Administrative Data Measures for Asthma

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Constructs to be Measured

• Severity
• Control
• Quality of Care
### Goals of Assessing Asthma Severity/Control or Quality of Care

- Improve asthma outcomes
- Severity/Control
  - Patient outreach
  - Targeted intervention
- Quality of care
  - Identify and reward provider quality care
  - Provider outreach to improve quality of care

### Asthma Control versus Severity

- **Asthma severity**
  - Inherent biologic intensity of the disease process
- **Asthma control:**
  - The degree to which the effects of the disease on the patient are mitigated
Clinical Definitions

• Severity
  – Symptoms, pulmonary function, and exacerbation history before controller treatment
  – Intensity of therapy required to achieve control
• Control
  – Symptoms, pulmonary function, and exacerbation history
  – On controller therapy

Domains of Severity and Control

• Impairment
  – Symptoms
  – Nocturnal awakening
  – Activity limitation
  – Pulmonary function
• Risk
  – History of exacerbations requiring systemic corticosteroids
Types of Administrative Data Used

- Encounter diagnosis of asthma
  - Hospital
  - Emergency Department
  - Outpatient
- Pharmacy data
  - Short-acting beta agonist canisters
  - Oral corticosteroid dispensings
  - Controller units and percent of days covered

Administrative Data Operational Definitions of Severity and Control

- **Asthma Severity**
  - Persistent (versus non-persistent) asthma (HEDIS)
  - Intensity of therapy
  - Risk and impairment in patients with no controllers dispensed
- **Asthma Control**
  - Rescue therapy dispensings (impairment)
  - Asthma exacerbations (risk)
Outline of Presentation

- Assessment of Severity
  - Medication intensity
  - HEDIS-defined persistent asthma
- Assessment of Impairment
  - Short-acting β-agonist canister dispensings
- Assessment of risk
  - Risk for exacerbations
- Assessment of Quality Care (HEDIS)
  - Any controller measure
  - Medication ratio measure
  - Adherence measure
Severity: Medication Intensity Possibilities

- Number of controller units in 12 months
- Number of different classes of controllers (0, 1, 2, 3 or more)
- Medication ratio [controllers/controllers + SABA] > 0.5 and SABA > 6

Proportions of Patients with 2004 Exacerbations in HEDIS Denominator

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* P < 0.05

Ann Allergy Asthma Immunol 2008; 101:235
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HEDIS Persistent Asthma

• HEDIS definition of persistent asthma
  – $\geq 4$ or more asthma medication dispensing events
  – $\geq 1$ ED visit with asthma as the principal diagnosis
  – $\geq 1$ hospital admission with asthma as the principal diagnosis
  – 4 ambulatory visits with asthma and $\geq 2$ asthma medication dispensing events
• One or two year
Relationship of HEDIS Persistent Asthma to Survey Persistent Asthma

• 2,895 HEDIS patients in 2006 completed survey in fall 2007
• Survey-defined persistent asthma
  – Daytime and nighttime symptoms
  – Rescue therapy
  – Activity limitation
  – Regular controller therapy
  – Exacerbations (> 1 requiring oral CS in past 12 months)


Relationship of HEDIS to Survey Persistent Asthma (PA)

• 86.9 % of patients reported survey PA
• Follow-up survey 5 month later
  – 95 % with 1st survey PA had PA on 2nd survey
  – 54 % of those without 1st survey PA had PA on 2nd survey
• HEDIS requalification in 2007
  – 68 % of patients with survey PA versus 22 % without survey PA
Mayo Clinic Study: HEDIS Persistent versus Non-persistent Asthma

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<th>HEDIS Persistent</th>
<th>HEDIS Non-Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT &lt; 20</td>
<td>27.7 %</td>
<td>12.1 %</td>
</tr>
<tr>
<td>Oral CS &gt; 2</td>
<td>9.0 %</td>
<td>0.5 %</td>
</tr>
<tr>
<td>Workdays lost</td>
<td>15.0 %</td>
<td>7.7 %</td>
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</table>


HEDIS Requalification and Subsequent Utilization

<table>
<thead>
<tr>
<th>2008 utilization</th>
<th>2007 HEDIS requalification</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (N=1,712)</td>
<td>No (N=805)</td>
</tr>
<tr>
<td>Hospitalization or ED visit</td>
<td>6.1 %</td>
<td>2.7 %</td>
</tr>
<tr>
<td>Any oral corticosteroid</td>
<td>37.6 %</td>
<td>28.0 %</td>
</tr>
<tr>
<td>Two or more oral corticosteroids</td>
<td>17.4 %</td>
<td>10.9 %</td>
</tr>
<tr>
<td>SABA &gt; 6</td>
<td>25.4 %</td>
<td>8.9 %</td>
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Persistent Asthma: Conclusions

- HEDIS persistent asthma is generally consistent with survey-defined persistent asthma
- Patients with HEDIS persistent asthma suffer increased asthma morbidity compared to patients without HEDIS persistent asthma
- The two year HEDIS population is even more specific for persistent asthma and associated with increased utilization
- The two year HEDIS population is a “valid” population for quality of care assessment

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Beta Agonist Long Term Control Scale

- Beta agonist canister dispensings per year
  - 0-2
  - 3-6
  - 7-12
  - > 12
- Two samples
  - Random sample of adult 2250 KP patients (aged 18-56) with persistent asthma (1999) who completed survey in 2000
  - 62,369 members of Southern California KP asthma database in 2002 and 2003


Relationship of Beta Agonist Scale to Patient-Reported Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>AQLQ</th>
<th>ATAQ</th>
<th>AOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Value</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0 to 2</td>
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<td><img src="image2.png" alt="Graph" /></td>
<td><img src="image3.png" alt="Graph" /></td>
</tr>
<tr>
<td>3 to 6</td>
<td><img src="image4.png" alt="Graph" /></td>
<td><img src="image5.png" alt="Graph" /></td>
<td><img src="image6.png" alt="Graph" /></td>
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<tr>
<td>7 to 12</td>
<td><img src="image7.png" alt="Graph" /></td>
<td><img src="image8.png" alt="Graph" /></td>
<td><img src="image9.png" alt="Graph" /></td>
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<tr>
<td>&gt; 12</td>
<td><img src="image10.png" alt="Graph" /></td>
<td><img src="image11.png" alt="Graph" /></td>
<td><img src="image12.png" alt="Graph" /></td>
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All p < 0.0001
Relationship of Beta Agonist Scale to Utilization Outcomes

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High, Medium and Low Risk of Exacerbations

- Patients identified from Southern California Kaiser Permanente Computerized Database
- Asthma Dx based on hospital discharge, ED or clinic visit coding, or 2 or more asthma-related medication dispensings in prior year
- Aged 5-56 (HEDIS)
- Continuously enrolled 1999 and 2000
- Training set: 8789 San Diego patients
- Testing Set: 6104 Fontana patients

1999 Predictors

- Gender
- Subsidized insurance
- Emergency hospital care (EHC)
- Number of routine visits
- Number of prescribers
- Short-acting beta agonist canisters
- Inhaled controller canisters
- Inhaled controller/total inhaler ratio
- Oral steroids
### Independent 1999 Predictors of 2000 Emergency Hospital Care

<table>
<thead>
<tr>
<th>1999 Predictor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency hospital care</td>
<td>3.1</td>
</tr>
<tr>
<td>Any oral steroid</td>
<td>1.5</td>
</tr>
<tr>
<td>&gt; 14 Short-acting beta agonists</td>
<td>1.3</td>
</tr>
</tbody>
</table>

### Risk Points and Definition

- **Points**
  - Emergency hospital care = 2
  - Oral steroid = 1
  - > 14 Beta agonists = 1
- **Risk definition**
  - Low risk = 0 points
  - Medium risk = 1 point
  - High Risk = > 2 points
Model Performance: Prevalence

- Low Risk: 63%
- Medium Risk: 28%
- High Risk: 9%

Model Performance: Positive Predictive Value

- Low Risk: 6.2%
- Medium Risk: 8.1%
- High Risk: 22.0%
Model Performance: High Risk

<table>
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<tr>
<th>Metric</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>25.4 %</td>
</tr>
<tr>
<td>Specificity</td>
<td>92.0 %</td>
</tr>
<tr>
<td>Relative Risk</td>
<td>3.2</td>
</tr>
<tr>
<td>High + Medium Sensitivity</td>
<td>53.7 %</td>
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</table>

Conclusion: Risk for Exacerbations

- Patients with prior emergency hospital care (EHC) or both oral steroid use and high $\beta$-agonist use ($>14$ canisters in prior year) are at approximately 3-fold increased risk of subsequent EHC.
- Patients with either oral steroid use or high $\beta$-agonist use are at approximately 33% increased risk of subsequent EHC.
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Asthma Control versus Asthma Quality of Care

• Control
  – Patient-centered
  – Outcome measure

• Quality of Care
  – Provider-centered
  – Process or outcome measure
**Assessment of Quality Care**

- Process versus outcome measure
  - Process measure more under the control of the provider
  - Outcomes depend on some factors beyond the provider’s control (e.g. disease severity)
- Process measure should be related to improved outcomes

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The following medications are considered valid controller medications:

- Inhaled corticosteroids
- Inhaled cromolyn and nedocromil
- Oral leukotriene modifier and theophylline medications
- Excludes long-acting beta agonists

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Asthma Medication Ratio

• Controllers/(Controllers + Short-acting Beta Agonists)

• Number of canisters or canister equivalents (30 day supplies of oral controllers)

• Ranges from 0 (no Controllers) to 1.0 (no Short-acting Beta Agonists)

• ≥ 0.5 appears to be the optimal cut-off (in relationship to improved outcomes)
Initial Kaiser Permanente Study

- 8789 San Diego patients aged 5-56
- Predictors in 1999
- Outcome in 2000: Asthma hospitalization or ED visit (“emergency hospital care”)


Prevalence of Patients in Ratio Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Prevalence (%)</th>
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<tbody>
<tr>
<td>&lt; 0.3</td>
<td>57.6</td>
</tr>
<tr>
<td>0.3 – 0.5</td>
<td>26.6</td>
</tr>
<tr>
<td>&gt; 0.5</td>
<td>15.8</td>
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Relationship of Ratio to Subsequent Emergency Hospital Care*

* p = 0.04

Optimal Cut-Off For the Medication Ratio

- Stepwise regression analysis
- Outcome: 2000 Emergency Hospital Care
- Predictors
  - 1999 Emergency Hospital Care
  - 1999 Ratio Cut-offs
    - < 0.3
    - < 0.4
    - < 0.5
    - < 0.6
The Winner

< 0.5

Relationship of Medication Ratio to Acute Episodes

- 38,433 Southern California Kaiser Permanente patients with persistent asthma
- Medication ratio determined in 2002
- Acute episodes (one or more asthma emergency department visits or hospitalizations) determined in 2003

**Relationship of Medication Ratio to Acute Episodes**

![Bar chart showing the relationship between medication ratio and percentage of ED or hospital visits.](chart.png)

- **P < 0.0001**

**Relation of Medication Ratio to Patient-Reported Outcomes**

- Random sample of 2250 adult patients (aged 18-56) with persistent asthma (1999)
- Northern California, Southern California, and Northwest Kaiser Permanente
- Survey completed in Fall, 2000
- Survey included quality of life (AQLQ), control (ATAQ) and symptom severity (AOMS)
- Medication ratio from year 2000 computerized pharmacy records

*Schatz, et al. Chest 2006; 130:43*
Relationship of Ratio \( \geq 0.5 \) to Poor Symptom Control

Joint Task Force Study
- A Joint Task Force of the American Academy of Allergy Asthma and Immunology and the American College of Allergy Asthma and Immunology convened to coordinate a study to define an improved asthma quality of care measure.
- Study Strategy: Perform a uniform analysis utilizing several commercial insurance data sets in patients aged 5-56 (HEDIS age group).
- Data sets
  - i3 Innovus Lab/Rx (Merck)
  - Marketscan (Novartis)
  - IHCIS (sanofi-aventis)
  - Pharmetrics (AstraZeneca)

All p < 0.0001
Joint Task Force Study

- Test the relationship of different numerator-denominator combinations in the first year (2003) to asthma exacerbations in the subsequent year (2004)
- *Exacerbations* defined as a hospitalization with a primary diagnosis of asthma, an emergency department visit with a primary diagnosis of asthma, or a dispensing of an oral corticosteroid medication

Numerators Tested

- HEDIS: Any controller
- 4 or more controllers
- Medication Ratio \( \geq 0.5 \)
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### Joint Task Force Study: One and Two Year HEDIS Denominators

#### % Exacerbations (Odds Ratio)

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<th>TWO YEAR HEDIS</th>
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<tr>
<td>Controllers ≥ 1</td>
<td>25* (1.78)</td>
<td>36* (1.18)</td>
</tr>
<tr>
<td>Controllers = 0</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>Ratio ≥ 0.5</td>
<td>23 (0.83)</td>
<td>34 (0.83)</td>
</tr>
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<td>Ratio &lt; 0.5</td>
<td>27*</td>
<td>39*</td>
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Medicaid Population

- 90,909 Medicaid patients aged 5-56 with persistent asthma in California and New York
- *Reduction* of risk of exacerbation in follow-up year in patients with ratio $\geq 0.5$
  - Aged 5-56
  - Aged 5-19
  - Aged 20-40
  - Aged 41-56
- *Increased* risk of exacerbations with HEDIS any controller measure in all age groups


Predictors of High Medication Ratio

- Higher controller medication possession ratio (adherence)
- Lower SABA dispensings
- Specialty care
- Combination ICS-LABA therapy
- Leukotriene receptor antagonist controller

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New HEDIS Adherence Measure

• HEDIS two year persistent asthma denominator

• Two Rates
  – The percentage of members who remained on an asthma controller medication for at least 50% of their treatment period
  – The percentage of members who remained on an asthma controller medication for at least 75% of their treatment period
New HEDIS Adherence Measure: Method

1. Identify earliest dispensing event for any asthma controller medication during the measurement year.
2. Determine treatment period (to end of year)
3. Count days covered by at least one prescription for an asthma controller medication filled during treatment period (based on days supply).
4. Calculate member’s proportion of days covered (PDC) using
   --Total Days Covered by a Controller Medication in the Treatment Period (step 3)
   -- Total Days in Treatment Period (step 2)

New HEDIS Adherence Measure: Results

• *Medication Compliance 50%*
  – The number of members who achieved a PDC of at least 50% for their asthma controller medications during the measurement year

• *Medication Compliance 75%*
  – The number of members who achieved a PDC of at least 75% for their asthma controller medications during the measurement year
New HEDIS Adherence Measure: Concerns

• Measuring adherence to inhaled medications from pharmacy data is methodologically challenging
  – Variable accuracy of days supply field
  – Varying MD directions and patient use
  – Varying number of puffs per canister
• Relationship of this measure to actual medication adherence is uncertain
• Relationship of this measure to improved outcomes has not been tested

Conclusions

• Pharmacy and medical claims data can be used to assess asthma severity, control and quality of care in large populations
• The severity and control measures can be used for outreach and targeted intervention
• Pharmacy and medical claims data can also be used to assess asthma quality of care
• Goal is to improve asthma outcomes, but demonstrating improved outcomes using these approaches will require further studies
Identifying Patients for Outreach and Targeted Intervention

• High risk for exacerbations defined based on prior emergency hospital, oral steroid, and beta agonist utilization
• No controller in patients with persistent asthma defined by HEDIS (especially two year)
• Short-acting beta agonist canisters > 6 in 12 months

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HEDIS Administrative Data Asthma Quality Measures: Conclusions

• The any controller measure is not related to improved asthma outcomes
• The medication ratio measure is related to improved asthma outcomes (impairment and risk) within health plans
• The relationship of the new adherence measure to asthma outcomes is unknown

Caveat: HEDIS Medication Ratio Measure

• The medication ratio measure has not been validated as a measure to compare health plans
• Types of controllers and number of short-acting beta agonist canister dispensings influence the medication ratio
• Differences between plans in prescribing practices and pharmacy benefits may influence the medication ratio to a greater degree than they influence asthma outcomes
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