Efficiency Methodology

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Bob Kelley

Thomson Healthcare
October 2007
Overview

• Definition
• Clinical Grouping Methods
• Implementation Considerations
• Reporting to Physician Organizations
• Example Analysis: Hypertension
Definition

Output

Inputs

→

Episode

Services
Clinical Grouping

• Clinical Condition
• Episode building
• Accounting for Comorbidities
Disease Staging Methodology
Disease Staging Framework

• Initially developed under contract to NCHSR with ongoing private development by Medstat/Jefferson teams

• Software converts a stream of claims into clinically homogeneous groups

• Takes over 15,000 ICD-9-CM codes to 560 disease categories

• Independent of setting or treatment

• Etiology assigned to each category

• Severity stratification based on robust clinical criteria

• Predicts a balanced set of outcome measures
Disease Staging

Disease Staging Severity Stratification

Stage 0  History of a disease

Stage 1  Conditions with no complications or problems of minimal severity

Stage 2  Problems limited to an organ system; significantly increased risk of complications

Stage 3  Multiple site involvement; generalized systemic involvement; poor prognosis

Stage 4  Death
### Cardiovascular Clinical Criteria for Disease Staging

**DISEASE:** Coronary Artery Disease with prior Coronary Revascularization  
**ETIOLOGY:** Degenerative, Genetic

<table>
<thead>
<tr>
<th>STAGE</th>
<th>DESCRIPTION</th>
<th>DIAGNOSTIC FINDINGS</th>
<th>ICD-9-CM CODES</th>
</tr>
</thead>
</table>
| 1.1   | Coronary atherosclerosis or asymptomatic chronic ischemic heart disease or old myocardial infarction | Coronary atherosclerosis  
OR asymptomatic chronic ischemic heart disease  
OR old myocardial infarction  
OR history of myocardial infarction ≥30 days old  
AND ejection fraction ≥ 50% [echocardiogram report or nuclear ejection fraction report] | Dx V4581, 99603, 41402-41407; (Dx 41181, 412, 41400-41405, 4292) + (Dx V4581, 99603) |
| 1.2   | Chronic stable exertional angina or chronic ischemic heart disease | Chronic stable exertional angina  
OR chronic ischemic heart disease | (Dx 4139, 4148-4149) + (Dx V4581, 99603) |
| 2.1   | Progressing angina pectoris or exertional myocardial ischemia at low workload or old myocardial infarction with low ejection fraction | Progressing angina pectoris  
OR exercise induced myocardial ischemia at < 6 METS [stress test report]  
OR history of prior myocardial infarction ≥ 30 days  
AND left ventricular ejection fraction < 50% [echocardiogram report or nuclear ejection fraction report]  
AND left ventricular ejection fraction ≥ 30% [echocardiogram report or nuclear ejection fraction report] | (Dx 4110, 41189) + (Dx V4581, 99603) |
| 2.2   | Prinzmetal’s variant angina | Change in nature of onset of symptoms and severity of known anginal pain  
AND past history of angina  
OR angina occurring at rest  
AND ST-T elevations at time of pain [EKG report]  
OR Prinzmetal’s variant angina | Dx 4130-4131 + (Dx V4581, 99603) |
Medical Episode Grouper (MEG) Methodology
Episodes of Care

- Health care is typically provided in a series of separate but related services
- All of these services must be included to produce a comprehensive economic analysis of care provided to patients
- Using an episode approach enables an assessment of costs of care and lends itself to the analysis of the processes as well as the outcomes of care

Episode Construction

- Case Mix Adjustment - Diagnosis codes from health care claims and other administrative data are grouped into one of over 560 Disease Staging disease categories and severity stages
- Clean periods unique to each disease category are used to develop boundaries around the episode
- Mappings of National Drug Codes (NDCs) and laboratory/diagnostic procedure codes enable pharmacy/lab/diagnostic claims to be grouped to relevant episodes
- Lab and diagnostic imaging claims preceding an episode are examined to determine whether they should be combined with the episode
MEG—Putting it All Together

Look-back

Episode 10
CAD, Progressive Angina

Clean Period

Lab

Prescription

Office Visit

Hospital Admission

Office Visit

Office Visit

DRUG TRANSACTION FILE

<table>
<thead>
<tr>
<th>PATID</th>
<th>NDC</th>
<th>SERVDATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>ISDN</td>
<td>95-01-15</td>
</tr>
<tr>
<td>01</td>
<td>INSUL</td>
<td>95-02-15</td>
</tr>
<tr>
<td>01</td>
<td>INSUL</td>
<td>95-04-15</td>
</tr>
<tr>
<td>01</td>
<td>AMOX</td>
<td>95-04-15</td>
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<tr>
<td>01</td>
<td>AMOX</td>
<td>95-11-15</td>
</tr>
<tr>
<td>01</td>
<td>GRHORM</td>
<td>95-11-15</td>
</tr>
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</table>

LOOKUP TABLE

<table>
<thead>
<tr>
<th>NDC</th>
<th>EPGRP</th>
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<tbody>
<tr>
<td>ISDN</td>
<td>10</td>
</tr>
<tr>
<td>INSUL</td>
<td>359</td>
</tr>
<tr>
<td>INSUL</td>
<td>360</td>
</tr>
<tr>
<td>INSUL</td>
<td>361</td>
</tr>
<tr>
<td>AMOX</td>
<td>484</td>
</tr>
<tr>
<td>AMOX</td>
<td>86</td>
</tr>
</tbody>
</table>
## Coronary Artery Disease Episodes

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Episodes</th>
<th>Mean Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stable Angina</td>
<td>80,470</td>
<td>$2,657</td>
</tr>
<tr>
<td>2</td>
<td>Progressive Angina</td>
<td>14,599</td>
<td>$11,017</td>
</tr>
<tr>
<td>3</td>
<td>AMI</td>
<td>7,749</td>
<td>$16,811</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>102,818</td>
<td>$4,911</td>
</tr>
</tbody>
</table>

MarketScan 2002
Patient-Level Complexity Adjusted Episodes
The Challenge

Patient A
Progressive Angina
2005 Costs ~ $15,323

62 year old, Male
Comorbidities
• Congestive Heart Failure
• Type 1 Diabetes
• Vascular disease
• Renal failure
Relative Risk Index = 29.62

Patient B
Progressive Angina
2005 Costs ~ $5,576

58 year old, Female
Comorbidities
• Hypertension, minimal
Relative Risk Index = 2.54

Patients with at the same severity level within an episode can have significant cost variance....

...due to different comorbidity profiles.
Episodes and Patient-Level Risk Adjustment

• MEG
  – Disease-based episodes of care, e.g., Coronary Artery Disease and Diabetes
  – Disease severity predicated on the progression of medical complications of a disease, e.g., Coronary Artery Disease:
    • Stage 1: Stable angina
    • Stage 2: Progressive Angina
    • Stage 3: AMI
  – Unit of analysis – an episode
Episodes and Patient-Level Adjustment (cont’d)

• Diagnostic Cost Groups (DCGs)
  – Risk adjustment methodology used to predict current or future patient costs, e.g. relative risk score (RRS)
  – Unit of analysis – the patient
  – Based on all prior or current year claims to identify patient-level complexity/comorbidities

• Together, MEG and DCGs provide a complete picture of a patient
DCG Model – Clinical Output

- Each ICD-9-CM code maps to one DxGroup (clinically homogeneous). Most members have multiple DxGroups.

- CCs are clinical groupings of DxGroups that are related and imply similar resource use (organized by body system or disease group). Each DxGroup maps to only one CC.

- 31 Hierarchies are imposed on the CCs to produce HCCs. These clinical hierarchies identify the most costly manifestation of each distinct disease. A member is only assigned the highest CC in each hierarchy. A member will likely have multiple HCCs.
## DCG Relative Risk Score (RRS)

<table>
<thead>
<tr>
<th>Risk Categories</th>
<th>Relative Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>62 year old male</td>
<td>.45</td>
</tr>
<tr>
<td><strong>HCCs</strong></td>
<td></td>
</tr>
<tr>
<td>Diabetes with renal manifestations</td>
<td>5.71</td>
</tr>
<tr>
<td>Type 1 diabetes</td>
<td>.95</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>1.84</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>.92</td>
</tr>
<tr>
<td>Vascular disease with complication</td>
<td>1.20</td>
</tr>
<tr>
<td>Vascular disease</td>
<td>0 (h)</td>
</tr>
<tr>
<td>Dialysis status</td>
<td>18.09</td>
</tr>
<tr>
<td>Diabetes with congestive heart failure</td>
<td>.46</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29.62</strong></td>
</tr>
</tbody>
</table>

Used by permission DxCG®, Inc.
## Coronary Artery Disease: Severity Stages and Complexity Levels

### Complexity Levels – RRS Ranges

<table>
<thead>
<tr>
<th>Disease Severity Stage</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable Angina</td>
<td>$1,080</td>
<td>$1,424</td>
<td>$1,679</td>
<td>$1,940</td>
<td>$2,246</td>
</tr>
<tr>
<td>Progressive Angina</td>
<td>$5,974</td>
<td>$8,704</td>
<td>$10,825</td>
<td>$13,173</td>
<td>$13,173</td>
</tr>
<tr>
<td>Acute Myocardial Infarction</td>
<td>$11,041</td>
<td>$15,041</td>
<td>$15,041</td>
<td>$18,423</td>
<td>$18,423</td>
</tr>
</tbody>
</table>

Source: Medstat Health Plan Customer, 83 million claims, 2003-2004
Dimensions of Risk – Coronary Artery Disease

Mean Allowed Payments

Complexity Levels - RRS Ranges

$0

$5,000

$10,000

$15,000

$20,000

A

B

C

D

E

Episode Severity Stages

1 - Stable Angina

2 - Progressive Angina

3 - AMI

Source: Medstat Health Plan Customer, 83 Million Claims, 2003-2004
Episode 496
Asthma

Which Physician is most Efficient?

Dr. A

Look-back

Test

Office

Drug

Hospital

Clean Period

Dr. B

Look-back

Test

Office

Drug

Office

Drug

Office

Drug

Office

Drug

Office

Clean Period

Dr. C

Drug

Office

Drug

Office

Drug

Office

Drug

Office

Clean Period
Implementation Issues

• Standardized Pricing
  – Capitated encounters do not contain actual charges
  – Appropriate standard costs are developed to convert utilization to dollars
  – For example, Resource Based Relative Value Units to convert CPT codes to dollars

• Outlier Trims
  – Exclude episodes with extreme high and low costs (top and bottom percentiles)

• Ensuring Stability and Reliability
  – Minimum sample size per analytic unit (30 episodes but for full scale test results will report all episodes, regardless of sample size)
  – Risk adjustment process applies statistical methods to ensure reliability

• Comparisons to Norms and Benchmarks
  – Internal norms vs external norms
  – Geographic differences to be evaluated

• Attribution:
  – Enrollment information from health plans used to attribute members to POs (requires continuous one year enrollment)
# Standardized Pricing

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Coding</th>
<th>Standard Pricing Methodology</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Inpatient</td>
<td>DRG</td>
<td>CMS DRG Relative Weights and LOS Groups</td>
<td>Scaled by MarketScan™-based conversion factor</td>
</tr>
<tr>
<td>Facility Outpatient</td>
<td>CPT, HCPCS</td>
<td>CMS APC and ASC weights</td>
<td>Scaled by MarketScan™-based conversion factor</td>
</tr>
<tr>
<td>Professional Fee</td>
<td>CPT</td>
<td>CMS RBRVU weights</td>
<td>CMS RBRVU weights, conversion factor</td>
</tr>
<tr>
<td>Lab/Radiology/Ancillary</td>
<td>CPT</td>
<td>CMS RBRVU weights</td>
<td>CMS RBRVU weights, conversion factor</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>NDC + Quantity</td>
<td>Average Allowed Price</td>
<td>MarketScan™ Average (NDC + Quantity)</td>
</tr>
</tbody>
</table>
Physician Organization Reporting
Reporting Results to Physician Organizations

Objectives:

1. Provide meaningful information about overall performance in all efficiency measures
2. Provide enough information to make results actionable, targeting areas for improvement.

Report Formats:

1. Summary document (.pdf) of PO results and relevant benchmark information for all efficiency measures:
   – Generic prescribing
   – Population-base efficiency
   – Episode-based efficiency
   – Efficiency by selected clinical area
2. Excel file of episode results, with detail at episode group level and service type.
3. Reference documentation with information on all measures and methods
Levels of Aggregation

• Methodology produces a common “building block” that can then be aggregated in different ways to produce different measures/measure breakdowns

• Building block is, for each patient episode, the risk adjusted comparison of actual to expected costs by service type:
  – Inpatient
  – Pharmacy
  – Outpatient
  – etc.

• See following slide for illustrative example
### Illustrative Episode-Level Results

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient ID</td>
<td>Episode Start Date</td>
<td>Episode</td>
<td>Disease Stage</td>
<td>Relative Risk Score</td>
<td>Complexity Level</td>
</tr>
<tr>
<td>12345</td>
<td>25-Jan-06</td>
<td>10 - Coronary Artery Disease</td>
<td>2.1 Progressive Angina</td>
<td>29.62</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Observed (Standard) Inpatient Costs</td>
<td>Total Expected (Standard) Inpatient Costs</td>
<td>Inpatient Cost-Efficiency</td>
<td>Total Observed (Standard) Pharmacy Costs</td>
<td>Total Expected (Standard) Pharmacy Costs</td>
<td>Pharmacy Cost-Efficiency</td>
</tr>
<tr>
<td>$12,000</td>
<td>$6,300</td>
<td>1.90</td>
<td>$1,200</td>
<td>$2,400</td>
<td>0.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M</th>
<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Observed (Standard) Outpatient Costs</td>
<td>Total Expected (Standard) Outpatient Costs</td>
<td>Outpatient Cost-Efficiency</td>
<td>Total Observed (Standard) Costs</td>
<td>Total Expected (Standard) Costs</td>
<td>Overall Episode Cost-Efficiency</td>
</tr>
<tr>
<td>$3,500</td>
<td>$4,473</td>
<td>0.78</td>
<td>$16,700</td>
<td>$13,173</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Note: Cost Efficiency = Observed/Expected. Therefore, lower rate is better. Final calculation algorithm TBD.
Level of Aggregation – Service Type: Example

- For all episodes assigned to a group for the measurement year, can:
  - Sum total expected costs for each service type
  - Sum total observed costs for each service type
  - Divide observed by expected costs to get score for each service type and total

- Service types include:
  - Inpatient
  - Prescription Drug
  - Office Visit
  - ER
  - Lab
  - Radiology
  - Outpatient Surgery

- Final set of service types to be informed by pilot test results
Summary Report

P4P Efficiency Domain Summary – Full Scale Test
Reporting Year: 2007
Measurement Year: 2006
Physician Organization Name, DMHC #

Efficiency Score

- Pop-Based Efficiency: 1.2
- Overall Episode-Based Efficiency: 1.25
- Inpatient: 1.25
- Episode 1 by Clinical Area: 1.33
- Pharmacy…etc.: 0.63

Episode-Based by Service Category
Population-Based Efficiency Summary

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Members</th>
<th>Ave Observed (Standardized) Cost/Member</th>
<th>Ave Expected (Standardized) Cost/Member</th>
<th>Overall Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>7,000</td>
<td>$6,000</td>
<td>$5,000</td>
<td>1.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Number of Members</th>
<th>Ave Observed (Standardized) Cost/Member</th>
<th>Overall Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10th percentile</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>25th percentile</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>50th percentile</td>
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<td></td>
<td></td>
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<tr>
<td>Mean</td>
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<td></td>
</tr>
<tr>
<td>75th percentile</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>90th percentile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td></td>
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</tr>
<tr>
<td>Standard Deviation</td>
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</table>
## Episode-Based Efficiency Summary

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Episodes</th>
<th>Ave Observed (Standardized) Cost/Episode</th>
<th>Ave Expected (Standardized) Cost/Episode</th>
<th>Overall Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>50,000</td>
<td>$500</td>
<td>$400</td>
<td>1.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Number of Episodes</th>
<th>Ave Observed (Standardized) Cost/Episode</th>
<th>Overall Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10&lt;sup&gt;th&lt;/sup&gt; percentile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25&lt;sup&gt;th&lt;/sup&gt; percentile</td>
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<tr>
<td>50&lt;sup&gt;th&lt;/sup&gt; percentile</td>
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<tr>
<td>Mean</td>
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<td>75&lt;sup&gt;th&lt;/sup&gt; percentile</td>
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<tr>
<td>Maximum</td>
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</tr>
<tr>
<td>Standard Deviation</td>
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</tr>
</tbody>
</table>
# Episode Efficiency by Service Type

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>50,000</td>
<td>$150</td>
<td>$120</td>
<td>1.25</td>
<td>$100</td>
<td>$160</td>
<td>0.63</td>
<td>$140</td>
<td>$180</td>
<td></td>
<td>$500</td>
<td>$400</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Percentile

- **Minimum**
- **10th percentile**
- **25th percentile**
- **50th percentile**
- **Mean**
- **75th percentile**
- **90th percentile**
- **Maximum**
- **Standard Deviation**
Excel File of Episode Results

• One row for each Episode Group (560 groups) (e.g. Essential Hypertension)

• Data Elements:
  – Episode name
  – Type (e.g. Chronic)
  – Number of Episodes
  – Total Observed Cost
  – Mean Observed Cost
  – Mean Expected Cost
  – Overall Efficiency Index
  – Percent of Episodes
  – Percent of Costs
  – Mean Episode Length
  – Observed and Expected Costs and Efficiency Score by Service Type

• Summary Group Roll-Ups
  – Episode Summary Group (192 groups)
  – Body System
Example Analysis of Episodic Efficiency Results:  
A Study of Treatment Patterns

- Standard reports to Physician Organizations will include service type benchmark data for a number of high impact episode groups.
- Considering deeper investigation into specific sources of variation in costs between high and low performing benchmark groups.
- Results could provide useful insights to PO improvement initiatives.
Study Methodology

• Select episode groups for investigation:
  – High variability in provider results
  – High volume
  – High cost

• Calculate overall performance index for each provider (e.g. physician group)

• Sort by performance index and categorize into “tiers” (e.g. quintiles)

• Profile tiers by service category
  – Performance index
  – Costs
  – Utilization

• Identify specific sources of variation in costs by service category
Hypertension: Average Total $/Episode by Provider Quintile

- Average cost per episode is standardized for patient risk
- Excludes outliers and incomplete episodes
Hypertension:
Average $/Episode by Provider Quintile

- Prescription Drug accounts for ~70% of costs
Hypertension Episode Variance Analysis

- As it accounts for the majority of cost, Rx accounts for most of total variance
- Question: Are high drug costs allowing for efficiency elsewhere?
Hypertension Episode Variance Analysis – No Rx

- Similar variation is seen in cost for medical care, particularly for Quintiles 1 & 5
- Differences in Quintiles 2 – 4 are less consistent
### Hypertension:

**Provider Variance: Prescription Drug $ per Episode**

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>$714</td>
</tr>
<tr>
<td>Q2</td>
<td>$805</td>
</tr>
<tr>
<td>Q3</td>
<td>$870</td>
</tr>
<tr>
<td>Q4</td>
<td>$1,005</td>
</tr>
<tr>
<td>Q5</td>
<td>$1,156</td>
</tr>
</tbody>
</table>

Average: $897

- Sample of 59 providers managing 30+ stage 1.01 hypertension patients
- Prescription drug payments standardized for price and patient risk
Average Prescription Drug $/Episode for 1st and 5th Quintiles

Compared to Q1, Q5 had higher $/Episode in all 5 major classes
Use of more costly drugs within each class contributed to Q5’s higher costs
Average Days Supply/Episode for 1\textsuperscript{st} and 5\textsuperscript{th} Quintiles

However, higher use was a greater factor for ARB and Ca Channel drugs.
Summary

• Definition
• Clinical Grouping Methods
• Implementation Considerations
• Reporting to Physician Organizations
• Example Analysis: Hypertension