accessing all of their data is that there are six major unintegrated data pools controlled by different stakeholders:

1. Providers: clinical/medical data (EHRs)
2. Payers and Providers: claims and cost data
3. Researchers: academic
4. Developers: pharma and medical device R&D, including clinical trials
5. Consumers and Marketers: patient behavior and sentiment data
6. Government: population and public health data

No, Really...... It Works

Physician Intelligence Database (PIMD)

Basis of Database

- Strategic Planning started meeting with campuses to share physician splitter and demand for physicians in their market. (THCIC)
- In those meetings, we started collecting intelligence on physicians, but did not store in one database.
- In a separate activity, Marketing started to create a PCP referral map. (Cerner)
  - And a comprehensive segmentation analysis appended to Cerner (Cohorts)
- Together we came up with idea of database to include intelligence on physicians we were looking at for PCP development plans for campuses.
- We decided to create PIMD as Access Database to track information.
Big data isn't a Big Deal
Dark Data is a lot more interesting
Data Sources Come In All Shades

- Claims
- Health Plans
- Pharmacy
- Providers
- Patient
- Supply Chain
- Charts
- Lab Tests
- Adverse Event
- Finance

- EMR
- Research
- Devices
- Digital Hosp.
- Social
Those Using Multiple Dark Data Sources

- **NextBio**
  - Assembles curated and annotated molecular data allowing scientists to compare research to other data sets
- **Exployrs**
  - Aggregates disparate data sources (financial, operational, clinical, claims) in a cloud tool to improve care paths
- **One Health**
  - Combines social and clinics data streams to create real time personal profiles to nurse navigators and other care managers
- **Tea Leaves Health**
  - Strategic growth & management platform blending financial, claims, government, financial, clinical, scraped, self reported and unstructured consumer data to a single bench tool.
- **Factual**
  - Aggregation for open data platforms.
Summary So Far…..
Healthcare Has to Walk the Walk

We have access to the best data than any other industry – just need to get our arms around it and unlock it.

We need to have the right assets in place to deliver and add value at the right time

We need to be open to new innovative ideas and react with better velocity

We have to measure response efficiencies MORE than clinical opportunities

Because in reality….

Finding People isn't Even Half the Battle

Fighting the Tide of Behavioral Economics
The Changes and Influences in Consumer Behavior

Cost shift to consumer
HDHPs/CDHPs, HIX and defined contribution health plans all shifting cost to consumers

Price transparency
A growing list of public and private resources help health care consumers compare prices

Innovation and technology
Health apps and social networking, amongst other innovations keep consumers informed and savvy

We Live in a Noisy World

Average U.S. consumer is exposed to well over 1,000 ad messages per day
We Live in a Connected Digital Age

We are always “on”, connected everywhere

Mobile and transportable

Marketing messages occur simultaneously across multiple channels and are “consumed” by different devices at different times

Changed from “something people watch” to “something people actively do” – consumers control their own experience

Information is everywhere and consumers are highly informed

Healthcare Presents Unique Marketing Challenges

The economics term “rational consumerism” encompasses many rational choices that are contrary to a healthcare providers objective

Do consumers really want to buy what we are selling?

What will it take to put you in this hospital bed today?
Total Information Awareness
(it starts here)

The Obligatory, Mundane Population Management Slide

Goal is to focus on modifying the factors that make people sick or aggravate their illnesses.

Have to focus efforts on both:
• The high-risk patients who generate most of the costs
• The preventive and chronic care needs of every patient

Source: Patient Centered Primary Care Collaborative, 2011
Beyond The Mundane & Into The Actionable

**Total Information Awareness**

- **Transactional**
  - Hospital Encounter
  - Clinic Encounter
  - Financials
  - Web Registrations
  - Event
  - Attendance
  - Call Center
  - Landing Pages
  - Active Digital Footprint

- **Quantitative**
  - Market Share
  - Market Claims
  - Demographics
  - Preference
  - Modeling/scoring
  - Prospects
  - Self-reported conditions
  - Media preferences
  - Buying preferences

- **Qualitative**
  - Online personas
  - Psychographics
  - Passive Digital Footprint
  - Patient Panels

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What REALLY Caused Readmissions at a Hospital Nearby

- The Data We Thought Would Be Useful... Wasn't
  - 113 candidate predictors from structured and unstructured data sources
  - Structured data was less reliable than unstructured data – increased the reliance on unstructured data

New Unexpected Indicators Emerged... Highly Predictive Model

- 18 accurate indicators or predictors (see next slide)

<table>
<thead>
<tr>
<th>Predictor Analysis</th>
<th>% Encounters Structured Data</th>
<th>% Encounters Unstructured Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejection Fraction (LVEF)</td>
<td>2%</td>
<td>74%</td>
</tr>
<tr>
<td>Smoking Indicator</td>
<td>33% (65% Accurate)</td>
<td>81% (95% Accurate)</td>
</tr>
<tr>
<td>Living Arrangements</td>
<td>&lt;1%</td>
<td>73% (100% Accurate)</td>
</tr>
<tr>
<td>Drug and Alcohol Abuse</td>
<td>16%</td>
<td>81%</td>
</tr>
<tr>
<td>Assisted Living</td>
<td>0%</td>
<td>13%</td>
</tr>
</tbody>
</table>

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What REALLY Caused Readmissions at a Hospital Nearby

Top 18 Indicators
New Insights Uncovered by Combining Content and Predictive Analytics

- LVEF and Smoking are significant indicators of CHF but not readmissions
- Assisted Living and Drug and Alcohol Abuse emerged as key predictors (only found in unstructured data)
- Many predictors are dependent on “Histories”

![Graph showing odds ratio and projected odds ratio for various factors]

18. Jugular Venous Distention Indicator
17. Past by Medication Indicator
16. Immune Disorder Disease Indicator
15. Cardiac Rehab Admission Diagnosis with CHF Indicator
14. Lack of Emotion Support Indicator
13. Self-COPD Misleading History Indicator
12. With Renal/Urinary System & Endocrine Disorders
11. Heart Failure History
10. High BNP Indicator
9. Low Hemoglobin Indicator
8. Low Sodium Level Indicator
7. Self-Medication (NUR only)
6. High Cholesterol History
5. Presence of Blood Diseases in Diagnosis History
4. High Blood Pressure History
3. Self-Reported Drug Use Indicator (Primary + NLP)
2. Heart Attack History
1. Heart Disease History

Practical, Not Theoretical
Big Data Today at TMF
Present-Day Healthcare Growth & Population Management is Uncoordinated

Integration gets everyone working in the same direction

Traditional Marketing
- Print media
- Mass media
- Outdoor
- Direct mail
- Radio
- Low response
- Difficult to track attribute impact
- Limited types of outreach

One-off targeted campaigns
- Service line
- New parent campaigns
- New mover campaigns
- Special events
- Purchased data is inflexible
- Unable to do “what if?” and causality analysis

Patchwork of tools
- Contact management
- SEO services
- Social media
- Email vendor
- Direct mail vendor
- Multiple vendor relationships
- Difficult to track campaigns across channels
- Data non-transferable

Meet Jim

Age Range, Gender, Ethnicity
35-44, Male, White

Individual Marital Status, Presence of Children
Wife (35-44) and 2 kids (Son, 6 & Daughter, 11)

Patient Payer
Full Insurance Coverage through BCBS

Lifestyle
Exercises regularly, but likes to eat out and works behind a desk

Conditions
Known Smoker, slightly overweight, joint pain, and frequent headaches
Through our use of dark data we know exactly how Jim and his family prefer to receive information & we intelligently deliver via Marketing Automation.

Rule Writing is Like Plinko
Clinical Engagement Guidelines for Breast Cancer Outreach

<table>
<thead>
<tr>
<th>Clinical Risk</th>
<th>Criteria</th>
<th>Rule</th>
<th>Threshold</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening - Avg Risk</td>
<td>Gender</td>
<td>Include</td>
<td>P</td>
<td>Presence</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>&lt; 40</td>
<td>≥ 40</td>
<td>Age ≥ 40 &amp; has not had a mammogram within 2 years</td>
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<tr>
<td></td>
<td></td>
<td>≥ 40</td>
<td>≤ 40</td>
<td>Age ≤ 40 &amp; has not had a mammogram within 2 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 40</td>
<td>Age ≤ 40 &amp; has not had a mammogram within 2 years</td>
</tr>
</tbody>
</table>

Written by a Medical Director of Clinical Analytics. CRM allows you to set these rules in the system and automate communications along the care path.
Initial CRM Population Health Strategies

<table>
<thead>
<tr>
<th></th>
<th>1 Breast Cancer</th>
<th>2 Colorectal Cancer</th>
<th>3 Heart Disease - CAD</th>
<th>4 Heart Failure - CHF</th>
<th>5 Diabetes - disease management</th>
<th>6 COPD</th>
<th>7 Pneumonia</th>
<th>8 Wellness Check / Preventive Care / Screenings</th>
<th>9 Hypertension</th>
<th>10 Asthma</th>
<th>11 Low Back Pain</th>
<th>12 Arthritis</th>
<th>13 Medicaid Expansion and Premium</th>
</tr>
</thead>
</table>

Common measures around:

- HEDIS/STAR
- ACO
- CMS IQR initiatives
- CMS 30-day Readmission Penalties
- NEJM Quality Indicators/Rand study
  - 431 indicators around 30 chronic conditions

Simple Example – ED “re-direct”

Problem - Inappropriate utilization
Solution – steer towards better care setting

Write the Query → Setup the "Trigger" → Engage → Measure / Refine
Up a Level  Medicaid Expansion & Premium Exchange

Define the ACA guidelines and build logic into the CRM System to find Expansion and Premium Targets

<table>
<thead>
<tr>
<th>Persons in family/household</th>
<th>Medicaid FPL 100%</th>
<th>Medicaid FPL 138%</th>
<th>Medicaid FPL 150%</th>
<th>Medicaid FPL 200%</th>
<th>Medicaid FPL 250%</th>
<th>Medicaid FPL 300%</th>
<th>Medicaid FPL 350%</th>
<th>Medicaid FPL 400%</th>
<th>Insurance Exchanges FPL 100%</th>
<th>Insurance Exchanges FPL 138%</th>
<th>Insurance Exchanges FPL 150%</th>
<th>Insurance Exchanges FPL 200%</th>
<th>Insurance Exchanges FPL 250%</th>
<th>Insurance Exchanges FPL 300%</th>
<th>Insurance Exchanges FPL 350%</th>
<th>Insurance Exchanges FPL 400%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11,490</td>
<td>13,856</td>
<td>17,235</td>
<td>22,880</td>
<td>28,725</td>
<td>34,670</td>
<td>40,215</td>
<td>45,960</td>
<td>15,856</td>
<td>19,291</td>
<td>23,265</td>
<td>29,020</td>
<td>35,775</td>
<td>41,430</td>
<td>47,795</td>
<td>54,190</td>
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<tr>
<td>3</td>
<td>19,530</td>
<td>24,911</td>
<td>29,295</td>
<td>39,060</td>
<td>48,825</td>
<td>58,590</td>
<td>68,355</td>
<td>78,120</td>
<td>26,951</td>
<td>32,499</td>
<td>39,325</td>
<td>47,100</td>
<td>56,875</td>
<td>67,650</td>
<td>79,320</td>
<td>92,000</td>
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<tr>
<td>4</td>
<td>23,550</td>
<td>30,499</td>
<td>35,325</td>
<td>47,100</td>
<td>58,875</td>
<td>70,650</td>
<td>82,425</td>
<td>94,200</td>
<td>30,947</td>
<td>39,355</td>
<td>47,100</td>
<td>56,875</td>
<td>67,650</td>
<td>79,320</td>
<td>92,000</td>
<td>104,800</td>
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<tr>
<td>5</td>
<td>27,570</td>
<td>36,047</td>
<td>41,355</td>
<td>55,140</td>
<td>68,925</td>
<td>82,710</td>
<td>96,495</td>
<td>110,280</td>
<td>38,047</td>
<td>47,385</td>
<td>55,140</td>
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<td>8</td>
<td>39,630</td>
<td>64,649</td>
<td>79,445</td>
<td>99,075</td>
<td>118,890</td>
<td>138,705</td>
<td>158,520</td>
<td></td>
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<td></td>
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</tbody>
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Example of Eligibility: A family of 5 with a household income of $30,000 would fall between the Federal Poverty Level (FPL) 100% and 138% categories and thus be eligible for Medicaid expansion. If they were between 138% - 400%, they would be considered for the Premium Exchange.

How Your Bench Tool Displays Your Data is Not To Be Overlooked

Trinity Mother Frances - Medicaid Premium Exchange target areas shown with primary care physician locations
Big Data Driven Marketing Automation Initiatives

Marketing Automation

- Software and technologies (MAT) allowing marketing departments to more effectively engage through multiple channels (email, websites, direct mail, IVR, social media) and automate tasks
- Business rules (criteria, outcomes and processes) are applied to the software to automate engagements with consumers – PLUS A FEEDBACK & LEARNING LOOP
Trinity Mother Frances Current Monthly MAT Initiatives

• Population Health
  – ED follow up
  – Primary Care
  – Medicare wellness reminder
  – Mammography screening reminders
  – Colorectal screening reminders
  – Pediatric Screenings & Immunizations

• Others
  – New movers
  – Medical home
  – Bariatric surgery
  – General Cardiology
  – Orthopedic (general and hand surgery)
  – Vascular Carotid Stenosis

Mammography Screenings
Monthly trigger to lapsed patients and prospects

• Started November 2012
• 61,096 communications
• Triggered off structures & unstructured data
• 1,388 new patients
Mammography Screenings
Monthly trigger to lapsed patients and prospects

4,254
RE-ENGAGED PATIENTS
$2.6M
PROFIT TO DATE
6.9:1
RETURN ON INVESTMENT

Primary Care “Check Engine”
Monthly trigger to lapsed patients and prospects

- Started March, 2014
- 21,214 communications
- 225 new patients seen
- Combination of digital and traditional vehicles
- Targeted churn risk in panels
Primary Care “Check Engine”
Monthly trigger to lapsed patients and prospects

829 RE-ENGAGED PATIENTS

$743,667 PROFIT TO DATE

23.7:1 RETURN ON INVESTMENT

The Near Future
(you thought that was cool?)
Near Field Communications

New mobile technology that will be in all smart phones
Used today in other applications in healthcare (patient/device monitoring, etc.

Web “3.0” – all about mobile and proximity
– NFC will allow location-based, content-relevant custom engagement on consumer’s personal mobile devices

Matches “conversations” (passive digital footprint) across Social Media to healthcare coding (the “grid” is disease-specific)

Most people do not discuss “brands” in their conversations
Profiles are built matched to treatment pathways
More highly targeted for healthcare
Did You Think A Marketing Guys Would Give You a New Statistic?

Get to know the Terms:
Cost of Acquisition (COA)
Or
Cost of Compliance (COC)

How much do you think a Nurse Navigator costs per intervention?

Parting Thoughts
Observations and Considerations

• For the good of all, you must embrace democratized decision support
• This means investment in establishing a single source of truth
  — And multiple stakeholders at the table
• And it implies an end to the gate keeper mentality

Observations and Considerations

• Swiftness of decisions making is liberating
  — Micrometers & Axes
• Don’t fall victim to a Big Data vendor glitz
  — Convolution of products
  — Niched according to our silos
  — Reinforces desire of certain data keepers to be hoarders
  — Makes it harder to unify. (Didn’t IBM say “Think”)
• At the end of the day, the data piece in only half the story
  — As an industry we are wholly ill equipped to persuade and modify consumer behavior
Thank You!

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(903) 525-7654

Sources

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• TeaLeaves Health “Big Data”