

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 #: 1587 NQF Project: Endorsing Resource Use Standards- Phase II

BRIEF MEASURE INFORMATION
Measure Title: Episode of care for ambulatory pneumonia
Measure Steward (IP Owner): American Board of Medical Specialties Research and Education Foundation, 222 N. LaSalle St., Suite 1500, Chicago, Illinois, 60601
Brief description of measure: Resource use and costs associated with management of an adult pneumonia episode following an initial trigger E&M visit with primary diagnosis of pneumonia. The initial E&M visit for pneumonia is defined by requiring that there be no E&M visit for pneumonia within the prior 6 weeks. An episode is defined to last 14 days. To limit the cohort to community acquired pneumonia (CAP), exclude all individuals with any hospital discharge (require length of stay [LOS] greater than two days only when not admitted for pneumonia) within 90 days prior to the trigger outpatient visit and also exclude individuals identified as being in a nursing home prior to the trigger visit. Also exclude all individuals hospitalized with pneumonia within three days after the trigger visit (these individuals will potentially be included in the CAP Hospitalization Episode).
Resource use service categories: 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 an adult pneumonia episode following an initial trigger E&M visit with primary diagnosis of pneumonia. The initial E&M visit for pneumonia is defined by requiring that there be no E&M visit for pneumonia within the prior 6 weeks. An episode is defined to last 14 days. To limit the cohort to community acquired pneumonia (CAP), exclude all individuals with any hospital discharge (require length of stay [LOS] greater than two days only when not admitted for pneumonia) within 90 days prior to the trigger outpatient visit and also exclude individuals identified as being in a nursing home prior to the trigger visit. Also exclude all individuals hospitalized with pneumonia within three days after the trigger visit (these individuals will potentially be included in the CAP Hospitalization Episode).
<i>If included in a composite or paired with another measure, please identify composite or paired measure:</i>
Subject/ Topic Areas: Pulmonary/Critical Care
Type of resource use measure: Cost/Resource Use
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. <i>The measure is in the public domain or an intellectual property (<u>measure steward agreement</u>) 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.</i>	A
A.1. Do you attest that the measure steward holds intellectual property rights to the measure? (If no, do	Y <input type="checkbox"/> N <input type="checkbox"/>

not submit)	
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:	
Signed_NQFMeasureSteward Agreement_020309.pdf	
B. Maintenance. <i>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)</i>	B Y <input type="checkbox"/> N <input type="checkbox"/>
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 <input type="checkbox"/> N <input type="checkbox"/>
D. Testing. <i>The measure is fully specified and tested for reliability <u>and</u> validity (See guidance on measure testing).</i>	D Y <input type="checkbox"/> N <input type="checkbox"/>
E. Harmonization and Competing Measures. <i>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)</i>	
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 <input type="checkbox"/> N <input type="checkbox"/>
F. Submission Complete. <i>The requested measure submission information is complete and responsive to the questions so that all the information needed to evaluate all criteria is provided.</i>	F Y <input type="checkbox"/> N <input type="checkbox"/>
Have all conditions for consideration been met?	Y <input type="checkbox"/>
Staff Notes to Steward (if submission returned):	N <input type="checkbox"/>
Staff Notes to Reviewers (issues or questions regarding any criteria):	
File Attachments Related to Measure/Criteria:	

Attachment:
Attachment: S5_Data Dictionary-634349385373452035.pdf
Attachment:
Attachment:
Attachment:
Attachment:
Attachment:
Attachment: 10.1_Risk adjustment method-634386967458104989.pdf
S12_sample score report CAP ambulatory.pdf
Attachment: SA_Reliability_VValidity Testing CAP Ambulatory.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 pneumonia 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 and efficiency of related care. Pneumonia is a major cause of death worldwide and is the sixth most common cause of death in the US. (1, 2). Estimates of the annual incidence of community-acquired pneumonia (CAP) in the US range from 4-6 million cases annually (3, 4) and account for approximately 10 million physician visits per year (5). The economic burden is significant with estimates of total cost of care for CAP ranging from \$8 to over \$12 billion US annually (3-6). The average cost for an inpatient case is about \$5,700 and the average cost for an outpatient case is about \$300 (6).

Pneumonia is the second most common reason for hospitalization after childbirth (7). Approximately 20% of CAP patients require hospitalization, accounting for more than 1 million hospitalizations annually (5).

The mortality rate for pneumonia is less than 1% for CAP patients who do not require hospitalization, however it climbs to 8% to 28% among hospitalized patients with CAP, and the one year mortality rate may be as high as 40% in Medicare patients (1, 2, 8).

The rates of pneumonia are higher for men than for women and for black persons compared with Caucasians (9). The etiology of CAP, varies by geographic variation, however, *Streptococcus pneumoniae* is the most common cause of pneumonia worldwide. It is associated with considerable mortality and morbidity, especially in the elderly population and patients with significant comorbidities (4).

Nearly 80% of the treatment for this condition is provided in the outpatient setting. The majority of patients are treated out of hospital, however, the majority of cost (US \$8 billion) is attributed to patients admitted to the hospital (3).

Nationwide, nearly 75% of community-acquired pneumonia patients are initially evaluated and treated in hospital-based emergency departments (EDs) (10). The cost of inpatient care for pneumonia is up to 25 times greater than that of outpatient care (3). Studies have shown that patients at low risk for death who are treated in an outpatient setting are able to resume their normal activity sooner than those who are hospitalized, and 80% are reported to prefer outpatient therapy (11, 12). Hospitalization increases the risk of thromboembolic events and superinfection by more-virulent or resistant hospital bacteria (13). Overall, 6-15% of hospitalized patients with CAP do not respond to initial antibiotic treatment (14, 15).

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

1. Niederman MS. Community-acquired pneumonia: the U.S. perspective. *Semin Respir Crit Care Med* 2009;30:179-188.
2. Mandell LA, Bartlett JG, Dowell SF, et al. Update of practice guidelines for the management of community-acquired pneumonia in immunocompetent adults. *Clin Infect Dis* 2003;37:1405-33.
3. Niederman MS, McCombs JS, Unger AN, Kumar A, Popovian R. The cost of treating community-acquired pneumonia. *Clin Ther* 1998; 20: 820-37.
4. <http://www.ahrq.gov/clinic/pneumonia/pneumonria.htm> Accessed April 5, 2010.
5. Colice GL, Morley MA, Asche C, Birnbaum HG. Treatment costs of community-acquired pneumonia in an employed population. *Chest*. 2004 Jun;125(6):2140-5.
6. Lave JR, Lin CJ, Fine MJ, et al. The cost of treating patients with community-acquired pneumonia. *Semin Respir Crit Care Med* 1999; 20(3):189-97.
7. "Pneumonia Most Common Reason for Hospitalization." AHRQ. <http://www.ahrq.gov/news/nn/nn070208.htm>.
8. Restrepo MI, Mortensen EM, Velez JA et al. A comparative study of community-acquired pneumonia patients admitted to the ward and the ICU. *Chest* 2008;133:610-7.
9. Marrie TJ. Epidemiology, pathogenesis, and microbiology of community-acquired pneumonia in adults. Up to date. http://www.uptodate.com/contents/epidemiology-pathogenesis-and-microbiology-of-community-acquired-pneumonia-in-adults?source=see_link
10. Yealy DM, Auble TE, Stone RA, et al. The emergency department community-acquired pneumonia trial: Methodology of a quality improvement intervention. *Ann Emerg Med*. 2004 ;43:770-82.
11. Marrie TJ; Shariatzadeh MR. Community-acquired pneumonia requiring admission to an intensive care unit: a descriptive study. *Medicine (Baltimore)*. 2007 Mar; 86(2): 103-11.
12. Carratala J, Fernandez-Sabe N, Ortega L, et al. Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. *Ann Intern Med* 2005; 142: 165-72.
13. Alikhan R, Cohen AT, Combe S, et al. Risk factors for venous thromboembolism in hospitalized patients with acute medical illness: analysis of the MEDENOX Study. *Arch Intern Med* 2004; 164:963-8.
14. Roson B, Carratala J, Fernandez-Sabe N, et al. Causes and factors associated with early failure in hospitalized patients with community-acquired pneumonia. *Arch Intern Med* 2004;164:502-8.
15. Menendez R, Torres A, Zalacain R, et al. Risk factors of treatment failure in community acquired pneumonia: implications for disease outcomes. *Thorax* 2004;59:960-5.

IM2. Opportunity for Improvement**IM2.1. Briefly explain the benefits envisioned by use of this measure:**

To identify actionable information on the underlying causes of differences in patterns of care for ambulatory care of community acquired pneumonia, it is useful to examine resource use and costs during an episode of care. If results from these analyses can provide clear and actionable information on which components of care can (or should) be reduced and which components of care can (or should) be increased, this information can help reduce spending while maintaining or even improving clinical quality and outcomes. This measure can be used to identify and, if necessary, address unwarranted variability in the resources used to treat pneumonia patients on an outpatient basis. In addition where gaps in utilization occur leading to suboptimal quality, education and care coordination can be implemented.

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

There is considerable documentation of regional and national variation in hospital admission rates and performance of processes of care considered "best practices" for the treatment of community-acquired pneumonia (1-12). Often there is no direct correlation between hospitalization and disease severity.

Approximately 10% of hospitalized patients with CAP require ICU admission (13-15) but the indications vary strikingly among patients, physicians, hospitals, and different health care systems. Some of the variability among institutions results from the availability of high-level monitoring or intermediate care units appropriate for patients at increased risk of complications. It is important to identify severe CAP requiring ICU care in order to optimize appropriate use of ICU sources and to avoid increased mortality due to delayed transfer to ICU (16).

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--Switzer et al conducted a study to assess physician awareness and reported use of medical guidelines for community-acquired pneumonia (CAP), and to identify factors associated with variations in awareness and use of these guidelines. A questionnaire was administered during the preintervention phase of a randomized clinical trial of a pneumonia guideline implementation strategy involving 352 physicians who managed CAP. Results indicated low levels of awareness and use of guidelines for the management of CAP. Key indicators (e.g., medical specialty, fewer clinical duties, and positive attitudes about guidelines) were associated with greater use of national and local guidelines (17).

--Lindenauer et al, conducted a cross-sectional study using hospital and outpatient Medicare claims between 2006 and 2009 to describe patterns of hospital and regional performance in the outcomes of elderly patients with pneumonia examining hospital and regional level risk-standardized 30-day mortality and readmission rates. The investigators found risk-standardized 30-day mortality and, to a lesser extent, readmission rates for patients with pneumonia vary substantially across hospitals and regions and may present opportunities for quality improvement, especially at low performing institutions and areas (18).

--The Pneumonia Severity Index (PSI) has been put forth as an objective measure of risk stratification to help determine the initial site of treatment for patients with community-acquired pneumonia. Carratalà, et al conducted an unblinded, randomized controlled trial to determine whether outpatient care of PSI-defined low-risk patients with community-acquired pneumonia is as safe and effective as hospitalization. Patients received either outpatient care with oral levofloxacin therapy or hospitalization with sequential intravenous and oral levofloxacin therapy. Overall successful outcome was achieved in 83.6% of outpatients and 80.7% of hospitalized patients. More outpatients were satisfied with their overall care. Quality of life and the percentages of patients with adverse drug reactions, medical complications, subsequent hospital admissions, and overall mortality were similar in the outpatient and hospitalization groups (19).

--Skrepnek et al conducted a study to evaluate the resource consumption and outcomes associated with first line antibiotic treatment of community acquired pneumonia. Erythromycin, azithromycin, and clarithromycin were observed to have significantly lower total costs than levofloxacin although treatment success rates did not differ between groups (20).

IM2.3. Citations for data on variation:

1. A Maryland Department of Health Mental Hygiene, Office of Policy Analysis and Program Evaluation, Division of Medical Practice Patterns Analysis: Variations in the use of medical and surgical services by the Maryland population. Rockville, Maryland Department of Health Mental Hygiene, 1986.
2. McMahon LF Jr; Wolfe RA; Tedeschi PJ. Variation in hospital admissions among small areas. A comparison of Maine and Michigan. *Med Care* 1989 Jun; 27(6): 623-31.
3. Meehan TP, Fine MJ, Krumholz HM, et al. Quality of care, process and outcomes in elderly patients with pneumonia. *JAMA*. 1997;278:2080-4. [PubMed]
4. McCormick D, Fine MJ, Coley CM, et al. Variation in length of hospital stay in patients with community-acquired pneumonia: are shorter stays associated with worse medical outcomes? *Am J Med*. 1999;107:5-12. [PubMed]
5. Fine MJ, Stone RA, Singer DE, et al. Processes and outcomes of care for patients with community-acquired pneumonia: results from the Pneumonia Patient Outcomes Research Team (PORT) Cohort Study. *Arch Intern Med*. 1999;159:970-80. [PubMed]
6. Gilbert K, Gleason P, Singer DE, et al. Variation in antimicrobial use and cost in more than 2,000 patients with community-acquired pneumonia. *Am J Med*. 1998;104:17-27. [PubMed]
7. Gleason PP, Kapoor WN, Stone RA, et al. Medical outcomes and antimicrobial costs with the use of the American Thoracic Guidelines for outpatients with community-acquired pneumonia. *JAMA*. 1997;278:32-9. [PubMed]
8. Weingarten S. Translating practice guidelines into patient care: guidelines at the bedside. *Chest*. 2000;118:4-7. [PubMed]
9. Roos NP, Wennberg JE, McPherson K. Using diagnosis-related groups for studying variations in hospital admissions. *Health Care Financ Rev*. 1988;9:53-62.
10. Wennberg JE, Freeman JL, Culp WJ. Are hospital services rationed in New Haven or over-utilised in Boston? *Lancet*. 1987;1:1185-1189.
11. Gilbert K, Fine MJ. Assessing prognosis and predicting patient outcomes in community-acquired pneumonia. *Semin Respir Infect*. 1994;9:140-152.
12. Dedier J, Singer DE, Chang Y, et al. Processes of care, illness severity, and outcomes in the management of community-acquired pneumonia at academic hospitals. *Arch Intern Med*. 2001;161:2099-2104.

13. Niederman MS, Bass JB, Campbell GD, et al. Guidelines for the initial management of adults with community-acquired pneumonia: diagnosis, assessment of severity, and initial antimicrobial therapy. American Thoracic Society. Medical Section of the American Lung Association. *Am Rev Respir Dis* 1993; 148:1418–26.
14. Roson B, Carratala J, Dorca J, Casanova A, Manresa F, Gudiol F. Etiology, reasons for hospitalization, risk classes, and outcomes of community-acquired pneumonia in patients hospitalized on the basis of conventional admission criteria. *Clin Infect Dis* 2001; 33:158–65.
15. El Solh AA, Sikka P, Ramadan F, Davies J. Etiology of severe pneumonia in the very elderly. *Am J Respir Crit Care Med* 2001; 163: 645–51.
16. Leroy O, Santre C, Beuscart C, et al. A 7-year study of severe community-acquired pneumonia with emphasis on prognosis in patients admitted to an intensive care unit. *Intensive Care Med* 1995; 21:24–31.
17. Switzer GE, Halm EA, Chang CC, Mittman BS, Walsh MB, Fine MJ. Physician awareness and self-reported use of local and national guidelines for community-acquired pneumonia. *J Gen Intern Med*. 2003;18:816-23.
18. Lindenauer PK, Bernheim SM, Grady JN, et al. The performance of US hospitals as reflected in risk-standardized 30-day mortality and readmission rates for medicare beneficiaries with pneumonia. *J Hosp Med*. 2010;5:E12-8
19. Carratalà J, Fernández-Sabé N, Ortega L, et al. Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. *Ann Intern Med*. 2005 Feb 1;142(3):165-7.
20. Skrepnek GH, Armstrong EP, Malone DC, Ramachandran S. An economic and outcomes assessment of first-line monotherapy in the treatment of community-acquired pneumonia within managed care. *Curr Med Res Opin* 2005;21:261-70.

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

There is some evidence of racial disparities in the treatment of community-acquired pneumonia. Studies have demonstrated African-American patients more likely to be re-admitted and are less likely to receive timely initiation of antibiotic therapy, diagnostic bronchoscopy, smoking cessation counseling, and pneumococcal and influenza vaccinations.

--Joynt et al. conducted a study to determine whether black patients have higher odds of readmission than white patients and whether these disparities are related to where black patients receive care. Using national Medicare data, they examined 30-day readmissions after hospitalization for acute myocardial infarction (MI), congestive heart failure (CHF), and pneumonia. The investigators found that among elderly Medicare recipients, black patients were more likely to be readmitted after hospitalization for the 3 common conditions, a gap that was related to both race and to the site where care was received (1).

--Mortensen et al conducted a review of Medicare beneficiaries hospitalized for pneumonia between 1998 and 1999. Significant findings were that blacks were less likely to receive antibiotics within 8 hours of admission (2).

--Bennett et al. conducted a retrospective chart review of Veterans Administration (VA) patients and non-VA patients with pneumocystis carinii pneumonia who were hospitalized from 1987 to 1990. Among non-VA patients, black and Hispanic patients were more likely to die in the hospital and less likely to undergo a diagnostic bronchoscopy in the first 2 days of hospitalization (3).

--Hausmann et al. conducted a retrospective cohort study of 1,183,753 non-Hispanic white, African American, and Hispanic adults hospitalized for pneumonia between January 2005 and June 2006 and found African American and Hispanic patients were less likely to receive pneumococcal and influenza vaccinations, smoking cessation counseling, and first dose of antibiotic within 4 hours than white patients at the same hospital (4).

--Hasan et al. conducted a retrospective database analysis of 154,381 adult discharges (age 18-64 years) with a principal diagnosis of acute myocardial infarction (AMI), stroke, or pneumonia from the 2005 Nationwide Inpatient Sample to determine whether there were insurance-related differences in hospital care. Compared with the privately insured, in-hospital mortality among pneumonia patients was significantly higher for Medicaid recipients. For pneumonia patients, LOS was consistently longer for Medicaid recipients and costs were significantly higher (5).

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

1. Joynt KE, Orav EJ, Jha AK. Thirty-day readmission rates for Medicare beneficiaries by race and site of care. *JAMA*. 2011 Feb 16;305(7):675-81.
2. Mortensen EM, Cornell J, Whittle J: Racial variations in processes of care for patients with community-acquired pneumonia. *BMC Health Serv Res*

<p>2004;4:20.</p> <p>3. Bennett CL, Horner RD, Weinstein RA, et al. Racial differences in care among hospitalized patients with <i>Pneumocystis carinii</i> pneumonia in Chicago, New York, Los Angeles, Miami, and Raleigh-Durham. <i>Arch Intern Med</i> 1995;155:1586-1592.</p> <p>4. Hausmann LR, Ibrahim SA, Mehrotra A, Nsa W, Bratzler DW, Mor MK, Fine MJ. Racial and ethnic disparities in pneumonia treatment and mortality. <i>Med Care</i> 2009;47:1009-1017.</p> <p>5. Hasan O, Orav EJ, Hicks LS. Insurance status and hospital care for myocardial infarction, stroke and pneumonia. <i>Journal of Hospital Medicine</i> 2010;5:452-459.</p>	
<p>IM3. Measure Intent</p> <p>IM3.1. Describe intent of the measure and its components/ Rationale (including any citations) for analyzing variation in resource use in this way</p> <p>While documentation of regional variability in the overall costs of care reveals that inefficiencies exist in the healthcare system, it does not provide actionable information on the underlying causes of these differences or how they can be reduced. One potential solution is to focus on episode-based resource use and costs so that variations within a particular clinical area can be examined and areas of variability can be optimized. Moreover, episode-based resource measures can be combined with surrogate measures of quality care to identify highly efficient care where quality is high and costs are low. With this information, all parties involved (consumers, purchasers, and providers) can optimize treatment decisions that affect the balance of costs and quality of care.</p>	<p>1c</p> <p>H <input type="checkbox"/></p> <p>M <input type="checkbox"/></p> <p>L <input type="checkbox"/></p> <p>I <input type="checkbox"/></p>
<p>IM4. Resource use service categories are consistent with measure construct</p> <p><i>Refer to IM3.1. & all S9 items to evaluate this criteria.</i></p>	<p>1d</p> <p>H <input type="checkbox"/></p> <p>M <input type="checkbox"/></p> <p>L <input type="checkbox"/></p> <p>I <input type="checkbox"/></p>
<p>TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for <i>Importance to Measure and Report</i>?</p>	
<p>Steering Committee: Was the threshold criterion, <i>Importance to Measure and Report</i>, met? Rationale:</p>	<p>Y <input type="checkbox"/></p> <p>N <input type="checkbox"/></p>

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

<p>S1. Measure Web Page: <i>Do you have a web page where current detailed measure specifications can be obtained?</i></p> <p>Yes http://www.healthqualityalliance.org/hvhc-project/cost-care-measurement-development</p> <p>S2. General Approach <i>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.</i></p>	<p>Eval Rating 2a1/2b1</p>
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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:

Adult/Elderly Care

S4.1. Subject/Topic Areas:

Pulmonary/Critical Care

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

Care Coordination

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-634349385373452035.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

Standardized price tables: Users can download tables from the NCQA website (see url below) or use the guidelines in the technical appendix of the written measure specification 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 an adult pneumonia episode following an initial trigger E&M visit with primary diagnosis of pneumonia. The initial E&M visit for pneumonia is defined by requiring that there be no E&M visit for pneumonia within the prior 6 weeks. An episode is defined to last 14 days. To limit the cohort to community acquired pneumonia (CAP), exclude all individuals with any hospital discharge (require length of stay [LOS] greater than two days only when not admitted for pneumonia) within 90 days prior to the trigger outpatient visit and also exclude individuals identified as being in a nursing home prior to the trigger visit. Also exclude all individuals hospitalized with pneumonia within three days after the trigger visit (these individuals will potentially be included in the CAP Hospitalization Episode).

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 steps are used to create the clinical framework for the measure.

Identify the measure population

Step 1: Identify patients that have one of the following diagnostic codes (also in Table PNEU-A) These ICD-9 codes, present in the primary diagnosis field, will be used to identify Pneumonia episodes during the measurement period. Trigger events must be accompanied by an E&M CPT code (see Table PNEU-A1): Viral pneumonia: ICD9: 480.xx; Pneumococcal pneumonia: ICD9: 481.xx; Pneumonia due to mycoplasma pneumoniae: ICD9: 483.0; Pneumococcal pneumonia: ICD9: 483.1; Other bacterial pneumonia: ICD9: 483.8; Bronchopneumonia, organism unspecified: ICD9: 485.xx; Pneumonia, organism unspecified: ICD9: 486.xx; Influenza w. Pneumonia: ICD9: 487.0; Ornithosis with pneumonia: ICD9: 073.0; Friedlander's bacillus infection in conditions specified elsewhere and of Unspecified site (also as caused by kebsiella pneumonia): ICD9: 041.3

Office or Other Outpatient Services: CPT: 99201–99215; Chiropractic-specific codes: CPT: 98940-98942; Physical therapy-specific codes: CPT: 97110, 97112, 97113, 97124, 97140; Hospital Observation Services: CPT: 99217–99220; Hospital Inpatient Services: CPT: 99221–99239; Consultations: CPT: 99241–99275; Critical Care and Intensive Care Services: CPT: 99289–99298; Nursing Facility, Domiciliary and Home Services: CPT: 99301–99350; Case Management Services and Care Plan Oversight Services: CPT: 99361–99380; Preventive Medicine Services: CPT: 99381–99429; Other E&M Services: CPT: 99450–99456, 99354–99357

Step 2: Identify patients that meet age, eligibility and continuous enrollment criteria

1. Age: Identify patients aged 18 and older.
2. Eligibility
 - a. Identify benefits during both the measurement period and prior period.
 - b. To be included persons must have both of the following benefits in both periods
 - i. Medical benefit
 - ii. Pharmacy benefit
3. Continuous enrollment
 - a. Determine enrollment during both the measurement and prior periods.
 - b. To be eligible, persons must have medical and pharmacy coverage for the measurement period and prior period

Step 3: Identify patients with exclusion criteria

1. Identify patients that meet one or more exclusion criteria during either the measurement period OR the prior year

- Patient discharged from hospital after greater than 2-day stay for any reason within 90 days prior to trigger E&M visit or discharged within 90 days prior to trigger E&M (any LOS) with a CAP primary diagnosis (see tables PNEU-C1 and PNEU-B3).

Primary Diagnosis of Pnuemonia: Viral pneumonia: ICD9: 480.xx; Pneumococcal pneumonia: ICD9: 481.xx; Pneumonia due to mycoplasma pneumoniae: ICD9: 483.0; Pneumococcal pneumonia: ICD9: 483.1; Other bacterial pneumonia: ICD9: 483.8; Bronchopneumonia, organism unspecified: ICD9: 485.xx; Pneumonia, organism unspecified: ICD9: 486.xx; Influenza w. Pneumonia: ICD9: 487.0; Ornithosis with pneumonia: ICD9: 073.0; Friedlander's bacillus infection in conditions specified elsewhere and of Unspecified site (also as caused by kebsiella pneumonia): ICD9: 041.3

OR secondary diagnosis of pneumonia with a primary diagnosis of one of the following: Bacteremia: ICD9: 790.7; Empyema: ICD9: 510.xx; Unspecified pleural effusion: ICD9: 511.9; Septicemia: ICD9: 038.xx; Respiratory failure: ICD9: 518.81, 518.84

- Are in a nursing home or hospice program within six months prior to trigger E&M visit (Table PNEU-C1). Resided in a nursing home (NH) within six months prior to trigger event (determined by medical visit in nursing home prior to trigger event or presence of NH claim). In hospice program within six months prior to trigger event (determined

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by claim for treatment within hospice program).

- Patient had E&M visit for pneumonia within 6 weeks prior to trigger event (see Table PNEU-A): Viral pneumonia: ICD9: 480.xx; Pneumococcal pneumonia: ICD9: 481.xx; Pneumonia due to mycoplasma pneumoniae: ICD9: 483.0; Pneumococcal pneumonia: ICD9: 483.1; Other bacterial pneumonia: ICD9: 483.8; Bronchopneumonia, organism unspecified: ICD9: 485.xx; Pneumonia, organism unspecified: ICD9: 486.xx; Influenza w. Pneumonia: ICD9: 487.0; Ornithosis with pneumonia: ICD9: 073.0; Friedlander's bacillus infection in conditions specified elsewhere and of Unspecified site (also as caused by kebsiella pneumonia): ICD9: 041.3

- Are hospitalized within 3 days subsequent to trigger ambulatory care trigger visit for diagnosis of pneumonia (see Table PNEU-B3). Primary Diagnosis of Pnuemonia: Viral pneumonia: ICD9: 480.xx; Pneumococcal pneumonia: ICD9: 481.xx; Pneumonia due to mycoplasma pneumoniae: ICD9: 483.0; Pneumococcal pneumonia: ICD9: 483.1; Other bacterial pneumonia: ICD9: 483.8; Bronchopneumonia, organism unspecified: 485.xx; Pneumonia, organism unspecified: ICD9: 486.xx; Influenza w. Pneumonia: ICD9: 487.0; Ornithosis with pneumonia: ICD9: 073.0; Friedlander's bacillus infection in conditions specified elsewhere and of Unspecified site (also as caused by kebsiella pneumonia): ICD9: 041.3

OR secondary diagnosis of pneumonia with a primary diagnosis of one of the following: Bacteremia: ICD9: 790.7; Empyema: ICD9: 510.xx; Unspecified pleural effusion: ICD9: 511.9; Septicemia: ICD9: 038.xx; Respiratory failure: ICD9: 518.81, 518.84

- One or more of the following exclusion criteria during the identification OR the measurement year (see Tables PNEU-C4-C7): 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; 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 Diagnosis: 042; cystic fibrosis: ICD-9 Diagnosis: 277.0x; lung cancer: ICD-9 Diagnosis: 162.x

Step 4: Combine prior steps to identify measure population

1. Identify Ambulatory Pneumonia eligible population
2. Exclude those patients not meeting general inclusion criteria (e.g. age, continuous eligibility)
3. Exclude those patients meeting one or more measure exclusion criteria
4. The resulting collection of patients is the measure population

Eligible Event Identification

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

Inpatient hospitalization events

Identify all inpatient claims/ encounters with an ambulatory pneumonia-related diagnosis code appearing in the primary diagnosis field (see Table PNEU-B3). Primary Diagnosis of Pnuemonia: Viral pneumonia: 480.xx; Pneumococcal pneumonia: 481.xx; Pneumonia due to mycoplasma pneumoniae: 483.0; Pneumococcal pneumonia: 483.1; Other bacterial pneumonia: 483.8; Bronchopneumonia, organism unspecified: 485.xx; Pneumonia, organism unspecified: 486.xx; Influenza w. Pneumonia: 487.0; Ornithosis with pneumonia: 073.0; Friedlander's bacillus infection in conditions specified elsewhere and of Unspecified site (also as caused by kebsiella pneumonia): 041.3

OR secondary diagnosis of pneumonia with a primary diagnosis of one of the following: Bacteremia: 790.7; Empyema:

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510.xx; Unspecified pleural effusion: 511.9; Septicemia: 038.xx; Respiratory failure: 518.81, 518.84

Outpatient events

Identify all outpatient claims/encounters with a pneumonia-related diagnostic code appearing in any position (see Tables PNEU-B1-B2). ICD-9 Codes: Viral pneumonia: ICD9: 480.xx; Pneumococcal pneumonia: ICD9: 481.xx; Pneumonia due to mycoplasma pneumoniae: ICD9: 483.0; Pneumococcal pneumonia: ICD9: 483.1; Other bacterial pneumonia: ICD9: 483.8; Bronchopneumonia, organism unspecified: ICD9: 485.xx; Pneumonia, organism unspecified: ICD9: 486.xx; Influenza w. Pneumonia: ICD9: 487.0; Ornithosis with pneumonia: ICD9: 073.0; Friedlander's bacillus infection in conditions specified elsewhere and of Unspecified site (also as caused by kebsiella pneumonia): ICD9: 041.3; Chest pain: ICD9: 786.50; Fever: ICD9: 780.6; Asthma, unspec.: ICD9: 493.90; Status Asthmaticus: ICD9: 493.91; Asthma unspec. w/ acute exacerbation: ICD9: 493.92; Bronchitis, acute: ICD9: 466.0; Cough: ICD9: 786.2; Influenza, NOS: ICD9: 487.1; Pneumonia, unspecified: ICD9: 486; Upper respiratory infection, unspec. Site: ICD9: 465.9; Shortness of breath: ICD9: 786.05; Respiratory disease, unspec.: ICD9: 519.9; Wheezing (excludes asthma): ICD9: 786.07; Pleurisy: ICD9: 511.xx; Costochondritis: ICD9: 733.6; Clostridium-difficile: ICD9: 008.45
X-rays chest: CPT: 71010-71035; CT Chest: CPT: 71250, 71260, 71270; EKGs: CPT: 93000, 93005, 93010, 93040, 93041, 93042; Bronchoscopy: CPT: 31624, 31628; Inhalation Treatment: CPT: 94640; Decortization, pulmonary: CPT: 32220; Anesthesia-related procedures: CPT: 00541, 00520; Blood Count (CBC): CPT: 85025; Bronchodilation, spirometry: CPT: 94010, 94060; Non-invasive ear or pulse oximetry: CPT: 94760; Carbon-Monoxide diffusing capacity: CPT: 94720; Home Health/DME: initial only with look-back to confirm newness, i.e., if repeat service do not include

Prescription drugs

Identify ambulatory pneumonia-related medications by therapeutic class or generic/brand medication name during the measurement period (see Table PNEU-B4): Respiratory agents, Bronchodilators, Antibiotics, Anti-influenza meds (not antiretrovirals), Steroids – all, O2, Antihistamines, Cough medicines, Nebulizers, Anti-fungals

Rationale for cluster, grouping and assignment framework

Age: The measure includes individuals 18 years of age or older at the time of the qualifying event. This follows the accepted practice of developing guidelines separately for adult and childhood pneumonia.

Trigger Outpatient Visit: To be included in this measure patient must have an ambulatory physician visit that is not followed by an inpatient visit within three days. When a hospitalization occurs within three days of an initial visit diagnosed as pneumonia, the case is included in the companion measure that starts with a CAP hospitalization. The three day rule developed by the physician workgroup is intended to distinguish between cases where an outpatient approach is fairly quickly deemed inappropriate and those where the outpatient care turns out to be ineffective in preventing a hospitalization.

2- week measurement period: The expert panel of clinicians on the pneumonia workgroup also specified that a 2 week period should define the end of the episode in order to capture the down stream resource use and costs subsequent to the initial visit. In particular, they believed this would be sufficient time to capture hospitalizations due to ineffective treatment.

Exclusion of individuals with prior pneumonia ambulatory care visits: Individuals were excluded if they had an outpatient E&M visit for pneumonia within the prior 6 weeks to define this as a new episode

Exclusion of individuals with prior hospitalization: Individuals with a prior hospitalization within 90 days for pneumonia, or individuals with prior hospitalization of more than 2 days for any reason were excluded to assure that this was community acquired pneumonia. For the same reason, individuals identified as being in a nursing home prior to the visit that triggers the episode were excluded.

Standard exclusions: We have several standard exclusions for each of our measures that are similar to the NCQA exclusions for their relative resource use measures. 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.

Diagnostic codes to identify patients with pneumonia: Diagnostic codes to identify individuals with pneumonia were based on discussions of the pneumonia workgroup, revised over a year of consultant telephone calls. Both viral and bacterial pneumonia were included, but not aspiration pneumonia. The diagnosis had to be a primary code to trigger the ambulatory care episode.

Rationale for assignment of specified codes

The scope of this measure was focused on 2 weeks of care for individuals with pneumonia following an initial ambulatory care visit with a primary pneumonia diagnosis. Each of the codes included in the lists were considered to be related to pneumonia care during the 2-week measurement period by the pneumonia clinical workgroup because these codes were pneumonia-related. This was determined using a quasi-Modified Delphi Approach. Moreover, during the measurement testing and validation process, the workgroup refined the diagnostic codes, procedure codes, and medications included in the episode of care measure.

The overarching rationale for each of the codes included in the list is that the clinical workgroup considered the codes as potentially associated with the care of individuals during the 2-week period following the initial ambulatory E&M visit. Importantly, this was not limited to appropriate care, but rather focused on resources that were likely to be associated with the condition. In particular, while only primary diagnoses of pneumonia defined the episode trigger event, pneumonia-related care during the episode included medical services for which pneumonia, various upper respiratory diagnoses, inflammation diagnosed as pleurisy or costochondritis, or possible effect of the treatment (clostridium-difficile), whether these diagnoses were coded as primary or secondary.

In addition, certain CPT codes were used to identify services to be included in the ambulatory pneumonia episode resource costs regardless of whether there was a pneumonia-associated diagnosis. These included chest x-rays, ct scans, ekgs, bronchoscopy, inhalation treatment, pulmonary decortization, anesthesia-related procedures, blood count (CBC), bronchodilation spirometry, non-invasive ear or pulse oximetry, carbon-monoxide diffusing capacity, and new home health/DME services. These services were defined and then revised by the workgroup following staff analyses of their occurrence in the presence and absence of a pneumonia diagnosis.

Several major societies have published extensive guidelines for the treatment of adult pneumonia. The medications selected for inclusion in the measure met at least one of the following criteria:

- Antibiotics or anti-influenza medications (not antiretrovirals)
- Used to treat symptoms that may be associated with pneumonia.
- Used to treat acute exacerbations of pneumonia.
- Used to reduce the risk of recurrence of exacerbations.
- Anti-fungals

References:

1. Mandell, LA, Wunderink, RG, Anzueto, A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis 2007; 44 Suppl 2:S27.
2. Fine MJ; Stone RA; Singer DE; Coley CM; Marrie TJ; Lave JR; Hough LJ; Obrosky DS; Schulz R; Ricci EM; Rogers JC; Kapoor WN. Processes and outcomes of care for patients with community-acquired pneumonia: results from the Pneumonia Patient Outcomes Research Team (PORT) cohort study. Arch Intern Med 1999 May 10; 159(9): 970-80.
3. Marrie TJ; Shariatzadeh MR. Community-acquired pneumonia requiring admission to an intensive care unit: a descriptive study. Medicine (Baltimore). 2007 Mar; 86(2): 103-11.
4. Marrie TJ; Poulin-Costello M; Beecroft MD; Herman-Gnjidic Z. Etiology of community-acquired pneumonia treated in an ambulatory setting. Respir Med 2005 Jan; 99(1): 60-5.
5. Li JZ; Winston LG; Moore DH; Bent S. Efficacy of short-course antibiotic regimens for community-acquired pneumonia: a meta-analysis. Am J Med. 2007 Sep; 120(9): 783-90.
6. Bartlett, JG, Dowell, SF, Mandell, LA, et al. Practice guidelines for the management of community-acquired pneumonia in adults. Infectious Diseases Society of America. Clin Infect Dis 2000; 31:347.
7. Niederman MS, McCombs JS, Unger AN, Kumar A, Popovian R. The cost of treating community-acquired pneumonia. Clin Ther 1998; 20: 820-37.
8. Carratala J, Fernandez-Sabe N, Ortega L, et al. Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. Ann Intern Med 2005; 142: 165-72.

S8.3. Comorbid and interactions

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

See risk adjustment details—Section S10.1

S8.4. Clinical hierarchies

Detail the hierarchy for codes or condition groups used and provide rationale for this methodology.

We do not provide specifications for clinical hierarchies.

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 10.1 of this submission form and in the risk adjustment section of the technical appendix in 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.

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 homogenous population through our inclusion and exclusion criteria.

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 their 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 supplemental 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. Creation of 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 measure trigger is an initial E&M visit with primary diagnosis of pneumonia with no E&M visit for pneumonia within the prior 6 weeks. The end date is 14 days post trigger.

A minimum of 24 months of continuous data is necessary to calculate the measure.

An episode is defined by a trigger event observed over a 50 week identification year. In addition a prior utilization period, which is 12 months prior to the trigger event, is necessary to exclude individuals based on the exclusion criteria defined below. Note that the identification year is a fixed 50-week period, while the prior year and the measurement period are both defined relative to the trigger event. Thus, if trigger events occur on the first and last days of the identification period, 12 additional months of data prior to the identification period and two additional weeks subsequent to the identification year are needed. The identification period is defined as 50 weeks rather than two years to limit the total data needed to two years.

The following steps are used to complete the construction sequence (for specific codes, see Section S8.2 clinical framework of this submission form as well as the written measure specification/technical appendix accessed via URL).

ELIGIBLE POPULATION IDENTIFICATION

The process of identifying patients to be included in the measure is divided into three separate steps, each with multiple sub-steps. The following steps are used for identifying the included population:

Step 1: Identify patients that meet episode inclusion criteria

Identify patients that have one of the diagnostic codes in for an E&M ambulatory care visit as listed in Section S8.2 above during the event identification period (see Tables PNEU-A and PNEU-A1). These ICD-9 codes must be present in the first diagnostic field, regardless of corresponding CPT and UB revenue codes.

Step 2: Identify patients that meet age, eligibility and continuous enrollment criteria

1. Age: Identify patients aged 18 and older.
2. Eligibility
 - a. Identify benefits during both the identification year and the measurement year. To be included persons must have both of the following benefits in both years
 - i. Medical benefit
 - ii. Pharmacy benefit
3. Continuous enrollment
 - a. Determine enrollment during both the identification and measurement years. (To be eligible, persons must have both medical and pharmacy coverage for the measurement period and prior period (do not include persons whose pharmacy benefits are dropped partway through the identification or measurement period).
 - b. Identify (or estimate) total days of coverage in 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).
 - 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 one or more of the following exclusion criteria during either the measurement period OR the prior year
- Exclusion criteria:

- Patient had ambulatory care diagnosis for E&M ambulatory visit within 6 weeks prior to potential trigger ambulatory pneumonia visit (see Section S8.2 above or Tables PNEU-A and Table PNEU-A1).
- Patient discharged from hospital after greater than 2-day stay for any reason within 90 days prior to trigger E&M visit or discharged within 90 days prior to trigger E&M (any LOS) with a CAP primary diagnosis (see Section S8.2 above or Table PNEU-C1 and PNEU-B3).
- Residence in nursing home (determined by medical visit in nursing home or presence of nursing home claim) within six months prior to trigger ambulatory visit (see Section S8.2 above or Table PNEU-C1).
- In hospice program within six months prior to trigger ambulatory visit (see Section S8.2 above or Table PNEU-C1).
- Patient hospitalized for any reason within 3 days subsequent to trigger ambulatory care trigger visit for diagnosis of pneumonia (see Section S8.2 above or Table PNEU-B3).
- Lung cancer diagnosis during measurement or prior period (see Section S8.2 above or Table PNEU-C3).
- End stage renal disease (ESRD) during measurement or prior period (see Section S8.2 above or Table PNEU-C5).
- HIV/AIDS during measurement or prior period (see Section S8.2 above or Table PNEU-C7).
- Organ transplant during measurement or prior period (see Section S8.2 above or Table PNEU-C6).
- Cystic fibrosis during measurement period or prior period (see Section S8.2 above or Table PNEU-C3).
- Active cancer treatment during measurement or prior period (see Section S8.2 above or Table PNEU-C4).

Step 4: Combine prior steps to identify measure population

1. Identify Ambulatory Pneumonia eligible population
2. Exclude those patients not meeting general inclusion criteria (e.g. age, continuous eligibility)
3. Exclude those patients meeting one or more measure exclusion criteria
4. The resulting collection of patients is the measure population

ELIGIBLE EVENT IDENTIFICATION

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

Inpatient hospitalization events

Referring to the codes listed in Section S8.2 above, identify all inpatient claims/ encounters with an ambulatory pneumonia-related diagnosis code appearing in the primary diagnosis field (see also Table PNEU-B3).

Outpatient events

Referring to the codes listed in Section S8.2 above identify all outpatient claims/encounters with a pneumonia-related diagnostic code appearing in any position (see also Tables PNEU-B1 and PNEU-B2).

Prescription drugs

Referring to the codes listed in Section S8.2 above, identify ambulatory pneumonia-related medications by therapeutic class or generic/brand medication name during the measurement period (see also Table PNEU-B4).

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 ambulatory pneumonia-related. For further details, see section S10.3 below.

CREATION OF EPISODE-SPECIFIC STRATA

Not applicable.

S9.3. Measure Trigger and End mechanisms

Detail the measure's trigger and end mechanisms and provide rationale for this methodology.

The measure trigger is an initial E&M visit with primary diagnosis of pneumonia with no E&M visit for pneumonia within the prior 6 weeks. The end date is 14 days post trigger.

In addition a prior utilization period, which is 12 months prior to the trigger event, is necessary to exclude individuals based on the exclusion criteria defined below. Note that the identification year is a fixed 50-week period, while the prior year and the measurement period are both defined relative to the trigger event. Thus, if trigger events occur on the first and last days of the identification period, 12 additional months of data prior to the identification period and two additional weeks subsequent to the identification year are needed. The identification period is defined as 50 weeks rather than two years to limit the total data needed to two years.

Rationale: the workgroup determined 2 weeks was an appropriate clinical period for resolution of the disease.

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.

To avoid redundancy and within episodes of community acquired pneumonia (CAP), we have elected to create two distinct measures. One measure for ambulatory CAP and a separate measure for CAP hospitalization. The two measures are designed not to overlap.

Beyond the two CAP measures, the other 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

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 include 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 : Ambulatory Surgery Center (ASC)

Ambulatory Care : Clinic/Urgent Care

Ambulatory Care : Clinician Office

Imaging Facility

Laboratory

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.

Calculation of risk adjusted costs (see also the risk adjustment section in the technical appendix of the written measure specification).

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 PNEU-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 $\geq 1\%$. 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 $\geq 1\%$ 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., heart failure for the CHF post hospitalization episode), 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 ambulatory pneumonia episode.

Risk Adjustment Model

Adjusted Pneumonia Costs = \$300 + (Male*\$5) + (Age*\$0) + (Chronic Obstructive Pulmonary Disease*\$25) + (Diabetes without Complication*\$0) + (Congestive Heart Failure*\$50) + (End-Stage Liver Disease*\$233) + (Pancreatic Disease*\$64) + (Rheumatoid Arthritis and Inflammatory Connective Tissue Disease*\$43) + (Drug/Alcohol Psychosis*\$158) + (Polyneuropathy*\$66) + (Unstable Angina and Other Acute Ischemic Heart Disease*\$55) + (Angina Pectoris/Old Myocardial Infarction*\$73) + (Vascular Disease with Complications*\$113) + (Aspiration and Specified Bacterial Pneumonias*\$54) + (Pneumococcal Pneumonia, Emphysema, Lung Abscess*\$68) + (Nephritis*\$111) + (Vertebral Fractures without Spinal Cord Injury*\$90) + (Traumatic Amputation*\$218) + (Major Complications of Medical Care and Trauma*\$63)

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 PNEU-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 the ambulatory pneumonia episode in the test episode: Average Cost: \$395
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 \$600. Calculate the adjustment factor by dividing the costs from the current population by the average costs in Table PNEU-RA2. That would result in an adjustment factor of 1.52 ($600/395=1.52$). This adjustment factor is then applied to the estimated coefficients for the adjusted risk adjustment model.

Risk Adjustment Model

Risk and Mean Adjusted Ambulatory Pneumonia Episode Costs= $1.52 \times \text{Risk Adjusted Ambulatory Pneumonia Episode Costs}$.

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 comorbid 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-634386967458104989.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 stratified.

While there is no stratification included in this measure--it is limited to cases where no hospitalization occurred. A separate CAP hospitalization measure has been developed.

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 $\$900.17 \times 8 = \$7,201.36$.

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 $\$900.17 \times 2 = \$1,800.34$.

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 $\$1,474 \times 8 = \$11,792$.

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 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 are attributed to the individual provider responsible for the trigger E&M ambulatory care event.

Rationale:

Given the two week time frame and limitation to ambulatory cases (no hospitalizations), the workgroup decided the appropriate physician was the physician making the initial diagnosis. It was this physician who would initiate treatment and any referral would be on the basis of this physician's recommendation. Data on frequency of number of E&M visits and number of physicians was presented to workgroup which they found confirmed their allocation rule.

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 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 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, Corrado 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.

$$\text{O-to-E} = \text{Sum of Observed Costs} / \text{Expected Costs from Risk Adjustment Model}$$

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 CAP ambulatory.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 indicates 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.

$$\text{O-to-E} = \text{Sum of Observed Costs} / \text{Expected Costs from Risk Adjustment Model}$$

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% then 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
<p>TESTING ATTACHMENT (5MB or less) or URL:</p> <p><i>If needed, attach <u>supplemental</u> documentation (Save file as: SA_Reliability_VValidity 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.</i></p> <p>URL: Please supply the username and password: Attachment: SA_Reliability_VValidity Testing CAP Ambulatory.pdf</p>	
<p>SA1. Reliability Testing <i>For each module tested or for the overall measure score:</i></p> <p>SA1.1. Data/sample <i>(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)</i></p> <p>Thomson Reuter's MarketScan Dataset was used in the testing of the ABMS REF episode-based resource use measures.</p> <p>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.</p> <p>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</p>	<p>2a2</p> <p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/></p>

individuals remain with the same employer, they can be tracked across health plans.

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.

SA1.2. Analytic Methods

(Describe method of reliability testing and rationale)

Reliability refers to the reproducibility of results (Bannigan and Watson, 2009). To investigate the reliability of the measure, we examined the distribution of costs across categories of care (inpatient facility charge, evaluation and management, procedures, etc.) for all pneumonia ambulatory care episodes in the MarketScan data that met inclusion/exclusion criteria and for a subsample of this cohort. After applying inclusion criteria to the MarketScan data, we identified 438,304 ambulatory care pneumonia episodes (see attached data summary Slide 4). This was reduced to 202,870 eligible visits after eliminating people lacking medical or pharmacy coverage over the prior and observation periods. After applying the exclusion criteria, there were 65,511 ambulatory pneumonia episodes for the measure. For these 65,511 individual episodes, we examined the distribution of costs across categories of care for the entire cohort and the subsample as well as across geographic regions. For those individuals with physician unique physician identifiers we were able to define variation across physicians, by specialty of the physician and compare costs across specialties. Rationale: Our investigation of reliability allowed us to leverage on analyses that were being done to examine overall resource use and attribution of care.

Reference: Bannigan K, Watson R. Reliability and validity in a nutshell Journal of Clinical Nursing. 2009;18: 3237–3243

SA1.3. Testing Results

(reliability statistics, assessment of adequacy in the context of norms for the test conducted)

For all ambulatory care pneumonia episodes of in the MarketScan data that met the inclusion/exclusion criteria (i.e., 65,511 episodes), evaluation and management payments comprised the largest portion of costs, as 31% (see attached data summary Slide 6), followed by drug costs (23%), outpatient facility costs (16%), imaging costs (10%), and hospitalization costs (10%).

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

The results of our comparison would suggest that the measure could be deemed reliable. It should be noted that this investigation highlighted a limitation of the data regarding the portion of missing provider identifiers. In the MarketScan data about half of the data are lacking physician identifiers. However, this is due to confidentiality agreements with insurers and would not be expected to be a problem were the measure to be implemented by the insurers to monitor provider episode costs.

SA2. Validity Testing

2b2

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 dataset

SA2.2. Analytic Method

(Describe method of validity testing and rationale; if face validity, describe systematic assessment)

Validity testing focused primarily on face validity. Initial testing included:

Level 1 analyses

- o Examined impact of inclusion/exclusion criteria on episode denominator
- o Examined total episode spending by type of service
- o 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
- o Tested proposed attribution logic, examined variability in per-episode resource use at individual provider level (as relevant) and by provider specialty.

Level 2 analyses

- o Incorporated risk adjustment
- o 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.
- o Examined specific drivers of resource use variation
- o 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.

By presenting our results to the clinical workgroups and others to examine the distributions of resource use and costs to determine if these results meant their clinical expectations, we were able to access the face validity of our results.

SA2.3. Testing Results

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

We have developed a measure specification to measure resource use associated with a community acquired pneumonia episode of care. The measure includes resource use related to management of pneumonia over a 2-week period in order to capture all pneumonia-related costs of treating these patients during the episode. For the Level 1 analysis, we found that there were 65,511 individuals after applying our exclusion criteria (see attached data summary Slide 4). We found that the average total cost of an ambulatory pneumonia episode was \$433, and the predominating costs of the episode were due to E&M visits (31% of the total costs). As part of the Level 2 analyses, we examined variability in per episode resource use by specialties of the attributed providers. The highest volume specialty was family practice, followed by internal medicine (see attached data summary Slide 26). It would be expected that E&M visits would be a large component of costs for patients with ambulatory pneumonia given the initial visit serves as the trigger event and the length of the episode is limited to two weeks. It would also be expected that family medicine, internal medicine and physicians not otherwise described, would account for most of the resource use since individuals might be expected to see their personal physicians for initial treatment. These results were presented to the clinical workgroup who concurred that these results met their clinical expectations and had face validity.

H ☐
M ☐
L ☐
I ☐

<p>SA2.4. Finding statement(s)—(i.e., is the measure deemed reliable, limitations identified)</p> <p>Based on the results of our investigations and concurrence from the clinical workgroup, our measure should be deemed to have face validity.</p>	
<p>SA3. Testing for Measure Exclusions</p> <p>SA3.1. Describe how the impact of exclusions (if specified) is transparent as required in the criteria</p> <p>In the attached data summary, we have detailed how the exclusions impacted the resulting size of the cohort (see attached data summary Slide 4).</p> <p>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)</p> <p>See section SA1.1 for description of Thomson Reuters MarketScan dataset.</p> <p>SA3.3. Analytic Method (Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference)</p> <p>We examined the impact of several types of exclusions. In order to ensure that data are available for assessing the 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: age < 18 years, hospitalization or nursing home stays or recent ambulatory treatment for pneumonia. We examined the impact of these exclusions on the resulting cohort size.</p> <p>SA3.4. Results (statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses)</p> <p>The exclusion of individuals without continuous enrollment in health insurance with medical and pharmacy benefits reduced the sample by more than 50%. Among the 438,304 episodes that met the inclusion criteria for the measure, 202,870 or 46% remained after the continuous enrollment exclusion criteria were applied (see attached data summary Slide 4). Of these, 65,511 remained after implementing the other exclusion criteria. Most were excluded due to prior ambulatory care pneumonia visits within 90 days prior to a potential trigger visit, i.e., it was a follow-up rather than initial visit in the pneumonia episode. 20% of individuals were excluded because they were under 18 years of age.</p> <p>SA3.5. Finding statement(s)-- (i.e., is the measure deemed reliable, limitations identified)</p> <p>Based on the results of our analyses and feedback from the clinical workgroup, we would deem the measure to be reliable. Our investigation did find that a substantial portion of individuals were excluded due to the continuous enrollment criteria, which is related to the data itself rather than the clinical characteristics of the individuals.</p> <p>SA4. Testing Population Which populations were included in the testing data? (Check all that apply)</p> <p>Commercial <input type="checkbox"/></p>	<p>2b3</p> <p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/></p>
<p>SA5. Risk adjustment strategy</p> <p>Refer to items S10.1 and S10.2 to rate this criterion.</p>	<p>2b4</p> <p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/></p>

	I <input type="checkbox"/>
SA6. Data analysis and scoring methods <i>Refer to items S12-S12.3 to rate this criterion.</i>	2b5 H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/>
SA7. Multiple data sources <i>Refer to S7 & all SA1 items to evaluate this criterion.</i>	2b6 H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/> NA <input type="checkbox"/>
SA6. Stratification of Disparities (if applicable) <i>Refer to item S10.2 to rate this criterion.</i>	2c H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/>
TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for <i>Scientific Acceptability of Measure Properties</i>?	
Steering Committee: Overall, was the criterion, <i>Scientific Acceptability of Measure Properties</i> , met? Rationale:	Y <input type="checkbox"/> N <input type="checkbox"/>
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. <i>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)</i> 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 <i>(If used in improvement programs, provide name of program(s), locations, Web page URL(s)).</i> See Section U1.1	3a H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/>

<p>U1.3. Use for other Accountability Functions (payment, certification, accreditation) <i>(If used in a public accountability program, provide name of program(s), locations, Web page URL(s).</i></p> <p>See Section U1.1</p>	
<p>U2. Testing of Interpretability <i>(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).</i></p> <p>U2.1. If understanding or usefulness was demonstrated <i>(e.g., through systematic feedback from users, focus group, cognitive testing, analysis of quality improvement initiatives) describe the data, methods, and results.</i></p> <p>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.</p>	<p>3b</p> <p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> NA <input type="checkbox"/></p>
<p>U2.2. Resource use data and result can be decomposed for transparency and understanding.</p> <p>Refer to items S11 -S12.3.</p>	<p>3c</p> <p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/></p>
<p>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.</p> <p>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?</p> <p>U3.2. If the measure specifications are not completely harmonized identify the differences, rationale, and impact on interpretability and data collection burden. <i>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.)</i></p>	<p>3d</p> <p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/> NA <input type="checkbox"/></p>
<p>TAP/Workgroup: What are the strengths and weaknesses in relation to the subcriteria for Usability?</p>	
<p>Steering Committee: Overall, to what extent was the criterion, Usability, met? Rationale:</p>	<p>H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/></p>
<p>FEASIBILITY</p>	
<p>Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement.</p>	<p>Eval Rating</p>
<p>F1. Data Elements Generated as Byproduct of Care Processes <i>How are the data elements needed to compute measure scores generated? Data used in the measure</i></p>	<p>4a</p>

are:		<input type="checkbox"/> H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I
Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims)		
F2. Electronic Sources <i>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)</i> ALL data elements in electronic claims	4b	
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.		<input type="checkbox"/> H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I
F3. Susceptibility to Inaccuracies, Errors, or Unintended Consequences <i>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.</i> <ul style="list-style-type: none"> 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	<input type="checkbox"/> H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I
F4. Data Collection Strategy <i>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).</i> Administrative claims lack the detail necessary to fully understand appropriateness of resource use in relation to	4d	<input type="checkbox"/> H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I

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 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. 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?
Rationale:

H ☐
M ☐
L ☐

RECOMMENDATION

Steering Committee: Do you recommend for endorsement?
Comments:

Y ☐
N ☐
A ☐

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)

Co.1 Organization

American Board of Medical Specialties Research and Education 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 Education 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.

Community Acquired Pneumonia Hospitalization Workgroup Members

William Dalsey, MD, American College of Emergency Physicians

Erika Ernst, MD, American College of Clinical Pharmacy

Thomas File, MD, Infectious Diseases Society of America

Lawrence Goodman, MD, American College of Radiology

Elizabeth Marlow, MD, Society of Hospital Medicine

Mark Metersky, MD, American College of Chest Physicians

Michael O'Dell, MD, American Academy of Family Physicians

Vincent Quagliarello, MD, American Geriatrics Society

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:

The Episode-based Resource Use Measures (Measures) and related data specifications, developed by the American Board of Medical Specialties Research and Education Foundation (ABMS REF), are intended to facilitate quality improvement activities by physicians.

These Measures are intended to assist physicians in enhancing quality of care. Measures are designed for use by any physician who manages the care of a patient for a specific condition or for prevention. These Measures are not clinical guidelines and do not 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.

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

04/21/2011

High-Value Health Care Project - Characterizing Episodes and Costs of Care (C3)
Data Elements Required to Calculate C3 Measures

<u>Variable Name</u>	<u>Variable Description</u>	<u>Required Data Sources*</u>
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
svcdat	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)

High-Value Health Care Project - Characterizing Episodes and Costs of Care (C3)
Data Elements Required to Calculate C3 Measures

<u>Measure Component</u>	<u>Required Variables</u>
Standardized Prices*	enrolid, ndcnum, pay, qty, drg, pproc,...,pprocn.
Exclusions and standard coverage definition	enrolid, pdx,dx1,...,dxn, age, svcdte, pproc, pproc1,..., pprocn, pay, qty, revcode, memdays, rx, stdplac, proctyp.
Cohort Definition	enrolid, svcdte, pdx, pdx1,...,pdxn, pproc1,..., pprocn, pay, qty, sex, age, thercls, dstatus, stdplac, billtyp, fachdid, revcode.
Related Resource Use	enrolid, facprof, pay, qty, pproc1,..., pprocn, svcdte, admdate, disdate, pdx, dx1,..., dxn, drg, ndcnum, thercls, gennme, prodnme, daysupp, procmo, mastfrm.
Output and Attribution	enrolid, svcdte, 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

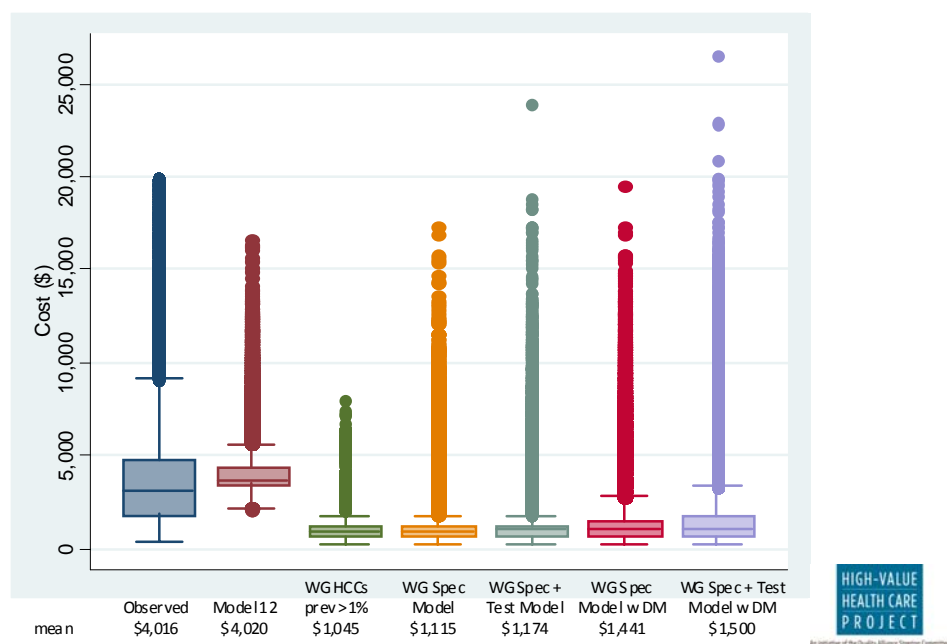
High-Value Health Care Project - Characterizing Episodes and Costs of Care (C3)
Data Elements Required to Calculate C3 Measures

<u>Condition (Workgroup)</u>	<u>Measure Name</u>	<u>Abbreviation</u>
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

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”



12

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 $\geq 1\%$. 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 $\geq 1\%$ 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						Distribution	Link function
	WG Specified (> 1%)	WG specified (> 1%) p < 0.1	Test condition s (> 1%)	Test condition s (> 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.

Example Episode Report

Ambulatory Episode

Report for Physician #28118549

Provider type = Family Practice

	MD	Peer Group	Non-Peer Group	National Avg
Episodes	16	33,614	37,973	71,603
Observed Costs*				
Average	\$ 300	\$ 290	\$ 365	\$ 330
Min	\$ 65	\$ 65	\$ 65	\$ 65
Median	\$ 278	\$ 220	\$ 241	\$ 231
Max	\$ 760	\$ 1912	\$ 1912	\$ 1912
Predicted Costs				
Average	\$ 330	\$ 330	\$ 331	\$ 331
Min	\$ 314	\$ 229	\$ 174	\$ 174
Median	\$ 328	\$ 327	\$ 327	\$ 327
Max	\$ 400	\$ 780	\$ 743	\$ 780
Observed-to-Expected Ratio				
Average	0.90	0.88	1.10	1.00
Min	0.20	0.12	0.12	0.12
Median	0.85	0.67	0.73	0.70
Max	1.90	7.90	7.90	7.90
% ≥ 2.0	0%	5.9%	12.1%	9.2%
% ≥ 2.5	0%	3.9%	8.9%	6.5%

% ≥ 75th percentile

peers 31.3% (11.0%, 58.7%)

* Observed costs adjusted for outliers (windsorized)

Notes:

- Use Model 12

- Includes all episodes

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American Board
of Medical Specialties

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Research and Education Foundation

Analytic Findings: Ambulatory Pneumonia Episode of Care

NQF Submission

Overview of Analyses Presented for Pneumonia Episode*

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

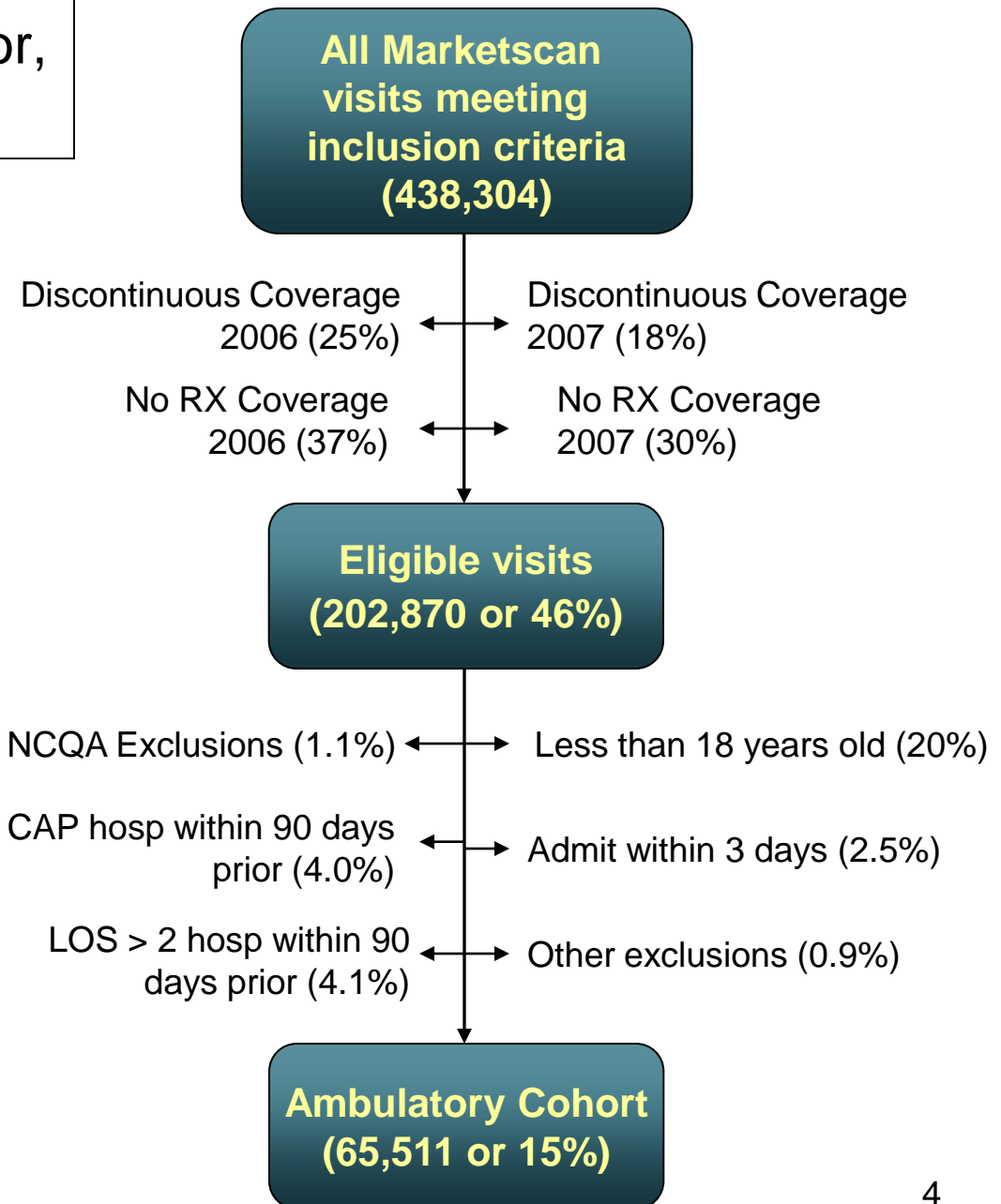
** The following results are based on the measure specification at different points in time, so the numbers are not always consistent, but they are not substantively different.*

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.

Amb. Measure Denominator, 2-week follow up

- Primary dx of pneumonia at admission, or
- Primary dx of bacteremia, empyema, unspecified pleural effusion, septicemia, respiratory failure.
- Admission between 6/1/2006 and 12/18/2007
- Other Exclusions:
 - Cystic Fibrosis
 - Lung Cancer
 - Nursing Home or Hospice
 - Prior CAP dx on E&M claim 4 days to 6 weeks
- Note: exclusions and inclusions 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.

Resource Use by Type of Service: Ambulatory Pneumonia, 2 wk

Description	Mean	% of Total	5th %	25th %	50th %	75th %	95th %
Inpatient Facility Costs	\$43	10%	\$0	\$0	\$0	\$0	\$0
Durable Medical Equipment	\$2	0%	\$0	\$0	\$0	\$0	\$0
Outpatient Facility Costs	\$70	16%	\$0	\$0	\$0	\$0	\$357
Imaging	\$44	10%	\$0	\$0	\$38	\$44	\$132
Evaluation and Management	\$136	31%	\$63	\$65	\$96	\$161	\$314
Other Services	\$12	3%	\$0	\$0	\$0	\$0	\$48
Procedures	\$11	3%	\$0	\$0	\$0	\$0	\$42
Tests	\$13	3%	\$0	\$0	\$0	\$12	\$68
Unclassified	\$1	0%	\$0	\$0	\$0	\$0	\$0
Drug Costs	\$100	23%	\$0	\$13	\$80	\$137	\$296
Total Costs	\$433	100%	\$65	\$160	\$262	\$423	\$1,089

Top 20, Pneumonia-related E&M, Ambulatory Episode, 2 wk

- 31% of total episode costs

CPT	Svcs.	Cost	% of Svcs	% of Cost	Description
99213	47,449	\$3,081,061	48.8%	34.6%	Office or other outpatient visit, established patient
99214	22,864	\$2,208,760	23.5%	24.8%	Office or other outpatient visit, established patient
99284	3,923	\$738,841	4.0%	8.3%	Office or other outpatient visit
99285	2,436	\$681,003	2.5%	7.6%	Emergency department visit
99203	3,183	\$340,539	3.3%	3.8%	Office or other outpatient visit, new patient
99215	1,841	\$253,941	1.9%	2.8%	Office or other outpatient visit, established patient
99204	1,488	\$226,960	1.5%	2.5%	Office or other outpatient visit, new patient
99283	1,857	\$218,819	1.9%	2.5%	Office or other outpatient visit
99212	4,620	\$206,617	4.8%	2.3%	Office or other outpatient visit, established patient
99244	524	\$106,622	0.5%	1.2%	Office consultation for a new or established patient
99232	1,282	\$100,841	1.3%	1.1%	Subsequent hospital care, per day
99202	1,104	\$82,795	1.1%	0.9%	Office or other outpatient visit, new patient
99222	205	\$74,159	0.2%	0.8%	Initial hospital care, per day
99245	276	\$72,043	0.3%	0.8%	Office consultation for a new or established patient
99205	355	\$67,993	0.4%	0.8%	Office or other outpatient visit, new patient
99223	323	\$63,977	0.3%	0.7%	Initial hospital care, per day
99233	490	\$55,825	0.5%	0.6%	Subsequent hospital care, per day
99254	194	\$34,590	0.2%	0.4%	Inpatient consultation for a new or established patient
99255	124	\$29,811	0.1%	0.3%	Inpatient consultation for a new or established patient
99291	86	\$28,742	0.1%	0.3%	Critical care, evaluation and management of the critically ill
Total	97,226	\$8,911,872	100.0%	100.0%	

Pneumonia Non-related E&M, Top 20 ICD-9 Codes, Ambulatory Episode, 2 wk

ICD-9 Code	Related	Not Related	Related Costs	Non-Related Costs
490 -Bronchitis NOS	22	534	\$2,464	\$42,313
496 -Chr Airway Obstruct NEC	44	445	\$5,007	\$40,345
78609-Respiratory Abnorm NEC	60	263	\$8,958	\$36,945
4019 -Hypertension NOS	16	377	\$1,210	\$34,075
4011 -Benign Hypertension	27	382	\$2,232	\$32,889
4619 -Acute Sinusitis NOS	25	436	\$1,976	\$32,456
25000-Dm II wo Cmp Nt St Uncntr	17	308	\$2,020	\$26,399
49121-Obs Chr Bronc W(Ac) Exac	21	210	\$3,069	\$23,744
78659-Chest Pain NEC	9	150	\$1,533	\$22,083
78079-Malaise & Fatigue NEC	15	220	\$1,492	\$20,757
41519-Pulm Embol/Infarct NEC	0	138	\$0	\$18,634
78652-Painful Respiration	14	140	\$2,239	\$18,553
78900-Abdmnal Pain Unspcf Site	10	166	\$896	\$18,047
7242 -Lumbago	2	190	\$193	\$17,083
7931 -Abn Findings-Lung Field	30	135	\$4,063	\$16,743
7840 -Headache	12	147	\$1,253	\$16,134
4280 -Chf NOS	17	124	\$2,158	\$14,711
41401-Crnry Athrsccl Natve Vssl	9	132	\$1,018	\$13,102
4739 -Chronic Sinusitis NOS	7	137	\$561	\$12,957
49300-Extrinsic Asthma NOS	11	132	\$1,050	\$12,556

Top 20, Pneumonia-related Procedures, Ambulatory Episode, 2 wk

- 3% of total episode costs

CPT	Svcs.	Cost	% of Svcs	% of Cost	Description
90772	7,901	\$192,398	48.9%	26.0%	Therapeutic, prophylactic or diagnostic injection
94640	5,285	\$110,093	32.7%	14.9%	Pressurized or nonpressurized inhalation treatment
90765	577	\$60,245	3.6%	8.2%	Intravenous infusion, for therapy, prophylaxis, or diagnosis
32220	16	\$31,019	0.1%	4.2%	Decortication, pulmonary (separate procedure); total
00541	19	\$28,419	0.1%	3.8%	Anesthesia for thoracotomy procedures
90760	234	\$21,831	1.4%	3.0%	Intravenous infusion, hydration; initial, 31 minutes to 1 hour
00542	12	\$17,449	0.1%	2.4%	Anesthesia for thoracotomy procedures
32652	10	\$17,153	0.1%	2.3%	Thoracoscopy, surgical; with total pulmonary decortication
90774	191	\$16,449	1.2%	2.2%	Therapeutic, prophylactic or diagnostic injection
31628	37	\$14,182	0.2%	1.9%	Bronchoscopy, with biopsy
94664	652	\$14,100	4.0%	1.9%	Demonstration of patient utilization of an aerosol generator
31624	54	\$14,038	0.3%	1.9%	Bronchoscopy, with bronchial alveolar lavage
00520	24	\$12,435	0.1%	1.7%	Anesthesia for closed chest procedures
32500	5	\$8,878	0.0%	1.2%	Removal of lung, other than total pneumonectomy
31622	29	\$8,871	0.2%	1.2%	Bronchoscopy, with or without cell washing
32000	52	\$8,852	0.3%	1.2%	Thoracentesis with insertion of tube with or w/out water seal
32020	24	\$8,430	0.1%	1.1%	Decortication and parietal pleurectomy
90766	160	\$8,180	1.0%	1.1%	Intravenous infusion, for therapy, prophylaxis, or diagnosis
32225	5	\$7,121	0.0%	1.0%	Decortication, pulmonary
90775	123	\$6,371	0.8%	0.9%	Therapeutic, prophylactic or diagnostic injection
Total	16,171	\$739,031	100.0%	100.0%	

Common Pneumonia non-related Procedures, Ambulatory Episode, 2 wk

CPT	Label	Related	Not Related	Related Costs	Non-Related Costs
58670	Laparoscopy, surgical; with fulguration of oviducts (with or without	0	3	\$0	\$57,989
97110	Therapeutic procedure, one or more areas, each 15 minutes	1	882	\$54	\$49,674
61510	Craniectomy, trephination, bone flap craniotomy; for excision	0	2	\$0	\$41,435
92980	Transcatheter placement of an intracoronary stent(s), percut	0	22	\$0	\$39,628
45378	Colonoscopy, flexible, proximal to splenic flexure; diagnostic	0	62	\$0	\$28,375
93510	Left heart catheterization, retrograde, from the brachial arter	7	54	\$4,169	\$28,295
27447	Arthroplasty, knee, condyle and plateau; medial AND lateral	0	18	\$0	\$28,272
97140	Manual therapy techniques (eg, mobilization/ manipulation,	7	675	\$280	\$27,278
43239	Upper gastrointestinal endoscopy including esophagus, stor	2	75	\$615	\$22,680
00790	Anesthesia for intraperitoneal procedures in upper abdomen	0	29	\$0	\$20,592
90772	Therapeutic, prophylactic or diagnostic injection (specify sub	7,901	780	\$192,398	\$18,874
31624	Bronchoscopy, rigid or flexible, with or without fluoroscopic g	54	52	\$14,038	\$14,552
00520	Anesthesia for closed chest procedures; (including bronchos	24	27	\$12,435	\$13,660
31628	Bronchoscopy, rigid or flexible, with or without fluoroscopic g	37	33	\$14,182	\$12,761
90765	Intravenous infusion, for therapy, prophylaxis, or diagnosis (577	112	\$60,245	\$11,451
00541	Anesthesia for thoracotomy procedures involving lungs, pleu	19	7	\$28,419	\$8,067
94640	Pressurized or nonpressurized inhalation treatment for acute	5,285	359	\$110,093	\$7,953
90760	Intravenous infusion, hydration; initial, 31 minutes to 1 hour	234	82	\$21,831	\$7,764
90774	Therapeutic, prophylactic or diagnostic injection (specify sub	191	46	\$16,449	\$3,983
32220	Decortication, pulmonary (separate procedure); total	16	1	\$31,019	\$893

Top 20, Pneumonia-related Imaging, Ambulatory Episode, 2 wk

- 10% of total episode costs

CPT	Svcs.	Cost	% of Svcs	% of Cost	Description
71020	49,969	\$1,816,847	84.5%	62.4%	Radiologic examination, chest, two views, frontal and lateral
71260	1,874	\$415,623	3.2%	14.3%	Computed tomography, thorax; with contrast material(s)
71250	703	\$150,108	1.2%	5.2%	Computed tomography, thorax; without contrast material
71275	494	\$105,885	0.8%	3.6%	Computed tomographic angiography, chest (noncoronary)
71010	2,918	\$91,293	4.9%	3.1%	Radiologic examination, chest; single view, frontal
71270	256	\$74,302	0.4%	2.6%	Computed tomography, thorax; with and w/out
78465	103	\$41,704	0.2%	1.4%	Myocardial perfusion imaging; tomographic (SPECT)
93307	162	\$24,850	0.3%	0.9%	Echocardiography, transthoracic
70220	242	\$11,892	0.4%	0.4%	Radiologic examination, sinuses, paranasal, complete
93320	158	\$11,124	0.3%	0.4%	Doppler echocardiography, pulsed wave &/or continuous
93325	157	\$10,327	0.3%	0.4%	Doppler echocardiography color flow velocity mapping
70210	229	\$8,809	0.4%	0.3%	Radiologic examination, sinuses, paranasal
74160	52	\$8,701	0.1%	0.3%	Computed tomography, abdomen; with contrast material(s)
78478	106	\$8,532	0.2%	0.3%	Myocardial perfusion study with wall motion
78480	105	\$8,125	0.2%	0.3%	Myocardial perfusion study with ejection fraction
A9500	32	\$7,361	0.1%	0.3%	Technetium tc-99m sestamibi, diagnostic
Q9949	103	\$6,363	0.2%	0.2%	Low osmolar contrast material
73701	35	\$5,122	0.1%	0.2%	Computed tomography, lower extremity; with contrast
70486	31	\$4,757	0.1%	0.2%	Computed tomography, maxillofacial area; without contrast
93970	43	\$4,500	0.1%	0.2%	Duplex scan of extremity veins including responses to compression
Total	59,138	\$2,913,164	100.0%	100.0%	

Common Pneumonia non-related Imaging, Ambulatory Episode, 2 wk

CPT	Label	Related	Not Related	Related Costs	Non-Related Costs
93307	Echocardiography, transthoracic, real-time with image docu	162	479	\$24,850	\$84,061
78465	Myocardial perfusion imaging; tomographic (SPECT), multip	103	108	\$41,704	\$55,257
71275	Computed tomographic angiography, chest (noncoronary),	493	209	\$105,738	\$51,465
74160	Computed tomography, abdomen; with contrast material(s)	52	240	\$8,701	\$49,520
72193	Computed tomography, pelvis; with contrast material(s)	0	293	\$0	\$47,826
70553	Magnetic resonance (eg, proton) imaging, brain (including b	0	72	\$0	\$46,172
93325	Doppler echocardiography color flow velocity mapping (List	157	455	\$10,327	\$39,022
93320	Doppler echocardiography, pulsed wave and/or continuous	158	477	\$11,124	\$38,316
70450	Computed tomography, head or brain; without contrast mat	39	279	\$4,475	\$35,174
70486	Computed tomography, maxillofacial area; without contrast	31	173	\$4,757	\$34,621
72192	Computed tomography, pelvis; without contrast material	23	220	\$2,920	\$34,507
72148	Magnetic resonance (eg, proton) imaging, spinal canal and	2	74	\$320	\$33,961
74150	Computed tomography, abdomen; without contrast material	25	221	\$3,184	\$33,960
74170	Computed tomography, abdomen; without contrast material	17	111	\$3,649	\$26,605
72141	Magnetic resonance (eg, proton) imaging, spinal canal and	0	61	\$0	\$23,664

Top 20, Pneumonia-related Tests, Ambulatory Episode, 2 wk

- 3% of total episode costs

CPT	Svcs.	Cost	% of Svcs	% of Cost	Description
85025	8,586	\$103,800	18.1%	12.0%	Blood count; complete (CBC)
93000	1,782	\$64,259	3.8%	7.4%	Electrocardiogram, with interpretation and report
94060	815	\$58,055	1.7%	6.7%	Bronchodilation responsiveness, spirometry
94010	1,096	\$47,894	2.3%	5.5%	Spirometry, including graphic record
93010	2,693	\$46,897	5.7%	5.4%	Electrocardiogram, interpretation and report only
36415	6,403	\$38,112	13.5%	4.4%	Collection of venous blood by venipuncture
94760	2,392	\$27,714	5.0%	3.2%	Noninvasive ear or pulse oximetry for oxygen saturation
80053	1,700	\$26,641	3.6%	3.1%	Comprehensive metabolic panel
87804	1,298	\$25,182	2.7%	2.9%	Infectious agent antigen detection by immunoassay; Influenza
87880	1,199	\$21,946	2.5%	2.5%	Infectious agent detection by immunoassay; Streptococcus
88305	137	\$15,508	0.3%	1.8%	Level IV - Surgical pathology
94720	248	\$14,148	0.5%	1.6%	Carbon monoxide diffusing capacity
86738	429	\$12,735	0.9%	1.5%	Antibody; mycoplasma
85027	975	\$11,413	2.1%	1.3%	Blood count; complete (CBC)
80048	837	\$10,714	1.8%	1.2%	Basic metabolic panel (Calcium, total)
80050	256	\$10,587	0.5%	1.2%	General health panel
93015	69	\$10,234	0.1%	1.2%	Cardiovascular stress test using treadmill or bicycle exercise
87040	574	\$9,546	1.2%	1.1%	Culture, bacterial; blood, aerobic, with isolation
86635	223	\$9,213	0.5%	1.1%	Antibody; Coccidioides
94240	184	\$8,851	0.4%	1.0%	Functional residual capacity or residual volume
Total	47,374	\$866,440	100.0%	100.0%	

Common Pneumonia non-related Tests, Ambulatory Episode, 2 wk

CPT	Label	Related	Not Related	Related Costs	Non-Related Costs
88305	Level IV - Surgical pathology, gross and microscopic examir	137	597	\$15,508	\$80,044
80061	Lipid panel This panel must include the following: Cholesterol	440	1,853	\$8,742	\$37,153
85025	Blood count; complete (CBC), automated (Hgb, Hct, RBC, V	8,586	3,079	\$103,800	\$36,914
95811	Polysomnography; sleep staging with 4 or more additional p	0	52	\$0	\$34,665
88185	Flow cytometry, cell surface, cytoplasmic, or nuclear marker	1	12	\$441	\$31,763
80053	Comprehensive metabolic panel This panel must include the	1,700	1,848	\$26,641	\$30,456
80050	General health panel This panel must include the following:	256	651	\$10,587	\$26,852
84443	Thyroid stimulating hormone (TSH)	226	958	\$5,783	\$25,617
36415	Collection of venous blood by venipuncture	6,403	3,319	\$38,112	\$19,725
94060	Bronchodilation responsiveness, spirometry as in 94010, pre	815	286	\$58,055	\$19,271
86003	Allergen specific IgE; quantitative or semiquantitative, each	22	69	\$6,576	\$18,976
93015	Cardiovascular stress test using maximal or submaximal tre	69	107	\$10,234	\$15,859
94010	Spirometry, including graphic record, total and timed vital ca	1,096	276	\$47,894	\$11,544
94720	Carbon monoxide diffusing capacity (eg, single breath, stea	248	191	\$14,148	\$10,326
80048	Basic metabolic panel (Calcium, total) This panel must inclu	837	733	\$10,714	\$9,742
87880	Infectious agent detection by immunoassay with direct optica	1,199	401	\$21,946	\$7,427
94760	Noninvasive ear or pulse oximetry for oxygen saturation; sin	2,392	197	\$27,714	\$2,305
87804	Infectious agent antigen detection by immunoassay with dire	1,298	84	\$25,182	\$1,654

Top 20, Pneumonia-related OP Facility Claims, Ambulatory Episode, 2 wk

- 16% of total episode costs

CPT	Svcs.	Cost	% of Svcs	% of Cost	Description
71020	5,960	\$754,586	18.9%	16.5%	Radiologic examination, chest, two views, frontal and lateral
99284	1,009	\$475,506	3.2%	10.4%	Emergency department visit for E&M care
71260	441	\$370,134	1.4%	8.1%	Computed tomography, thorax; with contrast material(s)
99283	1,053	\$317,909	3.3%	6.9%	Emergency department visit for E&M care
99285	385	\$274,228	1.2%	6.0%	Emergency department visit for E&M care
71275	175	\$184,666	0.6%	4.0%	Computed tomographic angiography, chest (noncoronary)
87040	808	\$103,940	2.6%	2.3%	Culture, bacterial; blood, aerobic
90765	545	\$96,815	1.7%	2.1%	Intravenous infusion, for therapy, prophylaxis, or diagnosis
71250	128	\$94,730	0.4%	2.1%	Computed tomography, thorax; without contrast material
85025	1,948	\$93,165	6.2%	2.0%	Blood count; complete (CBC), automated
80053	871	\$92,340	2.8%	2.0%	Comprehensive metabolic panel
93005	849	\$89,519	2.7%	2.0%	Electrocardiogram, routine ECG with at least 12 leads
90774	642	\$70,732	2.0%	1.5%	Therapeutic, prophylactic or diagnostic injection
99282	382	\$70,598	1.2%	1.5%	Emergency department visit for E&M care
80048	807	\$67,616	2.6%	1.5%	Basic metabolic panel (Calcium, total)
94640	800	\$51,296	2.5%	1.1%	Pressurized or nonpressurized inhalation treatment
90775	408	\$48,757	1.3%	1.1%	Therapeutic, prophylactic or diagnostic injection
J0696	338	\$42,331	1.1%	0.9%	Injection, ceftriaxone sodium, per 250 mg
84484	504	\$42,045	1.6%	0.9%	Troponin, quantitative
71270	49	\$41,550	0.2%	0.9%	Computed tomography, thorax; w/ & w/o contrast
Total	31,570	\$4,575,776	100.0%	100.0%	

Common Pneumonia non-related OP Facility Claims, Ambulatory Episode, 2 wk

CPT	Label	Related	Not Related	Related Costs	Non-Related Costs
99284	Emergency department visit for the evaluation and management of a patient with a chief complaint of	1,007	134	\$474,623	\$64,199
72193	Computed tomography, pelvis; with contrast material(s)		72		\$57,607
99283	Emergency department visit for the evaluation and management of a patient with a chief complaint of	1,052	164	\$317,434	\$49,599
99285	Emergency department visit for the evaluation and management of a patient with a chief complaint of	385	61	\$274,228	\$42,340
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s)	175	31	\$184,666	\$34,590
G0378	Hospital observation service, per hour	58	19	\$36,588	\$29,835
80053	Comprehensive metabolic panel This panel must include the following: glucose, calcium, total protein, total bilirubin, aspartate aminotransferase, alanine aminotransferase, and creatinine	868	293	\$91,641	\$28,016
36415	Collection of venous blood by venipuncture	1,333	490	\$36,056	\$23,157
85025	Blood count; complete (CBC), automated (Hgb, Hct, RBC, WBC, platelets)	1,943	504	\$92,631	\$20,711
99282	Emergency department visit for the evaluation and management of a patient with a chief complaint of	382	91	\$70,598	\$16,961
90774	Therapeutic, prophylactic or diagnostic injection (specify substance and route)	642	113	\$70,732	\$16,622
80048	Basic metabolic panel (Calcium, total) This panel must include the following: calcium, total protein, total bilirubin, aspartate aminotransferase, alanine aminotransferase, and creatinine	804	205	\$67,015	\$13,611
90775	Therapeutic, prophylactic or diagnostic injection (specify substance and route)	408	66	\$48,757	\$9,773
90765	Intravenous infusion, for therapy, prophylaxis, or diagnosis (specify drug, dose, and duration)	545	40	\$96,815	\$8,972
94640	Pressurized or nonpressurized inhalation treatment for acute or chronic respiratory condition	798	104	\$51,062	\$8,543
87040	Culture, bacterial; blood, aerobic, with isolation and presumptive identification	804	55	\$103,062	\$7,690

Pneumonia-related Inpatient Admissions, Ambulatory Episode, 2 wk

- 10% of total episode costs

Primary Diagnosis	N	Amt
486 -Pneumonia, Organism NOS	466	\$3,980,732
51881-Acute Respiratory Failure	60	\$1,383,607
0389 -Septicemia NOS	39	\$915,114
5109 -Empyema w/o Fistula	33	\$558,827
5119 -Pleural Effusion NOS	30	\$379,316
03811-Staph Aureus Septicemia	6	\$302,116
4821 -Pseudomonal Pneumonia	14	\$236,268
48241-Staph Aureus Pneumonia	13	\$211,468
0382 -Pneumococcal Septicemia	9	\$195,444
03842-E Coli Septicemia	4	\$168,227
03849-Gram-Neg Septicemia NEC	7	\$151,852
51884-Acute & Chronic Resp Fail	10	\$149,991
485 -Bronchopneumonia Org NOS	15	\$118,250
4820 -K. Pneumoniae Pneumonia	5	\$74,667
481 -Pneumococcal Pneumonia	6	\$63,969
Top 10	674	\$8,331,119
Total	771	\$9,565,251

CMS-DRG (2006)	N	Amt
089-SIMPLE PNEUMONIA & PLEURISY AGE > 15	54	\$422,052
075-MAJOR CHEST PROCEDURES	13	\$227,377
090-SIMPLE PNEUMONIA & PLEURISY AGE < 15	29	\$182,357
576-Septicemia w/o MV 96+ hours w MCC	6	\$99,678
079-RESPIRATORY INFECTIONS & INFLAMMATORY	7	\$78,857
076-OTHER RESP SYSTEM O.R. PROCEDURES	4	\$71,101
087-PULMONARY EDEMA & RESPIRATORY FAILURE	3	\$59,021
575-Septicemia w MV 96+ hours	1	\$37,680
578-Infectious & parasitic diseases w O.R. procedure	2	\$36,008
566-Respiratory system diagnosis w ventilator support	2	\$28,892

MS-DRG (2007)	N	Amt
194-Simple pneumonia & pleurisy w CC	174	\$1,360,227
195-Simple pneumonia & pleurisy w/o CC/MCC	173	\$1,188,797
871-Septicemia w/o MV 96+ hours w MCC	39	\$982,571
163-Major chest procedures w MCC	33	\$654,845
189-Pulmonary edema & respiratory failure	39	\$574,095
193-Simple pneumonia & pleurisy w MCC	37	\$384,669
004-Trach w MV 96+ hrs or PDX exc face, mouth	4	\$338,507
166-Other resp system O.R. procedures w MCC	10	\$319,862
207-Respiratory system diagnosis w ventilator support	11	\$315,058
853-Infectious & parasitic diseases w O.R. procedure	6	\$268,288

Non-Pneumonia-related Inpatient Admissions, Ambulatory Episode, 2 wk

Primary Diagnosis	N	Amt
41401-Crnry Athrscl Natve Vssl	175	\$3,845,335
71536-Loc Osteoarth NOS-L/Leg	98	\$1,893,802
4280 -Chf NOS	115	\$1,640,915
49121-Obs Chr Bronc W(Ac) Exac	124	\$1,099,230
V5789-Rehabilitation Proc NEC	39	\$1,092,761
78659-Chest Pain NEC	128	\$1,025,689
41071-Subendo Infarct, Initial	49	\$966,795
27801-Morbid Obesity	62	\$901,133
515 -Postinflam Pulm Fibrosis	61	\$821,318
42731-Atrial Fibrillation	66	\$703,966
41519-Pulm Embol/Infarct NEC	65	\$700,228
56211-Dvrtcli Colon wo Hmrhg	64	\$680,512
72210-Lumbar Disc Displacement	40	\$620,159
4240 -Mitral Valve Disorder	12	\$567,495
71596-Osteoarthros NOS-L/Leg	33	\$567,482
Top 10	917	\$13,990,944
Total	5,096	\$62,737,683

CMS-DRG (2006)	N	Amt
108-OTHER CARDIOTHORACIC PROCEDURE	4	\$224,648
088-CHRONIC OBSTRUCTIVE PULMONARY D	23	\$179,084
075-MAJOR CHEST PROCEDURES	11	\$177,324
078-PULMONARY EMBOLISM	15	\$152,534
105-CARDIAC VALVE & OTH MAJOR CARDIO	1	\$138,060
110-MAJOR CARDIOVASCULAR PROCEDURE	4	\$113,138
127-HEART FAILURE & SHOCK	13	\$110,673
076-OTHER RESP SYSTEM O.R. PROCEDUR	7	\$104,374
544-MAJOR JOINT REPLACEMENT OR REAT	9	\$90,435
079-RESPIRATORY INFECTIONS & INFLAMM	8	\$83,716

MS-DRG (2007)	N	Amt
470-Major joint replacement or reattachment of	170	\$3,307,592
249-Perc cardiovasc proc w non-drug-eluting st	83	\$1,821,532
460-Spinal fusion except cervical w/o MCC	89	\$1,643,568
392-Esophagitis, gastroent & misc digest disord	167	\$1,140,201
743-Uterine & adnexa proc for non-malignancy	126	\$1,122,487
885-Psychoses	163	\$1,034,837
313-Chest pain	127	\$904,092
227-Cardiac defibrillator implant w/o cardiac cat	22	\$844,391
287-Circulatory disorders except AMI, w card ca	86	\$823,580
621-O.R. procedures for obesity w/o CC/MCC	49	\$722,812

Pneumonia-Related Drug Costs, Ambulatory Episode, 2 wk

- Notes: Drugs compose 23% of total episode costs

Generic Drug Name	N	Amount	% of N	% of Amount
Levofloxacin	15,834	\$1,547,963	5.6%	8.4%
Fluticasone Propionate/Salmeterol Xinafoa	8,167	\$1,460,522	2.9%	8.0%
Levofloxacin	9,180	\$1,314,083	3.3%	7.2%
Azithromycin	24,323	\$1,141,836	8.6%	6.2%
Moxifloxacin Hydrochloride	10,395	\$1,003,905	3.7%	5.5%
Fluticasone Propionate/Salmeterol Xinafoa	2,960	\$764,458	1.1%	4.2%
Cetirizine Hydrochloride	8,154	\$729,154	2.9%	4.0%
Fexofenadine Hydrochloride	8,056	\$592,663	2.9%	3.2%
Amoxicillin/Clavulanate Potassium	6,415	\$543,439	2.3%	3.0%
Fluticasone Propionate	7,081	\$506,562	2.5%	2.8%
Albuterol Sulfate	11,311	\$383,793	4.0%	2.1%
Mometasone Furoate	4,475	\$383,167	1.6%	2.1%
Clarithromycin	4,537	\$375,185	1.6%	2.0%
Fluticasone Propionate/Salmeterol Xinafoa	2,675	\$369,245	1.0%	2.0%
Albuterol Sulfate/Ipratropium Bromide	3,658	\$325,033	1.3%	1.8%
Clarithromycin	3,524	\$280,898	1.3%	1.5%
Valacyclovir Hydrochloride	1,704	\$271,838	0.6%	1.5%
Valacyclovir Hydrochloride	1,371	\$263,469	0.5%	1.4%
Azithromycin	3,436	\$234,513	1.2%	1.3%
Albuterol	12,163	\$222,900	4.3%	1.2%
Top 20	149,419	\$12,714,627	53.1%	69.3%
Total	281,267	\$18,349,226	100.0%	100.0%

Common Pneumonia Non-related Drug Costs, Ambulatory Episode, 2 wk

Generic Drug Name	N	Amount	% of N	% of Amount
Esomeprazole Magnesium	15,437	\$2,903,347	1.8%	4.1%
Montelukast Sodium	13,743	\$1,551,113	1.6%	2.2%
Omeprazole	8,034	\$1,194,644	0.9%	1.7%
Etanercept	598	\$1,140,343	0.1%	1.6%
Lansoprazole	6,035	\$1,061,497	0.7%	1.5%
Adalimumab	489	\$965,473	0.1%	1.4%
Clopidogrel Hydrogen Sulfate	5,508	\$851,584	0.6%	1.2%
Atorvastatin Calcium	5,602	\$805,507	0.6%	1.1%
Tiotropium Bromide	4,521	\$722,441	0.5%	1.0%
Pantoprazole Sodium	5,114	\$681,076	0.6%	1.0%
Atorvastatin Calcium	5,491	\$565,804	0.6%	0.8%
Simvastatin	4,640	\$557,275	0.5%	0.8%
Venlafaxine Hydrochloride	3,618	\$555,254	0.4%	0.8%
Fenofibrate	4,162	\$543,752	0.5%	0.8%
Oxycodone Hydrochloride	684	\$543,507	0.1%	0.8%
Duloxetine Hydrochloride	4,514	\$540,130	0.5%	0.8%
Simvastatin	4,485	\$526,075	0.5%	0.7%
Ezetimibe	4,536	\$522,188	0.5%	0.7%
Celecoxib	3,834	\$516,880	0.4%	0.7%
Insulin Glargine, Recombinant	3,546	\$467,363	0.4%	0.7%

Pneumonia 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 – Ambulatory Pneumonia Episode

- Episodes will be attributed to the provider who billed for the visit acting as the episode's trigger or index event
 - These providers will be identified using the Provider ID number, where valid
- Providers of any specialty may be attributed the episode (though we recommend that comparisons of resource use between providers be made only within a single specialty)

Identifying Variability in Pneumonia-specific Resource Use

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

Ambulatory Pneumonia: Mean Resource Use by Type of Service, All Episodes

Description	Mean	% of Total	5 th %	25 th %	50 th %	75 th %	95 th %
Inpatient Facility Costs	\$43	10.9%	\$0	\$0	\$0	\$0	\$0
Durable Medical Equipment	\$2	0.5%	\$0	\$0	\$0	\$0	\$0
OP Facility Costs	\$69	17.5%	\$0	\$0	\$0	\$0	\$347
Imaging	\$43	10.9%	\$0	\$0	\$28	\$44	\$131
Evaluation and Management - IP	\$0	0.0%	\$0	\$0	\$0	\$0	\$0
Evaluation and Management - OP	\$134	33.9%	\$63	\$65	\$96	\$161	\$303
Other Services	\$12	3.0%	\$0	\$0	\$0	\$0	\$47
Procedures	\$11	2.8%	\$0	\$0	\$0	\$0	\$42
Tests	\$13	3.3%	\$0	\$0	\$0	\$12	\$66
Unclassified	\$1	0.2%	\$0	\$0	\$0	\$0	\$0
Drug Costs	\$67	17.1%	\$0	\$2	\$59	\$99	\$184
Total Costs	\$395	100.0%	\$65	\$142	\$232	\$367	\$995

n = 65,454

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

Description	US	Northeast	North Central	South	West
N	65,454	6,036	19,597	28,571	11,015
Inpatient Facility Costs	\$43	0.57	0.95	1.18	0.82
Durable Medical Equipment	\$2	0.51	0.68	1.25	1.22
OP Facility Costs	\$69	1.04	0.93	1.16	0.68
Imaging	\$43	0.72	0.98	1.14	0.83
Evaluation and Management - IP	\$0	0.00	0.00	0.00	0.00
Evaluation and Management - OP	\$134	0.96	0.97	1.05	0.95
Other Services	\$12	0.27	0.62	1.51	0.77
Procedures	\$11	0.64	0.76	1.30	0.84
Tests	\$13	0.89	0.75	1.27	0.79
Unclassified	\$1	0.45	0.79	1.38	0.71
Drug Costs	\$67	0.92	1.00	1.04	0.93
Total	\$395	0.86	0.94	1.12	0.86

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

Description	US	TX	CA	MI	GA	OH	TN	SC	IL	AL	FL
N	65,454	7,677	6,223	5,978	3,490	3,071	2,902	2,339	2,144	1,715	1,581
IP Facility	\$43	0.57	0.84	1.04	1.38	0.66	1.30	0.42	0.78	2.26	1.51
DME	\$2	0.51	0.93	0.44	1.23	0.43	0.66	2.51	0.44	0.72	1.16
OP Facility	\$69	1.04	0.53	0.54	0.60	0.58	1.05	1.38	1.87	0.75	1.98
Imaging	\$43	0.72	0.82	1.02	0.96	0.81	1.94	1.07	0.92	1.71	0.69
E & M – IP	\$0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E & M – OP	\$133	0.96	0.93	0.96	1.04	1.00	1.13	1.10	0.95	0.96	1.12
Other Services	\$12	0.27	0.87	0.53	1.42	0.39	1.84	3.32	0.36	3.36	0.92
Procedures	\$11	0.64	0.83	0.93	0.95	0.29	1.17	1.08	0.58	5.03	1.90
Tests	\$13	0.89	0.69	0.66	1.10	0.46	2.02	2.01	0.73	2.00	0.96
Unclassified	\$1	0.45	0.41	0.45	0.15	0.47	0.84	3.86	1.95	0.68	2.43
Drug Costs	\$67	0.92	0.94	1.01	0.86	0.84	1.13	1.06	1.14	1.02	0.93
Total	\$395	0.86	0.83	0.88	0.97	0.74	1.27	1.10	1.00	1.24	1.14

Ambulatory Pneumonia: Resource Use by Type of Service vs. Overall Mean, by Specialty

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

Description	All	Family Practice	Internal Medicine	Medical Doctor NEC	Emergency Medicine	Multi-Specialty Physician
N	65,454	31,151	12,182	5,184	5,080	2,352
IP Facility	\$43	0.76	0.91	1.06	2.39	1.46
DME	\$2	1.04	0.66	0.63	0.99	0.99
OP Facility	\$69	0.44	0.55	1.17	5.49	0.66
Imaging	\$43	0.94	0.97	1.00	1.50	0.87
E & M – IP	\$0	0.00	0.00	0.00	0.00	0.00
E & M – OP	\$134	0.89	0.89	0.98	1.91	1.09
Other Services	\$12	0.97	0.68	0.93	1.72	1.17
Procedures	\$11	0.99	0.78	0.68	1.48	1.21
Tests	\$13	0.93	0.98	0.80	1.32	0.90
Unclassified	\$1	0.85	0.53	2.10	1.34	0.51
Drug Costs	\$67	1.02	0.91	0.98	1.19	0.89
Total	\$395	0.83	0.84	1.01	2.38	1.01

Ambulatory Pneumonia: Resource Use by Type of Service vs. Overall Mean, by Specialty

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

Description	All	Mental Health	Pulmonary Disease	Other Facility NEC	Pediatrician	Nurse Practitioner
N	65,454	1,724	1,384	1,022	854	689
IP Facility	\$43	0.86	2.28	0.52	0.17	1.21
DME	\$2	2.22	2.07	0.51	0.55	0.82
OP Facility	\$69	0.26	1.00	0.37	0.39	3.13
Imaging	\$43	1.05	1.05	1.39	0.42	0.81
E & M – IP	\$0	0.00	0.00	0.00	0.00	0.00
E & M – OP	\$134	1.08	1.03	1.00	0.81	0.82
Other Services	\$12	0.97	0.82	0.50	0.49	1.28
Procedures	\$11	1.08	1.70	1.02	0.40	1.04
Tests	\$13	1.06	2.45	0.61	0.91	0.99
Unclassified	\$1	2.08	0.03	0.51	1.10	0.09
Drug Costs	\$67	1.32	0.55	1.06	0.82	0.77
Total	\$395	0.95	1.14	0.86	0.61	0.98

Risk Adjustment

- Testing of risk adjustment models
- Apply risk adjusted results to produce a procedure 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

Example Episode Report

Ambulatory Episode

Report for Physician #28118549

Provider type = Family Practice

	MD	Peer Group	Non-Peer Group	National Avg
Episodes	16	33,614	37,973	71,603
Observed Costs*				
Average	\$ 300	\$ 290	\$ 365	\$ 330
Min	\$ 65	\$ 65	\$ 65	\$ 65
Median	\$ 278	\$ 220	\$ 241	\$ 231
Max	\$ 760	\$ 1912	\$ 1912	\$ 1912
Predicted Costs				
Average	\$ 330	\$ 330	\$ 331	\$ 331
Min	\$ 314	\$ 229	\$ 174	\$ 174
Median	\$ 328	\$ 327	\$ 327	\$ 327
Max	\$ 400	\$ 780	\$ 743	\$ 780
Observed-to-Expected Ratio				
Average	0.90	0.88	1.10	1.00
Min	0.20	0.12	0.12	0.12
Median	0.85	0.67	0.73	0.70
Max	1.90	7.90	7.90	7.90
% ≥ 2.0	0%	5.9%	12.1%	9.2%
% ≥ 2.5	0%	3.9%	8.9%	6.5%

Notes:

- Use Model 12
- Includes all episodes

% ≥ 75th percentile

peers 31.3% (11.0%, 58.7%)

* Observed costs adjusted for outliers (windsorized)

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