The Evolving Science of Measurement and Care Performance

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Vice President of Research & Market Insights
Expect Updates About Proposed FY 2015 IPPS Rule in June will be posted on Midas+ Clients Only Website

Special Education Overview: FY IPPS Final Rule to Quality Reporting

Midas+ Solutions, A Xerox Company is pleased to share with you an overview of the CMS Fiscal Year 2014 Inpatient Perspective Payment System (IPPS) Final Rule as it pertains to Quality Reporting at your organization.

Part 1: Hospital Inpatient Quality Reporting Program FY 2014
Part 2: Hospital Value Based Purchasing Program FY 2014
Part 3: Hospital Readmission Reduction Program FY 2014
Part 4: Hospital Acquired Conditions Program FY 2014
Our Focus Today: Analytics and Hospital Readmissions
We’ve always been measuring our performance….we just have better tools to do it and now we call them analytics!
Culture Drives Measurement

• Effective *use* of *analytics* is "not something you can buy from a vendor; it's an organizational and cultural value that has to grow and mature".

James E. Gaston, at the Healthcare IT News/HIMSS Media the Healthcare Business Intelligence Forum
Linguistic Confusion

Indicators
Measures
Metrics
Analytics
Indicators

*a trend or fact that indicates the state or level of something*
IMSystem™
Circa 1994

✓ DOS application
✓ Manual data entry
✓ “State of Art” reporting
✓ One clinical topic!
✓ Truly Voluntary!!
Measures

the extent, dimensions, quality of something; ascertained by comparison with a standard or “best practice”
Core & Clinical Quality Measures

- Regional and national benchmarks
- Based on evidence-based “best practice”
Core & Clinical Quality Measures

Population criteria

--- Population Criteria 1 ---

- **Initial Patient Population 1 =**
  - AND: "Patient Characteristic: Birthdate: birth date" ≥ 18 year(s) starts before start of "Occurrence A of Encounter, Performed: Encounter Inpatient"
  - AND: "Occurrence A of Encounter, Performed: Encounter Inpatient (length of stay <= 120 day(s))"
  - AND: "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia" during "Occurrence A of Encounter, Performed: Encounter Inpatient"
  - AND: "Occurrence A of Procedure, Performed: SCIP Major Surgical Procedure (ordinality: 'Principal')" during "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"

- **Denominator 1 =**
  - AND: "Initial Patient Population 1"
  - AND:
    - OR: "Occurrence A of Procedure, Performed: Hospital measures-CABG (ordinality: 'Principal')" during "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"
    - OR: "Occurrence A of Procedure, Performed: Hospital measures-CABG (ordinality: 'Principal')" during "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"

- **Denominator Exclusions 1 =**
  - AND:
    - OR: "Occurrence B of Procedure, Performed: General or Neuraxial Anesthesia" <= 4 day(s) ends before start of "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"
    - OR: "Occurrence B of Procedure, Performed: General or Neuraxial Anesthesia" <= 4 day(s) starts after end of "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"
    - OR: "Procedure, Performed: Hospital measures-Pacemaker or implantable defibrillator insertion procedure (a) starts after end of "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"
    - OR: "Procedure, Performed: Hospital measures-Pacemaker or implantable defibrillator insertion procedure (a) starts after end of "Occurrence A of Procedure, Performed: General or Neuraxial Anesthesia"
    - OR: "Diagnosis, Active: Hospital Measures - Any infection (ordinality: 'Principal')" during "Encounter Inpatient"
    - OR:
      - AND: "Occurrence A of Patient Characteristic Clinical Trial Participant: Clinical Trial Participant during "Occurrence A of Encounter, Performed: Encounter Inpatient"

- Algorithmic logic
- Boolean logic statements
Measure Importance Changing

✔ Measures “Top Out” when they no longer show statistically distinguishable performance levels at the 75th and 90th percentile
### Proposed FY 2017 Value Based Purchasing
#### 3 Clinical Process of Care Measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>Baseline Period</th>
<th>Performance Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January 1, 2013 to December 31, 2013</td>
<td>January 1, 2015 to December 31, 2015</td>
</tr>
<tr>
<td>IMM-2 Influenza Immunization</td>
<td>Threshold (%)</td>
<td>Benchmark (%)</td>
</tr>
<tr>
<td></td>
<td>90.607</td>
<td>98.875</td>
</tr>
<tr>
<td>AMI 7a Fibrinolytic agent received 30 minutes of hospital arrival</td>
<td>91.154</td>
<td>100.00</td>
</tr>
<tr>
<td>PN 6 Initial antibiotic selection for CAP immunocompetent patient</td>
<td>94.46</td>
<td>100%</td>
</tr>
<tr>
<td>SCIP Inf-2 Received antibiotic consistent with recommendations</td>
<td>98.13</td>
<td>100%</td>
</tr>
<tr>
<td>SCIP Inf-3 Prophylactic Antibiotic Discontinued w/in 24 hrs surgery end time</td>
<td>96.63</td>
<td>100%</td>
</tr>
<tr>
<td>SCIP 9 Postop urinary catheter removed postop day 1 or 2</td>
<td>92.86</td>
<td>100%</td>
</tr>
<tr>
<td>SCIP-Card 2 Pre-admission beta blocker and periop beta blocker</td>
<td>95.65</td>
<td>100%</td>
</tr>
<tr>
<td>SCIP-VTE-2 Received VTE prophylaxis w/in 24 hrs prior to or after surgery</td>
<td>94.92</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Proposed to add**

PC-01: Elective Delivery Prior to 39 Completed Weeks Gestation to Process of Care Domain

**Proposed to be removed for FY 2017 Value Based Purchasing**
No “True North”

Measure **Interpretation** Changing

- Healthcare model is being turned upside down so that for many hospitals are “cost centers” vs. “revenue centers”
- Less acute care volume means smaller denominators
- Traditional indicators of LOS, Mortality and Readmissions will likely INCREASE despite our efforts to decrease them!
- How meaningful will “risk adjusted data” really be in our future?
Which way is good?
Metrics

A *collection* of parameters or measures of quantitative assessment to track performance or to compare performance and which *sheds light on the whole gestalt* of a phenomenon of interest
Dashboards and Scorecards
Analytics

A systematic and logical method for analyzing data that results in the discovery and communication of meaningful patterns in data that is actionable.
Analytics at our Chinese Restaurant!
Analytics: A Framework to Describe Value

Original Source: Gartner Business Intelligence & Analytics Summit 2013 (Blue)
CMS Hospital Readmission Reduction Program

- Acute MI 30-day readmission rates
- CHF 30-day readmission rates
- Pneumonia 30-day readmission rates
- Total Hip/Knee Replacement 30-day readmission rates
- COPD 30-day readmission rates
- CABG 30-day readmission rates (Proposed for FY 2017 Payment)
Interpreting QNET Reports

http://www.medicare.gov/hospitalcompare/

Rate of unplanned readmission after discharge from hospital (hospital-wide)

Why is this important?

Hide Graph

Lower Percentages Are Better

0%  5%  10%  15%  20%  25%  30%  35%

CARONDELET ST JOSEPH'S HOSPITAL

14.0%

TUCSON MEDICAL CENTER

16%

U.S. national rate of all cause hospital-wide readmission = 16.0%

Number of included patients

CARONDELET ST JOSEPH'S HOSPITAL: 3032
TUCSON MEDICAL CENTER: 4657

Out of 4809 in the United States →
316 hospitals in the United States were better than U.S. National Rate
3966 hospitals in the United States were no different than U.S. National Rate
369 hospitals in the United States were worse than U.S. National Rate

158 hospitals in the United States did not have enough cases to reliably tell how well they are performing.
Medicare Hospital Quality Chartbooks
Available to public at

- Regional variation
- Racial disparities
- Reasons for readmissions
- Proportion by Medicare
- Small hospital data
- Large hospital data
- Measure methodology
Is the rate of unplanned readmissions after admission to the hospital for all conditions changing over time?


<table>
<thead>
<tr>
<th>Year</th>
<th>Median Hospital’s RSRR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>16.1 (11.0, 22.6)</td>
</tr>
<tr>
<td>2010</td>
<td>16.1 (10.9, 22.6)</td>
</tr>
<tr>
<td>2011</td>
<td>16.1 (11.3, 24.0)</td>
</tr>
</tbody>
</table>
Downward Trends in Acute MI 30-day Readmissions Reflected in Midas+ Comparison Pool

Public Reporting Began July 2009

Official Start Date For Hospital Readmission Reduction Program October 1, 2012
Downward Trends in CHF 30-day Readmissions Reflected in Midas+ Comparison Pool

Official Start Date For Hospital Readmission Reduction Program October 1, 2012

Public Reporting Began July 2009
Stable Trend in Pneumonia 30-day Readmissions Reflected in Midas+ Comparison Pool

Official Start Date
For Hospital Readmission Reduction Program
October 1, 2012

Public Reporting Began
July 2009

Midas+®
Descriptive Statistics
FY 2014 Hospital Readmission Penalties

- 1258/3483 (36%) US Hospitals had no penalty
- $249,409,975.80 in penalties assigned across 2,225 hospitals
- Only 18 hospitals in US had a full 2% of Medicare Revenue Penalty
- On the average, Midas+ hospitals impacted by a penalty lost $720,538.90 (adjusted Medicare revenue) compared to non-Midas+ hospitals who lost $993,994.26
- New York, Florida, New Jersey and Illinois and Michigan were hardest hit in total overall dollars
- Kentucky, Arkansas, Tennessee, New Jersey and West Virginia hardest hit in terms of percentage of Medicare payment reductions
- Could socio-economic variables contribute to readmission rates?
Nearly 50% of the Highest Combined VBP and Readmission Reduction Program Bonus Hospitals are Midas+ Hospitals

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>City</th>
<th>State</th>
<th>Value Based Purchasing Bonus/Penalty Released in Nov.</th>
<th>Readmissions Penalty Released in Aug.</th>
<th>Total VBP &amp; Readmission Bonus/Penalty Net change to hospital payments due to both programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Leandro Hospital</td>
<td>San Leandro</td>
<td>CA</td>
<td>[1]</td>
<td>[1]</td>
<td>[1]</td>
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<tr>
<td>UPMC East</td>
<td>Monroeville</td>
<td>PA</td>
<td>[1]</td>
<td>[1]</td>
<td>[1]</td>
</tr>
<tr>
<td>Sanford Aberdeen Medical Center</td>
<td>Aberdeen</td>
<td>SD</td>
<td>[1]</td>
<td>[1]</td>
<td>[1]</td>
</tr>
<tr>
<td>Maine Coast Memorial Hospital</td>
<td>Ellsworth</td>
<td>ME</td>
<td>0.51%</td>
<td>0.80%</td>
<td>-0.13%</td>
</tr>
<tr>
<td>Arkansas Heart Hospital</td>
<td>Little Rock</td>
<td>AR</td>
<td>0.66%</td>
<td>0.88%</td>
<td>-0.23%</td>
</tr>
<tr>
<td>Holland Community Hospital</td>
<td>Holland</td>
<td>MI</td>
<td>0.62%</td>
<td>0.77%</td>
<td>0.00%</td>
</tr>
<tr>
<td>St Luke’s Miners Memorial Hospital</td>
<td>Coaldale</td>
<td>PA</td>
<td>0.15%</td>
<td>0.76%</td>
<td>-0.15%</td>
</tr>
<tr>
<td>Kansas Medical Center LLC</td>
<td>Andover</td>
<td>KS</td>
<td>0.32%</td>
<td>0.74%</td>
<td>0.00%</td>
</tr>
<tr>
<td>St Josephs Hospital</td>
<td>Breeze</td>
<td>IL</td>
<td>0.47%</td>
<td>0.71%</td>
<td>-0.05%</td>
</tr>
<tr>
<td>Oklahoma Heart Hospital</td>
<td>Oklahoma City</td>
<td>OK</td>
<td>0.47%</td>
<td>0.82%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Scripps Green Hospital</td>
<td>La Jolla</td>
<td>CA</td>
<td>0.52%</td>
<td>0.70%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Mayo Clinic Hospital</td>
<td>Phoenix</td>
<td>AZ</td>
<td>0.39%</td>
<td>0.67%</td>
<td>-0.17%</td>
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<tr>
<td>Saint James Hospital</td>
<td>Pontiac</td>
<td>IL</td>
<td>0.49%</td>
<td>0.66%</td>
<td>0.00%</td>
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<tr>
<td>Pikeville Medical Center</td>
<td>Pikeville</td>
<td>KY</td>
<td>0.47%</td>
<td>0.85%</td>
<td>-0.60%</td>
</tr>
<tr>
<td>Tanner Medical Center - Carrolton</td>
<td>Carrolton</td>
<td>GA</td>
<td>0.56%</td>
<td>0.69%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Oaklawn Hospital</td>
<td>Marshall</td>
<td>MI</td>
<td>-0.26%</td>
<td>0.65%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Oklahoma Heart Hospital South</td>
<td>Oklahoma City</td>
<td>OK</td>
<td>0.42%</td>
<td>0.66%</td>
<td>-0.03%</td>
</tr>
<tr>
<td>Rose Medical Center</td>
<td>Denver</td>
<td>CO</td>
<td>0.48%</td>
<td>0.68%</td>
<td>-0.03%</td>
</tr>
<tr>
<td>St Clare Hospital Hith Svcs</td>
<td>Baraboo</td>
<td>WI</td>
<td>0.38%</td>
<td>0.63%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Aurora Medical Center</td>
<td>Summit</td>
<td>WI</td>
<td>0.22%</td>
<td>0.63%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Memorial Mission Hospital And Asheville Surgery Co</td>
<td>Asheville</td>
<td>NC</td>
<td>0.30%</td>
<td>0.62%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Grand View Hospital</td>
<td>Sellersville</td>
<td>PA</td>
<td>0.25%</td>
<td>0.70%</td>
<td>-0.13%</td>
</tr>
<tr>
<td>Mary Greeley Medical Center</td>
<td>Ames</td>
<td>IA</td>
<td>0.50%</td>
<td>0.70%</td>
<td>0.00%</td>
</tr>
<tr>
<td>St Lukes Hospital</td>
<td>Chesterfield</td>
<td>MO</td>
<td>-0.01%</td>
<td>0.60%</td>
<td>-0.85%</td>
</tr>
<tr>
<td>Falmouth Hospital</td>
<td>Falmouth</td>
<td>MA</td>
<td>0.21%</td>
<td>0.65%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>
Largest Combined Penalty in US was – 2.57%

<table>
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</thead>
<tbody>
<tr>
<td>Saint Michael's Medical Center, Inc.</td>
<td>Newark</td>
<td>NJ</td>
<td>-0.24%</td>
<td>-1.00%</td>
<td>-1.24%</td>
</tr>
<tr>
<td>Great River Medical Center</td>
<td>Blytheville</td>
<td>AR</td>
<td>-0.62%</td>
<td>-1.00%</td>
<td>-1.62%</td>
</tr>
<tr>
<td>Livingston Regional Hospital</td>
<td>Livingston</td>
<td>TN</td>
<td>-0.02%</td>
<td>-1.00%</td>
<td>-1.02%</td>
</tr>
<tr>
<td>Madison River Oaks Medical Center</td>
<td>Canton</td>
<td>MS</td>
<td>-0.09%</td>
<td>-1.00%</td>
<td>-1.09%</td>
</tr>
<tr>
<td>Holzer Medical Center</td>
<td>Gallipolis</td>
<td>OH</td>
<td>-0.32%</td>
<td>-1.00%</td>
<td>-1.32%</td>
</tr>
<tr>
<td>Desoto Memorial Hospital</td>
<td>Arcadia</td>
<td>FL</td>
<td>-0.52%</td>
<td>-0.50%</td>
<td>-1.02%</td>
</tr>
<tr>
<td>Medical Center Of Southeastern Oklahoma</td>
<td>Durant</td>
<td>OK</td>
<td>-0.80%</td>
<td>-1.00%</td>
<td>-1.80%</td>
</tr>
<tr>
<td>Baxter Regional Medical Center</td>
<td>Mountain Home</td>
<td>AR</td>
<td>-0.25%</td>
<td>-1.00%</td>
<td>-1.25%</td>
</tr>
<tr>
<td>Pineville Community Hospital</td>
<td>Pineville</td>
<td>KY</td>
<td>-0.26%</td>
<td>-1.00%</td>
<td>-1.26%</td>
</tr>
</tbody>
</table>
Why do Smaller Hospitals Tend to Have Higher Readmission Rates?
Analytics: Improving Insight and Business Value

Descriptive Analytics
- What happened?
- Reporting, dashboards

Diagnostic Analytics
- Why did it happen?
- Ad-hoc query, data mining

Optimization
- Foresight
- Prospective

Value

Horizon, Difficulty

Original Source: Gartner Business Intelligence & Analytics Summit 2013 (Blue)
DataVision Readmission Toolpack is a Diagnostic Analytic Tool
AHRQ Analysis on 2010 Data
Released July 27, 2013

Readmission Rates by Payer

Medicaid and Medicare patients have a higher percentage of readmissions than other payers

- Procedure: Amputation of lower extremity
- Diagnosis: Congestive heart failure

<table>
<thead>
<tr>
<th>Payer</th>
<th>Readmission Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicare</td>
<td>26%</td>
</tr>
<tr>
<td>Medicaid</td>
<td>22%</td>
</tr>
<tr>
<td>Privately Insured</td>
<td>17%</td>
</tr>
<tr>
<td>Uninsured</td>
<td>13%</td>
</tr>
<tr>
<td>Medicare</td>
<td>30%</td>
</tr>
<tr>
<td>Privately Insured</td>
<td>25%</td>
</tr>
<tr>
<td>Uninsured</td>
<td>17%</td>
</tr>
</tbody>
</table>

*Readmissions were for all causes and did not necessarily include the same procedure or diagnosis as the original admission (index stay).*

Source: HCUP Statistical Briefs #153 and #154:
http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp

H-CUP
Agency for Healthcare Research and Quality
Advancing Excellence in Health Care • www.ahrq.gov

Midas+®

xerox®
Recent Findings show Community Factors NOT Hospital Factors Account for 58% of Variation in Hospital Readmission Rates


Demographic factors associated with **Higher** readmission rates include:
- Proportion of the population never married
- Number of Medicare beneficiaries *per capita*
- Low education area status

Demographic factors associated with **Lower** readmission rates include:
- Rural areas
- Retirement areas
- Primary care access (physician mix)
- Quality of Nursing Homes

**Conclusion:** “*Hospital readmission rates might be more effectively reduced if community-based readmission reduction strategies are added to ongoing, hospital-focused improvement efforts.*”
Are Readmission Penalties Creating Healthcare Disparities?

% Readmission Penalty for FY2014

Wage Index of County Associated with 3379 U.S. hospitals

Midas+®
xerox®
Chartbook 2013 Observation Stays On The Rise

Looks like we’re just readmitting patients as observation status!

AMI, Heart Failure, and Pneumonia

Did the use of observation stays after hospitalization for AMI, heart failure, and pneumonia change with the start of public reporting?

Figure A.27. Trend in Median Observation Stay Rates, 2008-2010

Observation stays are a subset of return-to-hospital events that have recently garnered significant media attention. CMS defines observation stays as services furnished by a hospital which are reasonable and necessary to determine the need for a possible inpatient admission. CMS currently does not count these events as outcomes in the publicly reported readmission measures. Although CMS has noted an overall increase in observation stay utilization in recent years, observation stay trends related to hospitalization for AMI, heart failure, and pneumonia have not been specifically examined. There appears to be a slight increase in the number of observation stays without readmission over the past three years following a hospitalization for AMI, heart failure, or pneumonia. However, this increase seems to have begun prior to public reporting.

Return-to-hospital rates after hospitalizations for AMI, heart failure, and pneumonia were stable from 2008 to 2010. Public reporting is not associated with a change in return-to-hospital rates.

Unlike return-to-hospital rates, rates of observation stays after hospitalizations for AMI, heart failure, and pneumonia increased by 0.5%, 0.4%, and 0.3% respectively between 2008 and 2010. The start of public reporting in July 2009 is not associated with a change in observation stay utilization.
Is the trend in hospital-level observation stays and ED visits following AMI hospitalizations continuing to rise?

FIGURE A.2.17. Trends in the Median Hospital’s Readmission Rate, Emergency Department Visit Rate and Observation Stay Rate for AMI, July 2009 – June 2012.

Observed Readmission Rate (Observed)

Emergency Department Visit Rate (Observed)

Observation Stay Rate (Observed)
More Patients Readmitted to Observation Status

% Inpatient Discharges Readmitted within 30 Days to Observation/Short Stay Status
MidasPlus, Inc. Comparative Database (N = 793 Hospitals)

Q1 09 Q2 09 Q3 09 Q4 09 Q1 10 Q2 10 Q3 10 Q4 10 Q1 11 Q2 11 Q3 11 Q4 11 Q1 12 Q2 12 Q3 12 Q4 12 Q1 13 Q2 13 Q3 13 Q4 13

0.00% 0.20% 0.40% 0.60% 0.80% 1.00% 1.20% 1.40% 1.60% 1.80%
Potentially Preventable Readmissions

Uses computerized methodology to give us clues about why readmissions are occurring.
Study Finds Automated Software Methods Inadequate to Replace Manual Review for Identifying Potentially Preventable Readmissions


- “Automated classification identified 78% (358) of readmissions as potentially preventable.
- Manual classification identified 47% (227)
- Overall, the methods agreed about the preventability of 56% (258) of readmissions.
- Using manual review as the reference, the sensitivity of 3M PPR was 85% and specificity was 28%”
Analytics: Improving Insight and Business Value

Descriptive Analytics
What happened?
Reporting, dashboards

Diagnostic Analytics
Why did it happen?
Ad-hoc query, data mining

Predictive Analytics
What will happen?
Statistics, planning

Prescriptive Analytics
What should happen?
Simulation, optimization

Value
Horizon, Difficulty
Insight
Concurrent
Optimization
Foresight
Prospective

“Big Data”

Original Source: Gartner Business Intelligence & Analytics Summit 2013 (Blue)
“Big Data”

“Big Hype”
or

“Big Opportunity”?
Big Data

1) Volume

Data is measured in terabytes or petabytes

THE WORLD’S INFORMATION IS DOUBLING EVERY TWO YEARS, with a colossial 1.8 zettabytes to be created and replicated in 2011.

New information being created in 2011 also includes replicated information such as shared documents or duplicated DVDs.

In terms of sheer volume, $1.8 \text{ ZB}$ of data is equivalent to:

- Every person in the United States tweeting for 3 tweets per minute
- Over 200 billion HD movies each 120 minutes long

4,320 tweets per day per person for 26,976 years non-stop

it would take one person 47 million years of 24/7 viewing to watch every movie

Borrowed from Cognizant 20-20 insights/September 2012
Follow Me on Twitter
https://twitter.com/MidasXerox
Big Data Requires Scalable Storage

1) Volume

- Data is measured in terabytes or petabytes
- Requires scalable storage

Storing 1.8 ZB of information would take:

57.5 billion
32 GB Apple iPads

With that many iPads we could build a mountain of iPads that is 25-times higher than Mount Fuji

Mount Fuji 3,776 miles
Mount iPad 94,400 miles

Borrowed from Cognizant 20-20 insights/September 2012
Big Data

2) Velocity

✓ Processed in real or near-real time
Big Data

3) Variety

- Aggregation of many types of data (structured and non-structured)
- Support for complex queries and correlations

Advanced Analytics
Analytics: Improving Insight and Business Value

Descriptive Analytics
What happened?
Reporting, dashboards

Diagnostic Analytics
Why did it happen?
Ad-hoc query, data mining

Predictive Analytics
What will happen?
Statistics, planning

Prescriptive Analytics
What should happen?
Simulation, optimization

Value

Optimization
Foresight
Prospective

Horizon, Difficulty

Information
Hindsight
Retrospective

Insight
Concurrent

Original Source: Gartner Business Intelligence & Analytics Summit 2013 (Blue)
Data is to Analytics like Wheat is to Bread!

Lots of stuff has to happen before we can bake!
Machine and Statistical Learning is the Secret Recipe!

It’s not about churning all the data through a machine…it’s about the SCIENCE that the computer science team brings to the methodology and the ART that they bring to interpreting the data!

- MS and PhD Statisticians
- Computer Scientists
- Data Scientists
- Data Analysts
- Clinical Researchers
- Xerox Research Center India
- Palo Alto Research Center (PARC)
A New Paradigm

Instead…..90% of the data scientist’s time is spent on computational manipulation to optimize the relationship between the predictors and the outcome

Data Discovery

✓ Is it a particular beta blocker?
✓ Is it a particular dose?
✓ Is it time between surgery and drug?
✓ Is it time between admission and drug?
✓ Is it time between discharge and drug?
✓ Is it related to other drugs?
✓ Is it related to gender?
✓ Is it related to age?
✓ Is it related to ejection fraction?
✓ Is it related to renal insufficiency?
✓ Is it…..
✓ Is it…..
✓ Is it…..
Complex Modeling Techniques for Data Manipulation and Probability Computation

- Linear or Logistical Regression
- Lasso
- Neural Networks
- Support Vector Machine
- Random Forests/Boosted Trees
- Hierarchical Clustering
Our Master Chef of Midas+ Advanced Analytics

Jim Kirkendall, VP Analytics
Decide What to Bake

1) Predictive Analytics to Help Hospitals Estimate the Financial Impact on their Readmission Performance

2) Predictive Analytics to Help Hospitals Identify Which Patients are at Highest Risk for Readmission

3) Algorithms to predict clinical decline and transfer to critical care

4) Algorithms to predict payment denials

5) Algorithms to risk adjust severity of illness and risk of mortality on “in-house” patients to strengthen our predictive analytics
Get the Data Ingredients… and Lots of it!

• **Midas+ Live Data**
  - Demographics
  - Historical Claims
  - Previous comorbidities
  - Lab tests and results
  - Medications
  - Clinical Documents
  - Radiology Reports
  - Vital Signs

• **Medicare Claims**
  - 3 years hospital inpatient
  - 3 years Part B outpatient
  - 3 years Home Care,
  - 3 years SNF
  - 3 years Hospice

• **Public Files**
  - Wage Index by County

• **Future Possibilities**
  - Retail Pharmacy Claims
  - Crimcheck™
  - Property Values
  - Income and credit scores
  - Census data
  - Educational level
  - Gallup Analytics
Payer Silos Breaking Down to Release the Power of All-Payer Claims Data

WEDNESDAY, MAY 14, 2014
TODAY'S HEALTHCARE IT NEWS HEADLINES

» Health plan giants to make payment data accessible to public
A new initiative by three of the country's largest health plans has the potential to transform the accessibility of claims payment data, according to healthcare finance experts. UnitedHealthcare, Aetna and Humana announced a partnership on Wednesday with the Health Care Cost Institute to create a payment database that will be available to the public for free.
Preparing Our Data…

• **Leveraging Midas+ Implementations**: Clinical and administrative interfaces and mapping established at the time of Midas+ installs (*minimizes rework & increases data quality!*)

• **Natural Language Processing Engine Using SyTrue**

![Midas+ logo](Midas+ logo)

![SyTrue logo](SyTrue logo)
Natural Language Processing

Non-Structured Data
- History & Physicals
- Operative Reports
- Imaging Results
- Consultant Notes
- Discharge Summaries
- Progress Notes

Structured Data
- Real time ICD-9 Dx codes
- RxNorm Codes
- LOINC Codes
- SNOMED Codes
- Temporal variables
- Ejection Fractions
- More!

Midas+ will transform non-structured data into ICD-9 and ICD-10 codes in “real time” to “risk adjust” data to strengthen our predictors.
For Meaningful Use, we were only able to get the RxNorm Codes for some hospitals and for some concepts. Now we can get the RxNorm Codes for ALL hospitals and ALL concepts.
Natural Language Processing

Do Beta Blockers Correlate to Readmission Risk?

Now we can know if it is ANY Beta Blocker or a Particular Drug/Dose or if the Drug is Influenced by Other Variables

Midas Hospital Dictionaries

- Inderal……………………………….…123456.
- Inderol………………………………….123456
- Inderal LA……………………………...233445
- Inderide………………………………..334455
- Inderide LA…………………………...333377
- Propranolol…………………………….556677
- Propranolol hydrochloride……………556677
- InnoPran……………………………….589991
- InnoPran XL……………………………589982

RxNorm Codes

Other Variables

- Time from admit
- Time to surgery
- Time to discharge
- Pain Medications
- Ejection Fraction
- Renal Clearance
- Gender
- Age
Link Patients Known to Midas+ Live to their Cross Continuum Claims

Midas Live Hospital Encounter 123456
Non-Midas+ Medicare Hospital Claim 78910
Medicare SNF Claim 22334455
Medicare Home Health Claim 66778899
Drug Claims

Mrs. JoAnn Brown

Episodes of Care Created for Patients in Midas+

Midas+ Annual Symposium Clinical & Application Effectiveness

xerox®
Methodology for Ensuring Privacy

• PHI Warehouse
  – Initially links patients known in Midas+ with other claims occurring outside of Midas+ in the care continuum
  – Also links patients across Midas+ hospitals
  – No direct connection to research database
  – Only clients who subscribe to Midas+ predictive analytics will be able to view patient identifiable information on their alerts
  – Limited access to only three persons in Xerox
Methodology for Ensuring Privacy

• Research Data Warehouse
  – Deidentified episodes of care here
  – Contains all data known about individuals e.g. 
    # ED visits, # doctors office visits, past 
    diagnoses and procedures, medications, 
    laboratory tests, socio-demographics, marital 
    status, ethnicity, payer and more
  – Algorithms and variables used for prediction 
    identified and tested here
  – Limited internal access by Xerox computer 
    scientists, statisticians, developers, analysts 
    and researchers
CLIENT

Cloud-based Service Bus

- PHI Warehouse
- Analytics Data Warehouse

1) Produces a Predictive Alert
• PHI Warehouse

2) Delivers Predictive Alert to an alert staging area

• Analytics Data Warehouse
3) Retrieve Patient Identifiers

- PHI Warehouse
- Research Data Warehouse
4) Client Consumes Predictive Alert and Patient Identity

- PHI Warehouse
- Research Data Warehouse

Client always Checking for New Stuff
4) Client Consumes Predictive Alert and Patient Identity

Readmissions Alert Content

- Patient Account Number
- Probability of readmission
- Client can decide the thresholds to display for the alert
- Top five contributing variables
- Temporal information pertinent to the alert
5) Displays Predictive Alert in Midas+ or Any Application of Choice
Midas+ Advanced Analytics Deployed Across Different Applications

- ICU Alerts in Midas+ Live
- Payment Denial Alerts in Your EMR
- Readmission alerts in Midas+ Care Management

Calculation of Correlations in Cloud-based Service Bus (along with descriptive Information to link probability to the right encounter)
Store the Data

- Xerox Data Center
- Detroit, MI
- High reliability
- High redundancy
Challenges of Advanced Analytics

• Getting the data is just the beginning of the journey
• Need for Data Governance at Local Levels
• Timeliness of data
• Better access to longitudinal data
  – Issues of fragmentation and propriety (silos)
• Access to patient self-reported data (non-claims)
• Privacy and security
• Normalization and standardization
• Implications of regionalization and globalization
How Will Advanced Analytics Change Healthcare?

If we could know x….then we could DO y.

The Drivers for Change

- Healthcare model is being turned upside down
- Increased pressure to improve quality of care while lowering costs.
- Patients want more information about their healthcare options
- Caregivers and Administrative staff need real-time actionable intelligence to impact decision making.
Analytics: Improving Insight and Business Value

Descriptive Analytics
What happened?
Reporting, dashboards

Diagnostic Analytics
Why did it happen?
Ad-hoc query, data mining

Predictive Analytics
What will happen?
Statistics, planning

Prescriptive Analytics
What should happen?
Simulation, optimization

Value

Horizon, Difficulty

Original Source: Gartner Business Intelligence & Analytics Summit 2013 (Blue)
Healthcare of the Future
Patient Centric or Provider Centric?
Watch Us Innovate!

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Clinical & Application Effectiveness

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Analytics: Improving Insight and Business Value

Descriptive Analytics
*What happened?*
Reporting, dashboards

Diagnostic Analytics
*Why did it happen?*
Ad-hoc query, data mining

Predictive Analytics
*What will happen?*
Statistics, planning

Prescriptive Analytics
*What should happen?*
Simulation, optimization

Qualitative Analysis
*Who did it happen to?*
Stories, Experiential

Original Source: Gartner Business Intelligence & Analytics Summit 2013 (Blue)
Vicky Mahn-DiNicola 2014 (Purple)
Thank you!

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