



## Measure Information

This document contains the information submitted by measure developers/stewards, but is organized according to NQF's measure evaluation criteria and process. The item numbers refer to those in the submission form but may be in a slightly different order here. In general, the item numbers also reference the related criteria (e.g., item 1b.1 relates to subcriterion 1b).

### Brief Measure Information

**NQF #: 0708**

**Corresponding Measures:**

**De.2. Measure Title:** Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window)

**Co.1.1. Measure Steward:** Health Care Incentives Improvement Institute

**De.3. Brief Description of Measure:** Brief Description of Measure: Percent of adult population aged 18+ years with Community Acquired Pneumonia who are followed for one-month, and have one or more potentially avoidable complication (PAC) during the episode time window. Please reference the attached document labeled NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls, in the tab labeled PACS I-9 & I-10 for a list of code definitions of PACs relevant to pneumonia.

Community Acquired Pneumonia may be managed in an inpatient setting, where the patient is admitted to a hospital within 1-3 days of onset of symptoms, or in milder cases, patients may be hospitalized a little later in the course of illness, or never at all where management could be solely in an outpatient setting. In any of these circumstances, potentially avoidable complications (PACs) may occur during the index stay, in the post-discharge period; or in patients who were never hospitalized, PACs may occur any time during the episode time window. Readmissions due to pneumonia or due to any related diagnosis are also considered as PACs.

We define PACs as one of two types:

(1) Type 1 PACs - PACs directly related to the index condition: Patients are considered to have a type 1 PAC if they develop one or more complication directly related to pneumonia or its management. Examples of these PACs are respiratory insufficiency, other lung complications, fluid electrolyte acid base problems, sepsis, respiratory failure etc.

(2) Type 2 PACs - PACs suggesting Patient Safety Failures: Patients are considered to have a type 2 PAC, if they develop any of the complications related to patient safety failures such as phlebitis, deep vein thrombosis, pressure sores or for any of the CMS-defined hospital acquired conditions (HACs).

PACs are counted as a dichotomous (yes/no) outcome. If a patient had one or more PAC in any of the above settings, they get counted as a "yes" or a 1. The enclosed workbook labeled NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls serves as an example. The tab labeled PAC overview gives the percent of pneumonia episodes that have a PAC and the tab labeled "PAC drill down" gives the types of PACs and their frequencies in pneumonia episodes within this dataset.

The information is based on a two-year claims database from a large regional commercial insurer. The database had 3,258,706 covered lives and \$25.9 billion in "allowed amounts" for claims costs. The database is an administrative claims database with medical as well as pharmacy claims.

**1b.1. Developer Rationale:** Measures associated to potentially avoidable complication (PAC) have been used as comprehensive outcomes measures since 2007 for several conditions and procedures (de Brantes 2010) (Joynt 2013) (James 2013). In 2011, following the NQF endorsement of these measures for certain acute medical conditions (AMI, Pneumonia and Stroke), and for chronic conditions, they were adopted for various purposes, including the creation of related measures (NQF – Measure #1550). Some commercial payers have used them as a means for tracking outcomes (Yong 2010) and for tiering providers for pay for performance programs (BCBSNC). In addition, some provider organizations have used them in quality improvement efforts by homing in on the detailed specifications of the measures to reveal opportunities for care improvement (CALPERS – link below). Identification of PACs has spurred provider innovation (Bundled Payment Summit 2015) for practice re-engineering, to create proactive care pathways, and to focus on areas of high variability (McVary 2010). Some employers are also using measures of

potentially avoidable complications as public measures of quality (Colorado Business Group on Health) given the research that demonstrated the potential efficacy of these measures to differentiate provider quality and cost (Hibbard 2012). In fact in a series of focus groups led by Judy Hibbard and colleagues, the researchers found that the very framing of potentially avoidable complications as an indicator of potential harm, is an effective way of communicating the quality of care. And when measures of PACs were presented in conjunction with price, consumers intuitively accepted the logical relationship between low PACs – fewer “defects” – and lower price.

Accountability for and measurement of PACs occurs at the practice, medical group, hospital, provider system or purchaser/payer level. PAC rates are calculated as absolute values. For example, a health plan would report that 60% of its plan members with pneumonia incurred PACs in the study time window. The objective of the measure is to encourage the unit being measured to progressively reduce that amount over time. In addition, comparisons of PAC rates across plans or provider systems should be encouraged and publicly reported. An organization that uses the measure should be able to identify the leading causes of PACs and implement improvements to existing processes that will decrease PACs. There are several tools available for provider systems and health plans to impact PAC rates. These include care coordination across care settings; post-discharge planning and patient follow-up, active care management, sharing medical record data between care settings and providers, total quality management within hospitals and active reduction of patient safety failures. Reducing PACs has the potential to significantly improve the overall level of quality.

Creating a single measure of accountability for physicians and hospitals tied to gaps in quality is likely to yield much improved outcomes for patients. A measure of accountability for health plans helps them review trends over time and work with physicians and hospitals to improve the ways in which they engage patients using more optimal care management and care coordination (Cassel 2014). In addition, PAC measures could be used as a surrogate for quality in a consumer transparency tool to differentiate providers with regards to their performance.

Moreover, since these measures are claims based, there is minimal added burden for collecting the data, and it also avoids potential gaming that may occur for other measures that require reporting information to registries. Although use of administrative claims data in identifying conditions and measuring provider quality has been questioned, there are several studies in literature that acknowledge validity of its use (Normand 2007) (Quan 2009). Until more readily available data are at hand, use of administrative data to measure provider performance has steadily increased (Miller 2001), (NQF Quality Positioning System). Interestingly, in the current fee for service system, services for most PACs are rewarded by continued payment (except the CMS defined “never events” and non-payment for certain readmissions) and hence to our advantage, adverse events surface in billing data. Claims based PAC measures; therefore serve as an alternative method to track adverse outcomes that do occur (Leibson 2008).

#### References:

- 1) deBrantes F, Rastogi A, and Painter M. “Reducing Potentially Avoidable Complications in Patients with Chronic Diseases: The Prometheus Payment Approach.” Health Serv Res 45.6.2 (2010 Dec): 1854-1871. doi: 10.1111/j.1475-6773.2010.01136x
- 2) Joynt KE, Gawande AA, Orav EJ, and Jha AK. “Contribution of Preventable Acute Care Spending to Total Spending for High-Cost Medicare Patients.” JAMA 309.24 (2013): 2572-2578. doi: 10.1001/jama.2013.7103.
- 3) James JT. “A New, Evidence-based Estimate of Patient Harms Associated with Hospital Care.” J Patient Safety 9.3 (2013): 122-128.
- 4) See, for example: NQF#1550: Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and / or total knee arthroplasty (TKA). Online version: <http://bit.ly/1BWQTRt>
- 5) Yong, Pierre L., Robert Samuel Saunders, and LeighAnne Olsen. The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary. Washington, D.C.: National Academies, 2010. Institute of Medicine of the National Academies, 17 Dec. 2010. Web.
- 6) Blue Cross Blue Shield of North Carolina: [https://www.bcbsnc.com/assets/providers/public/pdfs/specialty\\_methodology.pdf](https://www.bcbsnc.com/assets/providers/public/pdfs/specialty_methodology.pdf)
- 7) Community Campaigns for Quality Care. “Recommendations to Reduce Potentially Avoidable Complications (PACs) among CalPERS Employees.” Editorial. Calpers.ca.gov. Community Campaigns for Quality Care, June 2012. Web.
- 8) 2015 Bundled Payment Summit – Day 1, Track IV: Washington DC June 3-5. <http://www.bundledpaymentsummit.com/agenda/day1.html>
- 9) Micaela P. McVary. “The Prometheus Model: Bringing Healthcare into the Next Decade.” Annals of Health Law Advance Directive 19 (2010): 274-284.

<p>10) Colorado Business Group on Health: Healthcare Incentives Payment Pilot (HIPPP): <a href="http://www.cbghhealth.org/projects/reducing-costs/healthcare-incentives-payment-pilot-hipp/">http://www.cbghhealth.org/projects/reducing-costs/healthcare-incentives-payment-pilot-hipp/</a></p> <p>11) Hibbard JH, Greene J, Sofaer S, Firminger K, Hirsh J. "An experiment shows that a well-designed report on costs and quality can help consumers choose high-value health care." <i>Health Aff (Millwood)</i> 31.3 (2012): 560-8. doi: 10.1377/hlthaff.2011.1168.</p> <p>12) Cassel, Christine, MD et al. "Getting More Performance from Performance Measurement." <i>New England Journal of Medicine</i> 371 (2014): 2145-147. Web.</p> <p>13) Normand, Sharon-Lise T., Yun Wang, and Harlan M. Krumholz. "Assessing Surrogacy of Data Sources for Institutional Comparisons." <i>Health Services and Outcomes Research Methodology Health Serv Outcomes Res Method</i> 7.1-2 (2007): 79-96. Web.</p> <p>14) Quan, H., N. Khan, B. R. Hemmelgarn, K. Tu, G. Chen, N. Campbell, M. D. Hill, W. A. Ghali, and F. A. Mcalister. "Validation of a Case Definition to Define Hypertension Using Administrative Data." <i>Hypertension</i> 54.6 (2009): 1423-428. Web.</p> <p>15) Miller MR, Elixhauser A, Zhan C, and Meyer G. "Patient Safety Indicators: Using Administrative Data to Identify Potential Patient Safety Concerns." <i>Heath Services Research</i> 36.6.2 (2001): 110-132.</p> <p>16) NQF: Quality Positioning System™. National Quality Forum, 2015. Web.: Available at <a href="http://bit.ly/1ijl5Ar">http://bit.ly/1ijl5Ar</a>, Last accessed June 29 2015.</p> <p>17) Leibson CL1, et al. "Identifying in-hospital venous thromboembolism (VTE): a comparison of claims-based approaches with the Rochester Epidemiology Project VTE cohort." <i>Med Care</i> 46.2 (2008):127-32.</p>
<p><b>S.4. Numerator Statement:</b> Outcome: Number of patients with pneumonia who had one or more potentially avoidable complications (PACs) during the episode time window.</p> <p><b>S.7. Denominator Statement:</b> Adult patients aged 18 years and above who have a pneumonia episode and are followed for at least one-month.</p> <p><b>S.10. Denominator Exclusions:</b> The target population captures adult patients (18+) in the dataset, who have a complete episode of community-acquired pneumonia, with no enrollment gaps, and no outlier costs. Patients who do not meet these criteria are excluded from the target population.</p>
<p><b>De.1. Measure Type:</b> Outcome</p> <p><b>S.23. Data Source:</b> Claims</p> <p><b>S.26. Level of Analysis:</b> Clinician : Individual, Facility, Population : Regional and State</p>
<p><b>IF Endorsement Maintenance – Original Endorsement Date:</b> Jan 17, 2011 <b>Most Recent Endorsement Date:</b> Jan 17, 2011</p>
<p><b>IF this measure is included in a composite, NQF Composite#/title:</b></p> <p><b>IF this measure is paired/grouped, NQF#/title:</b></p> <p><b>De.4. IF PAIRED/GROUPED, what is the reason this measure must be reported with other measures to appropriately interpret results?</b> N/A</p>

<p><b>1. Evidence, Performance Gap, Priority – Importance to Measure and Report</b></p>
<p>Extent to which the specific measure focus is evidence-based, important to making significant gains in healthcare quality, and improving health outcomes for a specific high-priority (high-impact) aspect of healthcare where there is variation in or overall less-than-optimal performance. <b>Measures must be judged to meet all subcriteria to pass this criterion and be evaluated against the remaining criteria.</b></p>
<p><b>1a. Evidence to Support the Measure Focus – See attached Evidence Submission Form</b>  <a href="#">0708_PNE_Evidence_Attachment_HCI3.docx</a></p>
<p><b>1b. Performance Gap</b>          Demonstration of quality problems and opportunity for improvement, i.e., data demonstrating:</p> <ul style="list-style-type: none"> <li>considerable variation, or overall less-than-optimal performance, in the quality of care across providers; and/or</li> <li>disparities in care across population groups.</li> </ul> <p><b>1b.1. Briefly explain the rationale for this measure (e.g., the benefits or improvements in quality envisioned by use of this measure)</b>          Measures associated to potentially avoidable complication (PAC) have been used as comprehensive outcomes measures since 2007 for several condgns and procedures (de Brantes 2010) (Joynt 2013) (James 2013). In 2011, following the NQF endorsement of</p>

these measures for certain acute medical conditions (AMI, Pneumonia and Stroke), and for chronic conditions, they were adopted for various purposes, including the creation of related measures (NQF – Measure #1550). Some commercial payers have used them as a means for tracking outcomes (Yong 2010) and for tiering providers for pay for performance programs (BCBSNC). In addition, some provider organizations have used them in quality improvement efforts by homing in on the detailed specifications of the measures to reveal opportunities for care improvement (CALPERS – link below). Identification of PACs has spurred provider innovation (Bundled Payment Summit 2015) for practice re-engineering, to create proactive care pathways, and to focus on areas of high variability (McVary 2010). Some employers are also using measures of potentially avoidable complications as public measures of quality (Colorado Business Group on Health) given the research that demonstrated the potential efficacy of these measures to differentiate provider quality and cost (Hibbard 2012). In fact in a series of focus groups led by Judy Hibbard and colleagues, the researchers found that the very framing of potentially avoidable complications as an indicator of potential harm, is an effective way of communicating the quality of care. And when measures of PACs were presented in conjunction with price, consumers intuitively accepted the logical relationship between low PACs – fewer “defects” – and lower price.

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- 1) deBrantes F, Rastogi A, and Painter M. “Reducing Potentially Avoidable Complications in Patients with Chronic Diseases: The Prometheus Payment Approach.” Health Serv Res 45.6.2 (2010 Dec): 1854-1871. doi: 10.1111/j.1475-6773.2010.01136x
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- 4) See, for example: NQF#1550: Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and / or total knee arthroplasty (TKA). Online version: <http://bit.ly/1BWQTRt>
- 5) Yong, Pierre L., Robert Samuel Saunders, and LeighAnne Olsen. The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary. Washington, D.C.: National Academies, 2010. Institute of Medicine of the National Academies, 17 Dec. 2010. Web.
- 6) Blue Cross Blue Shield of North Carolina:  
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- 8) 2015 Bundled Payment Summit – Day 1, Track IV: Washington DC June 3-5.  
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- 9) Micaela P. McVary. "The Prometheus Model: Bringing Healthcare into the Next Decade." *Annals of Health Law Advance Directive* 19 (2010): 274-284.
- 10) Colorado Business Group on Health: Healthcare Incentives Payment Pilot (HIPP):  
<http://www.cbghhealth.org/projects/reducing-costs/healthcare-incentives-payment-pilot-hipp/>
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- 16) NQF: Quality Positioning System™. National Quality Forum, 2015. Web.: Available at <http://bit.ly/1ijl5Ar>, Last accessed June 29 2015.
- 17) Leibson CL1, et al. "Identifying in-hospital venous thromboembolism (VTE): a comparison of claims-based approaches with the Rochester Epidemiology Project VTE cohort." *Med Care* 46.2 (2008):127-32.

**1b.2. Provide performance scores on the measure as specified (current and over time) at the specified level of analysis.** *(This is required for endorsement maintenance. Include mean, std dev, min, max, interquartile range, scores by decile. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included). This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.*

The data included two years of administrative claims covering the period April 1, 2012 through December 17, 2014. There were a total 13,228 episodes of pneumonia with over 54% of episodes having one or more potentially avoidable complications. The enclosed workbook entitled NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls lists the types of PACs and their frequency as calculated in this database. The PAC overview tab shows the PAC rates in various settings across all episodes and the PAC drill down graph gives the details for each individual PAC type.

Over 27% of Community Acquired Pneumonia patients were managed in an inpatient setting, and another 30% had an outpatient facility encounter. The remaining patients were managed completely in doctor's offices and in the community setting. 54% of all pneumonia episodes had a PAC, 20% of them being observed in an inpatient setting, 13% in an outpatient setting and 50% in a professional setting. Majority of the PACs incurred were directly related to the pneumonia (type 1 PACs: 91%) such as respiratory insufficiency (23%), other lung complications (19%), fluid and electrolyte problems (14%), respiratory failure (12%) and sepsis (9%). Some of these patients also had Type 2 PACs related to patient comorbidities or patient safety failures. Overall 21% of patients had a type 2 PAC, such as urinary tract infection (4.5%), diabetes poor control (4%), aspiration pneumonia (3%), deep vein thrombosis (2.9%) and pulmonary embolism (2.5%). Four percent of all pneumonia patients had a readmission. The primary cause for readmissions and emergency room visits during the 30-day post-discharge period was due to respiratory failure, a repeat pneumonia, or sepsis.

Health plan PAC scores help look at network performance and helps plans target improvement opportunities through patient engagement tools, nurse help lines or by network management.

Provider level PAC scores were also calculated. Pneumonia episodes were attributed to the treating facilities in cases where the patients were hospitalized, and in a second attribution exercise to physicians who were primarily responsible for managing the pneumonia (those with the maximum number of E&M services).

Because providers with small volumes may provide unreliable estimates, we excluded any providers with fewer than 10 attributed episodes prior to the calculations. In the current database, 82 facilities and 170 physicians had cared for at least 10 patients during the analysis time period. Performance scores (PAC rates) for these facilities and providers are summarized in the following table:

#0708 Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window), Last Updated: Mar 05, 2018

Facility Unadjusted PAC Rates (n=82):

Median (IQR): 63% (58%, 69%)

Range: 27% - 100%

Facility Risk-Standardized PAC Rates (RSPR):

Median (IQR): 63% (57%, 69%)

Range: 30% - 91%

Physician Unadjusted PAC Rates (n=170):

Median (IQR): 60% (43%, 79%)

Range: 0% - 100%

Physician Risk-Standardized PAC Rates (RSPR):

Median (IQR): 58% (44%, 70%)

Range: 0% - 100%

Please refer to the NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls workbook under the “Facility RSPR & Reliability” and “Physician RSPR & Reliability” tabs to see specific results for each facility and physician respectively.

The variation in risk-standardized PAC rates across providers suggests there the measure identifies meaningful differences in performance among providers that manage pneumonia at both the level of facilities and physicians

The ability to clearly identify the type and frequency of each PAC creates a highly actionable measure for all providers that are managing or co-managing the patient, as well as for the health plan with whom the patient is a member.

**1b.3. If no or limited performance data on the measure as specified is reported in 1b2, then provide a summary of data from the literature that indicates opportunity for improvement or overall less than optimal performance on the specific focus of measurement.**

Pneumonia is a leading cause of mortality and morbidity in the US population (CDC 2015). Hospitalizations and readmissions due to community-acquired pneumonia are common and may not always be warranted (AHRQ 2015). Pneumonia has long been subject to quality improvement efforts and was often used as a marker for hospital quality (Meehan 2001). It has been shown that weekend admissions and decreased hospital reimbursements may lead to worse outcomes suggesting opportunity for improvement by implementing better processes in care (Guann-Ming Chang 2011). Clear guidelines have been published outlining criteria for admissions (PSI criteria, CURB-65 criteria, Niederman 2001). Adherence to guidelines results in better outcomes (Martinez 2009).

With the publication of clear-cut guidelines for selection of patients for outpatient management; there have been reports of better survival and more favorable outcomes in patients with pneumonia (Carratalà 2005), perhaps due to shifting of care into outpatient setting and due to decrease in inpatient complications. A recent report however suggested that the perceived improvement in pneumonia outcomes may be an artifact of secular trends in changes in documentation and coding towards sepsis and respiratory failure (Lindenauer 2012), suggesting an ongoing performance gap in the care of pneumonia patients.

Additionally, potentially avoidable complications may occur anytime during the course of a patient’s illness, especially if pneumonia patients get hospitalized. Once hospitalizations occur, the index stay itself may have a potentially avoidable complication (PAC) or patients may develop a PAC during the 30-day post-discharge period. PACs lead to significant variability in outcomes including prolonged length of stay, readmissions and emergency room visits, all indicating poor outcomes that harm the patient, cause payers to incur unnecessary costs and could be improved by providers (de Brantes 2011).

Readmissions constitute an important part of the PAC measure. Two-thirds of eligible hospitals had readmission rates that were higher than that predicted by the CMS model, highlighting the continued need for better care coordination across providers and the community to prevent PACs (Dharamrajan 2013). Importantly, recent studies have shown that high performing hospitals had fewer readmissions within 30 days for all common diagnoses, suggesting possible benefits of adopting strategies to reduce readmissions globally (Jack 2009, Dharmarajan 2013).

While PACs may not be completely eliminated, identifying their magnitude and understanding their causality, in particular for the



most frequent or the most expensive, could lead to improving patient outcomes (de Brantes 2008) (de Brantes 2009).

#### References

- 1) Centers for Disease Control and Prevention: <http://www.cdc.gov/nchs/fastats/deaths.htm> - Accessed Dec 6th 2015.
- 2) Agency for Health Research and Quality: <http://archive.ahrq.gov/research/findings/factsheets/pneumonia/issue7/> - Accessed Dec 6th 2015.
- 3) Meehan TP, Weingarten SR, Holmboe ES, et al. A statewide initiative to improve the care of hospitalized pneumonia patients: the Connecticut Pneumonia Pathway Project. *Am J Med.* 2001;111(3): 203-210.
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- 5) PSI criteria: Fine MJ, Auble TE, Yealy DM, Hanusa BH, Weissfeld LA, Singer DE, Coley CM, Marrie TJ, Kapoor WN. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N Engl J Med.* 1997;336(4):243.
- 6) CURB-65 criteria: Guidelines for the management of community-acquired pneumonia in adults admitted to hospital. The British Thoracic Society. *Br J Hosp Med.* 1993; 49(5):346.
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- 8) Martínez R, Reyes S, Lorenzo MJ, Menéndez R. Impact of Guidelines on Outcome: the evidence. *Semin Respir Crit Care Med* 2009; 30(2): 172.
- 9) Carratalà J, Fernández-Sabé N, Ortega L, Castellsagué X, Rosón B, Dorca J, Fernández-Agüera A, Verdaguer R, Martínez J, Manresa F, Gudiol F. Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. *Ann Intern Med.* 2005;142(3):165.
- 10) Peter K. Lindenauer, Tara Lagu, Meng-Shiou Shieh, Penelope S. Pekow, Michael B. Rothberg. Association of Diagnostic Coding With Trends in Hospitalizations and Mortality of Patients With Pneumonia, 2003-2009. *JAMA.* 2012;307(13):1405-1413
- 11) Dharmarajan, Kumar, et al. "Diagnoses and Timing of 30-Day Readmissions After Hospitalization for Heart Failure, Acute Myocardial Infarction, or Pneumonia." *JAMA* 309.4 (2013): 355. Web.
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- 14) de Brantes F, Rastogi A, and Sorensen CM. Episode of Care Analysis Reveals Sources of Variation in Costs. *Am J Manag Care.* 2011; 17(10): e383-e392.
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- 16) de Brantes, François M.S., M.B.A., Meredith B. Rosenthal, Ph.D., and Michael Painter, J.D., M.D. "Building a Bridge from Fragmentation to Accountability —The Prometheus Payment Model." *NEJM* (2009): 361:1033 (Perspective)

**1b.4. Provide disparities data from the measure as specified (current and over time) by population group, e.g., by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability.** *(This is required for endorsement maintenance. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities include.) This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.*

Not Applicable

**1b.5. If no or limited data on disparities from the measure as specified is reported in 1b4, then provide a summary of data from the literature that addresses disparities in care on the specific focus of measurement. Include citations.**

Various studies have documented health disparities between African-Americans and Caucasians hospitalized with common infectious diseases (Richardus 2001, Keppel 2007). Some studies demonstrated that African-American patients with community acquired pneumonia (CAP) do not receive timely antibiotic treatment or lag behind in other process measures such as smoking cessation counseling or pneumococcal or influenza immunizations (Fine 2002, Mortensen 2004, Bennett 1995, Hausmann 2009). However, a large multicenter study based on an analysis of over 40,000 patients with CAP managed over 5 years across 150 Veterans Health administration (VHA) hospitals demonstrated that African-Americans and Caucasians were equally likely to receive guideline-concordant antibiotics and experienced similar 30-day mortality when treated in medical wards. When admitted to the ICU, African Americans, in fact experienced a survival advantage with a lower 30-day mortality as well as shorter hospital LOS as compared to their Caucasians counterparts (Frei 2010).

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#### 1c. High Priority (previously referred to as High Impact)

The measure addresses:

- a specific national health goal/priority identified by DHHS or the National Priorities Partnership convened by NQF; OR
- a demonstrated high-priority (high-impact) aspect of healthcare (e.g., affects large numbers of patients and/or has a substantial impact for a smaller population; leading cause of morbidity/mortality; high resource use (current and/or future); severity of illness; and severity of patient/societal consequences of poor quality).

##### 1c.1. Demonstrated high priority aspect of healthcare

Affects large numbers, A leading cause of morbidity/mortality, High resource use, Patient/societal consequences of poor quality, Severity of illness, Other

1c.2. If Other: Lot of variability in complication rates and care patterns

##### 1c.3. Provide epidemiologic or resource use data that demonstrates the measure addresses a high priority aspect of healthcare.

##### List citations in 1c.4.

Pneumonia is a leading cause of mortality and morbidity in the US population (CDC 2015). There may be up to 5 to 6 million cases of community-acquired pneumonia (CAP) diagnosed annually in the United States, accounting for approximately 1 million hospitalizations and approximately 10 million physician visits (Aliberti 2008). It is estimated that the annual cost of treating CAP in the United States is \$12.2 billion (Colice 2004). Pneumonia is the second most common reason for hospitalization after childbirth (AHRQ - 2013). Hospitalizations and readmissions due to community-acquired pneumonia are common and may not always be warranted (AHRQ 2015). When hospitalizations do occur, they must be managed expeditiously and readmissions following discharge should be avoided (MedPac 2007, Meehan 2001).

The concept of preventable complications is well founded in medical literature. Hospital acquired conditions (HACs) have been defined by the Centers for Medicare and Medicaid (CMS) under the proposed rules for 2008 and 2009. Other potentially avoidable complications have been suggested by AHRQ as prevention safety indicators (PSIs). More broadly, potentially avoidable complications are rampant and programs are being set up in place to address them (Weaver 2013, Watcher 2013, Shekelle 2013). Umscheid et al (2008) used 2002 estimates of hospital-acquired infections (HAI) and determined the range of HAI risk reductions from US studies. They and others report that 18%-82% of blood-stream infections, 46%-55% of ventilator associated pneumonia, 17% - 69% of urinary tract infections and 26%-54% of surgical site infections are preventable (Ranji 2007). The National Pressure Ulcer Advisory Panel (NPUAP) reported in 2001 that pressure ulcer prevention programs had reported 50% or greater reductions in facility-acquired pressure ulcers (Cuddigan 2001). Similarly, appropriate prophylaxis could reduce the risk of venous thromboembolism by 45% in acutely ill medical patients (Leizorowicz 2004), and a recent study found a 50% reduction in



thromboembolic events with extended pharmacologic prophylaxis (Hull 2007). Adequate evidence-based treatment protocols in preventing contrast nephropathy and adequate drug dosing have demonstrated a risk reduction between 52% and 90% in the incidence of acute renal failure in patients in the intensive care unit (Singri 2003). Additionally, use of hospital electronic medical systems has demonstrated that in a sample hospital that used prompts for protocols for nursing care, infection rates dropped 88%, bedsores were reduced and compliance to guidelines for care of patients on ventilator increased by 77% (Landro 2009).

Readmissions constitute an important part of the PAC measure. Readmissions are rampant and represent waste within the healthcare system (Dharmarajan 2013, Jiang 2006). The June 2007 MedPAC report to Congress on "Promoting Greater Efficiency in Medicare" highlighted the fact that in 2005, \$12 billion were spent on potentially preventable readmissions alone within 30 days of discharge from the hospital. Another study by Jencks and colleagues found that roughly 19.6% of Medicare patients incurred re-hospitalizations within 30 days of discharge (Jencks 2009). Jack et al proposed a reengineered hospital discharge program to reduce readmission (Jack 2009). In Oct 2012, CMS initiated the Hospital Readmissions Reduction Program (HRRP), in an effort to reduce the readmission rate of Medicare patients (MedPAC 2013). If the readmission rate exceeds the expected readmissions rates, then financial penalties are imposed. The main impact of the HRRP has been to increase the efforts of hospitals to reduce readmissions. Two-thirds of eligible hospitals had readmission rates that were higher than that predicted by the CMS model, highlighting the continued need for better care coordination across providers and the community to prevent PACs (Jyont 2013). Subsequently, CMS reported a decline in readmissions ever since the penalties were imposed averting an estimated 150,000 hospitalization in just the fourth quarter of 2012 (MedPAC 2013).

Lewis et al suggest that a stratified approach targeting high impact conditions, using data to identify areas of opportunity and focused interventions with feedback loops could form a self-learning system that could avert "Triple Fail" events before they occur (Lewis 2013). While PACs may not be completely eliminated, identifying their magnitude and understanding their causality, in particular for the most frequent or the most expensive, could lead to improving patient outcomes (de Brantes 2008) (de Brantes 2009).

#### **1c.4. Citations for data demonstrating high priority provided in 1a.3**

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Medicine 158.5\_Part\_2 (2013): 365-69. Web.

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**1c.5. If a PRO-PM (e.g. HRQoL/functional status, symptom/burden, experience with care, health-related behaviors), provide evidence that the target population values the measured PRO and finds it meaningful. (Describe how and from whom their input was obtained.)**

## 2. Reliability and Validity—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. ***Measures must be judged to meet the subcriteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.***

**2a.1. Specifications** The measure is well defined and precisely specified so it can be implemented consistently within and across organizations and allows for comparability. eMeasures should be specified in the Health Quality Measures Format (HQMF) and the Quality Data Model (QDM).

**De.5. Subject/Topic Area** (check all the areas that apply):

Respiratory, Respiratory : Pneumonia

**De.6. Non-Condition Specific** (check all the areas that apply):

Care Coordination, Care Coordination : Readmissions, Care Coordination : Transitions of Care, Safety : Complications, Safety : Healthcare Associated Infections, Safety : Medication

**S.1. Measure-specific Web Page** (Provide a URL link to a web page specific for this measure that contains current detailed specifications including code lists, risk model details, and supplemental materials. Do not enter a URL linking to a home page or to general information.)

[http://www.hci3.org/ecr\\_descriptions/ecr\\_description.php?version=5.2.006&name=PNE&submit=Submit](http://www.hci3.org/ecr_descriptions/ecr_description.php?version=5.2.006&name=PNE&submit=Submit)

**S.2a. If this is an eMeasure**, HQMF specifications must be attached. Attach the zipped output from the eMeasure authoring tool (MAT) - if the MAT was not used, contact staff. (Use the specification fields in this online form for the plain-language description of the specifications)

This is not an eMeasure Attachment:

**S.2b. Data Dictionary, Code Table, or Value Sets** (and risk model codes and coefficients when applicable) must be attached. (Excel or csv file in the suggested format preferred - if not, contact staff)

Attachment Attachment: [nqf\\_pne\\_all\\_codes\\_risk\\_adjustment\\_12\\_14\\_15.xls](#)

**S.3. For endorsement maintenance**, please briefly describe any changes to the measure specifications since last endorsement date and explain the reasons.

Measure specifications have been updated since the last endorsement in the following ways:

1. The code tables have been revised to make them more user-friendly and readable. Earlier we had referenced the AHRQ-CCS categories that mapped to the PAC definitions. Now we have displayed the codes as either I-9 or I-10 codes so it is easier for users to use and implement the measure in their own programs.
2. Only codes relevant to Community Acquired Pneumonia have been retained as potential trigger codes. Codes suggestive of a healthcare Acquired Pneumonia such as for ventilator acquired pneumonia or fungal pneumonia and other opportunistic lung infections have been removed.
3. All codes have been updated to 2015 (current codes) and ICD-10 code conversions are included.
4. We no longer define PACs with procedure codes. PAC definitions are based on diagnosis codes and these drive the services for care of the complication. For example, if there is an in-patient infectious disease consultation service for sepsis, the diagnosis code of sepsis on the claim is the tag that alerts the user that there is a complication.
5. Instead of three types of PACs, we now define PACs as one of two types - Type 1 PACs are directly related to the index condition and type 2 PACs are related to patient safety failures. PACs related to comorbidities have been practically eliminated unless they cause patient safety issues, in which case they are listed with type 2 PACs.
6. Our service assignment logic has been modified. All services that are relevant to an episode are multi-assigned to all relevant open episodes. So if a patient had both an open pneumonia episode and an open diabetes episode concurrently, the services relevant to both (such as office visits) will be assigned to both episodes, thereby preventing the possibility of under-counting services in each episode.
7. We have expanded our databases to include the Medicaid population.
8. Reference to literature and publications have been updated to reflect current knowledge and thinking.

Our team, within HCI3, has been working with various pilot sites across the country to use the PAC (potentially avoidable complications) measures for reporting outcomes at the population level. PAC measures have been overwhelmingly adopted as category 1 quality measures for New York State DSRIP (Delivery System Reform Incentive Payment) project for Medicaid Redesign.

**S.4. Numerator Statement** (Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome)

IF an OUTCOME MEASURE, state the outcome being measured. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

Outcome: Number of patients with pneumonia who had one or more potentially avoidable complications (PACs) during the episode time window.

**S.5. Time Period for Data** (What is the time period in which data will be aggregated for the measure, e.g., 12 mo, 3 years, look back to August for flu vaccination? Note if there are different time periods for the numerator and denominator.)

The episode starts when the trigger criteria for Pneumonia are fulfilled. The episode time window looks back 7 days from the first trigger claim and continues forward for one month after the trigger date, or for 30-days after discharge if the patient is hospitalized for pneumonia, in order to aggregate relevant claims for the measure.

**S.6. Numerator Details** (All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)  
IF an OUTCOME MEASURE, describe how the observed outcome is identified/counted. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

Patients with a pneumonia episode that have a potentially avoidable complication (PACs), during the episode time window. The enclosed excel workbook entitled NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls gives the detailed codes for PACs in the tab entitled PACS I-9 & I-10.

Patients are identified as having a PACs if:

- a. The index stay for pneumonia has a PAC diagnosis code in any position except in the PRIMARY (principal) position
- b. They have a PAC diagnosis code in any position on any relevant claim (outpatient facility, professional, ancillary etc.) during the pneumonia episode time window
- c. Any readmission to an acute care facility that is relevant to pneumonia, within the 30-day time window
- d. Any admission to a post-acute care facility that is relevant to pneumonia and has a PAC code in any position on the claim

We define PACs as one of two types:

(1) Type 1 PACs - PACs directly related to the index condition: Patients are considered to have a type 1 PAC if they develop one or more complication directly related to pneumonia or its management. Examples of these PACs are respiratory insufficiency, other lung complications, fluid electrolyte acid base problems, sepsis, respiratory failure etc.

(2) Type 2 PACs - PACs suggesting Patient Safety Failures: Patients are considered to have a type 2 PAC, if they develop any of the complications related to patient safety failures such as for phlebitis, deep vein thrombosis, pressure sores or for any of the CMS-defined hospital acquired conditions (HACs).

PACs are counted as a dichotomous (yes/no) outcome. If a patient had one or more PAC in any of the above settings, they get counted as a “yes” or a 1.

**S.7. Denominator Statement** (Brief, narrative description of the target population being measured)

Adult patients aged 18 years and above who have a pneumonia episode and are followed for at least one-month.

**S.8. Target Population Category** (Check all the populations for which the measure is specified and tested if any):

Populations at Risk

**S.9. Denominator Details** (All information required to identify and calculate the target population/denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)

Please refer to the enclosed excel workbook entitled  
NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls

The target population is identified based on patients with claims that have a Pneumonia diagnosis codes as defined in the TRIGGERS tab (Triggers I-9 or Triggers I-10) of the enclosed workbook. In addition, they have to meet one of the following trigger criteria:

1. Have a hospitalization with a trigger code in the principal position of an inpatient stay claim
2. Have an outpatient facility visit such as an emergency department visit with one of the trigger codes in any position
3. Have a physician visit with a pneumonia code in any position AND a confirming claim between 7 days and 30 days of the first visit that could be any of the three above (an IP stay claim with a pneumonia code in the principal position, an outpatient facility visit claim or another professional visit claim with the pneumonia diagnosis in any position)

Inclusion criteria: Patients identified to have Pneumonia based on the trigger criteria above are retained in the measure if they meet the following inclusion criteria:

1. The patient has continuous enrollment for the entire time window with no enrollment gaps with the entity providing the data (so we can ensure that the database has captured all the claims for the patient in the time window).
2. The patient has a complete episode time window in the claims data – so the end date of the episode should not be past the database claims end date.
3. Patient is at least 18 years of age

Once the episode is triggered all relevant claims within the episode time window are assigned to the episode. Relevant claims could be inpatient facility claims, outpatient facility claims, professional services, laboratory services, imaging services, ancillary claims, home health, durable medical equipment as well as pharmacy claims across the entire continuum of care centered around the patient's episode of care. Any of these relevant claims serve to identify the presence of a PAC.

**S.10. Denominator Exclusions** *(Brief narrative description of exclusions from the target population)*

The target population captures adult patients (18+) in the dataset, who have a complete episode of community-acquired pneumonia, with no enrollment gaps, and no outlier costs. Patients who do not meet these criteria are excluded from the target population.

**S.11. Denominator Exclusion Details** *(All information required to identify and calculate exclusions from the denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*

Please refer to the tab called "Decision Tree" in the enclosed excel workbook NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15 .xls

Denominator exclusions include exclusions of "patients" as well as "claims" not relevant to pneumonia care.

1. "Patients" are excluded from the measure if they meet one of the following criteria:

- a. If age is < 18 years
- b. If gender is missing
- c. If they do not have continuous enrollment for the entire time window with the entity providing the data (this helps determine if the database has captured all the claims for the patient in the time window). If a patient has an enrollment gap for any time period during the episode time window, it is considered as an enrollment gap, and they are excluded from the measure.
- d. If the pneumonia episode time window extends outside the dataset time period (this helps eliminate incomplete episodes).
- e. The episode cost is an outlier (less than 1st percentile or greater than 99th percentile value for all episodes of the same type). This eliminates extreme variation that may result from random outlier events and eliminates random noise into the analysis from inappropriate codes or services. It is also another way to ensure that episodes included in the measure are complete and representative of the measure.

2. "Claims" are excluded from the pneumonia measure if they are considered not relevant to pneumonia care.

**S.12. Stratification Details/Variables** *(All information required to stratify the measure results including the stratification variables, definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format with at S.2b)*

None

**S.13. Risk Adjustment Type** (Select type. Provide specifications for risk stratification in S.12 and for statistical model in S.14-15)

Statistical risk model

If other:

**S.14. Identify the statistical risk model method and variables** *(Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development and testing should be addressed with measure testing under Scientific Acceptability)*

Conceptual Model:

Variations in outcomes across populations may be due to patient-related factors or due to provider-controlled factors. When we adjust for patient-related factors, the remaining variance in PACs may be due to factors that could be controlled by all providers that

are managing or co-managing the patient.

#### Statistical Method:

We use logistic regression to model the probability of at least one PAC occurring during the episode. For each patient the “predicted” coefficients from the risk adjustment model are summed to give the predicted probabilities of the occurrence of a PAC.

A number of patient-related “risk factors” or covariates are included in the model: This list was selected based on input from various clinical experts in clinical working groups. Risk Factors used in the models were:

Patient demographics: age, gender, and an indicator of whether a member has enrolled within the previous 6 months. This latter risk factor is intended to account for the patient’s lack of claims history, which limits the number of potential comorbidities that can be identified.

Comorbidities: These are conditions or events that occurred prior to the start of the episode that can have a potential impact on the patient’s risk of having a potentially avoidable complication (PAC). The risk factors are 170 disease indicators (0/1) identified through the presence of ICD diagnosis codes on individual medical claims and collected from the historical claims data before the start of an episode. These are universally applied across all episodes. Please see the tab labeled “All Risk Factors I-9” and “All Risk Factors I-10” for a list of risk factors and their corresponding codes in the enclosed workbook called NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls.

Episode Subtypes or Severity Markers: These are markers that distinguish an episode as being more severe than another. They indicate either specific patient comorbidities that are known to make the procedure or condition more difficult to manage (e.g., morbid obesity) or severity of the illness itself (e.g., viral, gram negative, or MRSA pneumonia). Subtypes are specific to each unique episode and are included in the models only if they are present at the start of the episode. Please see the tab labeled “Subtypes I-9” and “Subtypes I-10” for a list of subtypes and their corresponding codes in the enclosed workbook called NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls.

Risk Factors : (Please refer to the enclosed excel workbook entitled (NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15 .xls). The risk factors along with their codes are listed in the tabs called “All Risk Factors I-9” and “All Risk Factors I-10” and also listed below:

#### AGE CONTINUOUS VARIABLE

GENDER FEMALE = 1 (MALE IS REFERENCE = 0)

Risk Factor #	Risk Factor Name
RF0101	Anoxic Brain Damage, persistent vegetative state
RF0102	Delirium, Meningitis, Encephalitis
RF0103	Previous Stroke, Paralysis
RF0104	Cerebral Palsy and Other Paralytic Syndromes
RF0105	Spinal Cord Disorders/Injuries
RF0106	Polyneuropathy
RF0107	Multiple Sclerosis
RF0108	Convulsions, Epilepsy
RF0109	Dementia
RF0110	Parkinson’s and Huntington’s Diseases
RF0111	Cerebrovascular Disease
RF0115	after care, rehabilitation
RF0201	visual loss, blindness, retinal tear, detachment
RF0301	ENT, Upper Respiratory Problems
RF0401	Respiratory Failure, O2, ventilator dependence
RF0402	Advanced COPD, Asthma
RF0403	Empyema, bronchiectasis, Pneumonias
RF0404	Aspiration Pneumonia, Laryngeal Problems
RF0406	TB, Pneumoconiosis, Aspergillosis
RF0407	Tobacco use, Lung disease due to External Fumes
RF0408	Other Lung Disease
RF0501	Previous Shock, Syncope, Vent Fibrillation



#0708 Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window), Last Updated: Mar 05, 2018

RF0503 Advanced CHF  
 RF0504 Cardiomyopathy, valve disorders  
 RF0505 Cardiac Arrhythmias, Heart Block  
 RF0506 Pacemaker, AICD  
 RF0507 Endocarditis, Other post surgical cardiac problems  
 RF0508 Other Cardiovascular Disease  
 RF0511 DVT, Pulm Embolism, Pulm Heart Disease  
 RF0512 Unstable Angina  
 RF0513 Hypotension, chronic, orthostatic  
 RF0514 Hyperlipidemia  
 RF0515 Intraaortic Balloon Pump  
 RF0516 ventricular assist device, ecmo, prolonged bypass  
 RF0517 Previous electrophysiology studies, cryoablation  
 RF0518 Recent AMI  
 RF0519 Previous PCI  
 RF0520 Previous CABG  
 RF0521 Previous Heart & Valve Surgery  
 RF0522 Previous aortic reconstruction  
 RF0523 Previous carotid endarterectomy  
 RF0524 Aortic and peripheral vascular disease  
 RF0525 Advanced Aortic and Vascular Disease  
 RF0601 GI Bleed  
 RF0602 Intestinal Obstruction/Perforation  
 RF0603 Acute Gastritis, Duodenitis  
 RF0604 Gastroduodenal Ulcer  
 RF0606 Intestinal Uro-genital Fistula  
 RF0607 Abdominal hernia w complications  
 RF0608 Vascular insufficiency of intestine  
 RF0609 Inflammatory Bowel Disease  
 RF0610 Irritable Bowel  
 RF0611 Diverticulitis, Meckel's  
 RF0612 Digestive congenital anomalies  
 RF0613 Intestinal infection  
 RF0614 Esophageal Perforation, Hmg, Barretts, Compl Hiatal Hernia  
 RF0615 Abnormal weight loss  
 RF0616 Achalasia, Esophageal spasm, Stricture, Dysphagia  
 RF0617 GERD, Hiatal Hernia, Other Upper GI Disorders  
 RF0618 Previous Bariatric Surgery  
 RF0619 Hx of colon polyps, family Hx of colon cancer  
 RF0620 Enterostomy, GI devices, lap band  
 RF0701 Pancreatic Disease  
 RF0702 Perforation, fistula GB, bile duct, pancreas  
 RF0703 Gall stones, cholecystitis  
 RF0704 End-Stage Liver Disease  
 RF0705 Hepatitis, Cirrhosis, Other Hepatobiliary Disorders  
 RF0706 Recent Gall Bladder, Hepatobiliary Surgery  
 RF0707 Acute Pancreatitis, pseudo cyst  
 RF0801 Bone/Joint/Muscle Infections/Necrosis  
 RF0802 Muscular Dystrophy  
 RF0803 Osteoporosis, osteitis deformans, pathological fracture  
 RF0804 Rheumatoid Arthritis and Inflammatory Connective Tissue Disease  
 RF0805 Gout and other crystal arthropathies  
 RF0806 Other arthropathies  
 RF0807 Osteoarthritis

#0708 Proportion of Patients with Pneumonia that have a Potentially Avoidable Complication (during the episode time window), Last Updated: Mar 05, 2018

RF0808 Joint Deformities  
 RF0809 Knee derangements  
 RF0810 Traumatic Dislocation Knee  
 RF0811 Dislocation Hip  
 RF0812 Synovitis, Ruture Tendon  
 RF0813 Status Knee Replacement  
 RF0814 Status Total Hip Replacement  
 RF0901 Decubitus Ulcer  
 RF0902 Skin and wound problems  
 RF1001 Diabetes, poor control  
 RF1002 Advanced diabetes  
 RF1003 diabetes  
 RF1101 Acute renal failure  
 RF1102 Dialysis Dependent  
 RF1103 Nephritis  
 RF1104 Chronic renal failure  
 RF1105 Urinary Tract Infections  
 RF1301 Endometriosis  
 RF1302 Fibroid uterus, benign tumors of female organs  
 RF1303 Pelvic Inflammatory disease  
 RF1304 Uterine prolapse, cystocele, vaginocoele  
 RF1305 Female Harmonal Disorders  
 RF1306 Ovarian, Broad Ligament Disorders  
 RF1308 Other disorders of uterus, cervix  
 RF1309 Menopausal Disorders  
 RF1310 Menstrual Disorders  
 RF1401 Multiparity, multigravida  
 RF1402 Elderly Primi, other  
 RF1403 Poor obstetric history  
 RF1406 Cervical incompetence  
 RF1407 Abnormalities of uterus, female genital tract  
 RF1410 Maternal, gestational diabetes, large for date  
 RF1411 Genital Herpes  
 RF1467 Tobacco Use in Mother  
 RF1601 Bleeding Disorders  
 RF1602 Severe Hematological Disorders  
 RF1603 Disorders of Immunity  
 RF1604 Nutritional and other Anemias  
 RF1605 Long-term use of anticoag, Aspirin  
 RF1701 Head and Neck Cancers  
 RF1702 Lung and Intrathoracic Cancers  
 RF1703 Neuroendocrine, Myeloproliferative Cancers  
 RF1704 Poorly differentiated, Secondary, Metastatic Cancers  
 RF1705 Other Tumors  
 RF1706 Acute Leukemia  
 RF1707 Cancer uterus, localized female organs  
 RF1708 Colorectal, Hepatobiliary and other GI cancers  
 RF1709 Breast, Prostate, Thyroid cancers  
 RF1710 Testicular Cancer and localized of male organs  
 RF1711 Cancer of Bladder and Urinary Tract  
 RF1712 Musculoskeletal Cancers  
 RF1801 Sepsis, MRSA, Opportunistic infections  
 RF1901 Schizophrenia  
 RF1902 Major Depressive, Bipolar, and Paranoid Disorders

RF2001 Drug/Alcohol Psychosis  
 RF2002 Drug/Alcohol Dependence  
 RF2101 Drug Reactions, long term use of drugs  
 RF2102 Intra-abdominal injury  
 RF2201 Extensive Third-Degree Burns  
 RF2301 Major Organ Transplant Status  
 RF2302 Artificial Openings for Feeding or Elimination  
 RF2303 Complications of Medical & Surgical Care and Trauma  
 RF2304 severe morbid obesity  
 RF2305 morbid obesity  
 RF2306 obesity  
 RF2307 mild sleep apnea, hypoventilation  
 RF2308 moderate sleep apnea, hypoventilation  
 RF2309 obstructive sleep apnea  
 RF2310 Severe Protein-Calorie Malnutrition  
 RF2311 Mild-mod malnutrition  
 RF2401 Severe Head Injury  
 RF2402 Major Head Injury  
 RF2403 Vertebral Fractures without Spinal Cord Injury  
 RF2404 Falls, Fractures  
 RF2405 Amputation  
 RF2501 HIV/AIDS

Subtypes for pneumonia

STDX04138 Viral Pneumonia  
 STDX04171 Influenza w pneumonia  
 STDX04172 Gram Negative Pneumonia  
 STDX04173 MRSA Pneumonia  
 STDX04174 Other Staph Pneumonia  
 STDX1019 Morbid Obesity (concurrent)  
 STDX10107 Obesity (concurrent)  
 STDX1007 Overweight (concurrent)  
 STDX10108 Sleep Apnea (concurrent)

As you may notice some of the covariates (risk factors) such as obesity are collected from both historical claims as well as from the index stay and look-back period of the episode.

The prevalence of the risk factors in our analysis dataset are listed in the enclosed workbook entitled NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15 .xls – see tab “Risk Factor Prevalence”.

The regression model with its coefficients are given in the same workbook in the tab “Risk Model”.

**S.15. Detailed risk model specifications** (must be in attached data dictionary/code list Excel or csv file. Also indicate if available at measure-specific URL identified in S.1.)

*Note: Risk model details (including coefficients, equations, codes with descriptors, definitions), should be provided on a separate worksheet in the suggested format in the Excel or csv file with data dictionary/code lists at S.2b.*

Available in attached Excel or csv file at S.2b

**S.15a. Detailed risk model specifications** (if not provided in excel or csv file at S.2b)

Available in attached Excel or csv file at S.2b

**S.16. Type of score:**

Rate/proportion

If other:

**S.17. Interpretation of Score** (Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score)

Better quality = Lower score

**S.18. Calculation Algorithm/Measure Logic** (Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.)

Please refer to the enclosed excel workbook entitled (NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15 .xls).

#### Assembling the Denominator:

Using administrative claims database, patients with pneumonia are identified as those who fulfilled the trigger criteria for pneumonia. Pneumonia patients should have claims that have a Pneumonia diagnosis codes as defined in the TRIGGERS tab (Triggers I-9 or Triggers I-10) of the enclosed workbook. In addition, they have to meet one of the following trigger criteria:

1. Have a hospitalization with a trigger code in the principal position of an inpatient stay claim
2. Have an outpatient facility visit such as an emergency department visit with one of the trigger codes in any position
3. Have a physician visit with a pneumonia code in any position AND a confirming claim between 7 days and 30 days of the first visit that could be any of the three above (an IP stay claim with a pneumonia code in the principal position, an outpatient facility visit claim or another professional visit claim with the pneumonia diagnosis in any position)

Patients are retained if they are 18 years of age or more, do not have a missing gender, have continuous enrollment for the entire episode time window, and their entire time window is covered in the claims dataset.

Once the episode is triggered all relevant claims within the episode time window are assigned to the episode. Relevant claims could be inpatient facility claims, outpatient facility claims, professional services, laboratory services, imaging services, ancillary claims, home health, durable medical equipment as well as pharmacy claims across the entire continuum of care centered around the patient's episode of care. Any of these relevant claims serve to identify the presence of a PAC.

Readmissions carrying diagnosis codes relevant to pneumonia, and relevant admissions to post-acute care facilities are also included in the episode. If a patient has more than one concurrent episode open, and the claim is relevant to both episodes, the claim gets multi-assigned to all relevant open episodes preventing undercounting of PACs.

Once all the episodes are assembled, episodes that have outlier costs, are flagged (those with total episode costs less than 1st percentile or greater than 99th percentile), and excluded from the final analysis. This retains episodes that are more representative of care around pneumonia and excludes episodes that may be incomplete (low outlier costs), or have inappropriate codes or services leading to high outlier costs.

#### Assembling the Numerator:

For every episode included in the denominator, episodes are flagged as having a PAC (potentially avoidable complication) based on the criteria listed below:

- Any Index stay that has a PAC diagnosis code in any position except in the PRIMARY (principal) position
- Any readmission to an acute care facility 2 days or later after discharge but within 30-days post-discharge
- Any admission to a post-acute care facility with a PAC code in any position on the claim
- Any other service (professional, outpatient facility, ancillary) with a PAC code in any position on the claim

Relevant claims that do not qualify as a PAC based on the criteria outlined above, are listed as typical claims. All included relevant pharmacy services are flagged as typical. Patients that have even a single PAC claim are counted as part of the numerator.

#### Calculating the measure:

Proportion of pneumonia patients that have a PAC is simply the ratio of patients with PACs within the pneumonia population, and is called the PAC rate as shown in the equation below:

PAC rate = Patients with pneumonia that have at least one PAC / Total number of pneumonia patients

A flow chart demonstrating the series of steps and the counts of patients at each step is shown in tab entitled “Decision Tree” of the enclosed workbook called NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls

Drill Down Calculations:

Further analysis from this construct helps create actionable reports.

For example as shown in the tab labeled “PAC overview”, not only do we have the PAC rate for the entire pneumonia population analyzed (54.7%), we can calculate the frequency of PACs occurring in the hospital setting, in the outpatient facility, or in professional claims. These could be further broken down by the PAC type – type 1 being directly related to pneumonia and so actionable by the servicing physician, while type 2 PACs are related to patient safety failures and can be improved by process improvement by hospitals and nursing facilities (see tab labeled as “PAC Drill down Graph”). Additionally, readmissions could be analyzed separately. This helps focus strategies in reducing PACs and makes the data immensely actionable.

Risk Adjustment:

Once we have the observed PAC rates, we risk-adjust them for patient factors such as patient demographics, comorbidities collected historically, and for severity of illness using subtypes collected from the trigger claim and / or look-back period. This helps adjust for factors outside the providers control and levels the playing field for provider performance comparisons.

Unit of Analysis:

The unit of analysis is the individual episode.

Dependent Variable:

The dependent variable is a dichotomous variable indicating whether an episode had one or more PACs (=1) or not (=0).

Independent Variables:

A number of patient-related “risk factors” or covariates are included in the models:

Patient demographics: age, gender, and an indicator of whether a member has enrolled within the previous 6 months. This latter risk factor is intended to account for the patient’s lack of claims history, which limits the number of potential comorbidities that can be identified.

Comorbidities: These are conditions or events that occurred prior to the start of the episode that can have a potential impact on the patient’s risk of having a PAC. The risk factors are 170 disease indicators (0/1) identified through the presence of ICD diagnosis codes on individual medical claims and collected from the historical claims data before the start of an episode. These are universally applied across all episodes. Please see the tab labeled “All Risk Factors I-9” and “All Risk Factors I-10” for a list of risk factors and their corresponding codes in the enclosed workbook called NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls

Episode Subtypes or Severity Markers: These are markers that distinguish an episode as being more severe than another. They indicate either specific patient comorbidities that are known to make the procedure or condition more difficult to treat (e.g., obesity) or severity of the illness itself (e.g., viral, gram negative, or MRSA pneumonia). Please see the tab labeled “Subtypes I-9” and “Subtypes I-10” for a list of subtypes and their corresponding codes in the enclosed workbook called NQF\_PNE\_all\_codes\_risk\_adjustment\_12\_14\_15.xls

As mentioned previously, to avoid creating perverse incentives all comorbidities and subtypes are identified prior to or at the very start of the episode. None are identified during the episode period.

Statistical Methods:

We use logistic regression to model the probability of at least one PAC occurring during the episode. For each patient the “predicted” coefficients from the risk adjustment model are summed to give the “patient-level” predicted probabilities of the

occurrence of a PAC. Episodes with predicted probabilities <50% were classified as having a predicted 0 (not having a PAC). Episodes with predicted probabilities >50% were classified as having a predicted 1 (having a PAC).

To prevent unstable coefficients, comorbidities and subtypes are included in the models as covariates only if they are present in at least 10 episodes. No further model building is conducted after the initial models are built. This reflects a desire to explain as much variation in the probability of having a PAC as possible, but it does not make it a priority that all covariates in the model be individually significant or even uncorrelated with each other. Accordingly, the model uses a very large group of covariates. This modeling approach allows for fewer potentially artificial constraints around the definitions of what constitutes severity of a episode condition, and lets each regression model determine for itself which of the factors are more significant for a specific episode. Non-significant covariates in episode models can not overly influence predicted outcomes, nor is much harm realized, if a group of correlated covariates work together to explain variation rather than having the variation explained by a single best factor.

When more than one line of business is included in the data, separate models are calculated for each sample (i.e., commercial, Medicaid etc.).

Provider Attribution and calculating PAC rates by provider:

Once episodes are constructed they are attributed to providers based on one of the attribution rules. For community acquired pneumonia episodes, where the index claim is in the hospital setting, the episode is attributed to the facility where the index hospitalization occurred. In a second attribution exercise, all community acquired pneumonia episodes are attributed to the physician who has the maximum number of E&M claims during the episode time window.

To directly compare PAC rates across facilities or physicians while also appropriately accounting for differences in patient severity, we calculate a risk-standardized PAC rate (RSPR) for each provider. This method is similar to the methods employed by the Centers for Medicare and Medicaid Services (CMS) and endorsed by the National Quality Forum (NQF) to construct similar facility- and practice-level measures (i.e., mortality, readmissions, etc.).

1. For each provider, the actual number of PAC occurrence is summed across all attributed pneumonia patients, to give the observed PAC rates for the provider.
2. Similarly, patient-level probability estimates are summed across all attributed patients to give expected PAC rates for the provider.
3. The observed sum is then divided by the summed probabilities (O/E). This number yields whether the provider or facility had more PACs than expected (ratio>1), as expected (ratio=1), or less than expected (ratio<1). This calculation yields a practice-level unstandardized performance ratio.
4. To facilitate accurate comparisons of rates across providers, the O/E ratio is multiplied by the overall expected PAC rate across all facilities or physicians, to obtain the risk-standardized PAC rate (RSPR) for the facility or physician.

The formula for this calculation is as follows:

$$RSPR_j = \left\{ \frac{\sum \text{Observed}_{ij}}{\sum \text{Prob}_{ij}} \right\} \times \left\{ \frac{\sum \text{Prob}_i}{\# \text{ of episodes}} \right\}$$
  
Where an individual i is attributed to the unit of attribution j (e.g., facility, physician, etc.)

The risk-standardized PAC rate (RSPR) therefore adjusts the provider's observed PAC rate, by the severity of the panel of their patients. It represents what a provider's PAC rate would be if their patient population was reflective of the overall population, leveling the playing field, and allowing for meaningful comparisons across all providers adjusted similarly.

**S.19. Calculation Algorithm/Measure Logic Diagram URL or Attachment** *(You also may provide a diagram of the Calculation Algorithm/Measure Logic described above at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)*  
Available in attached appendix at A.1

**S.20. Sampling** *(If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.)*

IF a PRO-PM, identify whether (and how) proxy responses are allowed.

Not Applicable



**S.21. Survey/Patient-reported data** (If measure is based on a survey, provide instructions for conducting the survey and guidance on minimum response rate.)

IF a PRO-PM, specify calculation of response rates to be reported with performance measure results.

Not Applicable

**S.22. Missing data** (specify how missing data are handled, e.g., imputation, delete case.)

Required for Composites and PRO-PMs.

If data is missing, the case is deleted from both the numerator and denominator

**S.23. Data Source** (Check ONLY the sources for which the measure is SPECIFIED AND TESTED).

If other, please describe in S.24.

Claims

**S.24. Data Source or Collection Instrument** (Identify the specific data source/data collection instrument e.g. name of database, clinical registry, collection instrument, etc.)

IF a PRO-PM, identify the specific PROM(s); and standard methods, modes, and languages of administration.

The information is based on a two-year claims database from a large regional commercial insurer. The database has 3,258,706 covered lives and \$25.9 billion in "allowed amounts" for claims costs. The database is an administrative claims database with medical as well as pharmacy claims.

The methodology can be used on any claims database with at least two years of data and a minimum of 150 patients with the index condition or hospitalization.

The calculations of rates of potentially avoidable complications can be replicated by anyone that uses the measure specifications along with the metadata file that is available for free on our web site at <http://www.hci3.org/ecre/xml-agreement.html>.

We also plan on providing a limited automated analysis, at no cost, on our website.

The methodology has been tested on databases of several health plans as well as on a few employer databases.

No data collection instrument was used.

**S.25. Data Source or Collection Instrument** (available at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)

No data collection instrument provided

**S.26. Level of Analysis** (Check ONLY the levels of analysis for which the measure is SPECIFIED AND TESTED)

Clinician : Individual, Facility, Population : Regional and State

**S.27. Care Setting** (Check ONLY the settings for which the measure is SPECIFIED AND TESTED)

Inpatient/Hospital, Other, Outpatient Services

If other: Across the care continuum

**S.28. COMPOSITE Performance Measure** - Additional Specifications (Use this section as needed for aggregation and weighting rules, or calculation of individual performance measures if not individually endorsed.)

N/A

**2a. Reliability** – See attached Measure Testing Submission Form

**2b. Validity** – See attached Measure Testing Submission Form

0708\_PNE\_Testing\_Reliability\_Validity\_HCI3\_12\_14\_2015\_updated-635896942875581025.docx

### 3. Feasibility

Extent to which the specifications including measure logic, require data that are readily available or could be captured without undue burden and can be implemented for performance measurement.

### 3a. Byproduct of Care Processes

For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order).

#### 3a.1. Data Elements Generated as Byproduct of Care Processes.

[Coded by someone other than person obtaining original information \(e.g., DRG, ICD-9 codes on claims\)](#)

If other:

### 3b. Electronic Sources

The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified.

**3b.1. To what extent are the specified data elements available electronically in defined fields?** (*i.e., data elements that are needed to compute the performance measure score are in defined, computer-readable fields*)

[ALL data elements are in defined fields in electronic claims](#)

**3b.2. If ALL the data elements needed to compute the performance measure score are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.**

**3b.3. If this is an eMeasure, provide a summary of the feasibility assessment in an attached file or make available at a measure-specific URL.**

**Attachment:**

### 3c. Data Collection Strategy

Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality, costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use). For eMeasures, a feasibility assessment addresses the data elements and measure logic and demonstrates the eMeasure can be implemented or feasibility concerns can be adequately addressed.

**3c.1. Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues.**

**IF a PRO-PM, consider implications for both individuals providing PROM data (patients, service recipients, respondents) and those whose performance is being measured.**

[As part of our general implementation of these measures and related analyses, we have worked through dozens of different and sometimes very large datasets. From Medicaid to regional and national commercial carriers, as well as individual employers, the principal lesson learned is the heterogeneity of the data sets and the significant variability in fill rate of critical data elements. As a result, we have created highly specific recommendations that list the data elements required to ensure measure validity; the accuracy of those data elements, and their completeness in the dataset. When claims datasets are organized in the way we specify in the measure specifications, and contain the coding information required, the analysis of the measure and its results are highly reliable.](#)

**3c.2. Describe any fees, licensing, or other requirements to use any aspect of the measure as specified** (*e.g., value/code set, risk model, programming code, algorithm*).

[The calculations of rates of potentially avoidable complications can be replicated by anyone that uses the measure specifications along with the metadata file that is available for free on our web site at <http://www.hci3.org/ecre/xml-agreement.html>.](#)

[We also plan on providing a limited automated analysis, at no cost, on our website.](#)

## 4. Usability and Use

Extent to which potential audiences (e.g., consumers, purchasers, providers, policy makers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.

#### 4a. Accountability and Transparency

Performance results are used in at least one accountability application within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a credible plan for implementation within the specified timeframes is provided.

##### 4.1. Current and Planned Use

*NQF-endorsed measures are expected to be used in at least one accountability application within 3 years and publicly reported within 6 years of initial endorsement in addition to performance improvement.*

Planned	Current Use (for current use provide URL)
Public Reporting	Payment Program Blue Cross Blue Shield of North Carolina <a href="https://www.bcbsnc.com/">https://www.bcbsnc.com/</a> Horizon Blue Cross Blue Shield of New Jersey <a href="http://www.horizonblue.com/">http://www.horizonblue.com/</a> Pennsylvania Employee Benefits Trust Fund <a href="https://www.pebtf.org/">https://www.pebtf.org/</a>
Professional Certification or Recognition Program	Quality Improvement (Internal to the specific organization) Blue Cross Blue Shield of North Carolina <a href="https://www.bcbsnc.com/assets/providers/public/pdfs/specialty_methodology.pdf">https://www.bcbsnc.com/assets/providers/public/pdfs/specialty_methodology.pdf</a>

##### 4a.1. For each CURRENT use, checked above, provide:

- Name of program and sponsor
- Purpose
- Geographic area and number and percentage of accountable entities and patients included

Measures associated to potentially avoidable complications (PACs) are in use today with some private sector payers and gaining further acceptance among a wide variety of organizations across the health system (public and private payers, clinicians, consultants, all-payer claims database stewards, etc.) [1-9]. They are being used in various capacities in different pilot site implementations. To name a few:

- BCBSA (Blue Cross Blue Shield Association) – uses them for their Centers of Excellence (COE) programs: Blue Distinction
- BCBSNC (Blue Cross Blue Shield of North Carolina) – is using them for tiering providers

In addition, the PAC measures are incorporated by the following organizations in their bundled payment programs:

- BCBSSC – for CABG and PCI programs
- Horizon BCBSNJ– for CHF and CABG programs
- BCBSNC
- PEBTF in PA

<http://www.ajmc.com/interviews/Lili-Brillstein-on-How-Bundled-Payments-Are-Tranforming-Healthcare>

In these programs they look at PACs related to the measure for process improvement activities and for practice re-engineering.

We have created reports for rates of PACs for the following organizations:

- Vermont Payment Reform
- Maine Health Management Coalition
- WellPoint / Anthem CT
- NY State Medicaid
- CT Medicaid
- CO All-payer Claims Database, Center for Improving Value in Health Care

There are several companies that are leveraging these measures to create analytics and software for customers – these include HealthQx, Aver Informatics, McKesson, and TriZetto. FairHealth has joined others to use our analytics to create PAC rates for various consumer transparency efforts they are engaged in.

More recently, the PAC measures have been overwhelmingly adopted as category 1 quality measures for New York State DSRIP (Delivery System Reform Incentive Payment) project for Medicaid Redesign and are scheduled for pilot site implementations in 2016.

[http://www.health.ny.gov/health\\_care/medicaid/redesign/dsrip/vbp\\_reform.htm](http://www.health.ny.gov/health_care/medicaid/redesign/dsrip/vbp_reform.htm)

[http://www.health.ny.gov/health\\_care/medicaid/redesign/dsrip/docs/dsrip\\_vbp\\_webinar\\_slides.pdf](http://www.health.ny.gov/health_care/medicaid/redesign/dsrip/docs/dsrip_vbp_webinar_slides.pdf)

Below are some references that highlight our work with Potentially Avoidable Complications (PACs):

1. Hibbard JH, Greene J, Sofaer S, Firminger K, and Hirsh J. Experiment shows that a well-designed report on costs and quality can help consumers choose high value health care. *Health Affairs*, 31, no.3 (2012):560-568 (doi: 10.1377/hlthaff.2011.1168)
2. Rastogi A, de Brantes F, Costley J, and Tompkins C. HCI3 Improving Incentives Issue Brief – Analysis of Medicare and Commercial Insurer-Paid Total Knee Replacement Reveals Opportunity for Cost Reduction. Available from: <http://www.hci3.org/content/hci3-improving-incentives-issue-brief-analysis-medicare-and-commercial-insurer-paid-total-kn>, Accessed Jun 1 2015.
3. de Brantes F, Rastogi A, and Sorensen CM. Episode of Care Analysis Reveals Sources of Variation in Costs. *Am J Manag Care*. 2011; 17(10): e383-e392.
4. de Brantes F, Rastogi A, and Painter M. Reducing Potentially Avoidable Complications in Patients with Chronic Diseases: The Prometheus Payment Approach. *Health Services Research* 2010; 45(6), Part II: 1854-1871.
5. Pierre L. Yong and LeighAnne Olsen. The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary; Roundtable on Evidence-Based Medicine; Institute of Medicine. 2010. ISBN: 0-309-14434-5, <http://www.nap.edu/catalog/12750.html>, accessed June 14, 2015.
6. Pham HH, Ginsburg PB, Lake TK, and Maxfield MM. Episode-based Payments: Charting a course for Health care Payment Reform. National Institute for Health Care Reform. Policy Analysis, No.1. Jan 2010. Available from: [http://www.nihcr.org/Episode\\_Based\\_Payments.html](http://www.nihcr.org/Episode_Based_Payments.html). Accessed Jun 1 2015.
7. François de Brantes, M.S., M.B.A., Meredith B. Rosenthal, Ph.D., and Michael Painter, J.D., M.D. Building a Bridge from Fragmentation to Accountability —The Prometheus Payment Model. *NEJM* 2009; 361:1033 (Perspective)
8. de Brantes F, D’Andrea G, Rosenthal MB. Should health care come with a warranty? *Health Aff (Millwood)* 2009; 28:w678-w687.
9. de Brantes F and Rastogi A: Evidence-Informed Case Rates: Paying for Safer, More Reliable Care. Commonwealth Fund; 2008 June 17. Available from: <http://www.hci3.org/content/evidence-informed-case-rates-paying-safer-more-reliable-care>

**4a.2. If not currently publicly reported OR used in at least one other accountability application (e.g., payment program, certification, licensing) what are the reasons?** (e.g., Do policies or actions of the developer/steward or accountable entities restrict access to performance results or impede implementation?)

N/A

**4a.3. If not currently publicly reported OR used in at least one other accountability application, provide a credible plan for implementation within the expected timeframes -- any accountability application within 3 years and publicly reported within 6 years of initial endorsement.** (Credible plan includes the specific program, purpose, intended audience, and timeline for implementing the measure within the specified timeframes. A plan for accountability applications addresses mechanisms for data aggregation and reporting.)

Measures associated with PACs are currently in use as described in the prior section. In addition, we are working with several not-for-profit and for-profit organizations to provide them with the algorithms needed to calculate rates of potentially avoidable complications. Some of these organizations include:

Fair Health – based in NY and whose mission is to increase transparency of provider cost and quality,

CastLight – based in CA and serving large employers. We currently provide CastLight with Bridges To Excellence recognitions and are working with them to augment provider transparency by using PAC measures,

MA APCD (Massachusetts All Payers Claims Database) Council – we currently have an agreement in place with the MA APCD Council to produce PAC measures on hospitals and physicians and report back to the council with tests of reliability and validity of the

measures. The purpose is to authorize the publication of these measures, Maryland Health Care Cost Commission – we have a two year agreement to produce measures of cost and quality for public dissemination.

In Dec 2014, the measure was conditionally approved by MAP (Measure Applications Partnership), for use in Medicare's Inpatient Quality Reporting program, and continues to be pushed by organizations like the Consumer-Purchaser Alliance for that purpose.

#### **4b. Improvement**

Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.

##### **4b.1. Progress on Improvement. (Not required for initial endorsement unless available.)**

Performance results on this measure (current and over time) should be provided in 1b.2 and 1b.4. Discuss:

- Progress (trends in performance results, number and percentage of people receiving high-quality healthcare)
- Geographic area and number and percentage of accountable entities and patients included

We do not have any public information to share about the improvements in rates of potentially avoidable complications, as the implementation of these measures is too recent to provide valid comparisons. Further, some of the definitions of PACs have changed since the measures were initially endorsed, making comparisons even more difficult and unreliable.

Nevertheless, the variation in performance scores presented in Section 1b.2 indicates that there are differences between providers in their risk-adjusted PAC rates (higher scores equal worse performance). This suggests that real opportunities exist to identify lower performing providers and reduce the overall occurrence of PACs.

##### **4b.2. If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.**

Performance results provide summary PACs rates by provider, which can be used by payers and providers in a number of ways to improve the quality of care.

From the payer perspective, payers can use this information to 1) create a high-value provider network, 2) work with high-value providers to share best practices, 3) incentivize low-value providers to improve, 4) modify their insurance design to activate consumers to select the right care from the right providers at the right time.

From the provider perspective, providers can 1) view services and activity for their patients longitudinally across the entire care continuum, such as frequency of readmissions and ED visits and drill down on patients with high PAC rates, 2) review actionable drill down reports to identify the most frequent PACs across all patients to create care pathways and process improvement plans to impact the most frequent PACs.

#### **4c. Unintended Consequences**

The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists).

##### **4c.1. Were any unintended negative consequences to individuals or populations identified during testing; OR has evidence of unintended negative consequences to individuals or populations been reported since implementation? If so, identify the negative unintended consequences and describe how benefits outweigh them or actions taken to mitigate them.**

No unintended consequences were reported, but there is the potential for:

1. Under-coding of PACs in the claim stream resulting in under-reporting the actual rate and/or providers gaming the measures
2. Payers calculating the measures even with inadequate sample sizes and using the results to penalize providers

The measure is designed for transparency efforts and to spur quality improvement. Detailed PAC reports can help providers identify areas of quality improvement. Even detailed reports of small samples of patients can be helpful for quality improvement purposes, but not for public reporting. To mitigate the potential for invalid provider comparisons, we specify in this submission the minimum sample size needed to ensure the reliability of a provider's score. Ultimately, there isn't any good way to prevent provider gaming of

the measure by under-coding claims, however, under the current DRG payment methodology, many providers would be penalized by under-coding PACs since these codes often result in the assignment of more complicated DRGs.

## 5. Comparison to Related or Competing Measures

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure.

### 5. Relation to Other NQF-endorsed Measures

Are there related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population)? If yes, list the NQF # and title of all related and/or competing measures.  
Yes

#### 5.1a. List of related or competing measures (selected from NQF-endorsed measures)

0094 : Assessment of Oxygen Saturation for Community-Acquired Bacterial Pneumonia  
 0095 : Assessment Mental Status for Community-Acquired Bacterial Pneumonia  
 0096 : Community-Acquired Bacterial Pneumonia (CAP): Empiric Antibiotic  
 0141 : Patient Fall Rate  
 0147 : Initial antibiotic selection for community-acquired pneumonia (CAP) in immunocompetent patients  
 0148 : Blood cultures performed in the emergency department prior to initial antibiotic received in hospital  
 0151 : Initial antibiotic received within 6 hours of hospital arrival  
 0202 : Falls with injury  
 0232 : Vital Signs for Community-Acquired Bacterial Pneumonia  
 0233 : Assessment of Oxygen Saturation for Community-Acquired Bacterial Pneumonia  
 0234 : Assessment of Mental Status for Community Acquired Bacterial Pneumonia  
 0337 : Pressure Ulcer Rate (PDI 2)  
 0450 : Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI 12)  
 0468 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization  
 0506 : Hospital 30-day, All-Cause, Risk-Standardized Readmission Rate (RSRR) Following Pneumonia Hospitalization  
 0705 : Proportion of Patients Hospitalized with Stroke that have a Potentially Avoidable Complication (during the Index Stay or in the 30-day Post-Discharge Period)  
 0709 : Proportion of patients with a chronic condition that have a potentially avoidable complication during a calendar year.  
 1611 : ETG Based PNEUMONIA cost of care measure  
 1789 : Hospital-Wide All-Cause Unplanned Readmission Measure (HWR)  
 2579 : Hospital-level, risk-standardized payment associated with a 30-day episode of care for pneumonia (PN)

#### 5.1b. If related or competing measures are not NQF endorsed please indicate measure title and steward.

-0531 Patient Safety for Selected Indicators (Composite Measure, Endorsed)(AHRQ)  
 -CMS defined hospital acquired conditions (HACs) are a subset of our PACs. We have painstakingly matched the definitions to provide as much consistency as possible. <http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalRHQDAPU.html>

### 5a. Harmonization

The measure specifications are harmonized with related measures;

**OR**

The differences in specifications are justified

#### 5a.1. If this measure conceptually addresses EITHER the same measure focus OR the same target population as NQF-endorsed measure(s):

Are the measure specifications completely harmonized?

NoNo

#### 5a.2. If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden.



**Denominator Harmonization:** Several of the measures listed in the prior section are harmonized to the extent possible for denominator definitions with the submitted measure. In particular process measures related to community-acquired pneumonia (CAP) 0096, 0151, 0147, 0148 have defined CAP target population that matches closely to our submitted measure. **Numerator Harmonization:** Regarding numerator harmonization, several of the measures are subsets of our measure. In particular 0450, 0337, 0141, and 0202 list adverse events that have been synchronized with those definitions within the PAC measure. In addition, 0705, 0709 have numerator definitions harmonized completely for the definitions of PACs. However, there are some measures that are not harmonized, in particular the 30-day all-cause readmission measures. While the submitted PAC measures include readmissions that occur within 30 days of discharge, the readmissions, by definition, are related to pneumonia and not due to any cause. While 30-day all-cause readmissions might make sense in a Medicare population, it is not self-evident that they do for commercial or Medicaid populations. However, that said, our data suggest that there are, in fact, very few readmissions within 30 days post discharge that aren't relevant to the index hospitalization. It is worth noting that there is some mounting controversy about the 30 day all cause readmission measures and some data suggest that these measures might have simply pushed out certain readmissions to 31 or more days post discharge. Irrespective of these points, PACs include readmissions and are designed to enable accountability at the locus of provider control as well as some shared accountability between settings, centered around a patient, and for a specific medical episode of care. In that sense, they are consistent with the all-cause 30-day readmission rates, but represent a subset of those admissions. As such, the PAC measures, as submitted, don't create added burden of reporting because the readmissions reported are simply a part of the broader 30-day all-cause readmission measures already endorsed by NQF. Because PAC measures are comprehensive, they include patient safety events that can occur during the stay, as well as adverse events, including readmissions, that can occur post-discharge. As a result, they provide facilities and physicians with an overall measure of avoidable complications for a specific medical episode. The data collection for all of the HCI3 measures is automated by a software package and is fully harmonized with all other PAC measures. A single download automates creation of all reports related to each of the PAC measures.

**Denominator Harmonization:** Several of the measures listed in the prior section are harmonized to the extent possible for denominator definitions with the submitted measure. In particular process measures related to community-acquired pneumonia (CAP) 0096, 0151, 0147, 0148 have defined CAP target population that matches closely to our submitted measure. **Numerator Harmonization:** Regarding numerator harmonization, several of the measures are subsets of our measure. In particular 0450, 0337, 0141, and 0202 list adverse events that have been synchronized with those definitions within the PAC measure. In addition, 0705, 0709 have numerator definitions harmonized completely for the definitions of PACs. However, there are some measures that are not harmonized, in particular the 30-day all-cause readmission measures. While the submitted PAC measures include readmissions that occur within 30 days of discharge, the readmissions, by definition, are related to pneumonia and not due to any cause. While 30-day all-cause readmissions might make sense in a Medicare population, it is not self-evident that they do for commercial or Medicaid populations. However, that said, our data suggest that there are, in fact, very few readmissions within 30 days post discharge that aren't relevant to the index hospitalization. It is worth noting that there is some mounting controversy about the 30 day all cause readmission measures and some data suggest that these measures might have simply pushed out certain readmissions to 31 or more days post discharge. Irrespective of these points, PACs include readmissions and are designed to enable accountability at the locus of provider control as well as some shared accountability between settings, centered around a patient, and for a specific medical episode of care. In that sense, they are consistent with the all-cause 30-day readmission rates, but represent a subset of those admissions. As such, the PAC measures, as submitted, don't create added burden of reporting because the readmissions reported are simply a part of the broader 30-day all-cause readmission measures already endorsed by NQF. Because PAC measures are comprehensive, they include patient safety events that can occur during the stay, as well as adverse events, including readmissions, that can occur post-discharge. As a result, they provide facilities and physicians with an overall measure of avoidable complications for a specific medical episode. The data collection for all of the HCI3 measures is automated by a software package and is fully harmonized with all other PAC measures. A single download automates creation of all reports related to each of the PAC measures.

#### **5b. Competing Measures**

The measure is superior to competing measures (e.g., is a more valid or efficient way to measure);

**OR**

Multiple measures are justified.

#### **5b.1. If this measure conceptually addresses both the same measure focus and the same target population as NQF-endorsed measure(s):**

**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.)**

Not Applicable

Related Measures: AHRQ-PQIs (PQI 11) Bacterial Pneumonia Admission Rate; CMS-HACs (Hospital Acquired Conditions)Not Applicable

Related Measures: AHRQ-PQIs (PQI 11) Bacterial Pneumonia Admission Rate; CMS-HACs (Hospital Acquired Conditions)

## Appendix

**A.1 Supplemental materials may be provided in an appendix.** All supplemental materials (such as data collection instrument or methodology reports) should be organized in one file with a table of contents or bookmarks. If material pertains to a specific submission form number, that should be indicated. Requested information should be provided in the submission form and required attachments. There is no guarantee that supplemental materials will be reviewed.

**Attachment Attachment:** [PACs\\_and\\_Severity\\_Adjustment\\_Fact\\_Sheet-635860501570909220.pdf](#)

## Contact Information

**Co.1 Measure Steward (Intellectual Property Owner):** Health Care Incentives Improvement Institute

**Co.2 Point of Contact:** Francois, de Brantes, [francois.debrantes@hci3.org](mailto:francois.debrantes@hci3.org), 203-270-2906-

**Co.3 Measure Developer if different from Measure Steward:** Health Care Incentives Improvement Institute

**Co.4 Point of Contact:** Amita, Rastogi, [amita.rastogi@hci3.org](mailto:amita.rastogi@hci3.org), 219-934-9624-

## Additional Information

### Ad.1 Workgroup/Expert Panel involved in measure development

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

In 2006 the Prometheus Payment Design Team convened a series of meetings with physicians that had been organized in Clinical Working Groups. These Groups focused on Cancer, Cardiac, Chronic, Orthopedic and Preventive care. The results of this work were summarized in a Commonwealth Fund report published in June 2007 (1) and served as an input to the initial modeling work performed in 2007 and early 2008. The Pneumonia measure was derived from this framework (2).

From 2006 onwards, and under the auspices of various funding organizations, HCI3 has convened and managed, or helped to convene and manage, Clinical Working Groups to inform the development and refinement of the measures. For example, in 2011, 2012 and 2013, HCI3 worked collaboratively with the American Board of Medical Specialties and the American Medical Association's Physicians Consortium for Performance Improvement, under a federal contract, to convene and get input from various clinical experts on definitions of episodes of care and their sequelae, including avoidable complications. Subsequently in 2015, HCI3 worked collaboratively with KPMG under the Medicaid DSRIP effort in New York State to get clinical input from Clinical Advisory Groups and Clinical Validation Groups who validated various episode definitions created by HCI3.

For a brief history of PAC measures, please see enclosed document called PAC and Severity Adjustment Fact Sheet.

Some of the clinical experts that have contributed to our work include the following and are also listed at the link below:  
[http://www.hci3.org/programs-efforts/prometheus-payment/evidence\\_informed\\_case\\_rates/how\\_is\\_an\\_ecr\\_created/clinical-working-group-contributors](http://www.hci3.org/programs-efforts/prometheus-payment/evidence_informed_case_rates/how_is_an_ecr_created/clinical-working-group-contributors)

-Dr. John Allen, American Gastroenterology Association (AGA)

-Dr. Morton Arnsdorf, Cardiologist, University of Chicago, IL

-Dr. Peter Bach, Memorial Sloan Kettering Cancer Center (MSKCC)

-Dr. Peter Basch, Primary Care, Medstar Health, DC

-Dr. Justin Beckelman, Radiation Oncology, University of Pennsylvania, PA

-Dr. Debra Bingham, Executive Director, California Maternal Quality Care Collaborative (CMQCC) at Stanford University, CA

-Dr. John Birkmeyer, American Society of Metabolic and Bariatric Surgery (ASMBS)

-Dr. Linda Bosserman, Wilshire Oncology Medical Group, CA

-Dr. Matthew Brengman, American Society of Metabolic and Bariatric Surgery (ASBMS)

-Dr. Joel Brill, American Gastroenterology Association (AGA)  
 -Dr. George Cautilli, Cautilli Orthopedic Surgical Specialists PC, Yardley, PA  
 -Dr. Ashwini Davison, Internist, Johns Hopkins Hospital, MD  
 -Dr. James Denny, III, American Academy of Otolaryngology – Head and Neck Surgery (AAO-HNS)  
 -Dr. Chris Gallagher, American Society of Metabolic and Bariatric Surgery (ASMBS)  
 -Dr. Robert Haralson, III, American Academy of Orthopedic Surgeons (AAOS)  
 -Ms. Dawn Holcombe, Executive Director, Connecticut Oncology Association, CT  
 -Dr. Colin Howden, American Gastroenterology Association (AGA)  
 -Dr. John Knightly, American Association of Neurological Surgeons (AANS)  
 -Dr. Larry Kosinski, American Gastroenterology Association (AGA)  
 -Dr. Nalini Krishnan, Obstetrics & Gynecology, MN  
 -Dr. Kelly Kyanko, Internist, NYU School of Medicine, NY  
 -Dr. Tara Lagu, Internist & Infectious Disease, Baystate Medical Center, MA  
 -Dr. Robert Lee, Society of Thoracic Surgeons (STS)  
 -Dr. Alex Little, Society of Thoracic Surgeons (STS)  
 -Dr. Michael London, Orthopedic Surgeon, OMNI Orthopedics, OH  
 -Dr. Elliott Main, Obstetrics & Gynecology, California Pacific Medical Center, CA  
 -Dr. Constantine Mantz, 21st Century Oncology, FL  
 -Dr. Joseph Messer, Cardiologist, Rush University Medical Center, IL  
 -Dr. David Metz, American Gastroenterology Association (AGA)  
 -Dr. Ronald Nahass, Infectious Disease Care, NJ  
 -Dr. Ajay Nehra, Urologist, Rush University Medical Center, IL  
 -Dr. Francis Nichols, Society of Thoracic Surgeons (STS)  
 -Dr. Patrick O'Connor, Primary Care, HealthPartners, MN  
 -Dr. Sara Perkel, National Comprehensive Cancer Network, PA  
 -Dr. David Peura, American Gastroenterology Association (AGA)  
 -Dr. John Ratliff, American Association of Neurological Surgeons (AANS)  
 -Dr. Steven Schutzer, Connecticut Joint Replacement Institute, CT  
 -Dr. Leif Solberg, Primary Care, HealthPartners, MN  
 -Dr. Scott Sporer, Midwest Orthopedics at Rush, Chicago IL  
 -Dr. Bonnie Weiner, Cardiologist, Worcester Medical Center, MA  
 -Dr. Jonathan Weiner, Bariatric Surgery codes, Prof of Health Policy and Management, Johns Hopkins University, MD  
 -Dr. Janet Wright, Cardiologist, Northstate Cardiology Consultants, CA

(1) de Brantes F, Camillus J. Evidence-informed case rates: a new health care payment model. Commonwealth Fund; 2007 May 20. Available from: [http://www.commonwealthfund.org/publications/publications\\_show.htm?doc\\_id=478278](http://www.commonwealthfund.org/publications/publications_show.htm?doc_id=478278).

(2) de Brantes F and Rastogi A: Evidence-Informed Case Rates: Paying for Safer, More Reliable Care. Commonwealth Fund; 2008 June 17. Available from: <http://www.hci3.org/content/evidence-informed-case-rates-paying-safer-more-reliable-care>

#### Measure Developer/Steward Updates and Ongoing Maintenance

**Ad.2 Year the measure was first released:** 2008

**Ad.3 Month and Year of most recent revision:** 12, 2015

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

**Ad.5 When is the next scheduled review/update for this measure?** 12, 2016

**Ad.6 Copyright statement:** Evidence-informed Case Rates®, ECR® and PROMETHEUS Payment® are all registered trademarks of Health Care Incentives Improvement Institute, Inc (HCI3). Use of these materials and any other property of HCI3 is subject to the terms and conditions posted on the website. All rights reserved, 2008-2015.

**Ad.7 Disclaimers:**

**Ad.8 Additional Information/Comments:** Please see enclosed document called PAC and Severity Adjustment Fact Sheet attached to Appendix A.1