Readmission Analytics
Yesterday, Today, and Tomorrow

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22nd Annual Midas+ User Symposium
Session Objectives

1. Compare and contrast readmission analytics developed by Midas+ and CMS
2. Describe the scoring program tied to the Hospital Readmission Reduction Program
3. Review the 3M Potentially Preventable Readmissions methodology
4. Discuss predictive analytics models emerging in today’s marketplace and how to interpret their “predictive power”
5. Suggest workflow and dataflow requirements for “next generation” prescriptive analytics
Readmission Metrics Circa 1993

### Comparison of Quality Outcomes between Case Managed Group and Non-Case Managed Group DRG 107: Elective Coronary Artery Bypass

<table>
<thead>
<tr>
<th></th>
<th>Average Age of Patient</th>
<th>Average Length of Stay</th>
<th><strong>Total Readmission Days</strong></th>
<th><strong>Total Adverse Medical Outcomes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Managed Group</td>
<td>59</td>
<td>6</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>N=25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Case Managed</td>
<td>63</td>
<td>9</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>Group N=25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Non-elective readmissions 90 days after discharge
**Adverse medical outcomes as identified by Carondelet Quality Assurance MIDS System
Process for Evaluating Readmissions

- All Medical Records “pulled” for 50 patients
- Manual review of over 200 charts
- Arbitrary decisions made about which readmissions were expected vs. not expected
- Data findings were not easily verifiable
- Findings did not “match” readmission counts in our hospital information system
- HIS System readmission counts didn’t match those in Midas!
Backwards and Forward Readmission Rates

Hospital Encounter

Count of patients with previous encounter 30 Days Before Admission

Count of patients readmitted within 30 Days After Discharge
DataVision Navigator

Cardiac
- Coronary Atherosclerosis
- Chest Pain
- Angina
- Acute Myocardial Infarction
- Percutaneous Coronary Intervention (PCI)
- Primary Coronary Artery Bypass Graft
- Major Cardiovascular Procedures
- Atrial Fibrillation
- Congestive Heart Failure
  - Clinical Outcome Profile
  - Congestive Heart Failure - % Readmit within 30 Days
- Vascular
- Respiratory
- Pregnancy/Perinatal
- Musculoskeletal
- Genitourinary
- Digestive
- Endocrine/Metabolic
- Neoplasms
- Infections
- Pediatrics
- MS-DRG Coding Analysis
- Behavioral Health
- Facility Profile
- Physician Profiles
- Data Quality
- National Quality Improvement Projects
- Safety
- UserSelectable Indicator Functions

Compile Indicator Graphs

Start Month: 6/2012
End Month: 6/2012
No. of Comparison Years:
Reference by Fiscal Year:

Indicator
- Congestive Heart Failure - % Readmit within 30 Days

Facility
- Amy Memorial Hospital
Current Measure Definition for MIDAS+
Readmission Metrics
Congestive Heart Failure Readmissions within 30 Days

**Numerator Statement:** Non-elective inpatients returning for any cause as an acute care inpatient within 31 days of discharge from previous encounter

- **Inclusion Criteria:**
  - Inpatient readmission for any cause back to same facility
  - Day of discharge counts as zero
  - Includes All Payer Types

- **Exclusion Criteria:**
  - Outpatients or inpatient encounters for rehab, psychiatric, SNF or hospice care
  - Emergency Department admissions (encounter type emergency)
  - Admission status equivalent to “elective”

**Denominator Statement:** Count of acute care inpatients with a principal ICD-9 discharge diagnosis code of heart failure (defined the same as Hospital Quality Reporting populations defined by TJC and CMS)

- **Exclusion Criteria:**
  - Non-acute care encounters for rehab, psychiatric, SNF or hospice care
  - Inpatient delivery or newborn encounters
  - Discharge disposition equivalent to death
Midas+ Defined
CHF - % Readmit within 30 Days yields five qualifying patients in June

Drill-down takes you to the INDEX encounter, NOT the readmission
Measure Results Differ According to the Technical Specifications of the Measure

CMS Proxy 30-day Heart Failure Readmission Measure yields **only one** qualifying patient in June compared to the five patients in the Midas+ defined metric.
CMS Readmission Proxy Measure Definition in MIDAS+
Heart Failure CMS Readmission Reduction - % Readmit within 30 Days

**Numerator Statement:** Readmissions as an inpatient for any cause within 30 days of discharge from previous encounter. If index encounter has more than one qualifying readmission within the 30-day period the index encounter is counted only once.

**Inclusion Criteria:**
- Inpatient readmission for any cause back to same facility within 30 days of discharge
- Day of discharge counts as zero

**Exclusion Criteria:**
- Outpatients or inpatient encounters for rehab, psychiatric, SNF or hospice care
- Emergency Department admissions (encounter type emergency)
- Inpatient delivery or newborn encounters

**Denominator Statement:** Count of acute care inpatients with a principal ICD-9 discharge diagnosis code of heart failure (defined the same as Hospital Quality Reporting populations defined by TJC and CMS)

**Exclusion Criteria:**
- Patients less than 65 years of age at admission
- Payer Type equivalent to Medicare (excluding Medicare Advantage)
- Encounter is a readmission within 30 days of discharge of the previous encounter
- Length of stay longer than 365 days
- All encounters with overlapping dates (all are ignored)
- Discharge disposition equivalent to death, discharge to outside acute care or Left AMA
- Non-acute care encounters for rehab, psychiatric, SNF or hospice care
- Inpatient delivery or newborn encounters
CMS Readmission Proxy Measures in MIDAS+ close but not identical to metrics calculated by CMS
CMS Readmission Measures

- Calculated from Medicare Part A and B Claims Data
- Include readmissions back to ANY facility not just YOUR facility
- Individual hospitals and vendors can’t replicate exactly
- Complex Risk Model
- Getting more complex!

Note: The Hospital Readmissions Reduction Program includes only subsection(d) hospitals and hospitals paid under section 1814(b)(3) (i.e. Maryland hospitals), while the IQR calculations include non-Inpatient Prospective Payment System (IPPS) hospitals such as critical access, territories, and cancer hospitals, as well as Veterans Health Administration (VA) hospitals. Consequently, your hospital’s results for AMI, HF, and PN may differ from those calculated for IQR because they are calculated using a different set of hospitals.
CMS Readmission Measures

All derived from Medicare Claims

Inclusions for Index Admissions

• Medicare FFS Part A and B for 12 months prior to index admission

• VA beneficiaries (no 12-month enrollment requirement applies)

• Aged 65 years or over

• Admissions that were discharged and readmitted to same hospital on the same day with DIFFERENT diagnoses

Exclusions for Index Admissions

• Patients discharged and readmitted to same hospital on the same day with SAME diagnoses (the readmit will be combined with the previous index admission and considered to be one single encounter for measure purposes)

• In-hospital death

• Discharged against medical advise

• Less than 30 days post-discharge enrollment in Medicare FFS program

• Transferred to another acute care facility (admissions to another hospital within 1 day of discharge are considered transfers regardless of discharge disposition)

• Acute MI patients admitted and discharged on same day
Multiple Readmissions

• If a patient has more than one admission within 30-days, only the first one is counted as a readmission.

• No hospitalization will be counted as both a readmission and an index admission within the same measure.

• However, because the cohorts for the various readmission measure populations are determined independently, a readmission in one measure may qualify as an index admission in another CMS readmission measure.
Variables Used to Adjust Data in CMS Risk-standardized Readmission Rates

Variables Used

- Age
- Gender
- Cardiovascular disease*
- Comorbidities*
  - Renal Disease
  - COPD, Asthma, Pneumonia
  - Fluid & electrolyte imbalance
  - Urinary Tract Infection
  - Psychiatric Disorders
  - Liver or biliary disease
  - Drug or alcohol abuse
  - Peptic Ulcer Disease
  - Decubitus Ulcers
  - Anemia

Variables NOT used

- Admission source
- Discharge disposition
- Socioeconomic status

* Each clinical population, including the hospital-wide 30-day all cause readmission measure has slightly different variables for cardiovascular disease and comorbidities
Fractional Blobs
Really??

The Statistical Methods used by CMS for risk adjustment are documented here:

www.hospitalcompare.hhs.gov/staticpages/for-professionals/ooc/statistical-methods.aspx
Risk-standardized Readmission Rates

**Excess Readmission Ratio** = \( \frac{\text{Predicted Readmission Rate}}{\text{Expected Readmission Rate}} \times \text{National Unadjusted Readmission Rate} \)

**Excess Readmission Ratio** < 1 = lower-than-expected readmission rates (or better quality)

**Predicted Rate** = The number of readmissions predicted based on the hospital's performance with its observed case mix. Predicted values are based on hierarchical logistic regression models that include variables about the patient, such as age, gender, comorbid diseases and indicators of patient frailty.

**Expected Rate** = The number of readmissions expected on the basis of the nation's performance with that hospital's case mix.
Interval performance with overlap on either side of the crude unadjusted national rate are reported as “same as” other hospitals.
Interpreting QNET Reports

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

Interval performance with overlap on either side of the crude unadjusted national rate are reported as “same as” other hospitals.
Interpreting QNET Reports

Interval performance completely to the right of the national crude unadjusted national rate are “worse than” other hospitals.

Interval performance completely to the left of the national crude unadjusted national rate are “better than” other hospitals.
Hospital-specific Reports

- Go to qualitynet.org for your hospital’s HSR workbook
- Preview period started April 18, 2013
- Must be a QNET administrator to download into your secure inbox
# Your hospital's performance

## National and State Comparison

<table>
<thead>
<tr>
<th>Item Available on Hospital Compare</th>
<th>AMI 30-Day Readmission</th>
<th>HF 30-Day Readmission</th>
<th>PN 30-Day Readmission</th>
<th>THA/TKA 30-Day Readmission</th>
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</thead>
<tbody>
<tr>
<td>Your Hospital's Comparative Performance</td>
<td>Number of Cases Too Small&lt;sup&gt;*&lt;/sup&gt;</td>
<td>No Different than U.S. National Rate</td>
<td>Worse than U.S. National Rate</td>
<td>No Different than U.S. National Rate</td>
</tr>
<tr>
<td>Total Number of Discharges (Denominator) at Your Hospital</td>
<td>23</td>
<td>26</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>RSRR at Your Hospital</td>
<td>18.8</td>
<td>24.3</td>
<td>27.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Lower Limit of 95% Interval Estimate</td>
<td>15.6</td>
<td>20.0</td>
<td>18.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Upper Limit of 95% Interval Estimate</td>
<td>23.8</td>
<td>28.6</td>
<td>25.5</td>
<td>8.6</td>
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<tr>
<td>Crude Readmission Rate (Numerator/ Denominator) in the U.S.</td>
<td>18.3</td>
<td>23.0</td>
<td>17.0</td>
<td>5.4</td>
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</table>

## Additional Performance Information

<table>
<thead>
<tr>
<th>Total Number of Unplanned 30-Day Readmissions (Numerator) at Your Hospital</th>
<th>AMI 30-Day Readmission</th>
<th>HF 30-Day Readmission</th>
<th>PN 30-Day Readmission</th>
<th>THA/TKA 30-Day Readmission</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Crude Readmission Rate (Numerator/ Denominator) at Your Hospital</th>
<th>AMI 30-Day Readmission</th>
<th>HF 30-Day Readmission</th>
<th>PN 30-Day Readmission</th>
<th>THA/TKA 30-Day Readmission</th>
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</thead>
<tbody>
<tr>
<td>17.4</td>
<td>23.1</td>
<td>17.0</td>
<td>5.4</td>
<td></td>
</tr>
</tbody>
</table>

## Patient Detail for Readmissions

| Number that Performed Better than U.S. National Rate | 304 |
| Number that Performed No Different than U.S. National Rate | 3,983 |
| Number that Performed Worse than U.S. National Rate | 304 |
| Number of Cases Too Small | 158 |

## Table II.2: National and State Performance Categories for the HWR Measure

### Of the Total Number of U.S. Hospitals:

| Number | 4,809 |

### Of the Total Number of Hospitals in Your State:

| Number | 20 |

### Table II.3: Discharge-Level Information for the Hospital-Wide Readmission Measure

- **ID Number**: 1234567890
- **Provider ID**: 999999
- **Measure Specialty Cohort**: Medicine
- **HICN**
- **Medical Record Number**: 1234567890
- **Beneficiary DOB**: 01/01/1990

*To locate provider ID numbers (CMS Certification Numbers, or CCNs) and names Information table, which can be found here: https://data.medicare.gov/dataset/hospital-readmissions.*
Excess Readmission Ratio Replication Instructions

Resources
Hospital Readmissions Reduction Program

Timeline, PDF-17 KB (06/20/12) - a general timeline for the implementation of the proposed FY 2013 Hospital Readmissions Reduction Program.

Frequently Asked Questions, PDF-55 KB (06/20/12) - a list of questions and answers regarding the calculation and public reporting of the CMS 30-day Risk-Standardized Readmission measures for the Hospital Readmissions Reduction Program.

Excess Readmission Ratio Replication Instructions, PDF-60 KB (06/20/12) - instructions on how to replicate Excess Readmission Ratios. This document was included with each hospital's Hospital-Specific Report (HSR) and discharge-level data file along with an example of how to do the replication in Excel. If your hospital did not receive an HSR and would like the example of how to do the replication instructions, contact cms_readmissions_reduction@mathematica-mpr.com.

Fiscal Year 2013 Hospital Readmissions Reduction Program Measure Methodology Report, PDF-237 KB (6/20/12) - a detailed explanation of the methodology for the 30-day Risk-Standardized Readmission measures for the Hospital Readmissions Reduction Program.

Use the Hospital General Information table to locate provider ID numbers (CMS Certification Numbers, or CCNs) and names of hospitals. With provider IDs from the discharge-level data file accompanying the hospital-specific report (HSR), this table can also be used to determine where a patient was readmitted.
Medicare Hospital Quality Chartbooks


- Regional variation
- Racial disparities
- Reasons for readmissions
- Proportion by Medicare
- Small hospital data
- Large hospital data
- Measure methodology
Are Readmission Rates Associated with Public Reporting?

Public reporting is not associated with a reduction in readmission rates…
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.
Downward Trends in Acute MI 30-day Readmissions Reflected in DataVision Comparison Pool

Official Start Date
For Hospital Readmission Reduction Program
October 1, 2012
Stable Trend in Acute MI 30-day Readmissions Reflected when Process Phase Added

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 DataVision Comparison Pool

![CHF 30 Day Readmissions All Ages graph]

**Official Start Date**
For Hospital Readmission Reduction Program
October 1, 2012
Stable Trends Reflected in CHF 30-day Readmissions When Process Phase is Added
Stable Trend in Pneumonia 30-day Readmissions Reflected in DataVision Comparison Pool

Official Start Date For Hospital Readmission Reduction Program October 1, 2012
Downward Trends in National Readmission Rates for Acute Care Inpatients \( \geq 65 \) years of age Reflected in DataVision Comparison Pool

![Graph showing downward trends in readmission rates for patients 65 years and older from 2007 to 2012, with a positive direction indicated starting from October 1, 2012.](image)

Official Start Date For Hospital Readmission Reduction Program October 1, 2012
Stable Trend in National Readmission Rates for Acute Care Inpatients ≥ 65 years of age when Process Phase for Public Reporting is Added

Two more quarters below the center line could indicate a statistical change in our process….too early to tell!
Recommended Reading
http://www.rwjf.org/content/dam/farm/reports/reports/2013/rwjf404178

The Revolving Door:
A Report on U.S. Hospital Readmissions
An Analysis of Medicare Data by the Dartmouth Atlas Project
Stories From Patients and Health Care Providers by PerryUndem Research & Communication
February 2013
Reducing hospital readmission rates has captured the imagination of U.S. policymakers because readmissions are common and costly and their rates vary—and at least in theory, a reasonable fraction of readmissions should be preventable. Policymakers therefore believe that reducing readmission rates represents a unique opportunity to simultaneously improve care and reduce costs. As part of the Affordable Care Act (ACA), Congress directed the Centers for Medicare and Medicaid Services (CMS) to penalize hospitals with “worse than expected” 30-day readmission rates. This part of the law has stimulated hospitals, professional societies, and independent organizations to develop solutions. First, the metric itself is problematic: only a small proportion of readmissions at 30 days after initial discharge are probably preventable, and much of what drives hospital readmission rates are

Critics to CMS 30-day Readmission Reduction Initiatives

1. Only a small proportion of 30-day readmissions are probably preventable.
2. Much of what drives hospital readmission rates are patient and community-level factors outside of the hospital’s control; e.g., mental illness, poor social support, and poverty.
3. Readmission rates have weak signaling value for identifying high-quality hospitals.
   - No clear link between readmission rates and quality of care.
   - Higher readmission rates can be the result of low mortality rates or good access to hospital care.
4. Hospitals are expending so much energy on readmissions they may forgo other important quality improvement efforts.
5. Readmissions 3 to 7 days after discharge are much more under the hospital’s control than 30-day readmissions.
6. Financial penalties for high readmission rates dwarf the penalties for higher mortality rates and unsafe care.

Calculating Financial Impact of Hospital Readmission Reduction Program

- Hospital Readmission Reduction Program began with October 1, 2012, discharges for initial populations Acute MI, Heart Failure & Pneumonia

- 2,217 hospitals will be assessed a penalty ranging from 0.01 to 1 percent of their Medicare revenue in FY 2013 (cap is increasing to 2% in 2014 and 3% in 2015)

- CMS reports reduction of > 70,000 readmissions in 2012 (19% to 17.2%)

- FY 2013 projected savings of approximately $280 to 300 million (or 0.3 percent) of total Medicare IPPS operating payments

- FY 2014 projects approximately $175 million (0.2 percent) reduction in payment to hospitals
Calculating Financial Impact for Your Hospital’s Performance in the Readmission Reduction Program

Hospital’s Base Operating DRG Amount
(before any adjustments made by Value-based purchasing)

\[
\text{Adjustment Factor} \times \left( \text{Floor Adjustment Factor} \right)
\]

The GREATER value of the two becomes your hospital’s adjustment factor for any given fiscal year.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Floor Adjustment Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2013</td>
<td>0.9900</td>
</tr>
<tr>
<td>FY 2014</td>
<td>0.9800</td>
</tr>
<tr>
<td>FY 2015</td>
<td>0.9700</td>
</tr>
</tbody>
</table>
Steps to Calculate Your Hospital’s Adjustment Factor

Adjustment Factor = \frac{1}{\text{Aggregate payments for excess readmissions} \quad \text{Aggregate payments for all discharges}}

Step 1: Calculate aggregate payments for all discharges.

(Current Base DRG payment \times Medicare Part A Volume
(July 1, 2008 to June 30, 2011)

$7830 \times 27,601 = $216,115,830

...keep in mind this volume represents over 3 years July 1, 2008 to June 30, 2011 and is applicable to FY 2013 Payment determination
Steps to Calculate Your Hospital’s Adjustment Factor

**Step 2:** Go to Hospital Compare to obtain population volumes and calculate your hospital’s excessive readmission ratio (ERR) for Acute MI, Heart Failure and Pneumonia.

\[
\text{Adjustment Factor} = 1 - \frac{\text{Aggregate payments for excess readmissions}}{\text{Aggregate payments for all discharges}}
\]

We will use this volume value in Step 3

We will use this ERR value in Step 3
Steps to Calculate Your Hospital’s Adjustment Factor

**Step 3:** Calculate aggregate payments for excessive readmissions.

\[
\text{Aggregate payments for excess readmissions} = 1 - \frac{\text{Aggregate payments for excess readmissions}}{\text{Aggregate payments for all discharges}}
\]

\[(\text{Base DRG payment} \times \text{Acute MI volume}) \times (\text{ERR} - 1) = (\$7830 \times 415) \times [(20.6 \text{ Hospital} / 19.7 \text{ National}) - 1] = \$148,500 \text{ in Excess Payments}\]

\[(\text{Base DRG payment} \times \text{Heart Failure volume}) \times (\text{ERR} - 1) = (\$7830 \times 673) \times [(25.6 \text{ Hospital} / 24.7 \text{ National}) - 1] = \$191,813 \text{ in Excess Payments}\]

\[(\text{Base DRG payment} \times \text{Pneumonia volume}) \times (\text{ERR} - 1) = (\$7830 \times 255) \times [(21.5 \text{ Hospital} / 18.5 \text{ National}) - 1] = \$323,857 \text{ in Excess Payments}\]

**Aggregate payments for excess readmissions = \$664,170 Total Excess Payment**

You have to have zero excess payments in all three populations in order to avoid a reduction in your hospital’s adjustment factor.
Steps to Calculate Your Hospital’s Adjustment Factor

**Step 4:** Plug in your numbers.

\[
\text{Adjustment Factor} = 1 - \left( \frac{\text{Aggregate payments for excess readmissions}}{\text{Aggregate payments for all discharges}} \right)
\]

\[
\begin{align*}
\text{Adjustment Factor} &= 1 - \left( \frac{\$664,170 \text{ from step 3}}{\$216,115,830 \text{ from step 1}} \right) \\
&= 0.9693
\end{align*}
\]
Step 5: Compare your hospital’s adjustment factor to the floor adjustment factor for the selected fiscal year. The larger value becomes your hospital’s adjustment value!

Floor adjustment set at 0.9900 for FY 2013, 0.9800 for FY 2014, and 0.9700 for FY 2015 and subsequent fiscal years.

Hospital’s Base Operating DRG Amount (before any adjustments made by Value-based purchasing) \( \times \) Adjustment Factor determined by Hospital’s Readmission Rates

\[
\text{Ratio} = 0.9693 \\
\text{Floor Adjustment} = 0.9900
\]

Use the largest of the two values

\[ \$7830 \times 0.9900 = \text{Reduced Base DRG Payment to $7752 in FY 2013} \]

Meaning an overall payment reduction of $78 in FY 2013 for each Medicare claim. In this example this could translate to lost revenue of approximately $717,600 the first year!
Readmission Penalties for FY 2013 Payments are Publicly Available at www.kaiserhealthnews.org/~media/files/2012/medicare_readmissions_penalties_2013.pdf

2013 Medicare Readmissions Penalties By Hospital
Read more at Kaiser Health News: http://khne.ws/2013adjustments

Medicare will apply the readmissions penalty to reimbursements beginning on Oct. 1. The penalties do not apply to Maryland hospitals, as that state has a unique reimbursement arrangement with Medicare, and thus no Maryland hospitals are included in this spreadsheet.

Source: Centers for Medicare & Medicaid Services, Kaiser Health News

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>FY 2013 Readmissions Penalty</th>
<th>City</th>
<th>State</th>
<th>Hospital Referral Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDALUSIA REGIONAL HOSPITAL</td>
<td>0.62%</td>
<td>ANDALUSIA</td>
<td>AL</td>
<td>Pensacola, FL</td>
</tr>
<tr>
<td>ATHENS-LIMESTONE HOSPITAL</td>
<td>0.05%</td>
<td>ATHENS</td>
<td>AL</td>
<td>Huntsville, AL</td>
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<tr>
<td>ATMORE COMMUNITY HOSPITAL</td>
<td>0.94%</td>
<td>ATMORE</td>
<td>AL</td>
<td>Pensacola, FL</td>
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<tr>
<td>BAPTIST MEDICAL CENTER EAST</td>
<td>0.37%</td>
<td>MONTGOMERY</td>
<td>AL</td>
<td>Montgomery, AL</td>
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<td>BAPTIST MEDICAL CENTER SOUTH</td>
<td>0.71%</td>
<td>MONTGOMERY</td>
<td>AL</td>
<td>Montgomery, AL</td>
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<tr>
<td>BAPTIST MEDICAL CENTER-PRINCETON</td>
<td>0.00%</td>
<td>BIRMINGHAM</td>
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</tr>
<tr>
<td>BIBB MEDICAL CENTER</td>
<td>0.00%</td>
<td>CENTREVILLE</td>
<td>AL</td>
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<tr>
<td>BROOKWOOD MEDICAL CENTER</td>
<td>0.00%</td>
<td>BIRMINGHAM</td>
<td>AL</td>
<td>Birmingham, AL</td>
</tr>
<tr>
<td>BRYAN W WHITFIELD MEM-HOSP INC</td>
<td>0.27%</td>
<td>DEMOPOLIS</td>
<td>AL</td>
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<td>BULLOCK COUNTY HOSPITAL</td>
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<td>Montgomery, AL</td>
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<td>CALLAHAN EYE FOUNDATION HOSPITAL</td>
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<td>BIRMINGHAM</td>
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<td>Birmingham, AL</td>
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<tr>
<td>CHEROKEE MEDICAL CENTER</td>
<td>0.26%</td>
<td>CENTRE</td>
<td>AL</td>
<td>Rome, GA</td>
</tr>
<tr>
<td>CHILTON MEDICAL CENTER</td>
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<td>AL</td>
<td>Birmingham, AL</td>
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<tr>
<td>CITIZENS BAPTIST MEDICAL CENTER</td>
<td>0.00%</td>
<td>TALLADEGA</td>
<td>AL</td>
<td>Birmingham, AL</td>
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<tr>
<td>CLAY COUNTY HOSPITAL</td>
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<td>ASHLAND</td>
<td>AL</td>
<td>Birmingham, AL</td>
</tr>
<tr>
<td>COMMUNITY HOSPITAL INC</td>
<td>0.04%</td>
<td>TALLASSEE</td>
<td>AL</td>
<td>Montgomery, AL</td>
</tr>
<tr>
<td>COOPER GREEN MERCY HOSPITAL</td>
<td>0.00%</td>
<td>BIRMINGHAM</td>
<td>AL</td>
<td>Birmingham, AL</td>
</tr>
<tr>
<td>COOSA VALLEY MEDICAL CENTER</td>
<td>0.58%</td>
<td>SYLACAUGA</td>
<td>AL</td>
<td>Birmingham, AL</td>
</tr>
<tr>
<td>CRENSHAW COMMUNITY HOSPITAL</td>
<td>0.00%</td>
<td>LUVERNE</td>
<td>AL</td>
<td>Montgomery, AL</td>
</tr>
</tbody>
</table>
Proposed Changes to the Hospital Readmission Reduction Program

1. Add criteria to exclude “planned” readmissions from Acute MI, Heart Failure and Pneumonia measures beginning with discharges October 1, 2013
   a. Previously exclusions were limited to revascularization procedures in the Acute MI population only
   b. NQF endorsed Acute MI (NQF #0505) and Heart Failure (NQF #0330) Readmission measures in January 2013 and Pneumonia (NQF #0506) in March 2013.

2. Add 30-day COPD and elective Total Hip or Knee Arthroplasty Readmissions for Calculation FY 2015 Adjustments
   a. Acute exacerbation of COPD (4th largest Medicare diagnosis) and elective total hip and knee arthroplasty (represents the largest procedural cost in the Medicare Budget).
   b. NOT recommending to add CABG, PCI and other vascular conditions as previously recommended by MedPAC in 2007 because inpatient admissions for PCI and other vascular conditions are shifting to outpatient settings. Continuing to explore CABG for future inclusion.
Revised Step 3 to Calculate Your Hospital’s Adjustment Factor FY 2015 if Proposed Rule is Finalized in August 2013

**Step 3:** Calculate aggregate payments for excessive readmissions.

\[(\text{Base DRG payment} \times \text{Acute MI volume}) \times (\text{ERR} - 1) = \]
\[(\$7830 \times 415) \times [(20.6 \text{ Hospital} / 19.7 \text{ National}) - 1] = \$148,500 \text{ in Excess Payments} \]

\[(\text{Base DRG payment} \times \text{Heart Failure volume}) \times (\text{ERR} - 1) = \]
\[(\$7830 \times 673) \times [(25.6 \text{ Hospital} / 24.7 \text{ National}) - 1] = \$191,813 \text{ in Excess Payments} \]

\[(\text{Base DRG payment} \times \text{Pneumonia volume}) \times (\text{ERR} - 1) = \]
\[(\$7830 \times 255) \times [(21.5 \text{ Hospital} / 18.5 \text{ National}) - 1] = \$323,857 \text{ in Excess Payments} \]

\[(\text{Base DRG payment} \times \text{COPD volume}) \times (\text{ERR} - 1) = \]
\[(\$7830 \times \text{___}) \times [(\text{___} \text{ Hospital} / 22.0 \text{ National}) - 1] = \$\text{______} \text{ in Excess Payments} \]

\[(\text{Base DRG payment} \times \text{TKA/THA volume}) \times (\text{ERR} - 1) = \]
\[(\$7830 \times \text{___}) \times [(\text{___} \text{ Hospital} / 5.7 \text{ National}) - 1] = \$\text{______} \text{ in Excess Payments} \]

\(< 1 = \text{NO EXCESS PAYMENTS} \]

*You have to have zero in all FIVE populations in order to avoid a reduction in your adjustment factor*
Adding Planned Readmission Exclusions to CMS Readmission Methodology Starting in 2013

- **Planned readmission algorithm** added to all readmission measures to avoid penalizing hospitals for performing scheduled procedures within 30 days of discharge.

- This method also avoids counting unplanned readmissions that occur after a planned readmission, but within 30 days of discharge from the index admission.

- This modified measurement technique reduced hospital wide 30-day all cause readmission rates from **16.5% to 16.0%** in the July 1, 2011 to June 30, 2012 data set.
Planned Readmission Exclusions

Always Planned

- Transplants (bone, kidney, organ)
- Cesarean section
- Normal pregnancy and/or delivery
- Forceps, vacuum and breech delivery
- Maintenance Chemotherapy
- Rehabilitation

Potentially Planned

_When discharge diagnosis of readmission is NOT acute or a complication of care_

- Laminectomy, spinal fusion
- Knee and hip replacement
- Limb amputation
- Thyroidectomy and endocrine surgery
- Lung resections
- Hernia repairs
- Oophorectomy, hysterectomy
- TURP, prostatectomy
- Colorectal and gastrectomy surgery
- Cardiac surgery (CABG, Valve Repair)
- Wound and burn debridement
- Laryngectomy, tracheostomy revisions
- **More!**
Acute or Complication Categories
Determined by Using AHRQ Diagnoses CCS Codes

<table>
<thead>
<tr>
<th>Diagnosis CCS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>2</td>
<td>Septicemia (except in labor)</td>
</tr>
<tr>
<td>3</td>
<td>Bacterial infection, unspecified site</td>
</tr>
<tr>
<td>4</td>
<td>Meningitis</td>
</tr>
<tr>
<td>5</td>
<td>HIV infection</td>
</tr>
<tr>
<td>6</td>
<td>Viral infection</td>
</tr>
<tr>
<td>7</td>
<td>Other infections, including para-</td>
</tr>
<tr>
<td>8</td>
<td>Sexually transmitted infections</td>
</tr>
<tr>
<td>9</td>
<td>Gastroenteritis</td>
</tr>
<tr>
<td>10</td>
<td>Acute posthemorragic meningitis</td>
</tr>
<tr>
<td>11</td>
<td>Acute respiratory infection</td>
</tr>
<tr>
<td>12</td>
<td>Acute bronchitis</td>
</tr>
<tr>
<td>13</td>
<td>Acute tonsillitis</td>
</tr>
<tr>
<td>14</td>
<td>Acute rhinitis</td>
</tr>
<tr>
<td>15</td>
<td>Acute otitis media</td>
</tr>
</tbody>
</table>

Table P84 - Acute Diagnosis Categories (Version 2.1 - General Population)
AHRQ Clinical Classification Software (CCS)

- Developed by AHRQ as part of the Healthcare Cost and Utilization Project (HCUP)
- Categorization scheme for ICD-9 diagnose and procedure codes
- Clusters over 14,000 diagnosis codes and 3,900 procedure codes into a manageable number of clinically meaningful categories
  - Single level diagnosis CCS: 285 mutually exclusive categories
  - Single level procedure CCS: 231 mutually exclusive categories
- Useful in research and statistical analysis
- Files downloaded and used with SAS or SPSS to convert ICD-9 codes to CCS codes
- Mental health populations have unique CCS-Mental Health and Substance Abuse (MHSA) tools
Impact on National Readmission Rates when Unplanned Readmissions are Excluded

<table>
<thead>
<tr>
<th>Condition</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute MI</td>
<td>19.2%</td>
<td>18.2%</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>24.6%</td>
<td>23.1%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>18.5%</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

For More Information on Readmission Measure Methodology

2013 Midas+ User Symposium
<table>
<thead>
<tr>
<th>Source Data</th>
<th>Midas+ Defined Readmit Metric</th>
<th>Midas+ CMS Proxy Readmit Metrics</th>
<th>CMS Unplanned Readmission Reduction Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital Discharge Abstract and ADT System interfaced into Midas+</strong></td>
<td>Hospital Discharge Abstract and ADT System interfaced into Midas+</td>
<td>Medicare claims or VA administrative data (note: risk model for AMI, HF, PN, Hip and Knee uses inpatient, outpatient and physician carriers’ administrative data for the 12 months prior to initial encounter. Hospital wide rate uses only inpatient claims data)</td>
<td></td>
</tr>
<tr>
<td><strong>Limited to same hospital readmits</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Expired on index admission</strong></td>
<td>Denominator Exclusion</td>
<td>Denominator Exclusion</td>
<td>Denominator Exclusion</td>
</tr>
<tr>
<td><strong>Elective Admit Status</strong></td>
<td>Numerator exclusion</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Target Population</strong></td>
<td>All Payers Separate metrics for all ages and Age ≥ 65 years Non acute care inpatients and maternal-neonatal stays excluded</td>
<td>Medicare as primary payer Age ≥ 65 Non acute care inpatients and maternal-neonatal stays excluded</td>
<td>Medicare Part A with AHRQ CCS to exclude Rehab, Psych &amp; Cancer Care Age ≥ 65 (Note: Encounters with incomplete claims history 12 months prior to admission and less than 30 days post-discharge enrollment in Medicare are excluded)</td>
</tr>
<tr>
<td><strong>Left Against Medical Advice</strong></td>
<td>Not applicable</td>
<td>Denominator Exclusion</td>
<td>Denominator Exclusion</td>
</tr>
<tr>
<td><strong>DC/Transfer to other acute care hospital</strong></td>
<td>Not applicable</td>
<td>Denominator Exclusion</td>
<td>Transfers attributed to the receiving hospital (readmissions attributed to the final hospital)</td>
</tr>
<tr>
<td><strong>LOS &gt; 365 Days</strong></td>
<td>Not applicable</td>
<td>Denominator Exclusion</td>
<td>Denominator Exclusion</td>
</tr>
<tr>
<td><strong>Overlapping encounters</strong></td>
<td>Not applicable</td>
<td>Denominator Exclusion</td>
<td>Denominator Exclusion</td>
</tr>
<tr>
<td><strong>Index encounter can be a 30-day readmit</strong></td>
<td>Not applicable</td>
<td>Denominator Exclusion (only one index admission within 30 days is allowed)</td>
<td>Denominator Exclusion (only one index admission within 30 days is allowed for AMI, HF, PN and Hip/Knee but allowed for Hospital Wide All Cause Readmission Measure)</td>
</tr>
<tr>
<td><strong>Unplanned Readmissions</strong></td>
<td>Not applicable</td>
<td>Not YET applicable</td>
<td>Denominator Exclusion</td>
</tr>
<tr>
<td><strong>Risk Standardized</strong></td>
<td>No</td>
<td>No</td>
<td>Yes (RSRR)</td>
</tr>
</tbody>
</table>
Readmission Methodology Matters

27% of readmission are preventable
- 12% were deemed preventable in studies that used **clinical data**
- 59% were deemed preventable in studies that used only **administrative data**

Total number of readmissions vary substantially among hospitals, but the rate of preventable readmissions does not
Potentially Preventable Readmissions

- Proprietary methodology developed by 3M
  (requires software and a license with 3M or other third party vendor like Midas+)

- Populations are defined using APR DRGs
  (instead of ICD-9 defined populations used by CMS methodology)

- A “Preventable” readmission is determined by evaluating the relationship between the APR DRG assignment of the “Initial Admission” and the readmission
  (this is done by examining ICD-9 diagnosis and procedure codes, discharge status and other variables found in the administrative claims data)
Readmissions are assigned to one of 17 “buckets” when determining if an subsequent encounter is “potentially preventable”.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Medical readmission for a <em>continuation or recurrence</em> of the reason for the initial admission or for a closely related condition.</td>
</tr>
<tr>
<td>2A</td>
<td>Ambulatory care-sensitive conditions as designated by AHRQ.</td>
</tr>
<tr>
<td>2B</td>
<td>All other readmissions for a <em>chronic problem</em> that might be related to care either during or after the initial admission.</td>
</tr>
<tr>
<td>3</td>
<td>Medical readmission for an <em>acute medical condition or complication</em> that might be related to or might have resulted from care during the initial admission or in the postdischarge period after the initial admission.</td>
</tr>
<tr>
<td>4</td>
<td>Readmission for a <em>surgical procedure</em> to address a continuation or a recurrence of the problem that caused the initial admission.</td>
</tr>
<tr>
<td>5</td>
<td>Readmission for a surgical procedure to address a complication that might be related to or might have resulted from care during the initial admission.</td>
</tr>
<tr>
<td>6A</td>
<td>Readmission for <em>mental health reasons</em> after an initial admission for a non–mental health, non–substance abuse reason.</td>
</tr>
</tbody>
</table>
Clinical Relationship Reasons (continued)

Readmissions are assigned to one of 17 “buckets” when determining if an subsequent encounter is “potentially preventable”.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6C</td>
<td>Mental health or substance abuse readmission after an initial admission for a substance abuse or mental health diagnosis.</td>
</tr>
<tr>
<td>NC</td>
<td>Not clinically related</td>
</tr>
<tr>
<td>T</td>
<td>Trauma</td>
</tr>
<tr>
<td>C</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>NP</td>
<td>Clinically related, not preventable</td>
</tr>
<tr>
<td>P</td>
<td>Probably planned readmission</td>
</tr>
<tr>
<td>E</td>
<td>Error</td>
</tr>
<tr>
<td>OB</td>
<td>Obstetrics</td>
</tr>
<tr>
<td>TR</td>
<td>Transplants</td>
</tr>
<tr>
<td>M</td>
<td>Malignancy</td>
</tr>
</tbody>
</table>
• Counts Readmission Chains vs. Encounter Pairs
  • A readmission chain is a sequence of Potentially Preventable Readmissions that are all clinically related to the initial admission.
  • A readmission chain can consist of an Initial admission and only one PPR, which is the most common situation, or can include multiple PPRs after initial admission.
Chains Can Be Broken When:

- Readmissions are not clinically related to the Initial Admission
- Clinically related, but not preventable
- Admission date exceeds the time interval from the preceding admission’s discharge date
- Readmission with a status of
  - Left against medical advice
  - Expired
- Occurrence of an excluded admission
  - Malignancy
  - Neonatal
  - Human Immunodeficiency Virus
  - Trauma and burn
  - Other global exclusions such as cystic fibrosis, eye procedures/care
  - Obstetrics
- Age combined with specific APR DRG
  - For example, APR DRG 248 Major gastrointestinal and peritoneal infections if less than 6 years old
Midas+ Indicator Pairs vs. 3M PPR Chains

**Midas+ All Cause Readmission**

- Count all subsequent admissions in the time interval
- Midas CMS HRRP Indicators count one readmission in each 30-day time interval
- Pair an initial encounter with a readmission encounter
- Are not risk- or severity-adjusted

**3M PPRs**

- Count chains of clinically related admissions in the time interval
- Link an initial admission with clinically related readmissions until the chain is terminated
- Based on APR DRG risk- and severity-adjustment methodology

Confidential and Proprietary
## 30-day PPR Example

<table>
<thead>
<tr>
<th>APR DRG</th>
<th>Encounter</th>
<th>Clinical Relationship</th>
<th>Days Between</th>
<th>Admit Date</th>
<th>DC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>Initial admission</td>
<td></td>
<td>01-Jan</td>
<td>05-Jan</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>Medical readmission for an acute medical condition or complication that might be related</td>
<td>5</td>
<td>10-Jan</td>
<td>12-Jan</td>
</tr>
<tr>
<td>200</td>
<td>Cardiac structural and valvular disorders</td>
<td>All other readmissions for a chronic problem that might be related</td>
<td>7</td>
<td>19-Jan</td>
<td>21-Jan</td>
</tr>
<tr>
<td>207</td>
<td>Other circulatory system diagnoses</td>
<td>Medical readmission for an acute medical condition or complication that might be related</td>
<td>26</td>
<td>16-Feb</td>
<td>20-Feb</td>
</tr>
</tbody>
</table>

**Chain 1**
## 30-day PPR Example

<table>
<thead>
<tr>
<th>APR DRG</th>
<th>Encounter</th>
<th>Days Between</th>
<th>Admit Date</th>
<th>DC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>5</td>
<td>10-Jan</td>
<td>12-Jan</td>
</tr>
<tr>
<td>200</td>
<td>Cardiac structural and valvular disorders</td>
<td>7</td>
<td>19-Jan</td>
<td>21-Jan</td>
</tr>
<tr>
<td>207</td>
<td>Other circulatory system diagnoses</td>
<td>26</td>
<td>16-Feb</td>
<td>20-Feb</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>33 - Initial</td>
<td>25-Mar</td>
<td>31-Mar</td>
</tr>
<tr>
<td>463</td>
<td>Kidney/Urinary Tract Infection</td>
<td>10</td>
<td>10-Apr</td>
<td>12-Apr</td>
</tr>
</tbody>
</table>

**Chain 1**

**Chain 2**
CMS CHF 30-day All Cause Readmission Indicator Pairs vs. PPR Chains

<table>
<thead>
<tr>
<th>APR DRG</th>
<th>Encounter</th>
<th>Days Between</th>
<th>Admit Date</th>
<th>DC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>5</td>
<td>10-Jan</td>
<td>12-Jan</td>
</tr>
<tr>
<td>200</td>
<td>Cardiac structural and valvular disorders</td>
<td>7</td>
<td>19-Jan</td>
<td>21-Jan</td>
</tr>
<tr>
<td>207</td>
<td>Other circulatory system diagnoses</td>
<td>26</td>
<td>16-Feb</td>
<td>20-Feb</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>33 - Initial</td>
<td>25-Mar</td>
<td>31-Mar</td>
</tr>
<tr>
<td>463</td>
<td>Kidney/Urinary Tract Infection</td>
<td>10</td>
<td>10-Apr</td>
<td>12-Apr</td>
</tr>
</tbody>
</table>

CMS will only count one readmission pair within 30 days. No encounter can be both an index encounter and a readmission encounter.
Midas+ DataVision CHF 30-day Readmission Indicator Pairs vs. PPR Chains

<table>
<thead>
<tr>
<th>APR DRG</th>
<th>Encounter</th>
<th>Days Between</th>
<th>Admit Date</th>
<th>DC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>Heart failure</td>
<td></td>
<td>01-Jan</td>
<td>05-Jan</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>5</td>
<td>10-Jan</td>
<td>12-Jan</td>
</tr>
<tr>
<td>200</td>
<td>Cardiac structural and valvular disorders</td>
<td>7</td>
<td>19-Jan</td>
<td>21-Jan</td>
</tr>
<tr>
<td>207</td>
<td>Other circulatory system diagnoses</td>
<td>26</td>
<td>16-Feb</td>
<td>20-Feb</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure</td>
<td></td>
<td>25-Mar</td>
<td>31-Mar</td>
</tr>
<tr>
<td>463</td>
<td>Kidney/Urinary Tract Infection</td>
<td>10</td>
<td>10-Apr</td>
<td>12-Apr</td>
</tr>
</tbody>
</table>

Midas+ will count the second Heart Failure encounter because it was a qualifying encounter for the population of interest. If the second case had been RENAL failure this case would NOT have been counted.
CMS All Cause 30-day Readmissions vs. PPR Chains

<table>
<thead>
<tr>
<th>APR DRG</th>
<th>Encounter</th>
<th>Days Between</th>
<th>Admit Date</th>
<th>DC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>5</td>
<td>10-Jan</td>
<td>12-Jan</td>
</tr>
<tr>
<td>200</td>
<td>Cardiac structural and valvular disorders</td>
<td>7</td>
<td>19-Jan</td>
<td>21-Jan</td>
</tr>
<tr>
<td>207</td>
<td>Other circulatory system diagnoses</td>
<td>26</td>
<td>16-Feb</td>
<td>20-Feb</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure (33 - Initial)</td>
<td>33</td>
<td>25-Mar</td>
<td>31-Mar</td>
</tr>
<tr>
<td>463</td>
<td>Kidney/Urinary Tract Infection</td>
<td>10</td>
<td>10-Apr</td>
<td>12-Apr</td>
</tr>
</tbody>
</table>

CMS will only count one readmission pair within 30 days. No encounter can be both an index encounter and a readmission encounter.
Midas+ DataVision % Readmit to Acute Care within 30-day Readmission vs. PPR Chains

<table>
<thead>
<tr>
<th>APR DRG</th>
<th>Encounter</th>
<th>Days Between</th>
<th>Admit Date</th>
<th>DC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>5</td>
<td>10-Jan</td>
<td>12-Jan</td>
</tr>
<tr>
<td>200</td>
<td>Cardiac structural and valvular disorders</td>
<td>7</td>
<td>19-Jan</td>
<td>21-Jan</td>
</tr>
<tr>
<td>207</td>
<td>Other circulatory system diagnoses</td>
<td>26</td>
<td>16-Feb</td>
<td>20-Feb</td>
</tr>
<tr>
<td>194</td>
<td>Heart failure</td>
<td>33 - Initial</td>
<td>25-Mar</td>
<td>31-Mar</td>
</tr>
<tr>
<td>463</td>
<td>Kidney/Urinary Tract Infection</td>
<td>10</td>
<td>10-Apr</td>
<td>12-Apr</td>
</tr>
</tbody>
</table>

DataVision counts the initial qualifying encounter for each readmission pair
Benefits of 3M PPR

• All payer
• Risk adjusted so tends to be more accepted by clinical stakeholders
• Focuses on cases that you can affect through improved clinical and care management processes
• Helps you identify benchmarks and target thresholds for your key populations
• Optimally used with APR DRG LOS and Mortality findings to understand changing populations

Benefits of DataVision

• More inclusive data set that can be integrated into worklists for early alerts and notifications
• Easy drill-down to patient and provider detail
• Integrated with Readmission Toolpack so that patterns will be highly transparent

……but both these methodologies are still retrospective
Analytics: Improving Insight and Business Value

Horizon, Difficulty

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

Source: Gartner Business Intelligence & Analytics Summit 2013
Variables presumed to impact hospital readmissions

• Premature discharge
• Poor patient compliance
• Age of the patient
• Male sex
• Chronic disability
• Patient living alone
• Unavoidable relapse
• Inadequate medical management

• Poor self-rated general health
• Inadequate rehabilitation
• Poor discharge planning
• Inadequate follow up care
• Cognitive impairment
• Ethnic disparities
Risk Prediction Models for Hospital Readmission
A Systematic Review

Devan Kanagasara, MD, MCR
Honora Engleander, MD
Amanda Salanitro, MD, MS, MSPH
David Kagen, MD
Cecelia Theohald, MD
Michele Freeman, MPH
Sunil Kripalani, MD, MSc

Context Predicting hospital readmission risk is of great interest to identify which patients would benefit most from care transition interventions, as well as to risk-adjust readmission rates for the purposes of hospital comparison.

Objective To summarize validated readmission risk prediction models, describe their performance, and assess suitability for clinical or administrative use.

Data Sources and Study Selection The databases of MEDLINE, CINAHL, and the Cochrane Library were searched from inception through March 2011, the EMBASE database was searched through August 2011, and hand searches were performed of the retrieved reference lists. Dual review was conducted to identify studies published in the English language of prediction models tested with medical patients in both derivation and validation cohorts.

Data Extraction Data were extracted on the population, setting, sample size, follow-up interval, readmission rate, model discrimination and calibration, type of data used, and timing of data collection.

Data Synthesis Of 7843 citations reviewed, 30 studies of 26 unique models met the inclusion criteria. The most common outcome used was 30-day readmission; only 1 model specifically addressed preventable readmissions. Fourteen models that relied on retrospective administrative data could be potentially used to risk-adjust readmission rates for hospital comparison; of these, 9 were tested in large US populations and had poor discriminative ability (c statistic range: 0.50-0.66). Seven models could potentially be used to identify high-risk patients for intervention early during a hospitalization (c statistic range: 0.56-0.72), and 5 could be used at hospital discharge (c statistic range: 0.68-0.83). Six studies compared different models in the same population and 2 of these found that functional and social variables improved model discrimination. Although most models incorporated variables for medical comorbidity and use of prior medical services, few examined variables associated with overall health and function, illness severity, or social determinants of health.

Conclusions Most current readmission risk prediction models that were designed for either comparative or clinical purposes perform poorly. Although in certain settings such models may prove useful, efforts to improve their performance are needed as use becomes more widespread.
CMS Readmission Calculator

Resources
Readmission Measures

General Resources

Medicare Hospital Quality Chartbooks (located on CMS website; see Downloads section of Outcome Measures page) — The Centers for Medicare & Medicaid Services (CMS) explores hospital performance in the Medicare Hospital Quality Chartbooks. The Chartbooks review national performance trends, distribution, and regional variation, as well as other analyses relevant to questions and concerns raised by stakeholders.

- Chartbook 2012 — for the mortality, readmission, and complication measure sets
- Chartbook 2011 — for the AMI, HF, PN readmission measures

Resources for 2013 Public Reporting

- Frequently Asked Questions (FAQs), PDF-565 KB (04/11/13) — includes general as well as measure-specific questions and responses for all publicly reported risk-standardized outcome measures.
- Readmission Measures Fact Sheet, PDF-331 KB (04/11/13) — a general overview of the readmission measures, their development, and their purpose. A helpful introduction to the project for hospital staff and executives.
- Timeline, PDF-55 KB (04/11/13) — a general timeline showing relevant dates from pre-implementation to the current reporting of the risk-standardized outcome measures.

- Readmission Calculator — a tool that uses patient demographic and clinical characteristics to predict a patient’s estimated risk of hospital readmission within 30 days of discharge for heart attack, heart failure, or pneumonia.
- HWR - Condition Category ICD-9-CM Crosswalk, PDF-203 KB (04/11/13) — an illustration and description of the process by which the HWR cohort is identified and an admission is assigned to one of the five mutually exclusive severity cohorts.

AMI, HF, PN, HRR, and THA/TKA 2013 Condition Category - ICD-9-CM and Clinical Classification Software (CCS) - ICD-9 Crosswalks

The following documents show the relationship between ICD-9-CM codes and the condition categories (CCs) or the CCS and procedure categories used to adjust for patient risk factors in each readmission measure.

- Acute Myocardial Infarction, CSV-207 KB (04/11/13)
- Heart Failure, CSV-29 KB (04/11/13)
- Pneumonia, CSV-184 KB (04/11/13)
- HWR - Condition Category ICD-9-CM Crosswalk, CSV-239 KB (06/23/12)
- THA/TKA Readmission - Condition Category ICD-9-CM Crosswalk, CSV-291 KB (04/10/13)
Free and available to public

Readmission Risk Calculators
Select a Reason for Initial Hospitalization:

- Heart Attack
- Heart Failure
- Pneumonia

Available on the App Store

Center for Outcomes Research and Evaluation (CORE)
Readmission Risk Score for Heart Failure

This readmission calculator is based on a statistical model developed from chart abstracted data. It is intended for use with patients age 65 and older.

### DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Age</th>
<th>72 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
</tbody>
</table>

### PRESENTATION

| In-hospital Cardiac Arrest | Yes | No | N/A |

### HISTORY

<table>
<thead>
<tr>
<th>Diabetes</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Failure</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Prior PCI</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Aortic Stenosis</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Stroke, ischemic or hemorrhagic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>COPD</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Dementia</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### PHYSICAL EXAM (ON ADMISSION)

<table>
<thead>
<tr>
<th>Systolic Blood Pressure</th>
<th>165 mmHg</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>64 beats per min</td>
<td>N/A</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>22 breaths per min</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### DIAGNOSTICS (ON ADMISSION)

<table>
<thead>
<tr>
<th>Sodium</th>
<th>130 mmol/L</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Urea Nitrogen</td>
<td>28 mg/dL or mmol/L</td>
<td>N/A</td>
</tr>
<tr>
<td>Creatinine</td>
<td>2.4 mg/dL or mmol/L</td>
<td>N/A</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>48%</td>
<td>N/A</td>
</tr>
<tr>
<td>Glucose</td>
<td>132 mg/dL or mmol/L</td>
<td>N/A</td>
</tr>
<tr>
<td>LV Ejection Fraction</td>
<td>34%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

2013 Midas+ User Symposium

Manually Enter Demographics and Health History, Vital Signs, and Lab Results
How Accurate Are These Tools?

Readmission Risk Score for Heart Failure

26%

This represents the estimated risk of readmission within 30 days from discharge for a patient whose principal diagnosis was heart failure.

This readmission score is the best estimate of a patient's risk of readmission given the information provided. The risk for any individual could vary from this estimate as there may be other factors beyond what are in the model that may influence readmission risk.

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Statistical Model for Prediction = ROC Curve 0.60 to 0.63

Download the Free Mobile application

2013 Midas+ User Symposium
Four possible outcomes in Predictive Analytics

- True Positive (Sensitivity)
- False Positive (Specificity)
- False Negative
- True Negative
Statistical Primer for Predictive Analytics

Four possible outcomes in Predictive Analytics

- True Positive (Sensitivity)
- False Positive (Specificity)
- False Negative
- True Negative

Patient tests positive for the disease but doesn’t really have it!
Patient tests negative suggesting they are healthy but they actually have the disease.

Four possible outcomes in Predictive Analytics:

- True Positive (Sensitivity)
- False Positive (Specificity)
- False Negative
- True Negative
Statistical Primer for Predictive Analytics

- True Positive (Sensitivity)
- False Positive (Specificity)
- False Negative
- True Negative
ROC Curve is the Area Under the Line
Also known as the C-Statistic

1.0 = Perfect

0.05 = Random Coin Toss

Line of no-discrimination

Points above the Diagonal line
Represent better Than random

Points below the
Diagonal line
Represent Worse Than random

True Positive Rate

False Positive Rate
CMS Readmission Calculator

C-Statistic = .60 to .63

CMS Prediction Model Using Logistic Regression and Hierarchical logistic regression models on 2008 to 2010 data performed better than random guessing

Acute MI = .63
Heart Failure = .60
Pneumonia = .63
Other Predictive Analytic Tools

- **LACE Assessment**
  - Length of Stay
  - Acute Admit via ED
  - Comorbidities (modified)
  - ED visits in past six months

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
<th>Points</th>
<th>Prior Admit</th>
<th>Present Admit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Stay</td>
<td>Less 1 day</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1 day</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2 days</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3 days</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4-6 days</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>7-13 days</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>14 or more days</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Acute admission</td>
<td>Inpatient</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Observation</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>No prior history</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DM no complications, Cerebrovascular disease, Hx of MI, PVD, PUD, 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td></td>
<td>Mild liver disease, DM with end organ damage, CHF, COPD, Cancer, 2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Leukemia, lymphoma, any tumor, cancer, moderate to severe renal dz, 3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Dementia or connective tissue disease, 3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Moderate or severe liver disease or HIV infection, 4</td>
<td>4</td>
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<td>4</td>
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<tr>
<td></td>
<td>Metastatic cancer, 6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Take the sum of the points and enter the total

*C Statistic = .70 but data must be collected POST Discharge so usefulness to identify patients in-house for proactive management is limited*
Other Predictive Analytic Tools

- Probability of Repeated Admission Instrument (Pra™)
  - 17 item questionnaire
  - Medical history
  - Functional ability
  - Living circumstances
  - Nutrition
  - Depression
  - Licensing available from Johns Hopkins

*Tells me about estimated risk of readmission for this patient but not what to do about it*

*C Statistic = .53 to .61 depending on which study you review
Published in Kansagara (2011) systematic review paper*
What are the interventions presumed to reduce readmissions?

- Define and arrange post discharge medical services
- Define and arrange post discharge ancillary services e.g. PT, OT, Home Health
- Review medication changes
- Self care education and coaching
- Provide readable copy to patient and family
- Send discharge plan of care to all providers
- Red flag symptoms
- Assess home safety and ADLs
- Follow up call to Patient/Family
Next generation analytics will likely require machine learning techniques and “big data” manipulation of complex human and systems variables.
Midas+ PARC – Early Findings in Readmission Predictive

**Approach:**

- Predictive analytics applied to hospital encounter data (Real-time Admission Discharge Transfer and Discharge Abstract Data)
- Prelim: two years of data, 100 hospitals (~2.2M records)
- Machine learning classifier automatically identifies relevant factors, can adapt to hospital-specific population

**Insight:**

- Achieved c-statistic for individuals of >0.72, expect more with tuning
- Many factors are relevant (sample): age, length of stay, number of diagnoses, time of day of discharge, principal diagnosis
- Gender, time of day of admission, principal procedure NOT relevant
- Opportunity to analyze discharge supports for specific populations to create prescriptive analytics integrated with Midas+ workflow tools

C-Statistic = .72338
Closing Thoughts

• Readmissions are proxy measures of quality of care.
• Not all readmissions are undesirable.
• Not all readmissions are preventable.
• A certain percentage of readmissions *can* be influenced by proper medical management, discharge planning and continuity of care.
• The ultimate purpose of readmission rates are to help you identify those patients and conditions for whom you can most likely make a difference.
• Different readmission metrics will give you different results.
• Advanced computer science and machine learning are likely to emerge to bring us prescriptive analytics to better manage readmissions in the future.
Time for a Break!