NATIONAL QUALITY FORUM

Resource Use Measure Evaluation 1.0
January 2011

This form contains the measure information submitted by stewards. Blank fields indicate no information was provided. Attachments also may have been submitted and are provided to reviewers. The subcriteria and most of the footnotes from the evaluation criteria are provided in Word comments within the form and will appear if your cursor is over the highlighted area. Hyperlinks to the evaluation criteria and ratings are provided in each section.

Resource Use Definition:

- Resource use measures are broadly applicable and comparable measures of input counts—(in terms of units or dollars)-- applied to a population or population sample
- Resource use measures count the frequency of specific resources; these resource units may be monetized, as appropriate.
- The approach to monetizing resource use varies and often depends on the perspective of the measurer and those being measured. Monetizing resource use allows for the aggregation across resources.

NQF Staff: NQF staff will complete a preliminary review of the measure to ensure conditions are met and the form has been completed according to the developer's intent. Staff comments have been highlighted in green.

TAP/Workgroup (if utilized)**:** Complete all yellow highlighted areas of the form. Evaluate the extent to which each subcriterion is met. Based on your evaluation, summarize the strengths and weaknesses in each section.

Note: *If there is no TAP or workgroup, the SC also evaluates the subcriteria (yellow highlighted areas)*.

Steering Committee: Complete all pink highlighted areas of the form. Review the workgroup/TAP assessment of the subcriteria, noting any areas of disagreement; then evaluate the extent to which each major criterion is met; and finally, indicate your recommendation for the endorsement. Provide the rationale for your ratings.

Evaluation ratings of the extent to which the subcriteria are met (TAP or Steering Committee)
High (H) – based on the information submitted, there is high confidence (or certainty) that the criterion is met
Moderate (M) – based on the information submitted, there is moderate confidence (or certainty) that the criterion is met
Low (L) - based on the information submitted, there is low confidence (or certainty) that the criterion is met
Insufficient (I) – there is insufficient information submitted to evaluate whether the criterion is met, e.g., blank, incomplete, or information is not relevant, responsive, or specific to the particular question (unacceptable)
Not Applicable (NA) - Not applicable (only an option for a few subcriteria as indicated)

Evaluation ratings of whether the measure met the overall criterion (Steering Committee)
Yes (Y)- The overall criteria has been met
No (N)-The overall criterion has NOT been met
High (H) – There is high confidence (or certainty) that the criterion is met
Moderate (M) – There is moderate confidence (or certainty) that the criterion is met
Low (L) - There is low confidence (or certainty) that the criterion is met

Recommendations for endorsement (Steering Committee)
Yes (Y) – The measure should be recommended for endorsement
No (N)-The measure should NOT be recommended for endorsement
Abstain (A)- Abstain from voting to recommend the measure

TAP/Workgroup Reviewer Name:	
Steering Committee Reviewer Name:	
Staff Reviewer Name(s):	
NQF Review #: 1576	**NQF Project:** Endorsing Resource Use Standards- Phase II

BRIEF MEASURE INFORMATION
Measure Title: Episode of care for patients with diabetes over a one year period
Measure Steward (IP Owner): American Board of Medical Specialties Research and Educatio Foundation, 222 N. LaSalle St., Suite 1500, Chicago, Illinois, 60601
Brief description of measure: Resource use and costs associated with management of diabetes over a one year period. Identify patients in a management phase of diabetes by including patients with diabetes in the year prior to the measurement year and measure diabetes-related resource use and costs during the measurement year. Patients with new diagnoses of diabetes and those with end stage disease are excluded from the measure. Resource use is attributed at the level of the individual provider.
Resource use service categories: Inpatient services: Inpatient facility services Inpatient services: Evaluation and management Inpatient services: Procedures and surgeries Inpatient services: Imaging and diagnostic Inpatient services: Lab services Inpatient services: Admissions/discharges Ambulatory services: Outpatient facility services Ambulatory services: Emergency Department Ambulatory services: Pharmacy Ambulatory services: Evaluation and management Ambulatory services: Procedures and surgeries Ambulatory services: Imaging and diagnostic Ambulatory services: Lab services Durable Medical Equipment (DME)
Brief description of measure clinical logic: Resource use and costs associated with management of diabetes over a one year period. Identify patients in a management phase of diabetes by including patients with diabetes in the year prior to the measurement year and measure diabetes-related resource use and costs during the measurement year. Patients with new diagnoses of diabetes and those with end stage disease are excluded from the measure. Resource use attributed at the level of the individual provider.
If included in a composite or paired with another measure, please identify composite or paired measure:
Subject/ Topic Areas: Endocrine
Type of resource use measure: Per episode
Data Type: Administrative claims Other

CONDITIONS FOR CONSIDERATION BY NQF	
Four conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards:	**NQF Staff**
A. Measure Steward Agreement. ***The measure is in the public domain or an intellectual property (measure steward agreement) is signed. Public domain only applies to governmental organizations. All non-government organizations must sign a measure steward agreement even if measures are made publicly and freely available.*** **A.1.Do you attest that the measure steward holds intellectual property rights to the measure? (If no, do not submit)**	**A** **Y☐** **N☐**

Yes **A.2. Please check if either of the following apply:** **A.3. Measure Steward Agreement.** Agreement signed and submitted **A.4. Measure Steward Agreement attached:**	
B. Maintenance. ***The measure owner/steward verifies there is an identified responsible entity and process to maintain and update the measure on a schedule that is commensurate with the rate of clinical innovation, but at least every 3 years. (If no, do not submit)*** Yes, information provided in contact section	**B** **Y☐** **N☐**
C. Purpose/ Use *(All the purposes and/or uses for which the measure is specified and tested:* Quality Improvement (Internal to the specific organization)	**C** **Y☐** **N☐**
D. Testing. ***The measure is fully specified and tested for reliability and validity (See guidance on measure testing).*** Yes, reliability and validity testing completed	**D** **Y☐** **N☐**
E. Harmonization and Competing Measures. ***Have NQF-endorsed measures been reviewed to identify if there are related or competing measures? (List the NQF # and title in the section on related and competing measures)*** Yes ***E.1.*Do you attest that measure harmonization issues with related measure (either the same measure focus or the same target population) have been considered and addresses as appropriate? (List the NQF # and title in the section on related and competing measures)** No related measures *E.2.Do you attest that competing measures (both the same measure focus and the same target population) have been considered and addressed where appropriate?* No competing measures	**E** **Y☐** **N☐**
F. Submission Complete. ***The requested measure submission information is complete and responsive to the questions so that all the information needed to evaluate all criteria is provided.***	**F** **Y☐** **N☐**
Have all conditions for consideration been met? **Staff Notes to Steward** (*if submission returned*)**:**	**Y ☐** **N ☐**
Staff Notes to Reviewers (*issues or questions regarding any criteria*)**:**	
File Attachments Related to Measure/Criteria: Attachment:	

Attachment: S5_Data Dictionary-634343517487393186.pdf
Attachment:
Attachment:
Attachment:
Attachment:
Attachment:
Attachment:
Attachment: 10.1_Risk adjustment method-634343531915370646.pdf
S12_sample score report_diabetes.pdf
Attachment: SA_Reliability_Validity Testing Diabetes.pdf

IMPORTANCE TO MEASURE AND REPORT	
Extent to which the specific measure focus is important to making significant gains in health care quality (safety, timeliness, effectiveness, efficiency, equity, patient-centeredness) and improving health outcomes for a specific high impact aspect of healthcare where there is variation in performance. **Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All subcriteria must be met to pass this criterion.**	**Eval Rating**
High Impact **IM1. Demonstrated high impact aspect of healthcare:** Affects large numbers A leading cause of morbidity/mortality **IM1.1. Summary of evidence of high impact:** The Institute of Medicine and AQA have identified diabetes as one of 20 conditions that should be considered priority areas in need of quality improvement based on its relevance to a significant volume of patients, its impact on those patients, and the perception of opportunity to significantly improve the quality of related care. Diabetes had also been previously identified as a priority area in other national initiatives including AHRQ's Medical Expenditure Panel Survey, the VA's Quality Enhancement Research Initiative, HRSA's Health Disparities Collaboratives, and the Quality Improvement Program at CMS. The National Diabetes Statistics estimates that at least twenty-three million people (7.8%) of the US population has diabetes. (1). In addition, the costs of treatment for diabetic patients can be very high in some cases – according to HCUP, there were over 540,000 hospitalizations with a principal diagnosis of diabetes in the U.S. in 2006 – and these costs can vary dramatically from one provider to the next as well as across regions, in part because of underlying patient risk factors and comorbidities (for which this measure adjusts), but also because of variations in practice patterns (2). The prevalence of diabetes increases due to longer life expectancy and an increased prevalence of overweight and obesity(3). Between 80-90% of patients with type 2 diabetes are obese and this has reached epidemic proportions in the United States. The estimated prevalence of diabetes among adults in the United States ranges from 5.3 to 12.1 percent (median 7.5 percent). Due to the associated microvascular and macrovascular complications, diabetes accounts for almost 14 percent of the health care expenditures (4,5). About 90% - 95% of patients with diabetes are Type 2 diabetics, with the remainder being Type 1 (NDS, 2007). Diabetes of either type may cause life-threatening or life-ending complications. Complications of diabetes include metabolic abnormalities, micro- and macrovascular disorders, blindness, neuropathy and renal insufficiency. Diabetic morbidity produces significantly increased health utilization and disability the total annual economic burden of diabetes has increased from $100 billion in 2003 to close to $174 billion in 2007believed to approach $100 billion in the United States (6). Direct and indirect costs of diabetes have a significant impact on society, especially when lost productivity due to diabetes-related morbidity and mortality is included. Cost of illnesses studies have shown the cost of diabetes in the United States to be over $100 billion (7). In 2002, the total cost of diabetes was $132 billion. This includes $116 billion for direct medical costs and $58 billion for indirect costs (disability, work loss, premature mortality) (6). In a study done at Kaiser Permanente, expenditures overall for diabetics were 2.4 times those of non-diabetic controls. Excess annual costs for diabetics in this study were calculated to be $3,494 per patient. Of this total, 15.5% of the excess	**1a** **H☐** **M☐** **L☐** **I☐**

cost was attributable to outcomes which might be reduced by better glycemic control (exclusive of any potential benefit in cardiovascular disease) (8).
Nationwide, the long-term outcomes of blindness, amputation, and ESRD account for a considerable expenditure of health care dollars. Experts estimate annual costs for these complications in diabetics to be about $500 million for blindness and $2 billion for ESRD (9). Diabetes is currently the leading cause of all new cases of blindness for adults, nontraumatic lower extremity amputations, and kidney failure (6). Cumulative costs for amputation total ~ $40,000 per case, including follow-up treatment(10). Diabetes can lead to stroke, pregnancy complications, heart disease, and deaths associated with the flu and pneumonia. A reduction in any outcome would have significant financial implications and research has shown that adults with diabetes are 2-4 times higher than for non-diabetes people. In sum, over 200,000 people die from diabetes-related issues (6).

IM1.2. Citations for evidence of high impact cited in IM1.1.:

1.Priority Areas for National Action: Transforming Health Care Quality. Institute of Medicine. Karen Adams and Janet Corrigan Editors. March 10, 2003.
2.Health Care and Utilization Project. AHRQ. http://hcupnet.ahrq.gov/. Accessed March 2009.
3. Surveillance of certain health behaviors and conditions among states and selected local areas - behavioral risk factor surveillance system (BRFSS), United States, 2006. MMWR 2008; 57:SS7.
4.Mokdad, AH, Ford, ES, Bowman, BA, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA 2003; 289:76.
5.Harris, MI (Ed). Diabetes in America, 2d ed, National Institutes of Health Publication No. 95-1468, 1995.
6.CDC (2008): Diabetes Disabling Disease to Double by 2050. http://www.cdc.gov/nccdphp/publications/aag/ddt.htm.
7.Ettaro l, Songer TJ, Zhang P, Engelgau mm. Cost-of-illness studies in diabetes mellitus. Pharmacoeconomics 2004;22:149-64.
8.Selby JV, Ray GT, Zhang D, Colby CJ. Excess costs of medical care for patients with diabetes in a managed care population, Diabetes Care 20(9):1396-1402, 1997.
9.Nelson RG, Knowler WC, Pettitt DJ, Bennett PH. "Kidney diseases in diabetics", in Diabetes in America, 2nd ed. Bethesda: National Institutes of Health –National Institute of Diabetes and Digestive and Kidney Diseases, NIH Publication No. 95-1468, 1995.
10.Reiber GE, Boyko EJ, Smith DG. "Lower extremity foot ulcers and amputations in diabetes", in Diabetes in America, 2nd ed. Bethesda: National Institutes of Health -National Institute of Diabetes and Digestive and Kidney Diseases, NIH Publication No. 95-1468, 1995.

IM2. Opportunity for Improvement

IM2.1. Briefly explain the benefits envisioned by use of this measure:

There are existing quality measures over a one-year period for patients with diabetes. This measure complements those measures by focusing on the resource use during that period. It will ultimately be important to use the results from this measure in combination with quality measures to evaluate the overall efficiency of care for patients with diabetes. It is quite possible that providers that have higher costs are those that are provided the highest quality care. Therefore it is important to couple these two measurements to get an assessment of the overall efficiency of healthcare provided.

IM2.2. Summary of data demonstrating variation across providers or entities:

1b

•The AHRQ website summarizes State-generated estimates for four diabetes care quality measures from the Behavioral Risk Factor Surveillance System (BRFSS), collected by States and coordinated by the CDC. The BRFSS reports that States have a two-fold range of 48 to 89 percent of their residents with diabetes receiving an annual HbA1c test. A similar spread between the States occurs for foot exams; a slightly smaller difference occurs for eye exams. Influenza immunizations, however, have a four-fold difference between the high and low State rates.(1)
•A study by Krein et al, found large differences in the amount of practice variation across levels of care and for different types of diabetes care indicators. The greatest amount of variance tended to be attributable to the facility level. For process measures, such as whether a hemoglobin A1c was measured, the facility and primary care physician (PCP) effects were generally comparable. However, for three resource use measures the facility effect was at least six times the size of the PCP effect. (2)
•A study by Pugh, et el examined prescribing patterns for veterans
with type 2 diabetes finding those seen in primary care were less likely to receive novel regimens than those previously seen by a specialist.(3)
•Arday and colleagues examined state variability in diabetes care for Medicare beneficiaries—finding a third of 2 million

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beneficiaries with diabetes aged 18–75 years did not have annual HbA1c tests, biennial eye examinations, or biennial lipid profiles. There was wide variability in the measures among states (e.g., receipt of HbA1c tests ranged from 52 to 83%). (4)

IM2.3. Citations for data on variation:

1. http://www.ahrq.gov/qual/diabqual/diabqguidemod1a.htm
2. Krein SL, Hofer TP, Kerr EA, et al. Whom Should We Profile? Examining Diabetes Care Practice Variation among Primary Care Providers, Provider Groups, and Health Care Facilities. Health Serv Res 2002; 37:1159-1180.
3. Pugh MJ, Anderson J, et al. Differential adoption of pharmacotherapy recommendations for type 2 diabetes by generalists and specialists. Med Care Res Rev 2003 Jun;60(2):178-200.
4. Arday DR, Fleming BB, Keller DK, et al. Variations in diabetes care among states. Diabetes Care 2002;25:2230-2237.

IM2.4. Summary of data on disparities by population group:

- Compared to whites, African Americans are more than twice as likely to have diabetes. From 1980 through 2005, the age-adjusted prevalence of diagnosed diabetes doubled among black males and increased 69% among black females.(1)
- Bynum, Fisher et al, examined racial disparities in diabetes care across groups of physicians who care for populations of ambulatory diabetes patients. Among FFS Medicare beneficiaries with diabetes, blacks received less care for each of the 3 components of the study measure (eye exam, hemoglobin A1c and cholesterol testing). (2)
-
- A study by McBean and colleagues examined racial variation in the poor control of GHb among Medicare beneficiaries aged 65–75 years enrolled in managed care plans found blacks and Hispanics continued to have significantly higher rates of poor control than whites.(3)
- Jenks et al found approximately 30% of Medicare patients with diabetes do not receive at least one AIc test per year or a lipid profile at least every two years. [4]
- Piette et al report low-income patients are more likely to have negative beliefs about their medications resulting in lower adherence rates. Black patients are more likely to than White patients to report cost-related adherence problems. [5]
- O'Connell et al. found American Indians with diabetes had significantly higher rates of hypertension, cerebrovascular disease, renal failure, lower-extremity amputations, and liver disease than commercially insured U.S. adults with diabetes." [6]
- A study of racial and ethnic difference in insulin resistance found that minorities with type 1 diabetes are significantly more insulin resistant than Whites perhaps contributing to higher rates of diabetes-related complications compared with White patients. [7]

IM2.5. Citations for data on disparities cited in IM2.4:

1. CDC, Diabetes Data and Trends. http://apps.nccd.cdc.gov/ddtstrs/
2. Bynum JP, Fisher ES, Song Y, et al. Measuring racial disparities in the quality of ambulatory diabetes care. Medical Care 2010;48:1057-1063.
3. McBean AM, Huang Z, Virnig Ba, et al. Racial variation in the control of diabetes among elderly Medicare managed care beneficiaries. Diabetes Care 2003;26:3250-3256.
4. Jencks, S.F., E.D. Huff, and T. Cuerdon, Change in the quality of care delivered to Medicare beneficiaries, 1998-1999 to 2000-2001. JAMA, 2003. 289(3): p. 305-12.
5. Piette, J.D., et al., Beliefs about prescription medications among patients with diabetes: variation across racial groups and influences on cost-related medication underuse. J Health Care Poor Underserved, 2010. 21(1): p. 349-61.
6. O´Connell, J., et al., Racial disparities in health status: a comparison of the morbidity among American Indian and U.S. adults with diabetes. Diabetes Care, 2010. 33(7): p. 1463-70.
7. Danielson, K.K., et al., Racial and ethnic differences in an estimated measure of insulin resistance among individuals with type 1 diabetes. Diabetes Care, 2010. 33(3): p. 614-9.

IM3. Measure Intent

1c

IM3.1. Describe intent of the measure and its components/ Rationale (including any citations) for analyzing variation in resource use in this way

H☐ M☐ L☐

The intent is that the measure will be paired with quality measures to examine the overall efficiency of care being provided to patients with diabetes. This will help to identify providers that may be undertaking best care practices through identification of those that provide 'efficient' care by examining both the resource use as well as the readmission rates. It will be necessary to put both of these measures together in order to fully realize the potential of resource use measures. However, in the interim this can be used to compare the relative resource use by different providers to examine patterns in diabetes-related healthcare costs. This may provide actionable information if for example one providers costs are always higher because they provider is using more expensive medications or if the providers patients have more frequent hospitalizations than the patients of comparable providers.	**I**☐
IM4. Resource use service categories are consistent with measure construct *Refer to IM3.1. & all S9 items to evaluate this criteria.*	**1d** **H**☐ **M**☐ **L**☐ **I**☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Importance to Measure and Report*?	
Steering Committee: Was the threshold criterion, *Importance to Measure and Report*, met? **Rationale:**	**Y**☐ **N**☐

SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented.

MEASURE SPECIFICATIONS

S1. Measure Web Page: ***Do you have a web page where current detailed measure specifications can be obtained?*** Yes http://www.healthqualityalliance.org/hvhc-project/cost-care-measurement-development	**Eval Rating 2a1/2b1**
S2. General Approach ***If applicable, summarize the general approach or methodology to the measure specification. This is most relevant to measures that are part of or rely on the execution of a measure system or applies to multiple measures.*** The ABMS REF episode-based resource use measures were created in an open and transparent manner with input from a wide range of clinical experts, methodologists, health care economists and other stakeholders. The measure development process involved a series of deliberate steps where participating clinicians took into account the natural progression of a condition and existing best practices before carefully considering how to best use administrative claims data to construct the episode. They aimed to identify clinically homogenous populations so that the measures would be sensitive to provider decisions and existing practice protocols for like patients. Workgroup members were then asked to conceptualize the measure specifications based on their combined knowledge of guidelines, evidence, and clinical experience. The workgroups helped to define the denominator, duration, clinically relevant services and attribution of each episode as related to the clinical progression and treatment of the condition. Project staff then worked to translate the concepts into detailed written measure specifications and test the measures on a commercial database. The workgroups subsequently re-convened via a series of conference calls to review data analyses, share expert opinions, consider additional evidence-based literature, revise and finalize the measure specifications. Each measure was developed independently and, as such, they are not summative. Attachment:	

S3. Type of resource use measure:

Per episode

S4. Target Population:

S4.1. Subject/Topic Areas:

Endocrine

S4.2. Cross Cutting Areas *(HHS or NPP National health goal/priority)*

Care Coordination
Disparities

S5. Data dictionary or code table
Please provide a web page URL or attachment if exceeds 2 pages. NQF strongly prefers URLs. Attach documents only if they are not available on a web page and keep attached file to 5MB or less.

Data Dictionary:

URL:
Please supply the username and password:
Attachment: S5_Data Dictionary-634343517487393186.pdf

Code Table:

URL:
Please supply the username and password:
Attachment:

S6.Data Protocol (Resource Use Measure Module 1)
The measure developer must determine which of the following data protocol steps: data preparation, data inclusion criteria, data exclusion criteria, and missing data, are submitted as measure specifications or as guidelines. Specifications limit user options and flexibility and must be strictly adhered to; whereas guidelines are well thought out guidance to users while allowing for user flexibility. If the measure developer determines that the requested specification approach is better suited as guidelines, please select and submit guidelines, otherwise specifications must be provided.

Data Protocol Supplemental Attachment or URL:
If needed, attach document that supplements information provided for data protocol for analysis, data inclusion criteria, data exclusion criteria, and missing data (Save file as: S6_Data Protocol). All fields of the submission form that are supplemented within the attachment must include a summary of important information included in the attachment and its intended purpose, including any references to page numbers, tables, text, etc.

URL: http://www.healthqualityalliance.org/hvhc-project/cost-care-measurement-development
Please supply the username and password:
Attachment:

S6.1. Data preparation for analysis
Detail (specify) the data preparation steps and provide rationale for this methodology.

Guidelines : Approach to Data Cleaning:
If a standardized cleaning methodology or logic for the claims data exists, users are encouraged to apply the existing methodology, or conversely, encouraged not to remove data cleaning steps already implemented. If however, organizations impute missing data, we recommend using only non-imputed data.
Rationale: Each organization will be more familiar with the nature of their data therefore any standard cleaning

procedures are likely to be appropriate. Imputation can produce unpredictable biases in the results.

S6.2.Data inclusion criteria
Detail initial data inclusion criteria and rationale(related to claim-line or other data quality, data validation, e.g. truncation or removal of low or high dollar claim)

Guidelines : Paid claims with non-missing enrollee identification numbers, primary procedure and diagnosis codes should be included in the measure.
Note: The ABMS REF resource use measures are constructed based on date of service, not date of payment. Therefore, we recommend applying the measures to finalized or "closed" datasets so that complete claims histories during the measurement period are captured in the data.
Including enrollees with at least 24 months of continuous medical and pharmacy benefit enrollment during the identification year and the measurement year is recommended. However, the measure has been tested on enrollees with at least 320 total days of coverage during each year. If precise information regarding persons' total days of coverage is not available, it is recommended that measure implementers estimate this information to the best of their ability using available data elements (e.g., monthly enrollment indicators). This approach is based on the similar eligibility requirements used by NCQA for HEDIS measure denominators.

S6.3. Data exclusion criteria
Detail initial data exclusion criteria and rationale (related to claim-line or other data quality, data validation, e.g. truncation or removal of low or high dollar claim)

Guidelines : Beyond the standard data cleaning steps, we recommend that claim lines with missing or zero quantity values be set to a quantity of one and claim lines missing enrollee identification variables, primary diagnosis and procedure codes, and service date be eliminated. We also recommend eliminating all rejected or unpaid claims. Because a single provider id could have multiple specialties, we also recommend generating a uniform specialty for all providers by assigning each provider the specialty which is most frequently observed from all their Evaluation and Management visits.
Rationale: Converting missing or zero quantities to a minimum value of 1 allows for the pricing of these services. Claim lines missing enrollee identifiers, or primary procedure and diagnosis codes cannot be attributed to an individual, and without procedure and diagnosis codes, services cannot be properly identified and categorized. The resource use measures are intended to track costs to the payer, not general or societal costs, so rejected or unpaid claims should be eliminated.
Standardizing the specialty of all providers eliminates the possibility that providers are classified as one specialty for one enrollee and another specialty for others.

S6.4. Missing Data
Detail steps associated with missing data and rationale(e.g., any statistical techniques used)

Guidelines : Users are encouraged to eliminate claim lines missing enrollee identification variables or primary procedure and diagnosis codes. We do not recommend using any imputation methods to replace missing data.
Rationale: Claim lines missing enrollee identifiers cannot be attributed to an individual, and without procedure and diagnosis codes, services cannot be properly identified and categorized. Imputation of missing information could introduce bias into the measure, so we do not recommend the use of imputed data.

S7. Data Type: Administrative claims
Other

S7.1. Data Source or Collection Instrument
Identify the specific data source/data collection instrument (e.g. name of database, clinical registry, collection instrument, etc.)

Sources for administrative claims: commercial databases, CMS databases
Standardized price tables: Users can download tables from the NCQA website (see url below) or use the guidelines provided in the technical appendix of the written measure specifications to create their own standardized prices.

S7.2. Data Source or Collection Instrument Reference
(Please provide a web page URL or attachment). NQF strongly prefers URLs. Attach documents only if they are not available on a web page and keep attached file to 5MB or less)

URL: http://www.ncqa.org/tabid/1092/Default.aspx
Please supply the username and password:
Attachment:

S8.Measure Clinical Logic (Resource Use Measure Module 2)
The measure's clinical logic includes the steps that identify the condition or event of interest and any clustering of diagnoses or procedures. For example, the diagnoses and procedures that qualifies for a cardiac heart failure episode, including any disease interaction, comorbid conditions, or hierarchical structure to the clinical logic of the model. (Some of the steps listed separately below may be embedded in the risk adjustment description, if so, please indicate NA and in the rationale space list 'see risk adjustment details.')

Clinical Logic Supplemental Attachment or URL:
If needed, provide a URL or document that supplements information provided for the clinical framework, co-morbid interactions, clinical hierarchies, clinical severity levels, and concurrency of clinical events

URL: http://www.healthqualityalliance.org/hvhc-project/cost-care-measurement-development
Please supply the username and password:
Attachment:

S8.1. Brief Description of Clinical Framework
Briefly describe your clinical logic approach including clinical topic area, whether or not you account for comorbid and interactions, clinical hierarchies, clinical severity levels and concurrency of clinical events.

Resource use and costs associated with management of diabetes over a one year period. Identify patients in a management phase of diabetes by including patients with diabetes in the year prior to the measurement year and measure diabetes-related resource use and costs during the measurement year. Patients with new diagnoses of diabetes and those with end stage disease are excluded from the measure. Resource use attributed at the level of the individual provider.

S8.2. Clinical framework
Detail any clustering and the assignment of codes, including the grouping methodology, the assignment algorithm, and relevant codes and rationale for these methodologies.

The following clinical framework was used to construct the measure.
Inclusion criteria
Patients must meet the following enrollment criteria:
Continuous medical and pharmacy benefit enrollment for at least one year preceding the measurement year and during the measurement year, with no more than one gap in enrollment of more than 45 days during each year of continuous enrollment.

There are two inclusion criteria used to identify those eligible for the diabetes episode measure. The first focuses on those using oral hypoglycemics and the second on those using insulin only.

1) No age restrictions. Patients included in the measure must have at least one outpatient visit with a diagnosis of 250.x in the first 6 months of the identification year (the year prior to the measurement year);
and
At least one prescription for an oral hypoglycemic medication in the first 6 months of the identification year;
and
At least one diabetes-related resource use event (e.g. outpatient visit, hospitalization, medication use) during the measurement year.

OR

2) Patients included in the measure must have at least one outpatient visit with a diagnosis of 250.x in the first 6 months of the identification year;

and

No oral hypoglycemic medications in the first 6 months of the identification year;

and

At least one insulin claim in the first 6 months of the identification year;

and

Age: 30 years or older during the identification year;

and

At least one diabetes-related resource use event (e.g. outpatient visit, hospitalization, medication use) during the measurement year.

Patients are excluded if they meet one or more exclusion criteria during either the identification year OR the measurement year

Exclusion criteria :

- Polycystic ovaries
- Gestational or steroid-induced diabetes
- Active cancer (excluding melanoma, skin, prostate, and chronic lymphocytic leukemia)
- End stage renal disease (ESRD); Dialysis
- Renal failure
- HIV/AIDS
- Organ transplant

(see also table DIAB-E in written specification): polycystic ovaries: ICD9: 256.4; steroid-induced diabetes: ICD9: 251.8, 962.0; gestational diabetes: ICD9: 648.8; active cancer; ICD-9 Diagnosis: 140-171; 174-184; 187-203; 204.0; 204.2; 204.8; 205-208; 230-239 WITH CPT: 38230, 38240-38242, 77261-77799, 79000-79999, 96400-96549; ICD-9-CM Procedure: 41.0, 41.91, 92.2; UB Revenue 028x, 033x, 0342, 0344, 0973; end stage renal disease (ESRD) including renal dialysis: CPT36145, 36800-36821, 36831-36833, 90919-90921, 90923-90925, 90935, 90937, 90939, 90940, 90945, 90947, 90989, 90993, 90997, 90999, 99512; HCPCS: G0257, G0311-G0319, G0321-G0323, G0325-G0327, G0392, G0393, S9339;ICD-9-CM Diagnosis:585.5, 585.6, V42.0, V45.1, V56; ICD-9-CM Procedure: 38.95, 39.27, 39.42, 39.43, 39.53, 39.93, 39.94, 39.95, 54.98; UB Revenue: 080x, 082x-085x, 088x ; UB Type of Bill: 72x; POS: 65; chronic kidney disease: ICD9 CM: 585.2, 585.3, 585.4; organ transplant: CPT: 32850-32856, 33930-33945, 44132-44137, 44715-44721, 47133-47147, 48160, 48550-48556, 50300-50380; HCPCS: S2152, S2053-S2055, S2060, S2061, S2065; ICD-9-CM Procedure: 33.5, 33.6, 37.5, 41.94, 46.97, 50.5, 52.8, 55.6; UB Revenue: 0362, 0367, 0810-0813, 0819; HIV/AIDS: ICD-9-CM Diagnosis: 042

Eval Rating 2a1

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Identification of diabetes-related services:

The codes identified as diabetes-related codes and accumulated as part of the episode include those for diabetes, polyneuropathy in diabetes, diabetic retinopathy, and diabetic cataract. These codes are used to identify both qualifying inpatient (primary diagnosis) and outpatient (any diagnosis) events during the measurement period. In addition, we also include codes that may be indicative of treatment efforts to avoid the long term complications associated with diabetes. Therefore, both hypertension and hyperlipidemia are included as codes that are associated with a diabetes episode. Similar to the diabetes codes, events are linked to the episode if they are for a primary diagnosis for an inpatient event or listed as any diagnosis on an outpatient claim.

Several procedure codes that are associated with routine management of patients with diabetes are included as related to the episode regardless of the ICD-9 code associated with the claim. These include hemoglobin A1c tests, eye exams, cholesterol measures, blood glucose tests, metabolic panels, insulin tolerance tests, urinalysis, kidney imaging and foot exams.

Also, HCPCs for treatment and monitoring and for foot exams are included as related to the measure regardless of the associated ICD-9 code.

Finally, the measure includes diabetes-specific medications: Alpha-glucosidase inhibitors; Meglitinides; Sulfonylureas; Thiazolidinediones; Oral antidiabetic combinations and Insulin. Additionally other medications used to avoid or treat complications associated with diabetes are included in the episode and include: Angiotensin converting enzyme (ACE) inhibitors; Angiotensin II inhibitors (ARB); Diuretics; Beta-blockers; Calcium channel blockers; Alpha blockers;

Eval Rating 2b1

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Alpha2 agonists; Antihypertensive combinations; and Lipid lowering medications

The following are the specific codes identified as diabetes-related:

Inpatient Hospitalization events: include all inpatient hospitalization events with one of the following diagnosis codes appearing in the primary diagnosis field (see also Table DIAB-A in written measure specification): Diabetes: ICD9: 250.xx; DRG v24: 294,295; DRG v 25 (MS DRG): 637, 638, 639; Polyneuropathy in diabetes: ICD9: 357.2; Diabetic retinopathy: ICD9: 362.0x; Diabetic cataract: ICD9: 366.41; Hypertension: ICD9: 401.x, 402.x, 403.x, 404.x, Hyperlipidemia: ICD9: 272.x

The following codes are used to identify those services that should be categorized as "inpatient" : Nonacute inpatient: CPT: 99301-99313, 99315, 99316, 99318, 99321-99328, 99331-99337; acute inpatient: CPT: 99221-99223, 99231-99233, 99238, 99239, 99251-99255, 99261-99263, 99291

Outpatient events: Identify all outpatient claims/encounters with the following codes appearing in any position (see also Table DIAB-A) Diabetes: ICD9: 250.xx; Polyneuropathy in diabetes: ICD9: 357.2; Diabetic retinopathy: ICD9: 362.0x; Diabetic cataract: ICD9: 366.41; Hypertension: ICD9: 401.x, 402.x, 403.x, 404.x, Hyperlipidemia: ICD9: 272.x

The following codes are used to identify those services that should be categorized as "E&M" and used in determining attribution. To be included, codes must have a diabetes-related diagnosis code. Evaluation and Management: CPT: Office or Other Outpatient Services 99201–99215; Hospital Observation Services 99217–99220; Hospital Inpatient Services99221–99239; Consultations99241–99275; Critical Care and Intensive Care Services 99289–99298; Nursing Facility, Domiciliary and Home Services 99301–99350; Case Management Services and Care Plan Oversight Services 99361–99380; Preventive Medicine Services 99381–99429; Other E&M Services99450–99456, 99354–99357

Procedures and laboratory: Identify all claims / encounters with one of the following CPT, HCPCs, or ICD-9 procedure codes (see also Tables DIAB-A, DIAB-D in written specification). The procedure codes are used to identify diabetes-related services during the measurement period, regardless of corresponding ICD-9 diagnosis codes. Similarly, all claims with a qualifying ICD-9 code are included regardless of the procedure codes associated with that claim. Diabetes: ICD9: 250.xx; DRG v24: 294,295; DRG v 25 (MS DRG): 637, 638, 639; Polyneuropathy in diabetes: ICD9: 357.2; Diabetic retinopathy: ICD9: 362.0x; Diabetic cataract: ICD9: 366.41; Hypertension: ICD9: 401.x, 402.x, 403.x, 404.x, Hyperlipidemia: ICD9: 272.x; Diabetes Evaluation and Management: HCPCs: G0108, G0109, G0245, G0246, G0247, G8015, G8016, G8017, G8018, G8019, G8020, G8021, G8022, G8023, G8024, G8025, G8026, G8330, G8331, G8332, G8333, G8334, G8335, G8336, G8385, G8386, G8390, G8397, G8398, G8404, G8405, G8406, G8410, G8415, G8416, S9140, S9141, S9145, S9455, S9460, S9465; HBA1c: CPT: 83036, 83037; Eye Exams: CPT: 67028, 67030, 67031, 67036, 67038-67040, 67101, 67105, 67107, 67108, 67110, 67112, 67121, 67141, 67145, 67208, 67210, 67218, 67220, 67221, 67227, 67228, 92002, 92004, 92012, 92014, 92018, 92019, 92225, 92226, 92230, 92235, 92240, 92250, 92260, 99203-99205, 99213-99215, 99242-99245; HCPCs: S0620, S0621, S0625, S3000; ICD9-Diagnosis: V72.0; ICD9 Procedure:14.1-14.5, 14.9, 95.02-95.04, 95.11, 95.12, 95.16; Cholesterol: CPT: 80061, 83700, 83701, 83704, 83718, 83719, 83721; Glucose: CPT: 80422, 80424, 82947, 82950, 82951, 92952; Metabolic Panel: CPT: 80047, 80048, 80050, 80053, 80069; Insulin tolerance: CPT: 80434, 80435; Urinalysis: CPT: 81000, 81001, 81002, 81003; Kidney imaging: CPT: 78700, 78701, 78707, 78708, 78709, 78710; Foot exams: HCPCs: G8404, G8406, G8405

Supplies: Treatment /monitoring: HCPCs: A4230, A4231, A4232, A4233, A4233, A4234, A4235, A4236, A4244, A4245, A4252, A4253, A4254,A4255, A4258, A4259, S1030, S1031; Foot: HCPCs: A5500, A5501, A5503, A5504, A5505, A5506, A5507, A5508, A5509, A5510, A5511, A5512, A5513, L3201, L3202, L3203, L3204, L3206, L3207, L3215, L3216, L3217, L3219, L3221, L3222, L3224, L3225, L3230,L3250,L3251, L3252, L3253, L3254, L3255, L3257, L3500, L3510, L3520, L3530, L3540, L3550, L3560, L3570, L3580, L3590, L3595, L3600, L3610, L3620, L3630, L3640, L3649

Prescription drugs: Identify medications in the following therapeutic classes or HCPCs during the measurement period: Anti-diabetic medications

1. Alpha-glucosidase inhibitors
2. Meglitinides
3. Sulfonylureas
4. Thiazolidinediones
5. Other oral antidiabetic agents
6. Oral antidiabetic combinations

7. Insulin

Other Diabetes-related Medications
1. Angiotensin converting enzyme (ACE) inhibitors
2. Angiotensin II inhibitors (ARB)
3. Diuretics
4. Beta-blockers
5. Calcium channel blockers
6. Alpha blockers
7. Alpha2 agonists
8. Antihypertensive combinations
9. Lipid lowering medications

Prescription HCPCs:
J1815 INJECTION, INSULIN, PER 5 UNITS
J1817 INSULIN FOR ADMINISTRATION THROUGH DME (I.E., INSULIN PUMP) PER 50 UNITS
S5550 INSULIN, RAPID ONSET, 5 UNITS
S5551 INSULIN, MOST RAPID ONSET (LISPRO OR ASPART); 5 UNITS
S5552 INSULIN, INTERMEDIATE ACTING (NPH OR LENTE); 5 UNITS
S5553 INSULIN, LONG ACTING; 5 UNITS
S5560 INSULIN DELIVERY DEVICE, REUSABLE PEN; 1.5 ML SIZE
S5561 INSULIN DELIVERY DEVICE, REUSABLE PEN; 3 ML SIZE
S5565 INSULIN CARTRIDGE FOR USE IN INSULIN DELIVERY DEVICE OTHER THAN PUMP; 150 UNITS
S5566 INSULIN CARTRIDGE FOR USE IN INSULIN DELIVERY DEVICE OTHER THAN PUMP; 300 UNITS
S5570 INSULIN DELIVERY DEVICE, DISPOSABLE PEN (INCLUDING INSULIN); 1.5 ML SIZE
S5571 INSULIN DELIVERY DEVICE, DISPOSABLE PEN (INCLUDING INSULIN); 3 ML SIZE

Rationale:
Diabetes is a chronic condition, and therefore the measurement period will be as long as can be considered easily implemented in most data systems, a one-year period. To reduce the heterogeneity of the denominator population, the inclusion criteria were designed to ensure each of the included patients has diabetes and some history of related physician management, and the exclusion criteria were designed to ensure patients with particularly complex comorbidities that could affect the patient's diabetes treatment will not be evaluated through the same measure. The intent was to exclude patients that were newly diagnosed because of the initial costs that are associated with the management of a new diagnosis and getting patients adequately under control. These patients are likely to incur higher levels of resource use than patients that have been treated for the diabetes for longer periods of time but had yet to develop secondary complications of the condition (e.g. microvascular and macrovascular complications). For similar reasons, patients with complications that are indicative of long-term complications of diabetes were also excluded from the measure (renal failure, dialysis, ESRD) as these patients would likely have differential resource use than patients not yet experiencing these complications.

Patients with a diagnosis code for polycystic ovaries, gestational or steroid induced diabetes in the identification or measurement periods are excluded because these conditions may result in patients meeting our inclusion criteria as some of our qualifying medications may be used to treat these conditions. These patients are different from those with diabetes and are excluded from the measure.

We have several standard exclusions for each of our measures that are similar to the NCQA exclusions for their relative resource use measures (active cancer, HIV/AIDS). We exclude individuals with high resource use and high cost conditions that would likely be systematically different from the majority of individuals included in the analysis. These individuals are excluded to create a more homogeneous population included in the analysis.

The diagnosis codes directly for treatment of diabetes are included in the measure as related as that is the condition of focus for the episode. The other diabetes-related codes included in the measure are also indicators of care for diabetes-associated conditions.

The current measure was designed to be aligned with existing quality measures used in diabetes management which are typically constrained to a single year. Therefore, the cost of care measure was limited to a single year measure. However, it is clear that consequences of management of diabetes occur over a timeframe of three to five years rather than in a single year period. That is, appropriate management of hypertension and hyperlipidemia to avoid the

macrovascular complications in patients with diabetes leads to reduced rates of myocardial infarction and stroke and their associated resource use over a period of three to five years rather than a single year. Therefore, the measure does not include the resource use and costs of these macrovascular events as the management that occurs in a single year period may not modify the immediate risk of events during this timeframe and would be inappropriate to attribute the costs of these events to a single physician during the measurement period, as that physician may not have been involved in the care of the patient over a timeframe where these events would expect to be modified. So, the consequences of inadequate control of diabetes and its associated complications are not included as parts of the measure, the management of the co-occurring conditions that can lead to these events are included. Therefore, both hypertension and hyperlipidemia are included as diagnosis codes linked to the diabetes episode.

The procedure codes included for the measure represent routine care for the management of patients with diabetes or assessment of disease progression. Hemoglobin A1c tests are used to monitor the control of patients with diabetes. Eye exams are routine exams used to monitor for microvascular complications. Several blood draws are included as related to the measure that would be done for patients with diabetes as part of typical clinical management and include cholesterol measurement, blood glucose test, and metabolic panels. Urinalysis and kidney exams are additional tests used to monitor for complications of diabetes that are also included.

Several diabetes-specific HCPCs codes are included that are used to indicate direct care for diabetes-related issues including those for treatment and monitoring of diabetes and for foot exams.

Finally, the medications included follow the same logic as the diagnosis codes described above. All of the medications used to control diabetes are included as related to the episode. In addition, medications used to treat hypertension and hyperlipidemia are also included as related to diabetes for this measure. These are included as treatments intended to avoid the long term complications of diabetes. The treatments of the long-term complications are not included as they may be out of the control of the current provider given the timeframe of the measure.

S8.3. Comorbid and interactions
Detail the treatment of co-morbidities & disease interactions and provide rationale for this methodology.

see risk adjustment details in Section S10.1.

S8.4. Clinical hierarchies
Detail the hierarchy for codes or condition groups used and provide rationale for this methodology.

The only clinical hierarchies used in the measure are associated with the identification of comorbid conditions that are used in risk adjustment. Details are provided in Section S10.1 below and in the risk adjustment section of the technical appendix of the written measure specification. In short, we use the CMS hierarchical condition categories (HCC) for assignment of comorbid conditions which utilizes a hierarchy of codes based on the ICD-9 codes present during the pre-index period. We rely on the HCC system for identifying comorbid conditions in our risk adjustment procedure. The hierarchies are important for our risk adjustment as they are intended to identify different levels of severity of conditions that may be differentially associated with resource use. We used the HCC system because it is a previously developed and validated system for use in resource use measures.

Within our episode measure there are no hierarchies assigned to any of the codes that use.

S8.5. Clinical severity levels
Detail the method used for assigning severity level and provide rationale for this methodology.

We do not provide specifications for clinical severity levels.
No severity level is defined for patients included in the episode. We attempt to create a relatively homogeneous population through our inclusion and exclusion criteria to exclude those with the most severe disease that has progressed.

S8.6. Concurrency of clinical events (that may lead to a distinct measure)
Detail the method used for identifying concurrent clinical events, how to manage them, and provide

the rationale for this methodology.

We do not provide specifications for concurrency of clinical events.
Each of the measures developed as part of the ABMS measure set was intended as a standalone measure. The measures were not designed to be combined into a single composite measure of resource use for providers. Because the focus during the development of these measures was there eventual pairing with quality measures, each of the measures is considered as a unique measure. Therefore, the concurrency of events and the fact that events may be counted in more than one measure is not an issue. We were not trying to account for the overall resource use of a population but rather focused on resource use within specific cohorts of patients. The relative resource information produced is intended to result in actionable information which is not possible when all of the episodes are combined into a single composite measure.

S9. Measure Construction Logic (Resource Use Measure Module 3)
The measure's construction logic includes steps used to cluster, group or assign claims beyond those associated with the measure's clinical logic. For example, any temporal or spatial (i.e., setting of care) parameters used to determine if a particular diagnosis or event qualifies for the measure of interest.

Construction Logic Supplemental Attachment or URL:
If needed, attach <u>supplemental</u> documentation (Save file as: S9_Construction Logic). All fields of the submission form that are supplemented within the attachment must include a summary of important information included in the attachment and its intended purpose, including any references to page numbers, tables, text, etc.)

URL: http://www.healthqualityalliance.org/hvhc-project/cost-care-measurement-development
Please supply the username and password:
Attachment:

S9.1. Brief Description of Construction Logic
Briefly describe the measure's construction logic.

The following sequence is used to construct the measures:
1. Eligible population identification
2. Identification of related resources
3. Assignment of standardized prices
4. Create episode specific strata (if applicable)

S9.2. Construction Logic
Detail logic steps used to cluster, group or assign claims beyond those associated with the measure's clinical logic.

The following steps are used to complete the construction sequence (for specific codes, see Section S8.2 on clinical framework above and written measure specification/technical appendix).

The measurement period is 12 months in duration preceded by a 12 month identification period. For convenience, users may choose a calendar year with a start of Jan 1 and an end of Dec 31. However, if the user has a dataset that closes on a different time frame (i.e. it isn´t built on a calendar year), they should use date ranges that are easiest to implement.

Eligible population identification

Step 1: Identify patients that meet either of the following sets of inclusion criteria during the identification year

Inclusion Criteria Set 1:
Patients included in the measure must have at least one outpatient visit with a diagnosis of 250.x in the first 6 months of the identification year;
and
At least one prescription for an oral hypoglycemic medication in the first 6 months of the identification year.

No age restrictions

Inclusion Criteria Set 2:
Patients included in the measure must have at least one outpatient visit with a diagnosis of 250.x in the first 6 months of the identification year;
and
No oral hypoglycemic medications in the first 6 months of the identification year;
and
At least one insulin claim in the first 6 months of the identification year;
and
Age 30 years or older during the identification year.

Step 2: Identify patients that meet eligibility and continuous enrollment criteria
1. Eligibility
a. Identify benefits during both the identification year and the measurement year
b. To be included persons must have both of the following benefits in both years (do not include persons whose pharmacy benefits are dropped partway through the identification or measurement period).
i. Medical benefit
ii. Pharmacy benefit

2. Continuous enrollment
a. Determine enrollment during both the identification and measurement years
b. Identify (or estimate) total days of coverage in each year
c. To be eligible, persons must have at least 320 total days of coverage during each year

Step 3: Identify patients with exclusion criteria
1. Identify patients that meet any of the following exclusion criteria during either the identification year OR the measurement year:
2. Exclusion criteria (see Tables DIAB-E):
- Polycystic ovaries
- Gestational or steroid-induced diabetes
- Active cancer (excluding melanoma, skin, prostate, and chronic lymphocytic leukemia)
- End stage renal disease (ESRD); Dialysis
- Renal failure
- HIV/AIDS
- Organ transplant

Step 4: Combine prior steps to identify measure population
1. Identify diabetes eligible population
2. Exclude those patients not meeting general inclusion criteria (e.g., continuous eligibility)
3. Exclude patients meeting one or more measure exclusion criteria
4. The resulting collection of patients is the measure population

Identification of related resources

For each individual in the measure population, identify the paid claims for services rendered during the measurement period year. Claims / encounters will be identified based on the presence of diabetes-related diagnosis codes or procedure codes. These events will be used to determine the diabetes-related resource use.

Inpatient hospitalization events
Identify all inpatient hospitalization events with one of the diagnosis codes appearing in the primary diagnosis field (see Table DIAB-A or section S8.2 above). Codes must be present in primary diagnostic field for hospitalizations

Outpatient events
Identify all outpatient claims / encounters with an diabetes-related diagnostic code appearing in any position (see Table DIAB-A or section S8.2 above for specific codes).

Procedures and laboratory
Identify all claims / encounters with CPT, HCPCs, or ICD-9 procedure codes (see Tables DIAB-A, DIAB-D or section S8.2 above). The procedure codes are used to identify diabetes-related services during the measurement period,

regardless of corresponding ICD-9 diagnosis codes. Similarly, all claims with a qualifying ICD-9 code are included regardless of the procedure codes associated with that claim.

Prescription drugs
Identify medications in the appropriate therapeutic classes during the measurement period or with the HCPCs codes (see Technical appendix or section S8.2 above).

Assignment of standardized prices

Standardized prices are calculated for all of the components of care used to treat or manage the patient's condition to ensure that comparisons can be made solely on the basis of differential practice patterns and resource use. Three separate methodologies are used to derive these standardized prices: for inpatient facility charges, for ambulatory pharmacy charges (i.e., prescriptions dispensed outside the inpatient hospital setting), and for all other charges. These standardized prices are then applied to the claims identified as diabetes-related. For more detailed information see section S10.3 below)

Create episode specific strata

not applicable for diabetes measure

S9.3. Measure Trigger and End mechanisms
Detail the measure's trigger and end mechanisms and provide rationale for this methodology.

Due to chronic nature of this condition, we selected a 1 year timeframe for measurement (in keeping with the convention used for many other measures of chronic conditions). In order to identify a more homogeneous population, triggers/eligible population are identified in the year prior to the measurement year.
Identify patients in a management phase of diabetes by including patients with diabetes in the year prior to the measurement year and measure diabetes-related resource use and costs during the measurement year. (See section 1 of the measure specification technical appendix)

For convenience, users may choose a calendar year with a start of Jan 1 and an end of Dec 31. However, if the user has a dataset that closes on a different time frame (i.e. it isn´t built on a calendar year), they should use date ranges that are easiest to implement.

S9.4.Measure redundancy or overlap
Detail how redundancy and overlap of measures can be addressed and provide rationale for this methodology.

We do not provide specifications for measure redundancy or overlap.
The measures developed by ABMS REF were developed as standalone measures to address all relevant services associated with a particular health care condition. Collectively, the measures do not sum-up to a single total and there is the potential for overlap and redundancy to occur when multiple measures are applied simultaneously.

S9.5.Complementary services
Detail how complementary services have been linked to the measure and provide rationale for this methodology.

We do not provide specifications for linking complementary services.
All services included in the measure are included based on the presence of diagnosis codes, procedure codes, or medications.
Services are identified based on presence of qualifying codes. There is no effort to link complementary services to the episode. The strategy for all of our measures was to rely on the presence of codes to qualify for inclusion in the episode rather than to make assumptions about temporal or other associations between events.

S9.6.Resource Use Service Categories

Inpatient services: Inpatient facility services
Inpatient services: Evaluation and management
Inpatient services: Procedures and surgeries

Inpatient services: Imaging and diagnostic
Inpatient services: Lab services
Inpatient services: Admissions/discharges
Ambulatory services: Outpatient facility services
Ambulatory services: Emergency Department
Ambulatory services: Pharmacy
Ambulatory services: Evaluation and management
Ambulatory services: Procedures and surgeries
Ambulatory services: Imaging and diagnostic
Ambulatory services: Lab services
Durable Medical Equipment (DME)

S9.7.Identification of Resource Use Service Categories
For each of the resource use service categories selected above, provide the rationale for their selection and detail the method or algorithms to identify resource units, including codes, logic and definitions.

At the claim line level, the user should identify all relevant codes specified in the clinical framework Section 8.2 above (see also written measure specification). For inpatient services, these include all relevant ICD9, DRG v24, DRGv25, CPT codes; for ambulatory services, these in clued all relevant ICD9, and CPT codes; for procedures and laboratory these include all relevant ICD9 procedure codes, HCPCs, and CPT codes, and for prescription drugs, these include relevant HCPCs and NDCs.

The above categories were selected because they represent the vast majority of resource use for the episode and the measure developers examined the distribution of costs between categories to evaluate the face validity of the measure. Developers also reasoned that resource use variation between providers by category would be informative. Please refer to Section S8.2 Clinical Framework for the algorithms used to identify/assign some services.

Measure developers also applied the Berenson-Eggers Types of Service (BETOS) system which categorizes all HCPCS codes into resource use areas (e.g. Evaluation and Management, Procedures, Imaging, etc). In addition to the BETOS category there is an additional category included for medications related resource use that is determined using pharmacy data and HCPCs.

Rationale: The BETOS classification system is a widely used, publically available system for classifying healthcare services. These categories can be used to examine cost patterns across providers to identify differences across the different categories of service. This system provides a sufficient number of categories to make meaningful comparisons across patterns of resource use and yet is not too broad so as not to be able to draw conclusions based on differences. Furthermore, identification of important differences allows users to drill down within those categories to identify cost drivers within BETOS categories that may ultimately provide actionable information for providers.

If needed, provide specifications URL (preferred) or as an attachment:

URL:
Please supply the username and password:
Attachment:

S9.8. Care Setting; *provides information on which care settings the measure encompasses.*

Ambulatory Care : Clinician Office
Hospital/Acute Care Facility
Pharmacy

S10.Adjustments for Comparability (Resource Use Measure Module 4)
External factors can mingle and affect or confound a measure's result. Confounding occurs if an

extraneous factor causes or influences the outcome (e.g., higher resource use) and is associated with the exposure of interest (e.g., episode of diabetes with multiple co-morbidities). Measure developers often include steps to adjust the measure to increase comparability of results among providers, employers, and health plans.

S10.1. Risk adjustment method
Define risk adjustment variables and describe the conceptual, statistical, or other relevant aspects of the model and provide rationale for this methodology.

The risk adjustment models were developed and tested on the same population used for the measure testing—the Thomson Reuters Healthcare Marketscan database, with over 30 million covered lives in each year.
The sample sizes for the two cohorts tested for the diabetes measure were:
Cohort 1 (oral hypoglycemics): 212,559
Cohort 2 (insulin only): 25,085
The models were developed using a split sample approach with 75% of the cohort used in the development phase and 25% used to evaluate the model fit. In addition, model fit was also evaluated in the entire cohort.

The model developed for comorbidity adjustment uses Hierarchical Condition Categories (HCC) to identify comorbidities. This reflects the risk adjustment methodology used by CMS and recently evaluated by NCQA for their Relative Resource Use (RRU) measures. However, there is an important distinction between the use of HCCs by CMS and the model evaluated by NCQA and the risk adjustment model used to estimate expected costs. The CMS and NCQA model use HCCs to adjust TOTAL costs of care, whereas this model focuses on episode-specific costs of care. Because models developed to adjust total costs of care may not reflect the expected costs for episode-specific resource use, new models were developed from a sample of commercially insured patients for risk adjustment. The following process was completed to develop the models:

1. Utilized quasi-Modified Delphi approach with the condition-specific workgroup to categorize HCCs into three groups:
- Include in risk adjustment model;
- Exclude in risk adjustment model; and
- Test impact in risk adjustment model.

2. Identified HCCs in denominator population during the 12 months preceding the measurement year.

3. Tested 12 different model specifications (see Table DIAB-RA1 in technical appendix of written measure specification), where the HCCs included in the model varied, and the distribution and link functions in the generalized linear models also varied. Models were developed in a stepwise manner as indicated. The first four models used a gamma distribution and a log link function. The first model included all HCCs identified by the condition-specific workgroup as "Include HCCs" with a prevalence in the population of >=1%. The second model was a reduction of the first model that only included HCCs where $p<0.1$. The third model extended the second model by including HCCs with prevalence >=1% identified as "Test HCCs" by the condition-specific workgroup. The fourth model was a reduction of the third model and included only those HCCs where $p<0.1$. The next set of four models (Models 5-8) repeated the process of the first four models but used a normal distribution and identity link function. Model 9 used all of the HCCs, with the exception of the HCC for the episode being evaluated (e.g., diabetes for the diabetes episode; however HCCs for complications of diabetes were included), and a gamma distribution with log link function. Model 10 was a reduction of Model 9 where only the HCCs with $p<0.1$ were included. The final two models (Models 11-12) used the same process as Models 9 and 10 with a normal distribution and identity link function.

4. Models were developed in a split sample approach with 75% of the population randomly selected for model development and the remaining 25% used in model evaluation. Model performance was also evaluated in the full cohort.

5. The performance of each model was evaluated through comparisons of the observed and predicted distributions, comparisons of residuals, comparisons of absolute differences between observed and predicted, comparisons of observed-to-predicted ratios, and comparisons of mean squared errors across models. Summary information on model performance was presented to the condition-specific workgroup for selection of a risk adjustment model for the condition. Final model selection was based on the best performing model across metrics. Where model performance was similar, models using the normal distribution were preferentially chosen over the gamma distribution models for

ease of implementation. More parsimonious models were also preferentially chosen.

The following is the model selected for estimating adjusted costs in the diabetes episode.

Risk Adjustment Model
Risk Adjusted Diabetes Episode Costs = $2,129 + (Age*$27) + (Major Depressive, Bipolar, and Paranoid Disorders*$808) + (Proliferative Diabetic Retinopathy and Vitreous Hemorrhage*$2,413) + (Chronic Ulcer of Skin, Except Decubitus*$1,550) + (Rheumatoid Arthritis and Inflammatory Connective Tissue Disease*$818) + (Septicemia/Shock*$612) + (Diabetes with Renal or Peripheral Circulatory Manifestation*$1,338) + (Diabetes with Neurologic or Other Specified Manifestation*$1,591) + (Diabetes with Acute Complications*$1,622) + (Diabetes with Ophthalmologic or Unspecified Manifestation*$1,367) + (End-Stage Liver Disease*$1,123) + (Cirrhosis of Liver*$613) + (Intestinal Obstruction/Perforation*$670) + (Pancreatic Disease*$915) + (Inflammatory Bowel Disease*$694) + (Bone/Joint/Muscle Infections/Necrosis*$1,161) + (Severe Hematological Disorders*$2,034) + (Disorders of Immunity*$744) + (Drug/Alcohol Psychosis*$933) + (Drug/Alcohol Dependence*$864) + (Schizophrenia*$827) + (Spinal Cord Disorders/Injuries*$440) + (Polyneuropathy*$1,102) + (Parkinsons and Huntingtons Diseases*$1,497) + (Seizure Disorders and Convulsions*$910) + (Coma, Brain Compression/Anoxic Damage*$949) + (Respirator Dependence/Tracheostomy Status*$1,496) + (Cardio-Respiratory Failure and Shock*$705) + (Congestive Heart Failure*$1,445) + (Acute Myocardial Infarction*$931) + (Unstable Angina and Other Acute Ischemic Heart Disease*$1,677) + (Angina Pectoris/Old Myocardial Infarction*$1,130) + (Specified Heart Arrhythmias*$1,047) + (Cerebral Hemorrhage*$697) + (Ischemic or Unspecified Stroke*$1,185) + (Hemiplegia/Hemiparesis*$686) + (Vascular Disease with Complications*$1,479) + (Vascular Disease*$1,150) + (Chronic Obstructive Pulmonary Disease*$928) + (Nephritis*$678) + (Decubitus Ulcer of Skin*$1,892) + (Vertebral Fractures without Spinal Cord Injury*$909) + (Hip Fracture/Dislocation*$2,043) + (Traumatic Amputation*$1,331) + (Major Complications of Medical Care and Trauma*$921) + (Artificial Openings for Feeding or Elimination*$975)

Measure implementers have two choices when calculating risk adjusted costs. The first is to follow the process specified above to create risk adjustment models that are specific to their population and their dataset. The second option is to follow the below steps and use the above estimates for calculating risk adjusted costs. While the latter is a straightforward calculation, caution is warranted as the risk adjusted equations were derived from a population that may be different from the population to which the measure is being applied.

To estimate risk adjusted costs using the above risk adjustment equations in the measurement population, use the following steps:

Step 1: Identify the presence of HCCs on any claim in the 12 months preceding the measurement year, utilizing both inpatient (primary diagnosis field only) and outpatient encounters (all diagnosis fields).

Step 2: Create a person level file that contains an indicator (yes/no) variable for each of the HCCs. These variables indicate whether or not the patient had evidence of each HCC during the previous 12 months.

Step 3: Calculate an adjustment factor of the average episode costs in the measure population and divide it by the average cost of the test episode (Table Diabetes-RA2). Apply the inflation factor to the risk adjustment coefficients to account for cost differences between datasets used in development of the risk adjustment models and those used in calculating episode costs.

Summary estimates of the average cost for Diabetes episode in the test episode: Average Cost: $4,015

Example: To calculate the inflation factor, determine the average episode cost for the population to which the measure is being applied. As an example, the average cost might be $4,250. Calculate the adjustment factor by dividing the costs from the current population by the average cost of $4,015. That would result in an adjustment factor of 1.06. The adjustment factor is then applied to the estimated coefficients to provide an adjusted risk adjustment model.

Risk and Mean Adjusted Model

Risk and Mean Adjusted Diabetes Episode Costs = 1.06 * Risk Adjusted Diabetes Episode Costs

Step 4: Use the equation for the appropriate age group to generate risk adjusted expected costs for each individual in the

dataset.

Comorbidity Adjustment Strategy Rationale:

We acknowledge that risk adjustment is an important part of the development of an episode of care measure. Risk adjustment is intended to account for variation in episode costs that are not due to differences in practice patterns but rather are due to differences in the case mix of patients. When reporting episode costs at the provider level, risk adjustment attempts to account for differences in the case mix of patients across providers and minimizes the assertion that one providers patients are sicker than the comparator patients. An additional advantage of episode-based measurement is that focusing on costs related to care only for that episode may be a form of risk adjustment because we are not looking at the overall healthcare costs of the patients. Our risk adjustment strategy was not to attempt to account for all of the variation within an episode; however we want to be able to control for resource use variation that is attributed to the episode that may result from differences in patient case mix.

We selected to use Hierarchical Condition Categories (HCC) as our primary strategy for identification of comoribid conditions and for risk adjustment. We selected HCCs because of their use in risk adjustment methodology used by CMS and recently evaluated by NCQA for their Relative Resource Use (RRU) measures. We felt that many users of our episodes would be familiar with HCCs and the use of these measures in administrative data. Moreover, the analytic programmers for generating HCCs are freely available on the CMS website and therefore we mitigate issues of access to code for creating the risk adjustment groups.

While we use HCC as the starting point for our risk adjustment models, there is an important distinction between the use of HCCs by CMS and the model evaluated by NCQA and our episode definitions. The CMS and NCQA model use HCCs to adjust for TOTAL costs of care whereas, we are focused on the episode-specific costs of care. Briefly, NCQA has created weights for each of the HCCs on total costs of care using data from a large population that has one of the conditions in their RRU measure. These weights can then be applied to different populations to adjust for the presence of comorbid conditions when estimating total costs. The primary concern with applying the adjustment factors available from either CMS or NCQA are the fact they are total costs and not related to the episode-specific costs of care. This would lead to very different risk adjustment models that would not account for as much of the variability within the episode as a risk adjustment model focused on episode-specific costs. We compared the use of the 'off the shelf' HCC values with a risk adjustment model developed specifically for our episode.

See attached supplemental document for illustrative example of comparison of "off the shelf" HCC values to the risk adjustment model developed specifically for our episode (note: diabetes is used for purposes of illustration).

Given the disparity in the means and distributions of the off the shelf HCC values, we felt this justified our approach to develop risk adjustment models for each of our episodes that were focused on episode specific costs.

If needed, provide supplemental information via a web URL (preferred) or attachment with the risk adjustment specifications.

URL:
Please supply the username and password:
Attachment: 10.1_Risk adjustment method-634343531915370646.pdf

S10.2. Stratification Method
Detail the stratification method including all variables, codes, logic or definitions required to stratify the measure and rationale for this methodology

This method is not straified.

S10.3. Costing Method
Detail the costing method including the source of cost information, steps to capture, apply or estimate cost information, and provide rationale for this methodology.

Standardized prices are calculated for all of the components of care used to treat or manage the patient's condition to ensure that comparisons can be made solely on the basis of differential practice patterns and resource use. Three separate methodologies are used to derive these standardized prices: for inpatient facility charges, for ambulatory pharmacy charges (i.e., prescriptions dispensed outside the inpatient hospital setting), and for all other charges. These standardized prices are then applied to the claims identified as related.

Standard Cost Calculation

Step 1 Identify all claims paid for services rendered during the measurement period and with positive non-zero paid amounts for all patients, regardless as to whether they have been included in the measure population (rejected or unadjudicated claims should be dropped). Categorize these claims as follows (in accordance with the BETOS classification process):

- Inpatient Facility (services provided by a facility during an acute inpatient hospital stay, standard price includes room and board and ancillary services)
- Ambulatory Pharmacy (ambulatory prescriptions included in a member's pharmacy benefit)
- All other (E&M, procedures, imaging, tests, DME, other, and exceptions/unclassified)

Step 2 For each category identified, compute standardized prices. Refer to each service category's instructions (i.e., Calculating Standard Units of Service and Total Standard Cost) below.
Step 3 Combine standardized prices with eligible events (e.g., through a file merge as specified in each service category's instructions).
Step 4 For each individual claim, multiply the standardized price by the number of service units identified on the claim to determine the full cost of the service, hospitalization, or prescription.

Calculating Standard Units of Service and Total Standard Cost: Inpatient Facility

For inpatient facility costs, standardized prices are developed at the diagnosis-related group (DRG) level and – for those hospitalizations where DRG-level information is unavailable – at the ADSC level. Each is adjusted for length-of-stay (LOS) so as to more closely mirror the payment systems typically applied among commercial health plans. Both approaches use RRU HEDIS standardized daily price tables developed by NCQA. All inpatient facility costs are considered "acute" for this analysis.

Step 1 Identify all inpatient stays that occurred during the measurement period. Include stays that may have started before the measurement period or ended after the close of the measurement period. Define a single, unique record describing the member's inpatient stay.
Step 2. Identify the primary discharge DRG. Also identify the DRG version (e.g., CMS-DRG vs. MS-DRG). Care must be taken in using the standardized price tables (specified below) to insure the data and the tables use the same DRG version.
Step 3 Compute the stay's total LOS in days, using paid or expected-to-be-paid days only. Include all paid days in the LOS calculation, whether or not they fall outside the measurement period. Also identify the stay's LOS group based on the stay's LOS and the information below.

LOS (Days)	LOS GRP
1	A
2	B
3-4	C
5-6	D
7-8	E
9-15	F
16 or more	G

Step 4 Compute the LOS per diem multiplier. If the inpatient stay falls completely within the measurement period, use the total number of paid days as the per diem multiplier. If the inpatient stay does not fall completely inside the measurement period, count only the days within the measurement period (including the last day of the period) to compute the per diem multiplier.

Step 5 Download the HEDIS RRU standardized daily price tables from the NCQA website

(http://www.ncqa.org/tabid/1092/Default.aspx) for the corresponding measurement periods. Note that there is a one period lag in the file and data periods (i.e. files designated 2007 are based on 2006 data). Some periods may have two sets of tables if there is a significant change in DRG versions. Note: The project staff worked in collaboration with NCQA in development of this methodology for purposes of testing the initial set of measures. Users of the measures may wish to implement their own methodology that does not rely on a price list from NCQA.

Step 6 Calculate the DRG-specific per-diem payment rate by adjusting the standard daily prices for inflation to a reference period using the medical care component of the Consumer Price Index (CPI).

Step 7 Combine DRG-specific per-diem payment rates with the dataset containing eligible inpatient hospital events for the measure. For each event, multiply the per-diem payment rate by the event's LOS per diem multiplier to determine the event's total standard cost.
Total standard costs will not be computed using this approach for stays that have not been assigned a DRG, and for DRGs that are not assigned a standard price by HEDIS. These stays will be assigned a standard price using the ADSC method described below. (Note: Figures presented in this example are arbitrary and do not reflect any particular dataset or patient. Additionally, the DRG XXX is intended to be used as an illustrative example for calculating inpatient costs. Only DRGs related to the episode should be included in this calculation).

Example:

Assume the calculated DRG-specific per-diem payment rate for DRG XXX for FY 2007 is $900.17. An eligible member had an inpatient stay with the following characteristics:
- A principal diagnosis with an eligible ICD-9 code
- A DRG of XXX (DRG associated with an eligible inpatient stay for the episode)
- Date of admission of February 2, 2007 and date of discharge of February 9, 2007 (fiscal period 2007)
- A LOS of 8 days, and therefore a LOS per diem multiplier of 8 days

This event has a calculated total standard cost of $900.17 x 8 = $7,201.36.

Example:

Again assume the calculated DRG-specific per-diem payment rate for DRG XXX for FY 2007 is $900.17. An eligible member had an inpatient stay with the following characteristics:
- A principal diagnosis with an eligible ICD-9 code
- A DRG of XXX (DRG associated with an eligible inpatient stay for the episode)
- Date of admission of December 28, 2006 and date of discharge of January 2, 2007 (fiscal period 2007)
- A LOS of 6 days, and a LOS per diem multiplier of 2 days (January 1-2).

This event has a calculated total standard cost of $900.17 x 2 = $1,800.34.

Step 8 If DRG information is not available for a given inpatient hospitalization a method must be used that assigns prices to those hospitalizations. The methodology used in testing the initial development of the measures was to assign an Aggregate Diagnostic Service Category (ADSC) for the stay using the principal discharge diagnosis. To assign ADSC, download the ADSC Table (Table SPT-INP-ADSC) from the NCQA Web site (http://www.ncqa.org/tabid/1092/Default.aspx) and match the principal ICD-9-CM Diagnosis code from the discharge claim to an ADSC. If the claim does not contain a DRG and the primary ICD-9-CM Diagnosis code is invalid or missing, map the inpatient stay to the ADSC Table's MISA category. An alternative would be to create average prices from the dataset the measures are being implemented for each of the ADSC categories and discharge ICD-9-CM codes and assign those prices to missing hospitalizations.

Step 9 Determine if the member underwent major surgery during the inpatient stay. If this information is not available within the dataset, this may be determined using the list of codes included in a table from the NCQA Web site (Maj-Surg Table). Flag eligible members if one procedure code in the Maj-Surg-Table is present from any provider during the time period defined by the admission and discharge dates.

Step 10 Match each ADSC, LOS per diem multiplier, and major surgery flag assignment for the stay to a value in the Table SPT-INP-ADSC to obtain the assigned standard price. For each event, multiply the per-diem payment rate by the event's LOS per diem multiplier to determine the event's total standard cost. As with the DRG method, the ADSC standard prices must be adjusted for inflation to a reference period using the CPI. Between this ADSC methodology and the previously described DRG-based methodology, each inpatient hospital stay should now have an associated

standardized price.

Example:

An eligible member had an inpatient stay with the following characteristics:
- A principal diagnosis for an eligible event assigned to ADSC category Respiratory-C (RESC)
- No available valid DRG information
- Date of admission of February 2, 2007 and date of discharge of February 9, 2007
- A LOS of 8 days, and therefore LOS group E
- A major surgery event during the stay

Using Sample Table SPT-INP-ADSC, we determine this event has a standard per-diem payment rate of $1,474.00. Therefore this event has a calculated total standard cost of $1,474 x 8 = $11,792.

Calculating Standard Units of Service and Total Standard Cost: Ambulatory Pharmacy

For ambulatory pharmacy-related costs, standardized prices are developed at the NDC level, adjusted for days supply.

Step 1 Identify all pharmacy services that occurred during the measurement period. The following pharmacy services should also be included:
- Prescriptions that may have been dispensed before the measurement period and had days supply that extended into the measurement period (e.g., a prescription with a dispensed date of December 15, 2007 and 30 days supply would extend 13 days into the measurement period beginning January 1, 2008)
- Prescriptions that may have been dispensed during the measurement period and had days supply that extended into the following period (e.g., a prescription with a dispensed date of December 20, 2008).

Define a single, unique record describing the pharmacy service.
Step 2 Identify the NDC code and the days supply for each prescription, whether or not some days fall outside the measurement period.
If the days supply is not available for a given pharmacy claim, set the claim's standard cost to be equal to its listed payment amount.
Step 3 Compute the days supply per diem multiplier. If the prescription's days supply fall completely within the measurement period, use the claim's listed days supply as the per diem multiplier. If the prescription's days supply do not fall completely inside the measurement period, count only the days within the measurement period (including the last day of the period) to compute the per diem multiplier.
Step 4 For each NDC, calculate the total NDC-specific payments and the total days supply across all pharmacy claims within that NDC during the measurement period. Using these totals, calculate NDC-specific per-day-supply payment rates by dividing total NDC-specific payments by total days supply for each NDC.
Step 5 Combine NDC-specific per-day-supply payment rates with the dataset containing eligible pharmacy events for the measure. For each event, multiply the per-day-supply payment rate by the event's days supply per diem multiplier to determine the event's total standard cost.

Calculating Standard Units of Service and Total Standard Cost: All Other

For all non-inpatient hospital, non-pharmacy costs, standardized prices are developed at the procedure code and modifier level.

Step 1 Identify all non-inpatient hospital, non-pharmacy services that occurred during the measurement period.
Step 2 Identify the primary procedure code (CPT, HCPCs, ICD-9, etc.) and the first modifier code for each service.
Step 3 For each procedure-modifier combination, calculate the total procedure/modifier-specific payments across all non-inpatient-hospital, non-pharmacy claims with that procedure-modifier combination as well as the frequency of the procedure-modifier combination during the measurement period. Calculate procedure/modifier-specific payment rates by dividing total procedure/modifier-specific payments by the frequency for each procedure-modifier combination.

Example:
Assume that there are 3 non-inpatient-hospital, non-pharmacy claims during the measurement period with the following characteristics:
Patient: 1111, Procedure (CPT-4): 71010, Modifier: Date: 2/1/2007, Payment: $21

Patient: 1111, Procedure (CPT-4): 72240, Modifier: TC, Date: 2/18/2007, Payment: $90
Patient: 2222, Procedure (CPT-4): 71010, Modifier: Date: 1/5/2007, Payment: $25

For the procedure/modifier combination: 71010
The total payment is $21 + $25 = $46
The total frequency is 2
Therefore the procedure/modifier-specific payment rate is $46/2 = $23
For the procedure/modifier combination: 72240/TC
The total payment is $90
The total frequency is 1
Therefore the procedure/modifier-specific payment rate is $90/1 = $90

Step 4 Combine procedure/modifier-specific payment rates with the dataset containing eligible non-inpatient-hospital, non-pharmacy events for the measure so that each procedure-modifier combination is paired with its corresponding payment rate. This payment rate is the event's total standard cost.

Calculation of total individual episode costs

The resource use identified as diabetes-related– and to which standardized prices have been applied (i.e., the collection of eligible events) – is used to calculate individual level episode costs. The following steps are used in the calculation of total individual level costs.

Step 1: For each individual included in the episode, sum all of the total standard costs linked to diabetes-related events occurring during the measurement period at the BETOS service category level. This will provide an estimate of the costs of each category of service over the measurement period.

Step 2: For each individual in the episode, sum ALL total standard costs linked to diabetes-related events to calculate TOTAL episode costs.

Step 3: Exclude individuals that do not have positive, non-zero costs (e.g. outpatient visit, hospitalization, medication use) during the measurement period.

Rationale for costing method

We used standardized prices to estimate the costs for all components of care in the claims data that a patient received data during the measurement period. Because costs in claims data reflect both the quantity and mix of services delivered as well as the prices paid for those services, some of the cost variation is due to price differences across providers (Thomas et al., 2005). Variations in cost data among organizations and over time can obscure real cost differences (Ritzwoller, et al., 2004) and impede comparisons across providers. To ensure that comparisons are made on the basis of differences in practice patterns and resource use, we developed standardized prices, such that a given service would have the same price across all providers (Thomas et al., 2005). We used separate methods to estimate standardized price that were used to calculate for inpatient facility costs, pharmacy costs, and cost for all other care.
For the inpatient facility use, we developed standardized prices using diagnosis-related group (DRG) information. For hospitalizations without DRG-level information, we used aggregate diagnostic service category (ADSC) level information. In each case, we adjusted for length-of-stay (LOS) during the measurement period so as to more closely mirror the payment systems typically applied among commercial health plans. Both approaches use relative resource use (RRU) HEDIS standardized daily price tables developed by NCQA. We worked in collaboration with NCQA in development of this methodology; however, users of the measure may need to implement their own methodology that does not rely on a price list from NCQA.
For pharmacy use, we determined the days supply for each medication that was dispensed during the measurement period identified by a unique national drug code (NDC). We calculated a standardized price per diem for each NDC in our data by dividing the total payments in the claims data by the total days supply in the claims data for that NDC. We then estimated patient's pharmacy costs by multiplying the standardized price per diem for each NDC by the patient's days supply during the measurement period for that NDC. Standardized prices for pharmacy was estimated using this approach rather than an average whole price (AWP) because the AWP is not defined by law or regulation and does not reflect discounts obtained by most purchasers. As a result, the ultimate price paid by purchasers is often significantly lower than the AWP (Pereira, 2005).
For all other use, we identify the primary procedure code (CPT, HCPCs, ICD-9, etc.) and the first modifier code for

each service. We calculated a standardized price for each procedure/modifier by dividing the total procedure/modifier-specific payments by the frequency for each procedure/modifier combination in the claims data. We then applied this standardized price to each patient's procedure/modifier combination that occurred during the measurement period. This approach allowed for a consistent methodology to be applied to each procedure/modifier combination in the claims data to achieve the same price for a service across all providers.

References:
Pereira BJG. Medicare Prescription Drug, Improvement and Modernization Act: Average Wholesale Price (AWP) Medscape Nephrology.2005;2(1)

Ritzwoller DP, Goodman MJ, Maciosek MV, Lafata JE, Meenan R, Hornbrook MC, Fishman PA. Creating Standard Cost Measures Across Integrated Health Care Delivery Systems. J Natl Cancer Inst Monogr 2005;35:80 – 87

Thomas JW, Grazier KL, Ward K. Economic Profiling of Primary Care Physicians: Consistency among Risk-Adjusted Measures. Health Services Research. 2004;39(4):985- 1004

S11. Measure Reporting (Resource Use Measure Module 5)
The measure developer must determine which of the following Measure Reporting functions: attribution approach, peer group, outliers and thresholds, sample size, and benchmarking and comparative estimates, are submitted as measure specifications or as guidelines. Specifications limit user options and flexibility and must be strictly adhered to; whereas guidelines are well thought out guidance to users while allowing for user flexibility. If the measure developer determines that the requested specification approach is better suited as guidelines, please select and submit guidelines, otherwise specifications must be provided.

S11.1. Detail attribution approach
Detail the attribution rule(s) used for attributing costs to providers and rationale for this methodology (e.g., a proportion of total measure cost or frequency of visits during the measure's measurement period) and provide rationale for this methodology.

Resource use and costs for diabetes episodes are attributed to one or more physicians on a hierarchical basis. The episode's total count of qualifying E&M codes by unique provider ID are used for provider attribution. For each episode identify all such E&M codes occurring during the measurement year. The E&M codes are used to assign attribution using the following hierarchy:
1. Costs and resource use are assigned to a single provider if that physician has at least 70% of the episode's E&M codes during the measurement year ("single attribution"); OR
2. If no provider has more than 70% of the E&M codes, costs and resource use are assigned to each of the providers that have at least 30% of the episode's E&M codes during the measurement year ("multiple attribution"); OR
3. If no provider has at least 30% of the episode's E&M codes during the measurement year, the costs and resource use for that patient are not attributed to any provider ("no attribution").

To identify the attributable provider, the following steps will be used:
Step 1: Identify qualifying E&M codes for the episode:
Evaluation and Management: CPT: Office or Other Outpatient Services 99201–99215; Hospital Observation Services 99217–99220; Hospital Inpatient Services99221–99239; Consultations99241–99275; Critical Care and Intensive Care Services 99289–99298; Nursing Facility, Domiciliary and Home Services 99301–99350; Case Management Services and Care Plan Oversight Services 99361–99380; Preventive Medicine Services 99381–99429; Other E&M Services99450–99456, 99354–99357

Step 2: For every episode, count the total number of qualifying E&M codes and count the number of qualifying E&M codes for each unique provider id.

Step 3: For every episode and unique provider id combination, calculate the percentage of qualifying E&M codes using the formula below:

Percentage of Care = 100*(Episode's count of a provider's qualifying E&M codes divided by the Episode's total count of all qualifying E&M codes).

Step 4: Assign attribution based on the hierarchical attribution model described above.

Rationale:
A minimum of 30% of physician visits or physician costs has often been used as a minimum before an episode has been attributed to a physician (1,2). Similar to these previous efforts, our physician workgroup believed that this was a reasonable cutoff to define the minimum number of E&M codes before a physician received attribution. By the same token until a physician was responsible for 70% of E&M codes, it was believed by the physician workgroup that more than one physician shared responsibility for the costs of the episode and therefore multiple attribution was appropriate. Further, an advantage of multiple attribution is that it increases the number of cases attributed to physicians – a factor that is important given the generally acknowledged problem of many physicians having too limited number of cases to allow them to be included in a comparison with other physicians. As to the use of E&M codes rather than payments to define attribution cutoff levels, the use of codes appears to be more transparent to physicians, especially given the use of standardized rather than actual payments and the fact that many expensive aspects of care resulting from physician decisions are not billed by that physician. Further, when primary physicians are involved in the episode, their physician-related payments are likely to be lower due to lower visit fees, yet it is more likely that they were responsible for referrals to specialists.

1. Merotra A, Adams JL, Thomas W, McGlynn A. The effect of different attribution rules on individual physician cost profiles. Annals of Internal Medicine 2010; 152:649-654.
2. Adams JL, Mehrotra A, Thomas JW, McGlynn EA. Physician cost profiling – reliability and risk of misclassification. N England J Med; 362: 1014-21.

S11.2.Identify and define peer group
Identify the peer group and detail how peer group is identified and provide rationale for this methodology

Guidelines : Peer group comparisons should be based on physician specialty (as user data sets allow)as providers should only be compared to those of the same specialty.

Focusing on comparing physicians of the same specialty is another mechanism to ensure the severity of patients is similar across providers. It is quite possible that patients predominantly seen by endocrinologists or other specialists may be more complex or sicker patients than those seen by primary care physicians. Additionally, research has shown differences in the care provided by specialists versus generalists (1.2). Therefore, comparisons should be made to providers of similar specialties.

References:

1. Nash IS, Corrato RR, Dlutowski MJ, O´Connor JP, Nash DB. Generalist versus specialist care for acute myocardial infarction. Am J Cardiol. 1999 Mar 1;83(5):650-4.
2. Schreiber TL, Elkhatib A, Grines CL, O´Neill WW. Cardiologist versus internist management of patients with unstable angina: treatment patterns and outcomes. J Am Coll Cardiol. 1995 Sep;26(3):577-82.

S11.3. Level of Analysis:

Clinician : Individual

S11.4.Detail measure outliers or thresholds
Detail any threshold or outlier rules and decisions based on measure resource use and provide rationale for this methodology

Guidelines : For the physician reports, total observed episode costs are winsorized at the 2nd and 98th percentile, but claim line outliers are not removed and the use of risk adjusted results are intended to correct for any extreme outliers. The only exception is inpatient admissions. Extremely high admissions costs are winsorized at the 99th percentile (i.e. any value higher than the 99th percentile are set to the 99th percentile cost).
Rationale: Winsorizing and risk adjustment limits the influence of outliers. Episodes with extremely high admission costs skews mean costs for the entire episode. Winsorizing admissions at the 99th percentile reduces this effect without eliminating information on the distribution of total episode costs.

S11.5.Detail sample size requirements
Detail the sample size requirement including rules associated with the type of measure

We do not provide specifications or guidelines for sample size requirements : The ABMS REF episode-based resource use measures do not randomly sample enrollees nor do we recommend that implementers construct measures from a random sample. Regarding the issue of sample size determination. It is well known that the nature of resource use measurement at the level of individual providers will often lead to unstable estimations. There have been a number of efforts to derive a single number for which such measures might be stable enough for comparison of providers or individual providers over time. Yet to date there is no commonly accepted minimum. At this time we have not attempted to derive a minimal sample size for measure use.

S11.6.Define benchmarking or comparative estimates
Detail steps to produce benchmarking and comparative estimates and provide rationale for this methodology

Guidelines : Creation of provider summaries
The provider summaries are a report of the resource use for an attributable unit (hospital or provider) compared to their peer group, their non-peer group and all episodes in the dataset. Creation of the provider summaries uses the summary episode costs combined with the attributable provider data and the risk adjusted episode costs.

Step 1: Create a dataset that includes the following information: patient ID, total episode cost, attributable provider ID (or ID for the attributable unit if at the hospital level), attributable provider specialty type and episode expected costs from the risk adjustment model.

Step 2: Calculate the observed-to-expected ratio for each of the episodes by dividing observed costs for the episode by expected (predicted) costs for the episode.
O-to-E = Sum of Observed Costs / Expected Costs from Risk Adjustment Model
Step 3: If applicable, create indicators for the strata the episodes fall into so that separate summaries can be created for each of the strata.
Step 4: Summarize the observed, expected and observed-to-expected ratio for each attributable provider. Report minimum, maximum, median and mean values of the observed-to-expected ratio for all episodes attributed to the provider.

Step 5: Summarize the observed, expected and observed-to-expected ratio for each provider type, overall, and within each strata (if applicable). Report summary statistics for each of the provider types so the data are summarized for all providers of the same type. For example, report the summary statistics for the observed-to-expected ratio for all of the family practice physicians to facilitate peer group comparisons.

Step 6: Summarize the observed, expected, and observed-to-expected ratio for all of the episodes.
Step 7: For each of the individual attributable units (hospital or provider), determine the proportion of O-to-E ratios that are greater than or equal to the 75th percentile of the O-to-E ratio for the peer group. Calculate the 95% confidence interval for the proportion. For example, if the provider for which summary statistics are being calculated is a general internist and it is Dr. Y, the 75th percentile of O-to-E ratios for all episodes attributable to general interests is determined. The proportion of Dr. Y´s O-to-E ratio that are above the 75th percentile for all general interest episodes is determined and a 95% confidence interval is calculated for that proportion.
Step 8: Create provider summary reports for each attributable provider in the dataset

S12.Type of Score:

Ratio

If available, please provide a sample report:

S12_sample score report_diabetes.pdf

S12.1. Interpretation of Score.

(Classifies interpretation of score (s) according to whether higher or lower resource use amounts is associated with a higher or lower score, a score falling within a defined interval, or a passing score, etc)

The summary score calculated for the measure is the ratio of the observed cost to the expected cost or the O-to-E ratio. The O-to-E ratio is calculated for each patient for the attributable provider and summary statistics are calculated for the O-to-E ratio. The O-to-E ratio provides an estimate of the observed cost for a patient to the expected cost based on the patient's mix of chronic conditions. Expected costs for each patient are the calculation of their risk adjusted costs. A value of 1 for the O-to-E ratio indicates that the observed costs are equal to the expected costs. A value greater than 1 indicates that observed costs are more than what would be expected based on the patient's mix of chronic conditions. A value less than 1 indictates that the observed costs are less than what would be expected based on the patient's mix of chronic conditions. Calculation of the O-to-E ratio incorporates our approach to risk adjustment by determining the expected costs from the risk adjustment model. A summary O-to-E ratio is calculated for each of the attributable providers which combines all the episodes for that provider. Summary statistics are calculated for each provider for the raw (unadjusted) costs for the episode, expected costs and the O-to-E ratio. Each summary measure includes minimum, maximum, median, and mean values.

S12.2. Detail Score Estimation
Detail steps to estimate measure score.

Creation of provider summaries
The provider summaries are a report of the resource use for an attributable unit (hospital or provider) compared to their peer group, their non-peer group and all episodes in the dataset. Creation of the provider summaries uses the summary episode costs combined with the attributable provider data and the risk adjusted episode costs.

Step 1: Create a dataset that includes the following information: patient ID, total episode cost, attributable provider ID (or ID for the attributable unit if at the hospital level), attributable provider specialty type and episode expected costs from the risk adjustment model.

Step 2: Calculate the observed-to-expected ratio for each of the episodes by dividing observed costs for the episode by expected (predicted) costs for the episode.

O-to-E = Sum of Observed Costs / Expected Costs from Risk Adjustment Model

Step 3: If applicable, create indicators for the strata the episodes fall into so that separate summaries can be created for each of the strata.
Step 4: Summarize the observed, expected and observed-to-expected ratio for each attributable provider. Report minimum, maximum, median and mean values of the observed-to-expected ratio for all episodes attributed to the provider.

Step 5: Summarize the observed, expected and observed-to-expected ratio for each provider type, overall, and within each strata (if applicable). Report summary statistics for each of the provider types so the data are summarized for all providers of the same type. For example, report the summary statistics for the observed-to-expected ratio for all of the family practice physicians to facilitate peer group comparisons.

Step 6: Summarize the observed, expected, and observed-to-expected ratio for all of the episodes.
Step 7: For each of the individual attributable units (hospital or provider), determine the proportion of O-to-E ratios that are greater than or equal to the 75th percentile of the O-to-E ratio for the peer group. Calculate the 95% confidence interval for the proportion. For example, if the provider for which summary statistics are being calculated is a general internist and it is Dr. Y, the 75th percentile of O-to-E ratios for all episodes attributable to general interests is determined. The proportion of Dr. Y´s O-to-E ratio that are above the 75th percentile for all general interest episodes is determined and a 95% confidence interval is calculated for that proportion.
Step 8: Create provider summary reports for each attributable provider in the dataset

S12.3. Describe discriminating results approach
Detail methods for discriminating differences (reporting with descriptive statistics--e.g., distribution, confidence intervals)

Summary reports are generated at the attribution level that includes a summary estimate for the provider or hospital, the peer group, the non-peer group and the overall summary for the episode in the entire population. For each attributable

provider / hospital the observed, expected and O-to-E ratio are summarized. The summaries are created to facilitate comparisons for the attributable provider or hospital with other providers in the same peer group and overall. The most meaningful comparisons are likely those between the provider or hospital and the peer group. Even though the results are risk adjusted, this may help to further balance the case mix or severity of the patients being compared. The summary statistics for the O-to-E ratios can be compared in order to provide a sense of the relative performance of the provider or hospital compared to peers. In addition, the proportion of O-to-E ratios about thresholds of 2.0 and 2.5 are provided for comparisons. Finally, for the attributable unit (hospital or provider) the proportion of O-to-E ratios that are greater than or equal to the 75th percentile of the O-to-E ratio for the peer group is determined and the 95% confidence interval calculated. The expectation would be that 25% of the estimates for the attributable provider would fall about this value if the distribution of O-to-E ratios is similar to the peer group. A statistically significant difference would be found between the groups if the 95% confidence interval did not include 25% in the range. For example, if the proportion at or above the 75th percentile of the peer group is 38% and the 95% confidence interval ranges from 28% to 48% than this provider would have significantly more O-to-E ratios at the upper end of the distribution than the peer providers. Alternatively, if the proportion at or above the 75th percentile was 8% and the 95% confidence interval ranged from 3% to 16% then the provider would have significantly fewer O-to-E ratios in the upper end of the distribution than the peer group. The 75th percentile in our testing was selected as an illustrative cut-point and it will be important to evaluate this threshold for comparing providers.	

TESTING/ANALYSIS	
Measure testing must demonstrate adequate reliability and validity in order to be recommended for endorsement. Testing may be conducted for data elements and/or the computed measure score. See guidance on measure testing.	**Eval Rating**
TESTING ATTACHMENT (5MB or less) or URL: ***If needed, attach supplemental documentation (Save file as: SA_Reliability_Validity Testing) All fields of the submission form that are supplemented within the attachment must include a summary of important information included in the attachment and its intended purpose, including any references to page numbers, tables, text, etc.*** URL: Please supply the username and password: Attachment: SA_Reliability_Validity Testing Diabetes.pdf	
SA1. Reliability Testing ***For each module tested or for the overall measure score:*** **SA1.1. Data/sample** ***(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*** ABMS Diabetes Resource Use Measure was tested on Thomson Reuters Marketscan Dataset and the Wisconsin Health Information Organization's DataMart. Thomson Reuters Marketscan The MarketScan Commercial Database provides a rich, comprehensive source of longitudinal administrative claims data, offering the largest convenience sample available in proprietary databases with over 30 million covered lives in each of the three most current years of data. The MarketScan Commercial Claims and Encounters (Commercial) Database is constructed from data contributed from over 100 medium and large size employers and health plans, representing over 130 unique carriers. The MarketScan Databases' large sample size constitutes a nationally representative data sample of the U.S. population under the age of 65 with employer-sponsored health insurance. The stability of MarketScan data sources provides superior continuity of patients over multiple years, generally longer than other claims databases because the majority of the MarketScan data are sourced from large employers. As long as individuals remain with the same employer, they can be tracked across health plans.	**2a2** **H☐** **M☐** **L☐** **I☐**

Features of the MarketScan Research Databases include:
- Fully paid and adjudicated claims including inpatient, outpatient, and prescription drug claims
- Complete payment/charge information, including amount of patient responsibility
- Validated diagnosis, procedure, and other standard codes on claims where applicable (CPT, ICD-9, DRG, NDC, etc)
- Demographic information on enrollees including age, gender, and geographic information (three-digit zip codes and MSA)
- Plan-type identifiers in the database include major medical, comprehensive, PPO, EPO, HMO, consumer-driven health plan, capitated or part-capitated POS and non capitated POS
- Standardized data elements and definitions, ensuring accurate comparisons
- Clinical data enhancements, such as Therapeutic Class and Generic Product Identifiers on drug records, and Major Diagnostic Categories and Diagnosis Related Groups on inpatient and outpatient records
- Case records linking all of the hospital, physician, and ancillary services provided during an inpatient stay, allowing for comparisons based on such statistics as average length of stay, cost per admission, etc.

These data reflect the real world of treatment patterns and costs by tracking millions of patients as they travel through the healthcare system, offering detailed information about all aspects of care. Data from individual patients are integrated from all providers of care, maintaining all healthcare utilization and cost record connections at the patient level.

WHIO DataMart
WHIO is a voluntary partnership that brings together key health care stakeholders in Wisconsin to develop a statewide data mart of health care information that spans providers and systems. The goal is to use the data to improve the quality, affordability, safety and efficiency of health care delivered to patients in Wisconsin.

The WHIO data mart is an all-inclusive, central repository for health care claims data that will provide for tracking, analysis and measurement of entire episodes of care that can be used in determining value based on quality measures and cost over time.

WHIO collects an unprecedented volume of data that will span multiple systems and settings, including the physician office, outpatient services, pharmacy, lab and hospital. This data will reflect insurance claims and payers from across the state.

The data mart will holds a rolling twenty-seven (27) months worth of administrative claims data. With an unprecedented volume of data covering more than 207 million claims for care provided to 3.4 million Wisconsin residents.

SA1.2. Analytic Methods
(Describe method of reliability testing and rationale)

The iterative development process that was employed in defining the episode of care resulted in episode measures being examined (means, medians, distributions) and modified several different times. As the workgroup would suggest changes to the specifications, modifications would be made in the programming language to reflect these changes. This would allow us to examine the reliability of our implementation of the episode measures as we would not anticipate large changes in the observed costs with only small changes in the logic of the episode measure. For example, if we added a new diagnosis code to our episode that only had a small number of associated claims in our Level 1 analysis we would not expect large changes in the overall cost of the episode. Conversely, if large changes were made in the logic of the episode we would expect similar changes in the overall resource use and cost. In addition, our focus on defining condition specific episodes that are not intended for combining into a single composite measure could result in improved reliability relative combining condition episodes into a single profile for a provider where reliability of physician profiling was wide ranging (Adams et al. NEJM 2010)

Reference: Adams JL, Mehrota A, Thomas JW, McGlynn EA. Physician cost profiling – reliability and risk of misclassification. N Engl J Med 2010;362:1014-1021.

SA1.3.Testing Results
(reliability statistics, assessment of adequacy in the context of norms for the test conducted)

The iterative modification of measure specifications resulted in several runs of the episode programming. Comparisons

between results showed expected changes in overall resource use. The addition of a new diagnosis code that was previously included as unrelated but only had a minimal number of claims associated with it did not change the overall results associated with the episode.

SA1.4.Finding statement(s)—*(i.e., is the measure deemed reliable, limitations identified)*

We were able to produce consistent results within the episode.

SA2.Validity Testing
For each module tested or for the overall measure score:

SA2.1. Data/Sample
(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)

See section SA1.1 for description of Thomson Reuters Marketscan and WHIO data sets

SA2.2.Analytic Method
(Describe method of validity testing and rationale; if face validity, describe systematic assessment)

The iterative process of developing the specification with the clinical workgroup represented as assessment of the face validity of the results. Summary findings from the specifications would be presented to the workgroup to determine if results met their expectations or if there were modifications that were necessary. Specifically, the workgroup would assess whether the type of care being included in the measure would make sense in terms of the clinical condition. Moreover, the most frequently and highest cost services that were not related to the episode but were appearing in the data would also be examined. If there were services in this grouping that belonged in the related list modifications would be made. This was facilitated by the Level 1 and Level 2 testing that was done as part of the measure evaluation process.

Validity testing focused primarily on face validity. Initial testing included:
Level 1 analyses
- Examined impact of inclusion/exclusion criteria on episode denominator
- Examined total episode spending by type of service--means, medians an distributions.
- Identified top 20 “condition-related” and “non-condition-related” E&M, procedures, imaging, tests, inpatient admissions (by ICD-9 and DRG) and drugs, by service counts and dollar volume
- Tested proposed attribution logic, examined variability in per-episode resource use at individual provider level (as relevant) and by provider specialty.

Level 2 analyses
- Incorporated risk adjustment
- Produced sample physician-level reports in which observed-to-expected ratios are computed and the distribution of each physician’s episodes is compared to the peer group’s distribution.
- Examined specific drivers of resource use variation
- Examined variability in per-episode resource use across regions, states and the specialties of attributed providers.

Throughout the process of empirically testing the measures, summary analyses were presented to the workgroups for review and discussion. The workgroups reviewed denominator attrition diagrams to assess how the measure’s inclusion and exclusion criteria affected the episode’s denominator. They also reviewed summaries of costs by type of service (inpatient hospital care, outpatient care, procedures, imaging, tests, and prescription drugs) and were asked to assess whether the distributions matched the clinical expectations for the condition’s treatment. The clinicians were also presented with analyses of diagnosis and procedure level details in order to ensure that appropriate services were being captured and grouped to the episodes. At each step in the process, the measure specifications were revised based on workgroup feedback.
In addition to workgroup feedback results of the preliminary testing were also shared with a Technical Advisory Committee and the QASC Episodes Work Group and the measures revised according to feedback.

SA2.3.Testing Results

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(statistical results, assessment of adequacy in the context of norms for the test conducted; if face validity, describe results of systematic assessment)

Results of our Level 1 analyses for the measure are summarized in the attached summary slides (SA_reliability_validity testing_diabetes.ppt)

There were 212,559 events that qualified for inclusion in our measure via the oral hypoglycemic (cohort 1) inclusion criteria and 25,085 that qualified via the insulin only (cohort 2) inclusion criteria in the Marketscan data. The average cost of the episode for the oral hypoglycemic cohort was $3138 while the average episode cost in the insulin only cohort was $4457. It was anticipated that the insulin only group would have higher average costs due to potential differences in the disease severity of the two groups and the intensity of the treatment. In both groups, medications and office visits were responsible for the majority of the costs associated with the episode. In the oral hypoglycemic group, medications accounted for 69% of the average episode costs and evaluation and management related costs accounted for 20% of the average episode costs. In other words, the majority of the costs for the typical episode were associated with physician visits and medications which would represent the routine care of patients with diabetes. In the insulin only group a similar pattern was observed. Medications were responsible 52% of the costs of the average episode and evaluation and management costs made up 17% of the average episode costs. The primary difference between the two groups in terms of the proportion of costs across the service categories was for durable medical equipment where the proportion of average episode costs was 19% in the insulin only group and 3% in the oral hypoglycemic group. The majority of the costs in this category were for glucometers and test strips used to monitor blood glucose levels in patients with diabetes and may be used more frequently by patients being treated with insulin compared to those treated with oral hypoglycemics. The most common tests associated with the episode were HgbA1c tests, lipid panels and comprehensive metabolic panels all of which would be consistent with routine care of patients with diabetes. In the medication category, those medications used to treat diabetes made up more than a third of the medications in the category while the rest consisted of treatments aimed at preventing or managing secondary complications associated with diabetes (e.g. treatment of hypertension, treatment of hyperlipidemia). The patterns of care were similar for the insulin only group compared to the oral hypoglycemic group with slightly higher absolute costs across all categories of service compared to the oral hypoglycemic group. The top two specialties of providers attributed diabetes episodes were family practice and internal medicine. Because the intent was to focus the measure on patients with diabetes in a maintenance phase of their disease and treatment this is consistent with the expectations of the workgroup that led the development of the episode measure. When examining results across providers, family practice physician episodes were associated with lower costs and episodes attributed to an endocrinologist. This is consistent with endocrinologists treating patients with more severe or advanced disease and another motivation for comparing results only within peer groups.

SA2.4. Finding statement(s)—(*i.e., is the measure deemed reliable, limitations identified)*

The analyses conducted indicate that our measure has strong face validity for the measurement of diabetes-related costs.

SA3.Testing for Measure Exclusions **2b3**

SA3.1. Describe how the impact of exclusions (if specified) is transparent as required in the criteria

In the attached data summary, we have detailed how the exclusions impacted the resulting size of the cohort (see attached data summary Slides 4 and 5).

SA3.2. Data/sample for analysis of exclusions
(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)

See section SA1.1 for description of Thomson Reuters Marketscan data set.

SA3.3. Analytic Method
(Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference)

We examined the impact of several types of exclusions. In order to ensure that data are available for assessing the

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episode of care, we excluded individuals without continuous insurance coverage including medical and pharmacy benefits. We also excluded individuals who met standard NCQA exclusions for conditions that are resource intensive, which could potentially have a larger impact on resource use than the condition being studied (i.e., end stage renal disease, active cancer management, etc.) There were also exclusion criteria that were specified for this condition by the clinical workgroup: polycystic ovaries; gestational or steroid-induced diabetes. We examined the impact of these exclusions on the resulting cohort size.

SA3.4. Results
(statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses)

In 2006 there were 1.3 million enrollees in the Marketscan data that had any indication of diabetes which included either a diagnosis or medication consistent with diabetes. Among these individuals, there were 656,575 that met our standard inclusion criteria for measure eligibility. The primary reasons for lack of eligibility included no prescription medication coverage in 2007 (39%) and discontinuous coverage in 2007 (32%). Among those eligible based on these criteria, 212,559 (32%) of the
656,575 met criteria for the oral hypoglycemic cohort and 25,085 (4%) met the criteria for the insulin only cohort. The largest impact on the cohort size among the oral hypoglycemic group was no diabetes visit in the first half of 2006 raising the possibility that the patients could potentially be new diagnoses of diabetes. This criterion excluded 50% of the patients that met the initial criteria. Similarly, 41% of the initial cohort did not have a qualifying prescription in the first half of 2006 again raising concerns about the length of the diabetes diagnosis. The standard NCQA exclusions (e.g. active cancer, HIV/AIDS) disqualified 3% of the initial cohort whereas the specific exclusions for this measure (e.g.
dialysis, renal failure) excluded 6% of the initial cohort. For the insulin only group the majority were excluded because they did not use insulin in the first half of 2006 (84%) or had oral hypoglycemics in the
first half of 2006 (59%). The same proportions as above were excluded
from the initial cohort due to no diabetes visits, standard NCQA exclusions and episode specific exclusions. An additional 5% of the initial cohort was excluded because they were less than 30 years of age as the intent was to limit the number of Type I diabetics included in the measure.

SA3.5. Finding statement(s)-- ***(i.e., is the measure deemed reliable, limitations identified)***

Based on the findings from our cohort attrition analysis described above and feedback from the clinical workgroup, the measure is identifying the appropriate group for inclusion. The exclusions due to continuous enrollment are a function of the data that is available and necessary criteria to fully implement the measure. The requirement for visits and prescriptions in the first half of the identification year was included in order to limit patients with a new diagnosis in the measure. Overall, the workgroup felt this group represented the most homogenous population that could be reasonably compared across providers.

SA4. Testing Population
Which populations were included in the testing data? (Check all that apply)

Commercial

SA5. Risk adjustment strategy ***Refer to items S10.1 and S10.2 to rate this criterion.***	**2b4** **H☐** **M☐** **L☐** **I☐**
SA6. Data analysis and scoring methods ***Refer to items S12-S12.3 to rate this criterion.***	**2b5** **H☐** **M☐** **L☐** **I☐**
SA7. Multiple data sources	**2b6**

Refer to S7 & all SA1 items to evaluate this criterion.	H☐ M☐ L☐ I☐ NA☐
SA6. Stratification of Disparities (if applicable) ***Refer to item S10.2 to rate this criterion.***	**2c** H☐ M☐ L☐ I☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Scientific Acceptability of Measure Properties*?	
Steering Committee: Overall, was the criterion, *Scientific Acceptability of Measure Properties*, met? **Rationale:**	Y☐ N☐
USABILITY	
Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making.	**Eval Rating**
Meaningful, Understandable, and Useful Information **U1. Current Use:** Public reporting (disclosure to performance results to the public at large) Quality improvement with external benchmarking **U1.1. Use in Public Reporting Initiative Use in Public Reporting.** ***Disclosure of performance results to the public at large (If used in a public reporting program, provide name of program(s), locations, Web page URL(s). If not publicly reported in a national or community program, state the plans to achieve public reporting, potential reporting programs or commitments, and timeline, e.g., within 3 years of endorsement)*** The ABMS REF has only recently completed the development and testing of its Episode-based Resource Use Measures. The Robert Wood Johnson Foundation (RWJF) has provided follow-up funding in the form of technical assistance to Aligning Forces for Quality communities for continued testing of the measures—a 15-month award to Brookings Institute with a subcontract to ABMS REF for continued field testing of select measures in up to four Aligning Forces for Quality (AF4Q) communities toward the goal of public reporting and quality improvement benchmarking. **U1.2. Use in QI** ***(If used in improvement programs, provide name of program(s), locations, Web page URL(s)).*** See section U1.1 above. **U1.3. Use for other Accountability Functions (payment, certification, accreditation)** ***(If used in a public accountability program, provide name of program(s), locations, Web page URL(s).*** See section U1.1 above.	**3a** H☐ M☐ L☐ I☐

U2. Testing of Interpretability ***(Provide a rationale for why the measure performance results are meaningful, understandable, and useful to the intended audience(s) for both public reporting and quality improvement).*** **U2.1. If understanding or usefulness was demonstrated** ***(e.g., through systematic feedback from users, focus group, cognitive testing, analysis of quality improvement initiatives) describe the data, methods, and results.*** The ABMS REF measures have not yet been tested for usefulness or interpretability. They are currently undergoing continued testing in up to four RWJF AF4Q communities.	**3b** **H☐** **M☐** **L☐** **NA☐**
U2.2. Resource use data and result can be decomposed for transparency and understanding. ***Refer to items S11 -S12.3.***	**3c** **H☐** **M☐** **L☐** **I☐**
U3. If there are similar or related measures (either same measure focus or target population) measures (both the same measure focus and same target population), list the NQF # and title of all related and/or similar measures. **U3.1. If this measure has EITHER the same measure focus OR the same target population as NQF-endorsed measure(s): Are the measure specifications completely harmonized?** **U3.2. If the measure specifications are not completely harmonized identify the differences, rationale, and impact on interpretability and data collection burden.** ***Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)***	**3d** **H☐** **M☐** **L☐** **I☐** **NA☐**
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Usability*?	
Steering Committee: Overall, to what extent was the criterion, *Usability*, met? **Rationale:**	**H☐** **M☐** **L☐**
FEASIBILITY	
Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement.	Eval Rating
F1. Data Elements Generated as Byproduct of Care Processes ***How are the data elements needed to compute measure scores generated? Data used in the measure are:*** Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims)	**4a** **H☐** **M☐** **L☐** **I☐**

F2. Electronic Sources
Are the data elements needed for the measure as specified available electronically? (Elements that are needed to compute measure scores are in defined, computer-readable fields)

4b

ALL data elements in electronic claims

F2.1. If ALL data elements are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.

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F3. Susceptibility to Inaccuracies, Errors, or Unintended Consequences
Identify susceptibility to inaccuracies, errors, or unintended consequences of the measurement identified during testing and/or operational use and strategies to minimize or prevent. If audited, provide results.

- The majority of measures developed for this project are of 12 months duration or less with identification of the population in one year and measurement in the following. This resulted in eligibility criteria requiring a minimum of 24 months of continuous data (full medical and pharmacy benefit enrollment). Often, clinical workgroup members expressed a desire to extend the duration of a measure to encompass more longitudinal clinical outcomes (e.g. cardiac complications for diabetes) however this was not practical due to the typical enrollment patterns in the commercial population.
- Sample size may be of concern for implementers seeking to measure resource use at the level of the individual provider. Many of the measures, when tested on commercial datasets, resulted in small sample sizes that may prohibit meaningful attribution. Discontinuous medical coverage and missing pharmacy coverage were responsible for significant (often greater than 50%) decreases in eligible populations, emphasizing the trade-offs between ensuring adequate sample size and achieving specificity/homogeneity in the measure denominator. If users are unable to achieve adequate sample size at the level of the individual provider, the measures specifications may still provide valuable information at the level of group, system or region.
- Administrative claims lack the detail necessary to fully understand appropriateness of resource use in relation to severity of disease (e.g. bundled hospital payments, absence of cancer staging information, absence of cardiac severity indicators, Type 1 v. Type 2 diabetes). Future efforts should consider the integration of administrative claims with other sources of clinical information such as registries and electronic health records.
- Resource use is only one component of efficiency measurement. The measures created in this project are not intended to be used in isolation to evaluate physician performance; rather they are intended to complement quality measures as an important component of performance evaluation.
- The measures developed in this project represent a small subset of clinical conditions, and do not address the full range of patient and provider experience. Each measure was developed independently and, as such, they are not summative. Efforts to sum multiple measures will result in double counting of services.
- The standardized pricing algorithms used for testing the measures were developed for use in the Marketscan dataset. The technical appendices accompanying the measures provide a guide to assist users in developing their own set of standardized prices unique to their datasets. Until a national list of standardized prices is made available to the general public, the methods employed in the testing phase of this project do not allow for national benchmarking.

4c

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F4. Data Collection Strategy
Describe what you have learned/modified as a result of testing regarding barriers to operational use of the measure (e.g., availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, cost of proprietary measures).

Administrative claims lack the detail necessary to fully understand appropriateness of resource use in relation to severity of disease (e.g. bundled hospital payments, absence of cancer staging information, absence of cardiac severity indicators, Type 1 v. Type 2 diabetes). Future efforts should consider the integration of administrative claims with other sources of clinical information such as registries and electronic health records.

There were several lessons learned throughout the development and testing of the ABMS REF episode-based resource use measures. First, was the importance of garnering a diverse range of clinical input in a transparent manner to foster

4d

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face validity and acceptance in the clinical community. Second was the importance of adequate resources for data acquisition, preparation and analyses (time and personnel). Not all datasets are formatted the same which can lead to significant amounts of programmer time for re-formatting code or datasets (e.g. the WHIO data were provided as a set of SQL tables, which needed to be reconfigured into SAS datasets). It is also important to allow 2-6 months lead time to negotiate data use agreements as use of health care data–even de-identified data--often involves complex contract negotiations.

TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for *Feasibility*?

Steering Committee: Overall, to what extent was the criterion, *Feasibility*, met? H☐ M☐ L☐
Rationale:

RECOMMENDATION

Steering Committee: Do you recommend for endorsement? Y☐ N☐ A☐
Comments:

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)

Co.1 Organization

American Board of Medical Specialties Research and Educatio Foundation, 222 N. LaSalle St., Suite 1500, Chicago, Illinois, 60601

Co.2 Point of Contact

Kevin, Weiss, MD, kweiss@abms.org, 312-436-2600-

Measure Developer If different from Measure Steward

Co.3 Organization

American Board of Medical Specialties Research and Educatio Foundation, 222 N. LaSalle St., Suite 1500, Chicago, Illinois, 60601

Co.4 Point of Contact

Kevin, Weiss, MD, kweiss@abms.org, 312-436-2600-

Co.5 Submitter If different from Measure Steward POC

Robin, Wagner, rwagner@abms.org, 312-436-2605-, American Board of Medical Specialties Research and Education Foundation

Co.6 Additional organizations that sponsored/participated in measure development

Development of the ABMS REF Episode-based Resource Use Measures was supported by the Robert Wood Johnson Foundation under the High Value Healthcare Project: Characterizing Episodes and Costs of Care. Grant number 63609.

ADDITIONAL INFORMATION

Workgroup/Expert Panel involved in measure development

Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.

Diabetes Workgroup Members
David Aron, MD, Endocrine Society
Stuart Brink, MD, American Academy of Pediatrics
R. James Dudl, MD, Kaiser Permanente
Richard Hellman, MD, American Association of Clinical Endocrinologists
Carol Mangione, MD, American Geriatrics Society
Vincenza Snow, MD, American College of Physicians
Erica Swegler, MD, American Academy of Family Physicians
Workgroups consisting of a panel of experts were assembled for each condition. In collaboration with the AMA PCPI, a formal call for nominations was issued to the PCPI membership. This process was supplemented with direct outreach to relevant organizations in an effort to achieve representation from a wide range of clinical expertise (medical, nursing, pharmacy, other allied health professionals). Workgroup members were selected based on their clinical knowledge and administrative experience—many also had significant experience in developing quality measures. Where possible, groups also included technical expertise from the health plan perspective.
The measure development process involved a series of deliberate steps where participating clinicians took into account the natural progression of a condition and existing best practices before carefully considering how to best use administrative claims data to construct the episode.

Each clinical workgroup initially convened for a two-day in-person meeting that began with an introduction to the concepts of episodes of care and resource use measurement-- including a review of the NQF framework for evaluating efficiency across episodes of care. The groups were then asked to conceptualize one or more episodes based on the phases of the NQF model. They aimed to identify clinically homogenous populations so that the measures would be sensitive to provider decisions and existing practice protocols for like patients. Workgroup members were then asked to conceptualize the measure specifications based on their combined knowledge of guidelines, evidence, and clinical experience. The workgroups helped to define the denominator, duration, clinically relevant services and attribution of each episode as related to the clinical progression and treatment of the condition.

Throughout the months following the in-person meeting, project staff then worked to translate the concepts into detailed written measure specifications. The workgroups subsequently re-convened via a series of conference calls to review data analyses, share expert opinions, consider additional evidence-based literature, revise and finalize the measure specifications.

Measure Developer/Steward Updates and Ongoing Maintenance

Ad.2 Year the measure was first released:

2010

Ad.3 Month and Year of most recent revision:

12, 2010

Ad.4 What is your frequency for review/update of this measure?

every 3 years

Ad.5 When is the next scheduled review/update for this measure?

12, 2013

Ad.6 Copyright statement/disclaimers:

establish a standard of medical care. The ABMS REF has not tested its Measures for all potential applications. The ABMS REF encourages the testing and evaluation of its Measures. Measures are subject to review and may be revised or rescinded at any time by the ABMS REF. The Measures may not be altered without the prior written approval of the ABMS REF. The Measures developed by the ABMS REF, while copyrighted, can be reproduced and distributed, without modification, for noncommercial purposes, e.g., use by health care providers in connection with their practices. Commercial use is defined as the sale, license, or distribution of the Measures for commercial gain, or incorporation of the Measures into a product or service that is sold, licensed or distributed for commercial gain. Commercial uses of the Measures require a license agreement between the user and ABMS REF. Neither the ABMS REF nor its members shall be responsible for any use of these Measures.
Portions of the exclusion criteria in the ABMS REF episode-based resource use measures were adapted from HEDIS ® measure specifications.
Limited proprietary coding is contained in the Measure specifications for convenience. Users of the proprietary code sets should obtain all necessary licenses from the owners of these code sets. The ABMS REF disclaims all liability for use or accuracy of coding contained in the specifications.

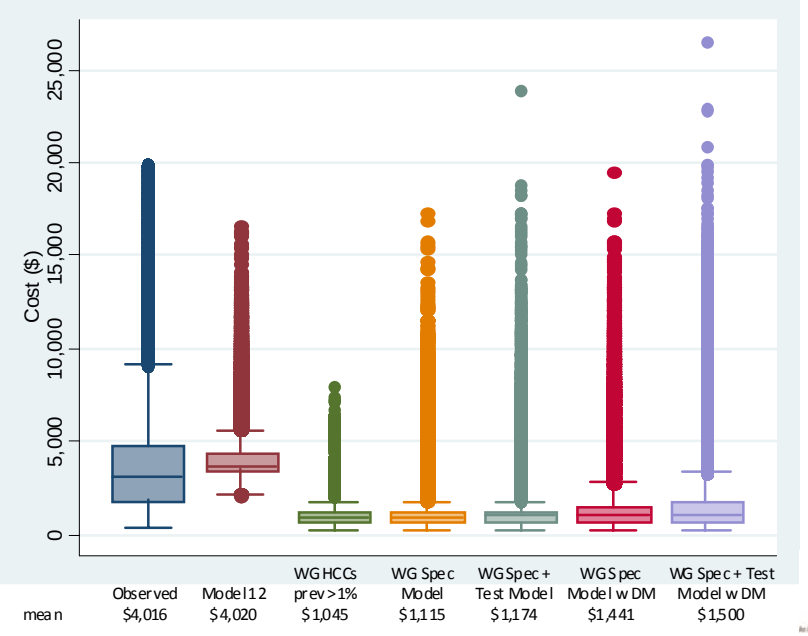
Ad. 7 Date of Submission (*MM/DD/YY*)**:**

03/18/2011

Comparison 'off the shelf' HCC Values with Episode-specific Risk Adjustment Model

Below we show the figure for the comparison of the diabetes risk adjustment model with diabetes risk adjustment models if we had used HCC values. The first box plot in the figure shows the observed costs in for the episode. The second box plot shows the risk adjustment model that we developed for our diabetes episode that is focused on diabetes-related costs. The final five box plots show the distribution of predicted costs including different HCCs for our diabetes episode if we had relied on the off the shelf HCC values. The mean predicted value for all of the off the shelf HCCs models is $1500 or less, while the observed episode costs were slightly more than $4,000. Given the disparity in the means and distributions of the off the shelf HCC values we felt this justified our approach to develop risk adjustment models for each of our episodes that were focused on episode specific costs

Observed and Predicted Values – Diabetes Episode with "off the shelf HCCs"



For this reason, we have developed separate risk adjustment models for each of our episodes that are based on episode-specific costs. We realize this increases the complexity of implementing our measures; however, we feel it is a more appropriate approach for risk adjustment within our episodes. Within our risk adjustment approach, we control for different comorbidities for each condition because patients with each of the measurement conditions often had very different risk profiles.

We used the following risk adjustment strategy in the development of our risk adjustment models:

1. Utilized quasi-Modified Delphi approach with the condition-specific workgroup to categorize HCCs into three groups:

- Include in risk adjustment model;
- Exclude in risk adjustment model; and
- Test impact in risk adjustment model.

2. Identified HCCs in denominator population during the 12 months before the measurement year.

3. Tested 12 different model specifications shown in Table 1 (below), where the HCCs included in the model varied, and the distribution and link functions in the generalized linear models also varied. Models were developed in a stepwise manner as indicated. The first four models used a gamma distribution and a log link function. This functional form of the model was selected as cost data are typically skewed and we wanted to account for that in the analysis. The first model included all HCCs identified by the condition-specific workgroup as "Include HCCs" with a prevalence in the population of >=1%. The second model was a reduction of the first model that only included HCCs where $p<0.1$. The third model extended the second model by including HCCs with prevalence >=1% identified as "Test HCCs" by the condition-specific workgroup. The fourth model was a reduction of the third model and included only those HCCs where $p<0.1$. The next set of four models (Models 5-8) repeated the process of the first four models but used a normal distribution and identity link function. We opted to include this functional form of the model so that the model output could be interpreted in dollars without requiring a transformation. We followed this strategy as we felt it would be easier for those implementing our measure to create their own risk adjustment models using this functional form of the model if they decided to create their own models. Finally, we opted to evaluate models that included all of the HCCs in case the work group may have failed to include HCCs that were influential on the overall episode costs. Model 9 used all of the HCCs, with the exception of the HCC for the episode being evaluated (e.g., diabetes for the diabetes episode; however HCCs for complications of diabetes were included), and a gamma distribution with log link function. Model 10 was a reduction of Model 9 where only the HCCs with $p<0.1$ were included. The final two models (Models 11-12) used the same process as Models 9 and 10 with a normal distribution and identity link function.

Table 1. Risk Adjustment Model Specifications

Model #	Independent Variables						Distri-bution	Link function
	WG Specified (> 1%)	WG specified (> 1%) p < 0.1	Test conditions (> 1%)	Test conditions (> 1%) p < 0.1	All HCCs	All HCCs p < 0.1		
1	X						Gamma	Log
2		X					Gamma	Log
3		X	X				Gamma	Log
4		X		X			Gamma	Log
5	X						Normal	Identity
6		X					Normal	Identity
7		X	X				Normal	Identity
8		X		X			Normal	Identity
9					X		Gamma	Log
10						X	Gamma	Log
11					X		Normal	Identity
12						X	Normal	Identity

4. Models were developed in a split sample approach with 75% of the population randomly selected for model development and the remaining 25% used in model evaluation. Model performance was also evaluated in the full cohort.

5. The performance of each model was evaluated through comparisons of the observed and predicted distributions, comparisons of residuals, comparisons of absolute differences between observed and predicted, comparisons of observed-to-predicted ratios, and comparisons of mean squared errors across models. Summary information on model performance was presented to the condition-specific workgroup for selection of a risk adjustment model for the condition. Final model selection was based on the best performing model across metrics. Where model performance was similar, models using the normal distribution were preferentially chosen over the gamma distribution models for ease of implementation. More parsimonious models were also preferentially chosen.

Variable Name	Variable Description	Required Data Sources*
admdate	Date of Admission	A
age	Age	E
billtyp	Facility Bill Type Code	C
days	Length of Stay	A
daysupp	Day's Supply	D
disdate	Date of Discharge	A
drg	Diagnosis related group	A,B
dstatus	Discharge status	A
egeoloc	Geographic Location	E
enrolid	Enrollee ID	All
fachdid	Facility Header Record ID	C
facprof	Professional/Facility Indicator	C
gennme	Generic Drug Name	D
mastfrm	Master Form Code	D
memdays	Member Days	E
ndcnum	National Drug Code (ndc_code in Redbook)	D
pay	Payment	A,B,C,D
pdx,dx1,dx2,…,dxn	Diagnosis Codes	A,B,C
physid	Physician ID	A,B
pproc, pproc1,…, pprocn	Procedure/Service Codes	A,B,C
procmod	Procedure Code Modifier	A,C
proctyp	Procedure Code Type	B,C
prodnme	Product Name	D
provid	Provider ID	A
qty	Quantity of Services	A,B,C,D
region	Region	E
revcode	Revenue Code	C
rx	Cohort Drug Indicator	D
sex	Gender	E
stdplac	Place of Service	C
stdprov	Provider Type	C
svcdate	Service Date	A,B,C,D
thercls	Therapeutic Class	D
tsvcdat	Date Service Ending	C

Data Sources*

A. Administrative claims data – inpatient (facility)
B. Administrative claims data – inpatient (professional)
C. Administrative claims data – outpatient/ambulatory (professional and facility)
D. Administrative claims data – pharmacy
E. Enrollment/coverage data (2 or more years)

Measure Component	**Required Variables**
Standardized Prices*	enrolid, ndcnum, pay, qty, drg, pproc,…,pprocn.
Exclusions and standard coverage definition	enrolid, pdx,dx1,…,dxn, age, svcdate, pproc, pproc1,…, pprocn, pay, qty, revcode, memdays, rx, stdplac, proctyp.
Cohort Definition	enrolid, svcdate, pdx, pdx1,…,pdxn, pproc1,…, pprocn, pay, qty, sex, age, thercls, dstatus, stdplac, billtyp, fachdid, revcode.
Related Resource Use	enrolid, facprof, pay, qty, pproc1,…, pprocn, svcdate, admdate, disdate, pdx, dx1,…, dxn, drg, ndcnum, thercls, gennme, prodnme, daysupp, procmod, mastfrm.
Output and Attribution	enrolid, svcdate, standardized price variables*, BETOS**, pproc1,…,pprocn, pdx, dx1,…,dxn, egeoloc, region, provid, stdprov, age, sex, physid.

* For internal testing and validation purposes, drug prices were calculated by taking the average of 2006 and 2007 Marketscan prices, inpatient facility prices were computed by calculating average daily price by DRG from 2007, and outpatient and service prices were constructed by calculating the mean price by procedure code within the Marketscan dataset.
** Berenson-Eggers Type of Service – Categorizes Health Care Procedure Coding System (HCPCS) procedure codes in order to analyze health care expenditures. See link for full description.
http://www.cms.hhs.gov/hcpcsreleasecodesets/20_betos.asp

Condition (Workgroup)	***Measure Name***	***Abbreviation***
Acute Myocardial Infarction (AMI)	Episode-of-Care for 30 days Following Onset	AMI1
Acute Myocardial Infarction (AMI)	Episode-of-Care for Post-Acute Period (Days 31-365 Days Post-Event)	AMI2
Asthma	Episode-of-Care for Patients with Asthma over a 1-year Period	ASTH
Breast Cancer	Episode-of-Care for 60-Day Period Preceding Breast Biopsy	BB
Breast Cancer	Episode-of-Care for Treatment in Newly Diagnosed Cases of Breast Cancer over a 15-month Period	BCT
Chronic Obstructive Pulmonary Disease (COPD)	Episode-of-Care for Patients with Stable COPD over a 1-year Period	COPD1
Chronic Obstructive Pulmonary Disease (COPD)	Episode-of-Care for Patients with Unstable COPD over a 1-year Period	COPD2
Colon Cancer	Episode-of-Care for 21-Day Period Around Colonoscopy	COL
Colon Cancer	Episode-of-Care for Treatment of Localized Colon Cancer	CCT
Congestive Heart Failure (CHF)	Episode-of-Care for Management of CHF Over 1-Year Period	CHF1
Congestive Heart Failure (CHF)	Episode-of-Care for Post Hospitalization Management of CHF over 4-Month Period	CHF2
Coronary Artery Disease (CAD)	Episode-of-Care for Management of Chronic CAD Over 1-Year Period	CAD1
Coronary Artery Disease (CAD)	Episode-of-Care for Management of CAD Post Revascularization Over 1-Year Period	CAD2
Diabetes	Episode-of-Care for Diabetes Over 1-Year Period	DIAB
Low Back Pain	Episode-of-Care for Simple Non-Specific Lower Back Pain (Acute and Sub-Acute)	LBP1
Low Back Pain	Episode-of-Care for Acute/Sub-Acute Lumbar Radiculopathy With or Without Lower Back Pain	LBP2
Pneumonia	Episode-of-Care for Community-Acquired Pneumonia Hospitalization	PN1
Pneumonia	Episode-of-Care for Ambulatory Pneumonia Episode	PN2

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Analytic Findings: Diabetes Episode of Care

Overview of Analyses Presented for Diabetes Episode*

- Denominator Attrition
- Related and Non-related Services
- Resource Use, Attribution and
- Risk Adjustment

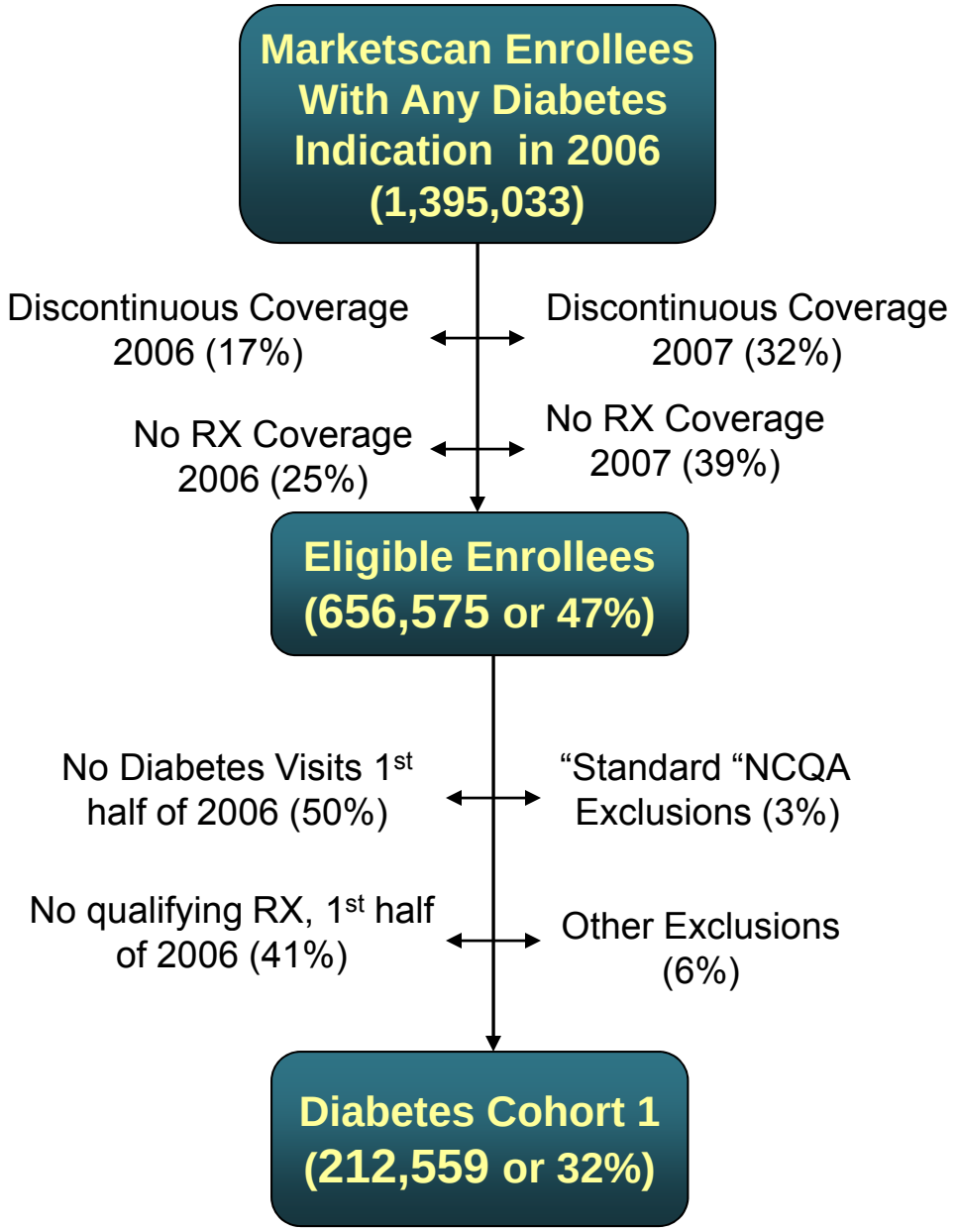
** The following results are based on the measure specification at different points in time, so the numbers are not always consistent, but they are not substantively different.*

Denominator Attrition

- Summarizes the initial denominator based on the workgroup's specifications
- Describes the percentage of enrollees removed from the analysis due to NCQA exclusions or other criteria.

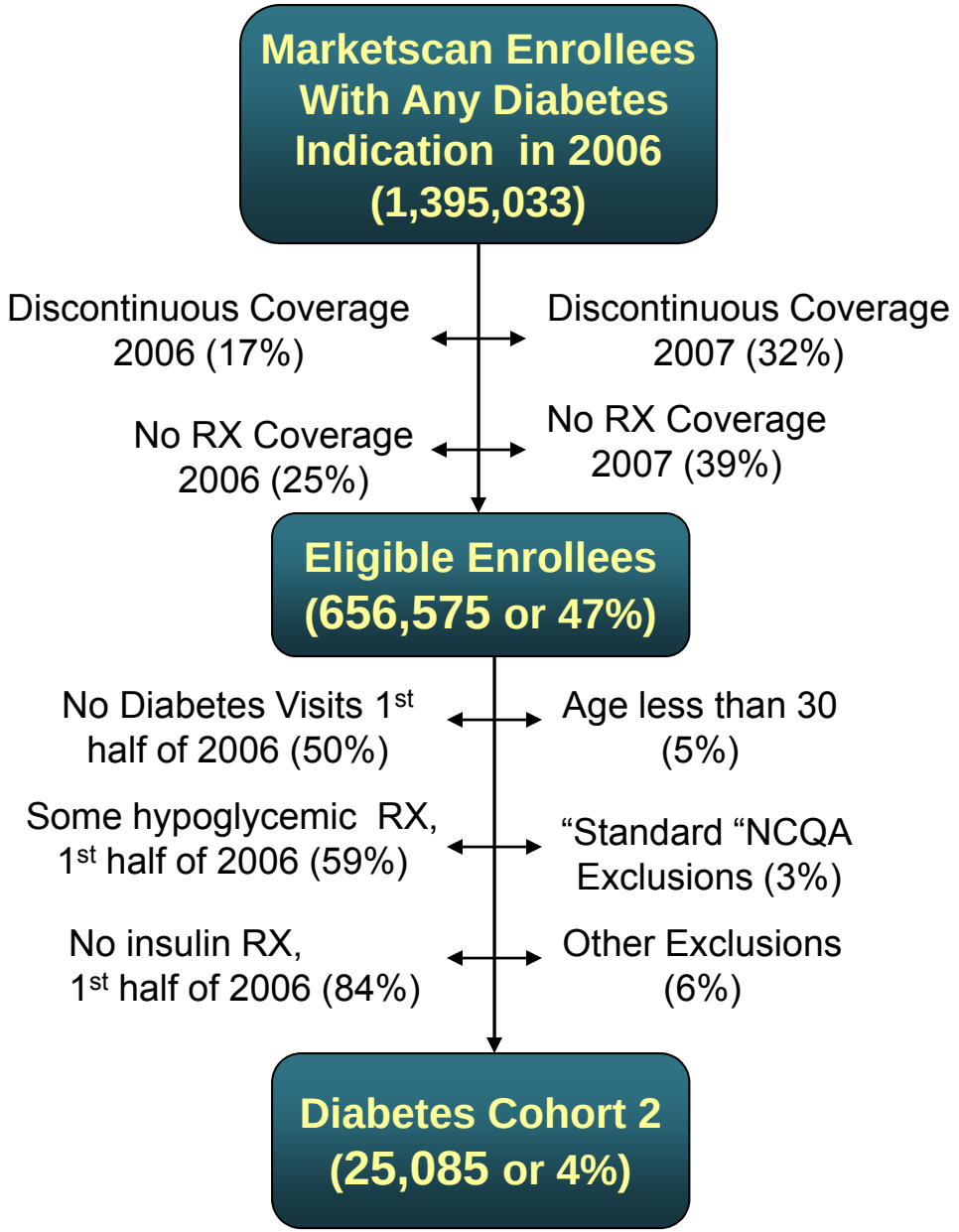
Diabetes One Year Measure Denominator 1

- At least one outpatient visits w. dx-250.x in 2006 (one in 1st half).
- At lease one oral hypoglycemic med. In 1st half 2006.
- Measurement window: Jan. 1, 2007 – Dec. 31, 2007
- Note: exclusions are not additive (double-counting occurs often)



Diabetes One Year Measure Denominator 2

- At least one outpatient visits w. dx-250.x in 2006 (one in 1st half).
- No oral hypoglycemic med. In 1st half 2006.
- At least one insulin claim in 1st half 2006.
- Age 30 years or more
- Measurement window: Jan. 1, 2007 – Dec. 31, 2007
- Note: exclusions are not additive (double-counting occurs often)



Related and Non-Related Services

- Examines most frequent related and non-related resource use by BETOS category
  - Evaluation and Management Visits, Procedures, Imaging, Tests, Admissions and Medications.
- Results are presented to the workgroup to examine the face validity of episodes.

Top 20, DM-related E&M, Cohort 1

- 20% of total episode costs

CPT	Svcs	Costs	% of Svcs	% of Costs	Description
99214	490,305	$44,757,826	31.9%	34.1%	Office visit, established patient
99213	658,620	$40,590,697	42.9%	31.0%	Office visit, established patient
99215	54,229	$7,183,027	3.5%	5.5%	Office visit, established patient
99244	36,545	$7,090,253	2.4%	5.4%	Office consultation
99243	30,767	$4,342,197	2.0%	3.3%	Office consultation
92014	39,380	$3,745,824	2.6%	2.9%	Ophthalmological services
99203	35,677	$3,687,313	2.3%	2.8%	Office visit, new patient
99245	13,149	$3,293,956	0.9%	2.5%	Office consultation
99204	19,923	$2,889,857	1.3%	2.2%	Office visit, new patient
92012	20,482	$1,518,997	1.3%	1.2%	Ophthalmological services
99205	6,280	$1,157,174	0.4%	0.9%	Office visit, new patient
92250	14,558	$1,076,103	0.9%	0.8%	Fundus photography
99242	8,964	$979,388	0.6%	0.7%	Office consultation
99232	11,495	$926,157	0.7%	0.7%	Subsequent hospital care
92004	7,428	$904,995	0.5%	0.7%	Ophthalmological services
92235	5,757	$901,076	0.4%	0.7%	Fluorescein angiography
99212	17,111	$755,675	1.1%	0.6%	Office visit, established patient
99222	972	$416,392	0.1%	0.3%	Initial hospital care
99233	3,698	$409,286	0.2%	0.3%	Subsequent hospital care
99285	1,312	$365,106	0.1%	0.3%	ED visit for E&M care
Grand Total	1,536,249	$131,117,978	100.0%	100.0%	

Non-DM related E&M, Top 20 ICD-9 Codes, Cohort 1

ICD-9 Diagnosis	Related Svcs	Non-related Svcs	Related Costs	Non-related Costs
V7231-Routine Gyn Examination	2,260	17,036	$220,909	$2,037,042
V700 -Routine Medical Exam	3,199	15,855	$344,115	$1,856,477
78650-Chest Pain NOS	9,423	8,274	$1,004,673	$1,612,252
29632-Recurr Depr Psychos-Mod	94	7,985	$8,907	$677,774
30928-Adjust Dis w Anxiety/Dep	31	7,243	$2,760	$611,879
3004 -Dysthymic Disorder	369	7,121	$29,827	$603,256
29633-Recur Depr Psych-Severe	80	5,558	$9,321	$494,273
78900-Abdmnal Pain Unspcf Site	6,116	3,073	$538,958	$490,382
486 -Pneumonia, Organism NOS	2,871	3,353	$235,488	$474,377
51881-Acute Respiratry Failure	216	3,362	$21,323	$352,655
78659-Chest Pain NEC	2,378	1,740	$259,013	$350,788
4280 -Chf NOS	2,900	2,640	$259,778	$347,119
6826 -Cellulitis of Leg	3,039	2,655	$239,686	$336,545
41401-Crnry Athrscl Natve Vssl	17,316	3,261	$1,495,517	$329,825
7802 -Syncope & Collapse	1,413	1,677	$152,039	$312,128
78909-Abdmnal Pain Oth Spcf St	838	1,455	$77,488	$298,403
311 -Depressive Disorder NEC	2,020	3,213	$149,832	$295,411
4019 -Hypertension NOS	34,636	3,077	$2,826,503	$290,333
42731-Atrial Fibrillation	4,529	2,484	$397,629	$287,222
4111 -Intermed Coronary Synd	468	1,597	$62,062	$282,056

Top 20, DM-related procedures, Cohort 1

- 2% of total episode costs

CPT	Svcs	Costs	% of Svcs	% of Costs	Description
67228	2,015	$2,256,179	5.0%	20.9%	Treatment of progressive retinopathy
67210	2,715	$2,127,064	6.7%	19.7%	Destruction or localized lesion of retina
67038	560	$948,664	1.4%	8.8%	Vitrectomy, mechanical, with epiretinal membrane stripping (code deleted)
67028	1,336	$424,031	3.3%	3.9%	Intravitreal injection of a pharmacologic agent
67040	372	$419,197	0.9%	3.9%	Vitrectomy, mechanical, with endolaser panretinal photocoagulation
67108	215	$382,669	0.5%	3.5%	Repair of retinal detachment
43644	118	$249,734	0.3%	2.3%	Laparoscopy, surgical, gastric restrictive procedure
11721	4,580	$198,635	11.3%	1.8%	Debridement of nail(s) by any method
99183	770	$161,794	1.9%	1.5%	Supervision of hyperbaric oxygen therapy
11042	1,359	$129,962	3.4%	1.2%	Debridement; skin, and subcutaneous tissue
43770	81	$121,610	0.2%	1.1%	Laparoscopy, surgical, gastric restrictive procedure
67145	162	$100,552	0.4%	0.9%	Prophylaxis of retinal detachment
11056	1,678	$85,159	4.2%	0.8%	Paring or cutting of benign hyperkeratotic lesion
90772	3,756	$83,565	9.3%	0.8%	Therapeutic, prophylactic or diagnostic injection
97802	838	$83,385	2.1%	0.8%	Medical nutrition therapy
00810	167	$74,258	0.4%	0.7%	Anesthesia for lower intestinal endoscopic procedures
00145	107	$72,338	0.3%	0.7%	Anesthesia for procedures on eye
67036	60	$72,290	0.1%	0.7%	Vitrectomy, mechanical
11041	975	$65,383	2.4%	0.6%	Debridement; skin, full thickness
01480	107	$58,266	0.3%	0.5%	Anesthesia for open procedures on bones of lower leg
Grand Total	40,360	$10,815,263	100.0%	100.0%	

Common non-DM related procedures, Cohort 1

CPT	CPT Description	Related Svcs	Non-related Svcs	Related Costs	Non-related Costs
97110	Therapeutic procedure, one or more areas, each 15 minutes; the	506	138,744	$27,174	$7,577,822
66984	Extracapsular cataract removal with insertion of intraocular lens p	14	4,272	$14,185	$3,870,920
45378	Colonoscopy, flexible, proximal to splenic flexure; diagnostic, with	12	9,106	$6,893	$3,855,123
97140	Manual therapy techniques (eg, mobilization/ manipulation, manu	226	92,257	$9,050	$3,669,364
27447	Arthroplasty, knee, condyle and plateau; medial AND lateral com	9	2,050	$14,159	$3,653,966
93510	Left heart catheterization, retrograde, from the brachial artery, axil	98	6,198	$52,789	$2,979,855
92980	Transcatheter placement of an intracoronary stent(s), percutaneo	16	2,115	$20,800	$2,659,981
45385	Colonoscopy, flexible, proximal to splenic flexure; with removal of	7	4,603	$3,399	$2,592,248
45380	Colonoscopy, flexible, proximal to splenic flexure; with biopsy, sin	9	5,518	$4,239	$2,522,859
00810	Anesthesia for lower intestinal endoscopic procedures, endosco	167	6,586	$74,258	$2,496,298
20610	Arthrocentesis, aspiration and/or injection; major joint or bursa (eg	543	24,852	$47,242	$2,204,200
00790	Anesthesia for intraperitoneal procedures in upper abdomen incl	62	2,440	$52,871	$2,117,888
43239	Upper gastrointestinal endoscopy including esophagus, stomac	15	6,874	$4,678	$2,081,628
33533	Coronary artery bypass, using arterial graft(s); single arterial graft	27	938	$55,026	$1,894,769
00562	Anesthesia for procedures on heart, pericardial sac, and great ve	17	743	$34,768	$1,724,026
01402	Anesthesia for open or surgical arthroscopic procedures on knee	37	1,715	$43,415	$1,562,358
00142	Anesthesia for procedures on eye; lens surgery	93	3,776	$37,930	$1,531,143
43644	Laparoscopy, surgical, gastric restrictive procedure; with gastric b	118	739	$249,734	$1,510,632

Top 20, DM-related Tests, Cohort 1

- 4% of total episode costs

CPT	Svcs	Costs	% of Svcs	% of Costs	Description
83036	351,678	$5,337,743	17.8%	18.7%	Hemoglobin; glycosylated (A1C)
80061	261,246	$5,098,386	13.2%	17.8%	Lipid panel
80053	200,097	$3,270,065	10.1%	11.4%	Comprehensive metabolic panel
80050	43,031	$1,701,963	2.2%	6.0%	General health panel
36415	195,961	$1,141,192	9.9%	4.0%	Collection of venous blood by venipuncture
80048	73,110	$1,000,634	3.7%	3.5%	Basic metabolic panel
84443	33,364	$885,011	1.7%	3.1%	Thyroid stimulating hormone
82043	62,482	$690,863	3.2%	2.4%	Albumin, urine
85025	48,246	$584,185	2.4%	2.0%	Blood count, complete (CBC)
84153	18,574	$523,986	0.9%	1.8%	Prostate specific antigen (PSA)
82947	60,281	$470,323	3.0%	1.6%	Glucose, quantitative, blood
93000	11,683	$412,412	0.6%	1.4%	Electrocardiogran
82570	49,810	$404,287	2.5%	1.4%	Creatinine
83721	19,845	$286,685	1.0%	1.0%	Lipoprotein
81001	35,478	$218,176	1.8%	0.8%	Urinalysis
82962	44,317	$210,003	2.2%	0.7%	Glucose, blood by glucose monitoring device
84439	13,491	$197,114	0.7%	0.7%	Thyroxine; free
95904	832	$183,908	0.0%	0.6%	Nerve conduction
81000	31,854	$177,017	1.6%	0.6%	Urinalysis
80076	13,223	$175,810	0.7%	0.6%	Hepatic function panel
Grand Total	1,979,096	$28,591,899	100.0%	100.0%	

Common non-DM-related tests, Cohort 1

CPT	CPT Description	Related Svcs	Non-related Svcs	Related Costs	Non-related Costs
88305	Level IV - Surgical pathology, gross and microscopic examinatio	210	1,494	$28,515	$5,916,080
95811	Polysomnography; sleep staging with 4 or more additional paran	9	52	$4,295	$3,452,476
95810	Polysomnography; sleep staging with 4 or more additional paran	13	68	$6,619	$2,681,165
93015	Cardiovascular stress test using maximal or submaximal treadmi	931	220	$135,442	$2,487,663
93000	Electrocardiogram, routine ECG with at least 12 leads; with interpr	11,681	1,018	$412,341	$1,706,605
95904	Nerve conduction, amplitude and latency/velocity study, each ne	832	237	$183,908	$1,648,717
95903	Nerve conduction, amplitude and latency/velocity study, each ne	628	197	$171,906	$1,172,681
85025	Blood count; complete (CBC), automated (Hgb, Hct, RBC, WBC a	48,245	2,796	$584,173	$1,036,293
84443	Thyroid stimulating hormone (TSH)	33,363	1,277	$884,985	$1,003,330
36415	Collection of venous blood by venipuncture	195,857	2,933	$1,140,578	$911,651
95900	Nerve conduction, amplitude and latency/velocity study, each ne	206	164	$48,331	$755,818
84153	Prostate specific antigen (PSA); total	18,573	719	$523,957	$726,649
93010	Electrocardiogram, routine ECG with at least 12 leads; interpretati	2,278	1,469	$40,662	$725,830
93350	Echocardiography, transthoracic, real-time with image document	194	138	$37,647	$624,932
82043	Albumin; urine, microalbumin, quantitative	62,480	743	$690,841	$219,755

DM-related Inpatient Admissions: Cohort 1

- 2% of total episode costs

ICD-9 Diagnosis	N	Amount
25080-Dm II Oth Nt St Uncntrld	612	$2,632,795
25002-Dm II wo Cmp Uncntrld	400	$700,592
25060-Dm II Neuro Nt St Uncntrl	364	$1,665,841
25013-Dm I Ketoacd Uncontrold	317	$940,051
25011-Dm I Keto Nt St Uncntrld	227	$63,619
25012-Dm II Ketoacd Uncontrold	207	$540,687
25082-Dm II Oth Uncntrld	199	$1,130,813
25000-Dm II wo Cmp Nt St Uncntr	197	$260,780
25062-Dm II Neuro Uncntrld	157	$800,449
25001-Dm I wo Cmp Nt St Uncntrl	132	$56,502
25070-Dm II Circ Nt St Uncntrld	128	$625,237
25010-Dm II Keto Nt St Uncntrld	100	$36,630
25081-Dm I Oth Nt St Uncntrld	61	$202,738
27651-Dehydration	60	$0
25022-Dm II Hprosmlr Uncontrold	54	$120,987
Top 10	2,812	$8,792,129
Grand Total	3,626	$10,900,652

DRG	N	Amount
294-DEEP VEIN THROMBOPHLEBITIS	934	$42,242
295-DEEP VEIN THROMBOPHLEBITIS	514	$0
639-DIABETES W/O CC/MCC	445	$1,457,048
638-DIABETES W CC	280	$1,731,297
074-CRANIAL & PERIPHERAL NERVE D	192	$1,505,408
296-CARDIAC ARREST, UNEXPLAINED	160	$1,822
18	111	$14,611
285-ACUTE MYOCARDIAL INFARCTION	96	$0
637-DIABETES W MCC	89	$663,636
19	85	$6,873
617-AMPUTAT OF LOWER LIMB FOR E	75	$1,110,670
287-CIRCULATORY DISORDERS EXCE	59	$16,710
041-PERIPH/CRANIAL NERVE & OTHEI	57	$646,754
007-LUNG TRANSPLANT	42	$0
468-REVISION OF HIP OR KNEE REPLA	38	$0
Top 10	2,906	$5,422,937
Grand Total	3,626	$10,900,652

Non-DM-related Inpatient Admissions: Cohort 1

ICD-9 Diagnosis	N	Amount
41401-Crnry Athrscl Natve Vssl	4,735	$16,919,670
78659-Chest Pain NEC	1,788	$3,892,446
27801-Morbid Obesity	1,589	$2,612,036
71536-Loc Osteoarth NOS-L/Leg	1,575	$8,528,359
486 -Pneumonia, Organism NOS	1,255	$6,864,876
41071-Subendo Infarct, Initial	981	$4,584,602
4280 -Chf NOS	977	$5,334,122
5770 -Acute Pancreatitis	921	$4,913,721
6826 -Cellulitis of Leg	882	$4,322,359
42731-Atrial Fibrillation	787	$2,900,492
78650-Chest Pain NOS	750	$1,646,103
V5789-Rehabilitation Proc NEC	743	$8,605,196
43491-Crbl Art Ocl NOS w Infrc	651	$2,371,523
72210-Lumbar Disc Displacement	590	$1,829,579
56211-Dvrtcli Colon wo Hmrhg	557	$2,756,132
Top 10	15,490	$60,872,683
Grand Total	54,012	$243,127,024

DRG	N	Amount
470-MAJOR JOINT REPLACEMENT OR	1,416	$14,348,986
544-PATHOLOGICAL FRACTURES & MI	1,342	$43,511
143	985	$2,077
249-PERC CARDIOVASC PROC W NON	912	$4,874,624
313-CHEST PAIN	893	$3,868,020
392-ESOPHAGITIS, GASTROENT & MIS	876	$8,481,554
288-ACUTE & SUBACUTE ENDOCARD	849	$34,183
287-CIRCULATORY DISORDERS EXCE	789	$4,412,572
556-SIGNS & SYMPTOMS OF MUSCUL	705	$444,184
603-CELLULITIS W/O MCC	619	$4,903,358
885-PSYCHOSES	602	$3,529,608
124-OTHER DISORDERS OF THE EYE	593	$24,807
430	579	$16,173
621-O.R. PROCEDURES FOR OBESITY	563	$1,411,454
182-RESPIRATORY NEOPLASMS W/O	546	$4,002
Top 10	9,386	$41,413,069
Grand Total	54,016	$243,135,883

DM-Related Drug Costs: Cohort 1

- Note: Drugs compose 69% of total episode costs

Therapeutic Class	N	Amount	% of N	% of Amount
174-Antidiabetic Agents, Misc	1,446,117	$174,827,125	28.1%	38.0%
053-Antihyperlipidemic Drugs, NEC	910,731	$110,196,521	17.7%	24.0%
172-Antidiabetic Agents, Insulin	320,355	$47,314,490	6.2%	10.3%
085-Diabetes Mell/Diab Supply, NEC	230,256	$26,077,187	4.5%	5.7%
173-Antidiabetic Ag, Sulfonylureas	558,155	$24,629,607	10.8%	5.4%
047-Cardiac, ACE Inhibitors	563,545	$22,163,981	10.9%	4.8%
046-Cardiac Drugs. NEC	240,024	$18,873,303	4.7%	4.1%
052-Cardiac, Calcium Channel	233,427	$16,939,671	4.5%	3.7%
051-Cardiac, Beta Blockers	309,951	$12,866,496	6.0%	2.8%
054-Hypotensive Agents, NEC	50,756	$1,980,875	1.0%	0.4%
123-Diuretics, Potassium-Sparing	69,781	$1,397,797	1.4%	0.3%
120-Diuretics, Loop Diuretics	94,004	$1,177,096	1.8%	0.3%
124-Diuretics, Thiazides & related	120,709	$1,129,501	2.3%	0.2%
050-Cardiac, Alpha-Beta Blockers	5,296	$274,885	0.1%	0.1%
125-Diuretics, Carb Anhydrase Inhib	1,104	$54,622	0.0%	0.0%
Grand Total	**5,154,211**	**$459,903,158**	**100.0%**	**100.0%**

Non-DM-related Drug Costs: Cohort 1

Therapeutic Class	N	Amount	% of N	% of Amount
162-Gastrointestinal Drugs Misc, NEC	210,733	$39,244,336	5.9%	13.6%
069-Psychother, Antidepressants	340,594	$30,205,569	9.6%	10.4%
234-Unclassified Agents, NEC	149,751	$24,230,497	4.2%	8.4%
060-Anal/Antipyr, Opiate Agonists	267,258	$14,699,891	7.5%	5.1%
068-Anticonvulsants, Misc	75,017	$13,582,141	2.1%	4.7%
045-Antiplatelet Agents, NEC	71,131	$11,071,103	2.0%	3.8%
059-Analg/Antipyr, Nonsteroid/Antiinflam	157,303	$9,436,851	4.4%	3.3%
999-Other/unavailable	180,832	$8,524,080	5.1%	2.9%
001-Antihistamines & Comb, NEC	111,277	$8,235,100	3.1%	2.8%
077-CNS Agents, Misc.	45,334	$6,971,661	1.3%	2.4%
046-Cardiac Drugs. NEC	76,648	$6,808,176	2.2%	2.4%
166-Adrenals & Comb, NEC	72,068	$6,665,467	2.0%	2.3%
070-Psychother, Tranq/Antipsychotics	21,350	$6,136,718	0.6%	2.1%
075-Anxiolytic/Sedative/Hypnotic NEC	76,741	$5,654,093	2.2%	2.0%
181-Immunosuppressants, NEC	5,744	$5,592,339	0.2%	1.9%
021-Antineoplastic Agents, NEC	15,218	$4,366,109	0.4%	1.5%
138-Antiinflam Agents EENT, NEC	51,458	$4,153,101	1.4%	1.4%
027-Sympathomimetic Agents, NEC	67,227	$3,932,320	1.9%	1.4%
016-Quinolones, NEC	61,692	$3,895,257	1.7%	1.3%
170-Estrogens & Comb, NEC	65,956	$3,652,300	1.9%	1.3%
Top 20	**2,123,332**	**$217,057,108**	**59.7%**	**75.0%**
Grand Total	**3,557,815**	**$289,601,349**	**100.0%**	**100.0%**

Resource use by Type of Service: Cohort 2 (insulin only)

Description	Mean	% of Total	5th %	25th %	50th %	75th %	95th %
Inpatient Facility Charge	$215	5%	$0	$0	$0	$0	$0
Evaluation and Management	$760	17%	$63	$315	$583	$992	$1,990
Procedures	$142	3%	$0	$0	$0	$0	$794
Imaging	$10	0%	$0	$0	$0	$0	$0
Tests	$149	3%	$0	$24	$112	$207	$430
Durable Medical Equipment	$844	19%	$0	$0	$0	$889	$5,587
Other Services	$16	0%	$0	$0	$0	$0	$31
Unclassified	$12	0%	$0	$0	$0	$0	$0
Drug Charges	$2,310	52%	$243	$1,286	$2,184	$3,149	$4,795
Sum of charges	**$4,457**	**100%**	**$928**	**$2,373**	**$3,738**	**$5,437**	**$10,311**

Top 20, DM-related E&M, Cohort 2

- 17% of total episode costs

CPT	Svcs	Costs	% of Svcs	% of Costs	Description
99214	67,598	$6,164,539	31.0%	32.3%	Office visit, established patient
99213	82,852	$5,089,864	37.9%	26.7%	Office visit, established patient
99215	8,302	$1,097,728	3.8%	5.8%	Office visit, established patient
99244	4,942	$954,703	2.3%	5.0%	Office consultation
92014	7,391	$703,841	3.4%	3.7%	Ophthalmological services
99243	3,895	$545,314	1.8%	2.9%	Office consultation
99245	1,979	$499,509	0.9%	2.6%	Office consultation
99203	4,631	$476,994	2.1%	2.5%	Office visit, new patient
99204	2,675	$387,916	1.2%	2.0%	Office visit, new patient
92012	4,066	$301,196	1.9%	1.6%	Ophthalmological services
99232	3,771	$292,948	1.7%	1.5%	Subsequent hospital care
92235	1,874	$290,680	0.9%	1.5%	Fluorescein angiography
92250	2,851	$210,943	1.3%	1.1%	Fundus photography
99205	925	$168,713	0.4%	0.9%	Office visit, new patient
99285	550	$153,319	0.3%	0.8%	ED visit for E&M care
99233	1,329	$146,886	0.6%	0.8%	Subsequent hospital care
99242	1,249	$136,880	0.6%	0.7%	Office consultation
99222	298	$128,511	0.1%	0.7%	Initial hospital care
99223	638	$122,261	0.3%	0.6%	Initial hospital care
99212	2,482	$107,676	1.1%	0.6%	Office visit, established patient
Grand Total	218,322	$19,056,916	100.0%	100.0%	

Non-DM related E&M, Top 20 ICD-9 Codes, Cohort 2

ICD-9 Diagnosis	Related Svcs	Non-related Svcs	Related Costs	Non-related Costs
78650-Chest Pain NOS	1,119	1,416	$124,831	$283,826
V7231-Routine Gyn Examination	226	2,138	$23,085	$255,910
V700 -Routine Medical Exam	243	1,506	$25,307	$175,139
51881-Acute Respiratry Failure	14	1,069	$1,549	$163,223
30928-Adjust Dis w Anxiety/Dep	4	1,235	$252	$107,222
29632-Recurr Depr Psychos-Mod	18	1,219	$1,515	$103,621
486 -Pneumonia, Organism NOS	388	707	$32,625	$96,217
3004 -Dysthymic Disorder	51	1,080	$3,651	$90,612
78900-Abdmnal Pain Unspcf Site	777	555	$71,264	$89,282
29633-Recur Depr Psych-Severe	12	950	$1,450	$87,061
4280 -Chf NOS	560	644	$49,711	$83,764
78701-Nausea w Vomiting	267	461	$26,360	$71,882
41401-Crnry Athrscl Natve Vssl	2,428	685	$207,970	$71,366
4111 -Intermed Coronary Synd	76	378	$10,182	$69,290
7802 -Syncope & Collapse	206	378	$23,682	$65,922
78659-Chest Pain NEC	281	298	$34,573	$60,337
6826 -Cellulitis of Leg	453	438	$35,158	$54,948
7806 -Fever	173	373	$15,763	$50,880
42731-Atrial Fibrillation	420	415	$34,727	$49,175
311 -Depressive Disorder NEC	302	593	$22,716	$47,375

Top 20, DM-related procedures, Cohort 2

- 3% of total episode costs

CPT	Svcs	Costs	% of Svcs	% of Costs	Description
67228	1,074	$1,203,336	11.4%	33.9%	Treatment of progressive retinopathy
67210	778	$612,473	8.2%	17.2%	Destruction or localized lesion of retina
67038	207	$344,907	2.2%	9.7%	Vitrectomy, mechanical, with epiretinal membrane stripping (code deleted)
67040	182	$204,650	1.9%	5.8%	Vitrectomy, mechanical, with endolaser panretinal photocoagulation
67028	384	$122,251	4.1%	3.4%	Intravitreal injection of a pharmacologic agent
C1300	60	$96,451	0.6%	2.7%	Hyperbaric oxygen under pressure
67108	61	$89,975	0.6%	2.5%	Repair of retinal detachment
99183	345	$69,097	3.7%	1.9%	Supervision of hyperbaric oxygen therapy
11042	517	$52,245	5.5%	1.5%	Debridement; skin, and subcutaneous tissue
00145	67	$46,607	0.7%	1.3%	Anesthesia for procedures on eye
11721	651	$28,083	6.9%	0.8%	Debridement of nail(s) by any method
11041	416	$27,655	4.4%	0.8%	Debridement; skin, full thickness
67036	17	$18,928	0.2%	0.5%	Vitrectomy, mechanical
66984	3	$18,119	0.0%	0.5%	Extracapsular cataract removal
11056	343	$16,244	3.6%	0.5%	Paring or cutting of benign hyperkeratotic lesion
01480	30	$16,180	0.3%	0.5%	Anesthesia for open procedures on bones of lower leg
11040	327	$15,380	3.5%	0.4%	Debridement; skin, partial thickness
97803	249	$15,363	2.6%	0.4%	Medical nutrition therapy, re-assessment
97802	141	$14,376	1.5%	0.4%	Medical nutrition therapy, initial
29445	76	$13,053	0.8%	0.4%	Application of rigid total contact leg cast
Grand Total	9,446	$3,552,044	100.0%	100.0%	

Common non-DM related procedures, Cohort 2

CPT	CPT Description	Related Svcs	Non-related Svcs	Related Costs	Non-related Costs
97110	Therapeutic procedure, one or more areas, each 15 minutes; the	123	18,574	$7,010	$992,121
66984	Extracapsular cataract removal with insertion of intraocular lens p	3	897	$18,119	$788,561
97140	Manual therapy techniques (eg, mobilization/ manipulation, manu	39	12,337	$1,568	$488,262
92980	Transcatheter placement of an intracoronary stent(s), percutaneo	4	328	$4,939	$410,698
93510	Left heart catheterization, retrograde, from the brachial artery, axil	13	886	$4,899	$406,618
45378	Colonoscopy, flexible, proximal to splenic flexure; diagnostic, with	0	872	$0	$366,587
00142	Anesthesia for procedures on eye; lens surgery	29	760	$11,562	$311,362
33533	Coronary artery bypass, using arterial graft(s); single arterial graf	5	146	$11,776	$307,092
43239	Upper gastrointestinal endoscopy including esophagus, stomac	0	872	$0	$265,759
45380	Colonoscopy, flexible, proximal to splenic flexure; with biopsy, sin	0	556	$0	$254,359
00562	Anesthesia for procedures on heart, pericardial sac, and great ve	1	123	$2,398	$243,688
45385	Colonoscopy, flexible, proximal to splenic flexure; with removal of	0	433	$0	$241,284
00790	Anesthesia for intraperitoneal procedures in upper abdomen incl	11	271	$8,583	$230,605
00810	Anesthesia for lower intestinal endoscopic procedures, endosco	29	589	$11,537	$226,058
27447	Arthroplasty, knee, condyle and plateau; medial AND lateral com	0	126	$0	$211,225
00145	Anesthesia for procedures on eye; vitreoretinal surgery	67	218	$46,607	$158,406

Top 20, DM-related Tests, Cohort 2

- 3% of total episode costs

CPT	Svcs	Costs	% of Svcs	% of Costs	Description
83036	42,783	$647,848	16.8%	17.4%	Hemoglobin; glycosylated (A1C)
80061	26,794	$522,506	10.5%	14.0%	Lipid panel
80053	22,609	$367,445	8.9%	9.9%	Comprehensive metabolic panel
84443	6,867	$182,337	2.7%	4.9%	Thyroid stimulating hormone
80050	4,613	$181,401	1.8%	4.9%	General health panel
36415	25,206	$146,889	9.9%	3.9%	Collection of venous blood by venipuncture
80048	9,745	$131,120	3.8%	3.5%	Basic metabolic panel
82043	9,646	$106,907	3.8%	2.9%	Albumin, urine
82947	8,450	$65,656	3.3%	1.8%	Glucose, quantitative, blood
82570	7,987	$65,443	3.1%	1.8%	Creatinine
85025	5,380	$63,103	2.1%	1.7%	Blood count, complete (CBC)
95250	294	$52,580	0.1%	1.4%	Ambulatory continuous glucose monitoring
84439	3,192	$47,147	1.3%	1.3%	Thyroxine; free
93000	1,180	$42,108	0.5%	1.1%	Electrocardiogran
82962	8,562	$40,685	3.4%	1.1%	Glucose, blood by glucose monitoring device
84153	1,378	$38,593	0.5%	1.0%	Prostate specific antigen (PSA)
95904	164	$38,088	0.1%	1.0%	Nerve conduction
83721	2,512	$36,992	1.0%	1.0%	Lipoprotein
82306	745	$35,038	0.3%	0.9%	Calcifediol (25-OH Vitamin D-3)
95903	108	$26,747	0.0%	0.7%	Nerve conduction
Grand Total	255,167	$3,729,843	100.0%	100.0%	

Common non-DM-related tests, Cohort 2

CPT	CPT Description	Related Svcs	Non-related Svcs	Related Costs	Non-related Costs
88305	Level IV - Surgical pathology, gross and microscopic examinatio	52	5,106	$5,684	$699,111
95811	Polysomnography; sleep staging with 4 or more additional paran	1	531	$270	$303,562
93015	Cardiovascular stress test using maximal or submaximal treadmi	131	1,987	$18,895	$286,678
95810	Polysomnography; sleep staging with 4 or more additional paran	3	509	$750	$277,017
95904	Nerve conduction, amplitude and latency/velocity study, each ne	164	1,025	$38,088	$243,927
93000	Electrocardiogram, routine ECG with at least 12 leads; with interpr	1,180	5,602	$42,108	$195,343
95903	Nerve conduction, amplitude and latency/velocity study, each ne	108	608	$26,747	$156,963
84443	Thyroid stimulating hormone (TSH)	6,867	5,109	$182,337	$131,123
93010	Electrocardiogram, routine ECG with at least 12 leads; interpretati	599	7,217	$10,745	$124,961
85025	Blood count; complete (CBC), automated (Hgb, Hct, RBC, WBC a	5,380	10,749	$63,103	$123,382
95900	Nerve conduction, amplitude and latency/velocity study, each ne	56	534	$14,647	$113,269
36415	Collection of venous blood by venipuncture	25,196	16,523	$146,831	$96,782
88307	Level V - Surgical pathology, gross and microscopic examinatior	11	426	$1,768	$80,200
84153	Prostate specific antigen (PSA); total	1,378	1,982	$38,593	$56,807
82043	Albumin; urine, microalbumin, quantitative	9,645	1,945	$106,896	$21,818

DM-related Inpatient Admissions: Cohort 2

- 5% of total episode costs

ICD-9 Diagnosis	N	Amount
25013-Dm I Ketoacd Uncontrold	373	$1,104,193
25011-Dm I Keto Nt St Uncntrld	170	$104,122
25080-Dm II Oth Nt St Uncntrld	164	$690,811
25060-Dm II Neuro Nt St Uncntrl	157	$735,175
25012-Dm II Ketoacd Uncontrold	156	$473,562
25010-Dm II Keto Nt St Uncntrld	105	$26,003
25002-Dm II wo Cmp Uncntrld	97	$166,777
25062-Dm II Neuro Uncntrld	90	$339,562
25081-Dm I Oth Nt St Uncntrld	66	$295,674
25061-Dm I Neuro Nt St Uncntrld	63	$276,907
25082-Dm II Oth Uncntrld	63	$367,080
25070-Dm II Circ Nt St Uncntrld	44	$231,794
25063-Dm I Neuro Uncntrld	38	$120,214
25000-Dm II wo Cmp Nt St Uncntr	24	$33,114
25083-Dm I Oth Uncntrld	24	$53,353
Top 10	1,441	$4,212,786
Grand Total	1,794	$5,403,457

DRG	N	Amount
294-DEEP VEIN THROMBOPHLEBITIS	554	$9,677
639-DIABETES W/O CC/MCC	267	$911,043
638-DIABETES W CC	170	$1,104,540
074-CRANIAL & PERIPHERAL NERVE D	131	$870,788
637-DIABETES W MCC	81	$507,665
295-DEEP VEIN THROMBOPHLEBITIS	80	$0
18	78	$0
19	52	$0
296-CARDIAC ARREST, UNEXPLAINED	36	$0
285-ACUTE MYOCARDIAL INFARCTION	31	$0
287-CIRCULATORY DISORDERS EXCE	30	$0
617-AMPUTAT OF LOWER LIMB FOR E	30	$432,176
007-LUNG TRANSPLANT	22	$0
468-REVISION OF HIP OR KNEE REPLA	20	$0
041-PERIPH/CRANIAL NERVE & OTHEI	17	$174,761
Top 10	1,480	$3,403,713
Grand Total	1,794	$5,403,457

Non-DM-related Inpatient Admissions: Cohort 2

ICD-9 Diagnosis	N	Amount
41401-Crnry Athrscl Natve Vssl	724	$2,857,516
78659-Chest Pain NEC	267	$595,922
4280 -Chf NOS	223	$1,121,278
486 -Pneumonia, Organism NOS	223	$1,192,702
41071-Subendo Infarct, Initial	213	$831,832
5770 -Acute Pancreatitis	179	$730,833
V5789-Rehabilitation Proc NEC	135	$1,853,707
43491-Crbl Art Ocl NOS w Infrc	133	$537,334
6826 -Cellulitis of Leg	123	$499,893
78650-Chest Pain NOS	114	$227,847
27801-Morbid Obesity	104	$165,124
71536-Loc Osteoarth NOS-L/Leg	95	$545,464
5589 -Noninf Gastroenterit NEC	87	$337,866
5990 -Urin Tract Infection NOS	86	$324,470
0389 -Septicemia NOS	79	$841,851
Top 10	2,334	$10,448,864
Grand Total	9,034	$44,892,319

DRG	N	Amount
182-RESPIRATORY NEOPLASMS W/O	182	$15,189
392-ESOPHAGITIS, GASTROENT & MIS	178	$1,865,110
143	145	$0
204-RESPIRATORY SIGNS & SYMPTOI	145	$63,394
287-CIRCULATORY DISORDERS EXCE	135	$712,987
313-CHEST PAIN	133	$580,987
249-PERC CARDIOVASC PROC W NON	130	$734,251
544-PATHOLOGICAL FRACTURES & MU	115	$16,263
277	108	$3,110
127	107	$3,996
603-CELLULITIS W/O MCC	104	$870,016
556-SIGNS & SYMPTOMS OF MUSCULO	103	$49,368
430	91	$0
470-MAJOR JOINT REPLACEMENT OR	91	$904,801
089-CONCUSSION W CC	89	$5,205
Top 10	1,378	$3,995,287
Grand Total	9,034	$44,892,319

DM-Related Drug Costs: Cohort 2

- Notes: Drugs compose 52% of total episode costs

Therapeutic Class	N	Amount	% of N	% of Amount
172-Antidiabetic Agents, Insulin	194,629	$29,551,713	37.0%	51.0%
053-Antihyperlipidemic Drugs, NEC	80,211	$9,789,601	15.3%	16.9%
085-Diabetes Mell/Diab Supply, NEC	67,890	$8,875,079	12.9%	15.3%
047-Cardiac, ACE Inhibitors	58,960	$2,418,737	11.2%	4.2%
174-Antidiabetic Agents, Misc	15,530	$2,091,493	3.0%	3.6%
046-Cardiac Drugs. NEC	22,418	$1,759,371	4.3%	3.0%
052-Cardiac, Calcium Channel	20,328	$1,384,852	3.9%	2.4%
051-Cardiac, Beta Blockers	27,831	$1,313,926	5.3%	2.3%
054-Hypotensive Agents, NEC	4,900	$204,762	0.9%	0.4%
120-Diuretics, Loop Diuretics	14,119	$195,688	2.7%	0.3%
123-Diuretics, Potassium-Sparing	5,979	$136,380	1.1%	0.2%
124-Diuretics, Thiazides & related	10,291	$118,757	2.0%	0.2%
173-Antidiabetic Ag, Sulfonylureas	1,907	$74,764	0.4%	0.1%
050-Cardiac, Alpha-Beta Blockers	556	$24,181	0.1%	0.0%
125-Diuretics, Carb Anhydrase Inhib	227	$13,590	0.0%	0.0%
122-Diuretics, Osmotic	1	$11	0.0%	0.0%
Grand Total	**525,777**	**$57,952,904**	**100.0%**	**100.0%**

Non-DM-related Drug Costs: Cohort 2

Therapeutic Class	N	Amount	% of N	% of Amount
162-Gastrointestinal Drugs Misc, NEC	22,648	$4,239,584	4.5%	10.1%
069-Psychother, Antidepressants	43,255	$3,798,780	8.6%	9.1%
234-Unclassified Agents, NEC	17,565	$3,659,634	3.5%	8.7%
060-Anal/Antipyr, Opiate Agonists	40,202	$3,121,428	8.0%	7.5%
068-Anticonvulsants, Misc	12,258	$2,178,189	2.5%	5.2%
999-Other/unavailable	41,096	$2,118,984	8.2%	5.1%
045-Antiplatelet Agents, NEC	10,720	$1,666,843	2.1%	4.0%
181-Immunosuppressants, NEC	1,960	$1,428,297	0.4%	3.4%
237-Devices and Non-Drug Items, NEC	35,678	$1,297,748	7.1%	3.1%
077-CNS Agents, Misc.	6,304	$967,918	1.3%	2.3%
001-Antihistamines & Comb, NEC	11,937	$831,017	2.4%	2.0%
070-Psychother, Tranq/Antipsychotics	2,715	$773,076	0.5%	1.8%
166-Adrenals & Comb, NEC	8,886	$760,121	1.8%	1.8%
059-Analg/Antipyr, Nonsteroid/Antiinflam	12,842	$701,007	2.6%	1.7%
075-Anxiolytic/Sedative/Hypnotic NEC	9,457	$680,236	1.9%	1.6%
022-Interferons, NEC	335	$611,509	0.1%	1.5%
046-Cardiac Drugs. NEC	6,167	$565,056	1.2%	1.4%
016-Quinolones, NEC	8,513	$554,965	1.7%	1.3%
178-Thy/Antithy, Thyroid Hormones	29,733	$546,354	5.9%	1.3%
Top 20	324,064	$31,037,953	64.8%	74.2%
Grand Total	500,221	$41,849,761	100.0%	100.0%

Diabetes Provider Attribution

- Identify the provider or providers “responsible” for the patient’s care during the course of an episode
- Support a comparison across providers rather than simply across all episodes, which may be reflective of a normal distribution of costs population-wide

Proposed Attribution Model

- "Tiered" attribution model, depending on the number of each episode's DM-related E&M visits during the measurement period and the distribution of those visits across providers
  - Requires that the episode has at least 1 E&M visit and that at least 70% of the E&M visits include valid provider ID numbers
- Tier 1 – Single Attribution: if one provider ID has at least 70% of an episode's E&M visits, that provider will be attributed the episode
- Tier 2 – "Multiple" Attribution: if no provider has at least 70% of the episode's E&M visits, any provider with at least 30% will be attributed the episode
- Tier 3 – No Attribution: if no provider has at least 30% of the episode's E&M visits, no provider will be attributed the episode

Diabetes Episode: Attribution Testing

- Required: 1) ≥ 1 E&M visit for diabetes care; 2) ≥ 70% of E&M visits with valid provider IDs
- 1 provider with ≥ 70% of E&M visits – single attribution only; else
- 1+ providers with ≥ 30% of E&M visits – up to 3 providers attributed episode; else
- No attribution

Diabetes Measure Denominator	**229,894**	**100.0%**
No related E&M visits during measurement year	567	0.2%
Episode's E&M visits have insufficient provider IDs	126,217	54.9%
Episodes to be attributed	103,110	44.9%
Single attribution	**82,646**	**35.9%**
Multiple attribution	**16,612**	**7.2%**
2 providers	*16,294*	*7.1%*
3 providers	*318*	*0.1%*
No attribution	**3,852**	**1.7%**

Attributed Providers by Specialty

Specialty Description	Episodes Attributed	% of Episodes
Family_Practice_____240	40,369	39.2%
Internal_Medicine__NEC_____204	32,691	31.7%
Medical_Doctor___MD__NEC___200	7,357	7.1%
MultiSpecialty_Physician_Gr206	5,501	5.3%
Endocrinology___Metabolism_270	5,291	5.1%
Cardiovascular_Dis_Cardiolo250	2,981	2.9%
Podiatry_____130	1,791	1.7%
Orthopaedic_Surgery_____530	1,553	1.5%
Acute_Care_Hospital_____001	1,297	1.3%
Ophthalmology_____330	1,117	1.1%
Urology_____210	978	0.9%
Nurse_Practitioner_____825	880	0.9%
Pediatrician__NEC_____400	758	0.7%
Dermatology_____215	739	0.7%
Gastroenterology_____275	720	0.7%
Obstetrics___Gynecology____320	655	0.6%
Neurology_____260	648	0.6%
Otolaryngology_____340	608	0.6%
Surgeon__NEC_____500	537	0.5%
Other_Facility__NEC_____040	475	0.5%
OTHER	5,887	5.7%
TOTAL	103,110	100.0%

Identifying Variability in Diabetes-specific Resource Use

- Analyses intended to identify trends in the observed variability in resource use for episodes of diabetes management
- Variability measured at the following levels:
  - Region
  - State
  - Specialty

Diabetes: Mean Resource Use by Type of Service, All Episodes*

Description	Mean	% of Total	5th %	25th %	50th %	75th %	95th %
Inpatient Facility	$965	22.7%	$0	$0	$0	$0	$5,222
Durable Medical Equipment	$149	3.5%	$0	$0	$0	$0	$603
OP Facility	$163	3.8%	$0	$0	$0	$0	$688
Imaging	$10	0.2%	$0	$0	$0	$0	$20
Evaluation and Management	$641	15.1%	$65	$269	$494	$836	$1,684
Other Services	$8	0.2%	$0	$0	$0	$0	$32
Procedures	$64	1.5%	$0	$0	$0	$0	$113
Tests	$141	3.3%	$0	$41	$115	$197	$379
Unclassified	$10	0.2%	$0	$0	$0	$0	$0
Drug Costs	$2,097	49.4%	$152	$957	$1,859	$2,968	$4,846
Grand Total	**$4,248**	**100.0%**	**$602**	**$1,750**	**$2,940**	**$4,575**	**$11,111**

* Analysis limited to those episodes that could be attributed to one or more providers and had non-zero Diabetes-specific costs (n=104,932)

Diabetes: Resource Use by Type of Service vs. Overall Mean, by Region

Description	Mean	Northeast	North Central	South	West
N	**104,932**	**5,962**	**16,000**	**66,449**	**16,344**
Inpatient Facility	$965	0.85	0.95	1.09	0.73
Durable Medical Equipment	$149	1.01	1.33	0.95	0.89
OP Facility	$163	0.99	1.25	1.05	0.57
Imaging	$10	0.56	0.30	1.34	0.45
Evaluation and Management	$641	1.04	0.88	1.02	1.02
Other Services	$8	1.06	0.59	1.09	1.01
Procedures	$64	1.27	0.78	1.09	0.78
Tests	$141	0.81	0.76	1.08	0.97
Unclassified	$10	0.46	0.80	1.20	0.60
Drug Costs	$2,097	1.15	1.01	0.98	1.02
Grand Total	**$4,248**	**1.04**	**0.98**	**1.02**	**0.93**

Diabetes: Resource Use by Type of Service vs. Overall Mean, by State

Description	Mean	TX	GA	CA	TN	SC	MS	NC	FL	OH	MI
N	**104,932**	**17,043**	**13,625**	**8,818**	**8,441**	**5,452**	**5,246**	**3,168**	**3,154**	**2,873**	**2,708**
Inpatient Facility	$965	1.40	1.28	0.79	0.74	1.21	0.78	0.77	0.95	1.33	1.02
DME	$149	0.82	1.05	0.94	0.88	1.08	1.11	0.81	1.02	1.74	2.00
OP Facility	$163	2.70	0.09	0.12	0.56	1.09	0.11	0.96	0.35	2.05	1.53
Imaging	$10	2.08	1.66	0.27	0.84	1.99	0.29	1.33	0.65	0.15	0.33
E&M	$641	1.02	1.10	1.02	1.03	1.02	0.78	0.93	1.21	0.96	0.78
Other Services	$8	1.27	1.55	1.08	0.79	1.05	0.90	0.52	0.61	0.21	0.23
Procedures	$64	1.30	1.23	0.80	0.76	0.93	0.89	0.65	1.05	0.64	0.80
Tests	$141	1.27	1.14	0.93	1.15	0.85	0.82	0.96	1.36	0.60	0.49
Unclassified	$10	3.70	0.43	0.87	0.18	0.23	0.19	0.17	0.39	2.41	0.09
Drug Costs	$2,097	0.90	0.97	1.03	1.10	0.93	0.95	1.00	1.10	1.00	0.84
Grand Total	**$4,248**	**1.12**	**1.04**	**0.93**	**0.97**	**1.02**	**0.85**	**0.92**	**1.06**	**1.12**	**0.92**

Diabetes: Resource Use by Type of Service vs. Overall Mean, by Specialty*

- Results presented for high-volume specialties: 1-5

Description	Mean	Family Practice	Internal Medicine	Medical Doctor NEC	Multi-Specialty Group	Endocrinology/ Metabolism
N	**104,932**	**41,123**	**33,197**	**7,496**	**5,591**	**5,389**
Inpatient Facility	$965	0.84	0.98	0.90	0.91	0.64
DME	$149	0.57	0.94	1.09	1.18	3.01
OP Facility	$163	0.94	0.89	0.65	0.45	0.73
Imaging	$10	0.95	1.07	0.52	0.30	1.42
E&M	$641	0.92	0.98	0.93	0.99	1.01
Other Services	$8	0.73	0.83	0.84	0.82	1.47
Procedures	$64	0.81	0.93	1.01	0.80	1.00
Tests	$141	0.95	1.07	0.89	0.87	1.42
Unclassified	$10	0.33	0.44	0.21	1.03	1.07
Drug Costs	$2,097	0.94	1.03	1.03	0.97	1.28
Grand Total	**$4,248**	**0.90**	**1.00**	**0.96**	**0.94**	**1.14**

* Individual episodes may be attributed to as many as three providers, and so the resource use associated with any given episode may be reflected in the results for up to three provider specialties; family practitioners will be the subject of further analysis on slide 11

Diabetes: Resource Use by Type of Service vs. Overall Mean, by Specialty*

- Results presented for high-volume specialties: 6-10

Description	Mean	CV Disease/ Cardiology	Podiatry	Orthopedic Surgery	Acute Care Hospital	Ophthalmology
N	**104,932**	**3,037**	**1,824**	**1,583**	**1,420**	**1,150**
Inpatient Facility	$965	1.80	1.04	1.63	1.08	0.32
DME	$149	1.02	1.54	1.02	1.30	1.45
OP Facility	$163	1.35	0.87	0.97	4.38	1.11
Imaging	$10	2.53	1.20	1.09	0.75	0.69
E&M	$641	0.99	1.18	0.99	0.84	0.92
Other Services	$8	0.59	1.54	2.09	1.05	1.63
Procedures	$64	0.88	3.06	0.93	1.34	5.07
Tests	$141	0.89	0.92	0.81	0.59	0.78
Unclassified	$10	0.48	0.37	0.61	0.44	1.06
Drug Costs	$2,097	1.14	1.07	0.96	0.93	1.02
Grand Total	**$4,248**	**1.26**	**1.11**	**1.11**	**1.09**	**0.92**

* Individual episodes may be attributed to as many as three providers, and so the resource use associated with any given episode may be reflected in the results for up to three provider specialties

Risk Adjustment

- Testing of risk adjustment models

- Apply risk adjusted results to produce a provider specific summary report.

Risk Adjustment Model Specification

- Test 12 different model specifications
  - Logged GLM model using gamma distribution
    - Full list of recommended comorbidities (> 1% prevalence)
    - Only recommended comorbidities that are statistically significant
    - Only recommended comorbidities that are statistically significant + additional comorbidities flagged for “empirical analysis” (all, significant only)
    - All HCCs & all statistically significant HCCs (regardless of prevalence)
  - Normal GLM model (estimates in dollars)
    - Same tweaks as above
- Fit models for the entire cohort, then for each of the age strata separately (total of 48 risk adjustment models)

Diabetes Episode Risk Adjustment Matrix – Overall Cohort Model

Model #	Independent Variables						Distribution	Link function
	WG Specified (> 1%)	WG specified (> 1%) p < 0.1	Test conditions (> 1%)	Test conditions (> 1%) p < 0.1	All HCCs	All HCCs p < 0.1		
1	X						Gamma	Log
2		X					Gamma	Log
3		X	X				Gamma	Log
4		X		X			Gamma	Log
5	X						Normal	Identity
6		X					Normal	Identity
7		X	X				Normal	Identity
8		X		X			Normal	Identity
9					X		Gamma	Log
10						X	Gamma	Log
11					X		Normal	Identity
12						X	Normal	Identity

Example Diabetes Episode Report

Diabetes Episode

Report for Physician #957554433

Provider type = Internal Medicine

	MD	Peer Group	Non-Peer Group	National Avg
Episodes	118	33,079	67,876	233,029
Observed Costs*				
Average	$ 3,721	$ 3,893	$ 3,756	$ 4,015
Min	$ 356	$ 356	$ 356	$ 356
Median	$ 2,476	$ 2,990	$ 2,852	$ 3,087
Max	$ 19,884	$ 19,884	$ 19,884	$ 19,884
Predicted Costs				
Average	$ 3,896	$ 4,006	$ 3,957	$ 4,019
Min	$ 2,789	$ 2,156	$ 2,156	$ 2,129
Median	$ 3,613	$ 3,696	$ 3,668	$ 3,696
Max	$ 10,807	$ 13,870	$ 16,098	$ 16,618
Observed-to-Expected Ratio				
Average	0.97	0.97	0.95	1.00
Min	0.09	0.03	0.04	0.03
Median	0.66	0.76	0.74	0.78
Max	5.30	9.11	8.18	9.11
% ≥ 2.0	9.3%	7.7%	7.7%	8.4%
% ≥ 2.5	6.8%	5.2%	5.2%	5.6%
% ≥ 75th percentile peers	22.9%	(15.7%, 31.5%)		

* Observed costs adjusted for outliers (windsorized)

Notes:
- Uses Model 12
- Includes all attributable episodes, except National Avg which includes all episodes

Example Diabetes Episode Report

Diabetes Episode

Report for Physician #980070973

Provider type = Endocrinology

	MD	Peer Group	Non-Peer Group	National Avg
Episodes	129	5,260	95,684	233,029
Observed Costs*				
Average	$ 4,242	$ 4,616	$ 3,755	$ 4,015
Min	$ 753	$ 356	$ 356	$ 356
Median	$ 3,774	$ 3,904	$ 2,844	$ 3,087
Max	$ 19,884	$ 19,884	$ 19,884	$ 19,884
Predicted Costs				
Average	$ 4,218	$ 4,122	$ 3,965	$ 4,019
Min	$ 3,008	$ 2,184	$ 2,871	$ 2,129
Median	$ 3,751	$ 3,696	$ 3,668	$ 3,696
Max	$ 7,726	$ 11,094	$ 16,098	$ 16,618
Observed-to-Expected Ratio				
Average	1.05	1.14	0.95	1.00
Min	0.20	0.05	0.03	0.03
Median	0.88	0.96	0.73	0.78
Max	5.34	6.67	9.11	9.11
% ≥ 2.0	7.0%	9.8%	7.6%	8.4%
% ≥ 2.5	5.7%	5.8%	5.2%	5.6%
% ≥ 75th percentile peers	20.2%	(13.6%, 28.1%)		

* Observed costs adjusted for outliers (windsorized)

Notes:
- Uses Model 12
- Includes all attributable episodes, except National Avg which includes all episodes

Example Diabetes Episode Report

Diabetes Episode

Report for Physician #957554433

Provider type = Internal Medicine

	MD	Peer Group	Non-Peer Group	National Avg
Episodes	118	33,079	67,876	233,029
Observed Costs*				
Average	$ 3,721	$ 3,893	$ 3,756	$ 4,015
Min	$ 356	$ 356	$ 356	$ 356
Median	$ 2,476	$ 2,990	$ 2,852	$ 3,087
Max	$ 19,884	$ 19,884	$ 19,884	$ 19,884
Predicted Costs				
Average	$ 3,896	$ 4,006	$ 3,957	$ 4,019
Min	$ 2,789	$ 2,156	$ 2,156	$ 2,129
Median	$ 3,613	$ 3,696	$ 3,668	$ 3,696
Max	$ 10,807	$ 13,870	$ 16,098	$ 16,618
Observed-to-Expected Ratio				
Average	0.97	0.97	0.95	1.00
Min	0.09	0.03	0.04	0.03
Median	0.66	0.76	0.74	0.78
Max	5.30	9.11	8.18	9.11
% ≥ 2.0	9.3%	7.7%	7.7%	8.4%
% ≥ 2.5	6.8%	5.2%	5.2%	5.6%
% ≥ 75th percentile peers	22.9%	(15.7%, 31.5%)		

* Observed costs adjusted for outliers (windsorized)

Notes:

- Uses Model 12
- Includes all attributable episodes, except National Avg which includes all episodes

Example Diabetes Episode Report

Diabetes Episode

Report for Physician #980070973

Provider type = Endocrinology

	MD	Peer Group	Non-Peer Group	National Avg
Episodes	129	5,260	95,684	233,029
Observed Costs*				
Average	$ 4,242	$ 4,616	$ 3,755	$ 4,015
Min	$ 753	$ 356	$ 356	$ 356
Median	$ 3,774	$ 3,904	$ 2,844	$ 3,087
Max	$ 19,884	$ 19,884	$ 19,884	$ 19,884
Predicted Costs				
Average	$ 4,218	$ 4,122	$ 3,965	$ 4,019
Min	$ 3,008	$ 2,184	$ 2,871	$ 2,129
Median	$ 3,751	$ 3,696	$ 3,668	$ 3,696
Max	$ 7,726	$ 11,094	$ 16,098	$ 16,618
Observed-to-Expected Ratio				
Average	1.05	1.14	0.95	1.00
Min	0.20	0.05	0.03	0.03
Median	0.88	0.96	0.73	0.78
Max	5.34	6.67	9.11	9.11
% ≥ 2.0	7.0%	9.8%	7.6%	8.4%
% ≥ 2.5	5.7%	5.8%	5.2%	5.6%
% ≥ 75th percentile peers	20.2%	(13.6%, 28.1%)		

* Observed costs adjusted for outliers (windsorized)

Notes:
- Uses Model 12

- Includes all attributable episodes, except National Avg which includes all episodes