Predictive Modeling for Improved Outcomes & Quality Performance

March 26, 2015

Presented by:
Scott Zasadil
Chief Scientist, UPMC Health Plan

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Executive Vice President, Cognisight
UPMC Health Plan

Part I:
Predictive Modeling for Improved Outcomes & Quality Performance
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Scott Zasadil, Chief Scientist
Levels of Analytics Framework

10% of patients account for 70% of all healthcare expenditures
  - Goal: Use Predictive Modeling to identify these patients

Predictive Modeling \rightarrow identify patterns in data
  - Requires an Enterprise Data Warehouse (EDW) and Disease Registry

Any knowledge that is uncovered can potentially be useful
  - An informed decision is better than random guessing
Uses prior utilization to
- Identify health risks and their importance
- Forecast future medical/Rx utilization
  - Goal of risk stratification is to make comparisons between similar patient populations

Expansion of input variables due to adoption of electronic health records
- EHRs are highly variable

Predictive Modeling tools tend to be opaque
- Clinical judgment is needed to be effective
  - A risk score by itself is not actionable
Predictive Modeling Applications

- Care management
- Premium setting
- Quality monitoring and improvement
- Provider performance assessment
- Predict admissions, readmissions, and ED use
  - Models are not very accurate
Data Sources

**Medical and Behavioral Conditions**
- COPD
- CHF
- Diabetes
- Depression, anxiety

**Administrative**
- Member enrollment
- Line of business
- Employer/Market
- Exclusion list
- Contact info
- Zip Code

**Clinical**
- Lab values
- Blood pressure
- BMI
- Cholesterol
- Provider visits

**Financial**
- Inpatient cost
- Pharmacy cost
- Overall medical cost
- Dental cost
- Vision cost

**Quality/HEDIS**
- Time since PCP visit
- Preventive screenings
- Cancer screening
- Condition specific measures

**Service Utilization**
- Number and length of inpatient admissions
- ED visits
- Condition specific measures

**Pharmacy Utilization**
- Number of prescriptions filled in 12 months
- Condition and drug specific measures

**Member Self-Report**
- Medical history
- Depression screen
- Alcoholism screen
- Tobacco use
- Stress level

UPMC Health Plan
Issues with Healthcare Data

- Non-normal data
- Rare outcomes
- Numerous ICDs, CPTs, and DRGs
  - Increased opportunities for data entry errors
  - Aggregate using Clinical Classification Software (CCS) and Berenson Eggers Type of Service (BETOS)
- Diagnosis may depend upon the physician
- Accounting for illness severity
  - Charlson Comorbidity Index
  - Hierarchical Condition Categories (Medicare only)
Illness Severity/Case Mix Measures

- Charlson Comorbidity Index (CCI)
- Adjusted Clinical Groups (ACG)
- Chronic Disease Score (CDS)
- $R_x$ Risk
- *Area Deprivation Index (ADI)*
- Disease or Pharmacy Count
- E&M Visits

- *From a modeling perspective, the type of illness is usually not the main driver of resource utilization*
Admits for Medicare Patients

The number of MDCs is a strong driver of admits – not any specific MDC by itself.

Source: J. Wolff et al, Archives of Internal Medicine, 2002
Dangers of Using a Threshold Model: Regression to the Mean

Danger of chasing the money
Expenditures decrease in Year 2, even without intervention.
Many models, e.g. Neural Networks, are black boxes
Caregivers are mostly interested in the high readmit rate predictions
Physicians prefer easy to follow sets of rules

- HOSPITAL Readmission Model

- Hemoglobin at discharge
- Oncology
- Sodium level at discharge
- Procedure during index admission
- Index Type of admission (elective vs. non-elective)
- Admissions during previous 12 months
- Length of stay
Find Easy to Understand Rules, cont.

Decision Tree for 30 Day Readmission

- Medical
  - Cancer
    - Alcohol Abuse
      - CHF
    - Renal Disease
  - Diabetes
- Surgical

UPMC HEALTH PLAN
Nearly all models focus on
  • A specific population
  • A specific disease
  • A single hospital
    ▪ 18% of all 30 day readmits occur at a different hospital

Target (30-day readmit) is a relatively short window
  • Target is small which makes modeling a challenge

Models do not focus on actionability

Any improvement over the base readmit rate is valuable

Can be used to perform hospital profiling
Identification of Patients at Risk for Readmission

  - 159 discharges
  - Age ≥ 65
  - Evaluated readmission predictions from: Attending Physician, Resident Physician, Intern Physician, Case Manager, Nurse
    - None of the predictions differed from chance
Avoidable Readmissions

  - Review of 34 studies
  - 27% of readmissions are avoidable

  - 4812 discharges
  - Readmissions reviewed by at least 4 physicians
    - 16% of the readmissions were potentially avoidable
Causes of Readmissions

  - 537 Readmissions
  - Most frequent cause was lack of referral to auxiliary services
  - Medication error was a contributing cause in 28% of all avoidable readmissions
    - 23% of patients identified lack of medication information as being a factor
Focus on ambulatory care sensitive conditions
  • Asthma, Diabetes, Heart Failure, Hypertension, etc.
Focus on gaps in care
Patient activation measure
Similarities to previous patients
  • Can model using K Nearest Neighbors (KNN)
Modeling which patients are actionable is the most critical area that needs to be addressed by predictive models
  • Vendor tools are too general
  • In-house data scientists lack the required skill set
Part II: Predictive Modeling for Improved Outcomes & Quality Performance
March 26, 2015

Presented by:
Kim Browning, CHRS, PMP, CHC
Executive Vice President
Today’s Agenda

- Objectives
- Top Line Revenue
- Infrastructure & Operations
- Predictive Modeling Works
  - Care management services
    - Care management risk score
  - Dashboard
  - Provider engagement
  - STARs impact
- Samples & Resources
- Q&A
Objectives

- How to impact top line revenue and manage utilization costs to improve bottom line
- Get beyond the rhetoric
- Actionable items that work
Risk adjustment impact
- Persistency and suspects
  - Persistency = elementary intervention
  - Suspects = use of algorithms to predict likeliness of a condition
    - The stronger the analytics, the better the results
    - Predictive modeling isn’t used to prevent services; rather to ensure conditions are captured

Predictive modeling premise to anticipate member status changes
- Get out in front of them
  - ESRD
  - Duals
  - Disabled
  - Aged
Begin with organizational infrastructure and resource support in place

- Doesn’t have to be perfect to get started
- Work with what you can—any informed action is better than guessing
- Work the output!
Current state: assemble all patient data with multiple data source integration
Predictive modeling works
  
  - Greater Rochester Independent Practice Association (GRIPA)
    
    - Uses predictive modeling to provide care management services
      
      ▪ Chronic condition management
      ▪ Cardiac risk management
      ▪ Diabetes prevention
      ▪ Clinical Rx program
- Chronic condition management
  - Strive for reduced ED visits and admissions—timely A1c, FLP, visits for with CAD and DM

- Cardiac risk management
  - Target hyperlipidemia and HTN—timely visits, kidney function testing, FLP

- Diabetes prevention
  - Target high risk members
• Elements of care management risk score
  o 16 Chronic conditions and their associated co-morbidities
  o Utilization markers
    • # ED visits
    • # Hospital visits
    • # Physician visits
  o Socio-economic marker
    • Zip code
• Patients/members are scored and managed
  o Patient outreach report
  o Refreshed monthly
- **Budget is managed via Dashboard**
  - **Pharmacy cost savings: 50%**
    - Pharmacist(s) and CMO outreach
  - **High cost/high risk patients: 25%**
    - Top 1–2% of patients; proactively closing gaps
    - Coordinated care network
  - **Readmission reduction: 25%**
    - Better transitions of care
    - Includes home visits with medication reconciliation and developing care plans

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Provider Engagement

- **Budget is managed by provider engagement**
  - CMO review of physician performance
  - Clinical Integration Committee review
    - PCPs
    - SCPs
  - Physician incentive
    - $ based on individual performance
  - Recruitment influence

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Ensure providers know their high risk patients
  - Providers, know your high risk patients and give them a “free pass”
  - Squeeze the patient in
    - Prevents admissions or re-admissions

Mark H. Belfer, DO, FAAFP
Chief Medical Officer, Cognisight & GRIPA
STARs Impact

- Care Management + Provider Engagement = Closing Gaps in Care

Drive the Results

- STARs will follow
- Patient literature
- Patient dashboard
- High cost Rx outreach
- Financial dashboard
- Readmission intervention programs literature references
- GRIPA’s Value Report

GripaConnect.com
  - Real-time data reports at your fingertips
  - Let’s you proactively manage patient care

Care management support team
  - Full service, multi-disciplinary team to facilitate patient health improvements

GRIPA support team
  - Provide customized support to help physician practices optimize their patient performance and results

Accountable Care communication support resources
  - Missing lab reports
  - High cost drug reports
  - Patient outreach reports
# Patient Dashboard Report

**Date:** 12/9/2011

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>DOB</th>
<th>Age</th>
<th>M/F</th>
<th>PCP</th>
<th>Contract Name</th>
<th>Payer Subcode</th>
<th>Start Month</th>
<th>End Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASHLEY, STEPHEN</td>
<td>11/14/1949</td>
<td>62</td>
<td>M</td>
<td>Ip, Guy R.</td>
<td>Excellus</td>
<td>1234568-001</td>
<td>2009-01</td>
<td>2011-10</td>
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</table>

**Conditions**
DM, HTN, Hyperlipidemia, Obesity

**Care Management Involvement**

<table>
<thead>
<tr>
<th>CMS Status</th>
<th>Max CMS Date</th>
<th>RN</th>
<th>SW</th>
<th>Pharm</th>
<th>ES</th>
<th>DM CM</th>
<th>CMS Score</th>
</tr>
</thead>
</table>

**RGHS Appt Date**
(No appt, scheduled)

<table>
<thead>
<tr>
<th>Hospital Admission</th>
<th>Admit Date</th>
<th>Discharge Date</th>
<th>Readmit?</th>
<th>MD Seen in 14 Days?</th>
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## Lab Results

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
<th>2008</th>
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<td>11/14/2011</td>
<td>06/17/2010</td>
<td>06/16/2010</td>
<td>06/22/2009</td>
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<td>03/22/2011</td>
<td>06/17/2010</td>
<td>07/1/2010</td>
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<tr>
<td></td>
<td>06/17/2010</td>
<td>07/1/2010</td>
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<tr>
<td></td>
<td>06/16/2010</td>
<td>06/13/2010</td>
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<tr>
<td></td>
<td>03/13/2010</td>
<td>03/23/2010</td>
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<tr>
<td></td>
<td>06/16/2009</td>
<td>09/09/2009</td>
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<table>
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<tr>
<th>A1c</th>
<th>6.4</th>
<th>7.5</th>
<th>7.7</th>
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<tbody>
<tr>
<td>Cholesterol</td>
<td>174</td>
<td>155</td>
<td>138</td>
<td>139</td>
</tr>
<tr>
<td>Cholesterol Non-HDL</td>
<td>143</td>
<td>127</td>
<td>108</td>
<td>119</td>
</tr>
<tr>
<td>CRP</td>
<td>&gt;50</td>
<td>&gt;59</td>
<td>&gt;59</td>
<td>&gt;59</td>
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<tr>
<td>HCT</td>
<td>47</td>
<td>43</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>HDL</td>
<td>31</td>
<td>29</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>HGB</td>
<td>13.9</td>
<td>14.7</td>
<td>14.5</td>
<td>14.5</td>
</tr>
<tr>
<td>LDL</td>
<td>94</td>
<td>82</td>
<td>74</td>
<td>84</td>
</tr>
<tr>
<td>Microalbumin/Creat Ratio</td>
<td>0.7</td>
<td>0.1</td>
<td>5.6</td>
<td>4.9</td>
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<tr>
<td>Serum Creatinine</td>
<td>1.0</td>
<td>1.0</td>
<td>0.8</td>
<td>1.1</td>
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<tr>
<td>Serum Glucose</td>
<td>147</td>
<td>189</td>
<td>154</td>
<td>177</td>
</tr>
<tr>
<td>Serum Potassium</td>
<td>4.6</td>
<td>4.6</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>244</td>
<td>225</td>
<td>168</td>
<td>176</td>
</tr>
<tr>
<td>TSH</td>
<td>1.35</td>
<td>2.05</td>
<td>1.05</td>
<td>1.58</td>
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**Physician Visits**

<table>
<thead>
<tr>
<th>Provider Full Name</th>
<th>Specialty</th>
<th>Recent Visit Date</th>
</tr>
</thead>
</table>

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### GRIPA Accountable Care Medical Program

#### High Cost Drug Outreach

The High Cost Drug Outreach report identifies GRIPA contracted members who have an opportunity to initiate a lower cost drug substitution.

**Physician:** Smith, John

**Report Source:** Claims data for prescriptions filled 4/1/2012 through 6/27/2012

<table>
<thead>
<tr>
<th>Last Name</th>
<th>First Name</th>
<th>DOB</th>
<th>M/F</th>
<th>Drug Class</th>
<th>Drug Name (High Cost)</th>
<th>Days Supply</th>
<th>Qty</th>
<th>Date Last Filled</th>
<th>Next Fill Date (Expected)</th>
<th>Co Pay (Current)</th>
<th>Co Pay (Lower Cost)</th>
<th>Drug Name (Lower Cost)</th>
<th>Savings to Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doe</td>
<td>John</td>
<td>2/25/1958</td>
<td>M</td>
<td>Statins</td>
<td>Crestor Tablets 20 mg</td>
<td>90</td>
<td>90.00</td>
<td>5/22/2012</td>
<td>8/20/2012</td>
<td>--</td>
<td>--</td>
<td>Crestor 40 mg 1/2 tablet</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Atorvastatin 80 mg</td>
<td></td>
</tr>
</tbody>
</table>

Please direct comments and questions to:

GRIPA Provider Relations 100 Kings Highway South, Suite 2500 Rochester, NY 14617
Phone: (585) 922-1525 Fax: (585) 922-0016 Email: gripa.network@rochestergeneral.org

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## Financial Dashboard

### GRIPA Dashboard

Prepared xx/xx/xx; See "Report Period" for data timing

### Foundational Information

<table>
<thead>
<tr>
<th>Membership</th>
<th>Baseline</th>
<th>Current</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACQA: Commercial Members</td>
<td>166,252</td>
<td>126,152</td>
<td>11/14</td>
<td></td>
</tr>
<tr>
<td>ACQA: Medicare Adv. Members</td>
<td>13,761</td>
<td>21,423</td>
<td>7/14</td>
<td></td>
</tr>
<tr>
<td>ACQA: Members $&gt;525k at Attachment Pt.-Yr 2</td>
<td>19</td>
<td>12,282</td>
<td>9/14</td>
<td></td>
</tr>
<tr>
<td>MSIP ACO: Members</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ACQA Quality Metrics

<table>
<thead>
<tr>
<th>Points Earned Out of 100 Possible</th>
<th>Baseline</th>
<th>Target</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>65.3</td>
<td>90.0</td>
<td>95.7</td>
<td>10/13</td>
</tr>
<tr>
<td>Year 2</td>
<td>37.0</td>
<td>90.0</td>
<td></td>
<td>10/14</td>
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</tbody>
</table>

### ACQA Cost Saving Metrics

<table>
<thead>
<tr>
<th>Pharmacy Savings Achieved: Year 1</th>
<th>Prior</th>
<th>Target</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$800,000</td>
<td>$814,000</td>
<td></td>
<td>12/13</td>
</tr>
<tr>
<td>Pharmacy Savings Achieved: Year 2</td>
<td>$5,400,000</td>
<td>$3,350,000</td>
<td></td>
<td>11/14</td>
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<tr>
<td>30 Day Readmissions/1,000 (Commercial)</td>
<td>11/14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Day Readmissions/1,000 (Medicare)</td>
<td>11/14</td>
<td></td>
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<td></td>
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</table>

### ACQA Utilization Metrics

<table>
<thead>
<tr>
<th>IP Admission Rate/1,000 (Commercial)</th>
<th>Benchmark</th>
<th>Prior</th>
<th>Current</th>
<th>On Target</th>
<th>Report Period</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11/14</td>
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<tr>
<td>IP Admission Rate/1,000 (Medicare)</td>
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<td></td>
<td></td>
<td></td>
<td>11/14</td>
</tr>
<tr>
<td>ED Usage Rate/1,000 (Commercial)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11/14</td>
</tr>
<tr>
<td>ED Usage Rate/1,000 (Medicare)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11/14</td>
</tr>
</tbody>
</table>

### High Cost/High Risk Care Mgmt. (CM)

<table>
<thead>
<tr>
<th>High Cost/High Risk Members in CM</th>
<th>Baseline</th>
<th>Target</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</table>

### ACQA Financial Status (Year 1)

<table>
<thead>
<tr>
<th>Variance: Medical Budget to Actual PMPM</th>
<th>Target</th>
<th>Current</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain allocated to GRIPA</td>
<td>$0.00</td>
<td></td>
<td></td>
<td>12/13</td>
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</table>

### ACQA Financial Status (Year 2)

<table>
<thead>
<tr>
<th>Variance: Medical Budget to Actual PMPM</th>
<th>Target</th>
<th>Current</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain/(Loss) allocated to GRIPA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ACQA Physician Engagement

<table>
<thead>
<tr>
<th>% of PCPs Utilizing POR</th>
<th>Target</th>
<th>Current</th>
<th>On Target</th>
<th>Report Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td></td>
<td>11/14</td>
</tr>
</tbody>
</table>

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Readmission Intervention Programs Literature

  - Simplified, easy to understand, patient instructions; follow-up phone calls; dedicated discharge advocate
  - Patients are 30% less likely to be readmitted or have an ED visit

  - 11 hospitals
  - 2% absolute reduction in readmission rate
Readmission Intervention Programs Literature, cont.

  - Randomized Control Trial for Age ≥ 65 and 1 of 11 specific diagnoses
For more information, please contact:

Kim Browning
(e) kbrowning@cognisight.com
(p) 585.662.4215
LinkedIn  www.linkedin.com/in/kimbrowning1