**National Quality Forum—Evidence (subcriterion 1a)**

**Measure Number** (*if previously endorsed*)**:** 0283

**Measure Title**: Asthma in Younger Adults Admission Rate (PQI 15)

**IF the measure is a component in a composite performance measure, provide the title of the Composite Measure here:**

**Date of Submission**: 12/14/2015

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| **Instructions**  *For composite performance measures:*  *A separate evidence form is required for each component measure unless several components were studied together.*  *If a component measure is submitted as an individual performance measure, attach the evidence form to the individual measure submission.*   * Respond to all questions as instructed with answers immediately following the question. All information needed to demonstrate meeting the evidence subcriterion (1a) must be in this form. An appendix of *supplemental* materials may be submitted, but there is no guarantee it will be reviewed. * If you are unable to check a box, please highlight or shade the box for your response. * Maximum of 10 pages (*incudes questions/instructions*; minimum font size 11 pt; do not change margins). ***Contact NQF staff if more pages are needed.*** * Contact NQF staff regarding questions. Check for resources at [Submitting Standards webpage](http://www.qualityforum.org/Measuring_Performance/Submitting_Standards.aspx). |

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| **Note: The information provided in this form is intended to aid the Steering Committee and other stakeholders in understanding to what degree the evidence for this measure meets NQF’s evaluation criteria.**   1a. Evidence to Support the Measure Focus The measure focus is evidence-based, demonstrated as follows:   * Health outcome: [**3**](#Note3) a rationale supports the relationship of the health outcome to processes or structures of care. Applies to patient-reported outcomes (PRO), including health-related quality of life/functional status, symptom/symptom burden, experience with care, health-related behavior. * Intermediate clinical outcome: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [**4**](#Note4)that the measured intermediate clinical outcome leads to a desired health outcome. * Process: [**5**](#Note5) a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [**4**](#Note4) that the measured process leads to a desired health outcome. * Structure: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [**4**](#Note4) that the measured structure leads to a desired health outcome. * Efficiency: [**6**](#Note6) evidence not required for the resource use component.   **Notes**  **3.** Generally, rare event outcomes do not provide adequate information for improvement or discrimination; however, serious reportable events that are compared to zero are appropriate outcomes for public reporting and quality improvement.  **4.** The preferred systems for grading the evidence are the U.S. Preventive Services Task Force (USPSTF) [grading definitions](http://www.uspreventiveservicestaskforce.org/uspstf/grades.htm) and [methods](http://www.uspreventiveservicestaskforce.org/methods.htm), or Grading of Recommendations, Assessment, Development and Evaluation [(GRADE) guidelines](http://www.gradeworkinggroup.org/publications/index.htm).  **5.** Clinical care processes typically include multiple steps: assess → identify problem/potential problem → choose/plan intervention (with patient input) → provide intervention → evaluate impact on health status. If the measure focus is one step in such a multistep process, the step with the strongest evidence for the link to the desired outcome should be selected as the focus of measurement. Note: A measure focused only on collecting PROM data is not a PRO-PM.  **6.** Measures of efficiency combine the concepts of resource use and quality (see NQF’s [Measurement Framework: Evaluating Efficiency Across Episodes of Care](http://www.qualityforum.org/Publications/2010/01/Measurement_Framework__Evaluating_Efficiency_Across_Patient-Focused_Episodes_of_Care.aspx); [AQA Principles of Efficiency Measures](http://www.aqaalliance.org/files/PrinciplesofEfficiencyMeasurementApril2006.doc)). |

**1a.1.This is a measure of**: (*should be consistent with type of measure entered in De.1*)

Outcome

Health outcome: Hospitalization for asthma

Patient-reported outcome (PRO): Click here to name the PRO

*PROs include HRQoL/functional status, symptom/symptom burden, experience with care, health-related behaviors*

Intermediate clinical outcome (*e.g., lab value*): Click here to name the intermediate outcome

Process: Click here to name the process

Structure: Click here to name the structure

Other: Click here to name what is being measured

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**HEALTH OUTCOME/PRO PERFORMANCE MEASURE**  *If not a health outcome or PRO, skip to* [*1a.3*](#Section1a3)

**1a.2.** **Briefly state or diagram the path between the health outcome (or PRO) and the healthcare structures, processes, interventions, or services that influence it.**

Asthma among young adults age 18-39, for the most part, can be treated in the outpatient setting. Numerous studies have shown an association at the patient level, between appropriate treatment and hospital admission rates, although education interventions have not always had an impact on admission rates.1,2 Asthma admission rates are also associated conceptually, and in some cases empirically, with community-level pollution3 and smoking rates.

**1a.2.1.** **State the rationale supporting the relationship between the health outcome (or PRO) to at least one healthcare structure, process, intervention, or service (*i.e., influence on outcome/PRO*).**

This indicator is intended to identify hospitalizations for asthma in younger adults age 18-39. With appropriate pharmaceutical and other outpatient management, risk of hospitalization is decreased.

*Note: For health outcome/PRO performance measures, no further information is required; however, you may provide evidence for any of the structures, processes, interventions, or service identified above.*

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**intermediate outcome, PROCESS, or STRUCTURE PERFORMANCE measure**

**1a.3.****Briefly state or diagram the path between structure, process, intermediate outcome, and health outcomes**. Include all the steps between the measure focus and the health outcome.

**1a.3.1.** **What is the source of the systematic review of the body of evidence that supports the performance measure?**

Clinical Practice Guideline recommendation – ***complete sections*** [***1a.4***](#Section1a4)***, and*** [***1a.7***](#Section1a7)

US Preventive Services Task Force Recommendation – ***complete sections*** [***1a.5***](#Section1a5) ***and*** [***1a.7***](#Section1a7)

Other systematic review and grading of the body of evidence (*e.g., Cochrane Collaboration, AHRQ Evidence Practice Center*) – ***complete sections*** [***1a.6***](#Section1a6) ***and*** [***1a.7***](#Section1a7)

Other – ***complete section*** [***1a.8***](#Section1a8)

*Please complete the sections indicated above for the source of evidence. You may skip the sections that do not apply.*

Please note that this is an outcome measure. Therefore, a systematic review of the body of evidence that supports the performance measure is not required. However, information is provided in 1a.4.1 and 1a.8 below, to provide additional context and support for the measure.

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**1a.4. CLINICAL PRACTICE GUIDELINE RECOMMENDATION**

**1a.4.1.** **Guideline citation** (*including date*) and **URL for guideline** (*if available online*):

Not applicable

**1a.4.2.** **Identify guideline recommendation number and/or page number** and **quote verbatim, the specific guideline recommendation**.

Not applicable

**1a.4.3.** **Grade assigned to the quoted recommendation with definition of the grade:**

Not applicable

**1a.4.4. Provide all other grades and associated definitions for recommendations in the grading system.** (*Note: If separate grades for the strength of the evidence, report them in section 1a.7.*)

Not applicable

**1a.4.5. Citation and URL for methodology for grading recommendations** (*if different from 1a.4.1*)**:**

Not applicable

**1a.4.6. If guideline is evidence-based (rather than expert opinion), are the details of the quantity, quality, and consistency of the body of evidence available (e.g., evidence tables)?**

Yes **→ *complete section*** [***1a.7***](#Section1a7)

No **→ *report on another systematic review of the evidence in sections*** [***1a.6***](#Section1a6) ***and*** [***1a.7***](#Section1a7)***; if another review does not exist, provide what is known from the guideline review of evidence in*** [***1a.7***](#Section1a7)

Not applicable

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**1a.5.** **UNITED STATES PREVENTIVE SERVICES TASK FORCE RECOMMENDATION**

**1a.5.1.** **Recommendation citation** (*including date*) and **URL for recommendation** (*if available online*):

Not applicable

**1a.5.2.** **Identify recommendation number and/or page number** and **quote verbatim, the specific recommendation**.

Not applicable

**1a.5.3.** **Grade assigned to the quoted recommendation with definition of the grade**:

Not applicable

**1a.5.4. Provide all other grades and associated definitions for recommendations in the grading system.** (*Note: the* *grading system for the evidence should be reported in section 1a.7.*)

Not applicable

**1a.5.5. Citation and URL for methodology for grading recommendations** (*if different from 1a.5.1*)**:**

Not applicable

***Complete section*** [***1a.7***](#Section1a7)

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**1a.6. OTHER SYSTEMATIC REVIEW OF THE BODY OF EVIDENCE**

**1a.6.1.** **Citation** (*including date*) and **URL** (*if available online*):

Not applicable

**1a.6.2.** **Citation and** **URL for methodology for evidence review and grading** (*if different from 1a.6.1*)**:**

Not applicable

***Complete section*** [***1a.7***](#Section1a7)

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**1a.7. FINDINGS FROM SYSTEMATIC REVIEW OF BODY OF THE EVIDENCE supporting the measure**

*If more than one systematic review of the evidence is identified above, you may choose to summarize the one (or more) for which the best information is available to provide a summary of the quantity, quality, and consistency of the body of evidence. Be sure to identify which review is the basis of the responses in this section and if more than one, provide a separate response for each review.*

**1a.7.1.** **What was the specific structure, treatment, intervention, service, or intermediate outcome addressed in the evidence review?**

Not applicable

**1a.7.2.** **Grade assigned for the quality of the quoted evidence with definition of the grade**:

Not applicable

**1a.7.3. Provide all other grades and associated definitions for strength of the evidence in the grading system.**

Not applicable

**1a.7.4.** **What is the time period covered by the body of evidence? (*provide the date range, e.g., 1990-2010*). Date range**: Click here to enter date range

Not applicable

**QUANTITY AND QUALITY OF BODY OF EVIDENCE**

**1a.7.5.****How many and what type of study designs are included in the body of evidence**? (*e.g., 3 randomized controlled trials and 1 observational study*)

Not applicable

**1a.7.6.** **What is the overall quality of evidence across studies in the body of evidence**? (*discuss the certainty or confidence in the estimates of effect particularly in relation to study factors such as design flaws, imprecision due to small numbers, indirectness of studies to the measure focus or target population*)

Not applicable

**ESTIMATES OF BENEFIT AND CONSISTENCY ACROSS STUDIES IN BODY OF EVIDENCE**

**1a.7.7.** **What are the estimates of benefit—magnitude and direction of effect on outcome(s) across studies in the body of evidence**? (*e.g., ranges of percentages or odds ratios for improvement/ decline across studies, results of meta-analysis, and statistical significance*)

Not applicable

**1a.7.8.** **What harms were studied and how do they affect the net benefit (benefits over harms)?**

Not applicable

**UPDATE TO THE SYSTEMATIC REVIEW(S) OF THE BODY OF EVIDENCE**

**1a.7.9.** **If new studies have been conducted since the systematic review of the body of evidence, provide for each new study: 1) citation, 2) description, 3) results, 4) impact on conclusions of systematic review**.

Not applicable

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**1a.8 OTHER SOURCE OF EVIDENCE**

*If source of evidence is NOT from a clinical practice guideline, USPSTF, or systematic review, please describe the evidence on which you are basing the performance measure.*

**1a.8.1** **What process was used to identify the evidence?**

Formal environmental scans of the literature, including routine PubMed searches are performed to continually update evidence for all AHRQ PQIs, including PQI15. The current evidence review results presented below constitute articles published from January 2012 - October 2015. Additional articles from earlier years were identified from previous project-related literature reviews. Search terms included the relevant MeSH term (asthma). We combined this clinical search string with hospital\*[Title/Abstract]) AND (prevent\*[Title/Abstract] OR "access to care"[Title/Abstract] OR "ambulatory care sensitive"[Title/Abstract] OR “avoidable hospitalization”[Title/Abstract] OR "small area analysis"[MeSH]). For completeness, we also tested more inclusive search strings. Below, we have provided a summary of the most up-to-date evidence.

**1a.8.2.** **Provide the citation and summary for each piece of evidence.**

This section describes the current evidence related to PQI 15. Because studies evaluating asthma exacerbations often combine Emergency Department (ED) visits with hospitalizations, we note below when this combined outcome was assessed. Furthermore, asthma studies include patients of varying ages, and may combine data from children and young adults or young adults with older adults. We include in the evidence for PQI 15, studies with various age ranges that include young adults.

**Importance**

Using 2000-2010 NIS and SID data, one HCUP statistical brief by the Agency for Health Care Policy and Research (2014) examined geographic and temporal variation in PQI15 (version 4.1) rates.4 The rate of adult asthma-related hospital stays remained relatively unchanged between 2000 and 2010, at about 119 hospital stays per 100,000 population. Adults treated in the Northeast had a higher rate of hospital stays for asthma (167.6 per 100,000 population) than adults in other Census regions (which were 110.0 or less per 100,000 population) (p < 0.05). A study by Roy et al. (2010) found that asthma hospitalization rates were significantly higher among all demographic groups in the rural Delta region compared with the urban Jackson Metropolitan Statistical Area (P < 0.001). Residents of the Delta also had higher odds for multiple hospitalizations when controlling for race, sex, age, and household income (P < 0.05).5 In another study of an urban Philadelphia population, rates of hospitalization declined significantly between 1995–1997 and 1997-1999 (from 23 to 19 per 10,000; χ2= 30.62; *P* < .001).6

**Validity**

As a population health indicator, we consider the relationship of PQI 15 to a wide range of factors that are amenable to changes in public policy and community based interventions that may in turn improve access to quality care and community resources, reduce risky personal behaviors or improve self-care, reduce environmental exposure, or prevent the development of asthma.

***Disparities***

Disparities in asthma hospitalization rates among non-whites, particularly among Blacks, has been documented in numerous studies. Using 2000-2010 NIS and SID data, the Agency for Health Care Policy and Research revealed gender, racial and income-based disparities in PQI15 (version 4.1) rates. 4 In 2010, females had a 129 percent higher rate of hospital stays than males (163.0 versus 71.2 hospital stays per 100,000 population), while African American and Hispanic patients had higher rates of asthma hospitalization (297.9 and 144.6 per 100,000 population, respectively) than White and Asian and Pacific Islander patients (90.5 and 65.4 per 100,000 population, respectively). Additionally, adult patients in the lowest income communities had higher rates of hospital stays for asthma than those in the highest income communities (194.3 versus 72.6 hospital stays per 100,000 population). All differences noted exhibited at least a 10 percent difference between estimates and were statistically significant at 0.05 or better. 4 In a large prospective cohort study, Blacks and Asians had higher asthma hospitalization rates compared to Whites (relative risks (RR) 1.7; 95% CI 1.4–2.0 and RR 1.6; 95% CI 1.2– 2.1), but Hispanics did not (RR 0.9; 95% CI 0.6–1.4). Among Asians, increased risk was concentrated in Filipino men and women and South Asian men.8 In another study of an urban population, African Americans had signifigicantly higher hospitalization rates than Caucasians (45.7 vs. 7.6 per 10,000). These findings were consistent across all poverty levels. Moreover, asthma hospitalization was significantly associated with poverty area residence (relative risk [RR], 2.29) and with African American race (RR 4.31) (both p < 0.001).6 Roy et al. (2010) found that hospitalization rates were higher among blacks and females (p < 0.001). In both Mississipi regions studied, Blacks were more likely than Causasians to have 3 or more asthma hospitalizations (P < .001).5 In a retrospective analysis, asthma hospitalizations were associated with male gender (OR 0.67; 95% CI 0.52–0.86) and with residence in neighborhood in which more than 10% of the population is non-white (OR 1.62; 95% CI 1.23–2.13).9 Sawicki et al. (2010) reported that asthma hospitalizations were associated with residence in neighborhood in which more than 50% of adults have only high school education or less (OR 1.39; 95% CI1.02–1.89).9 By contrast, another study by Gold et al. (2013) found that across all levels of asthma control, non-whites did not have significantly higher rates of hospitalizations than whites.7

**Community characteristics**

The following section discusses evidence related to leverage points within the community outside the healthcare system. It describes the relationship of county characteristics to asthma hospitalization. Interventions which effectively modify these characteristics, may impact asthma hospitalization. Although, all studies were correlational in nature, and cannot speak to the causal nature of the relationship.

***Environmental exposure***

Silverman and Ito (2010) found an increased risk for total asthma hospitalizations associated with both Particulate Matter (PM2.5) and ozone. These estimated risks were age-dependent, with the stronger associations appearing for those under age 19 than for those over the age of 18. The risk of non-ICU asthma hospitalization among all age groups for PM2.5 and ozone were each 1.09 (95% CI 1.06-1.12).10 Anderson et al. (2012) observed the effect of traffic-related air pollution on older Danish adults over time and found that NO2 levels were associated with risk for asthma hospitalisation (HR and 95% CI per IQR, 5.8 μg/m3: 1.12; 1.04-1.22), and for first-ever admissions (1.10; 1.01-1.20), with the highest risk in people with a previous asthma hospitalization (1.41; 1.15-2.07) (p <0.05, Wald test for interaction).11 Another small study observed 142 workers exposed to welding and found that welding exposure was the fifth leading cause of work-related asthma, a condition which required hospitalization in 36.7% (n=50) of the study sample.12

***Access to care***

The following section discusses evidence related to leverage points within the health care system. The following studies primarily examine alternative care models and patient-level hospitalization rates. While it cannot be assumed from these studies that improving care for patients will necessarily result in lower area-level hospitalization rates, these studies identify potential mechanisms to improve outcomes for patients.

Several studies have linked asthma hospitalizations with other markers of asthma severity or uncontrolled disease. Gold et al. (2013) examined various patient characteristics and reported that those with asthma characterized as uncontrolled or partly controlled had more hospitalizations than patients whose asthma was well-controlled (mean 12-month hospitalizations were 0.5, 0.07 and 0.03, respectively; p < 0.001).7 In one study of an urban population, asthma hospitalizations were directly correlated with prescriptions for inhaled short-acting β-agonists in 1995–1997 and 1997-1999 (rs = 0.61 and 0.60 respectively for both time periods, p <0.001) and inversely correlated with long-acting β-agonists (LABA) prescriptions during the same time periods (rs = -0.56 and -0.66, respectively, p < 0.001). This study also found higher hospitalization rates for 35- to 64-year-olds than for 18- to 34 year olds (13.7 vs. 11.9 per 10,000); and asthma hospitalization was also significantly associated with age (RR 1.15; P <.001).6

However, Williams et al. (2011) found that an estimated 24% of asthma exacerbations were attributable to inhaled corticosteroid (ICS) medication nonadherence. In that study, inhaled corticosteroid adherence varied in the time period leading up to an asthma exacerbation and was associated with a reduction in asthma exacerbations (including hospitalization), but this association was only statistically significant among patients whose adherence was greater than 75% of the prescribed dose (Hazard ratio 0.61; 95% CI 0.41-0.90) when compared with patients whose adherence was 25% or less. This pattern was largely confined to patients whose asthma was not well controlled initially.13

Schlender et al. (2012) developed a model that predicted the clinical effects of two widely used controller medications, ICS and LABA, and then applied that model to a population derived from the National Asthma Survey to quantify the effects of increasing prescriptions to guideline-recommended levels, increasing adherence, or both, on the frequency of hospitalizations.14 They used the simulation model to estimate the impact of increased corticosteroid use under EO (Expanded Prescribing Observed Adherence), OP (Observed Prescribing Perfect Adherence), and EP (Expanded Prescribing Perfect Adherence) scenarios on averting hospitalizations. The authors found that differences in outcomes rates observed for EO and OP scenarios were not significant, however, the mean hospitalizations, per year for the EP group was 0.04 (0.01 SD) compared to the OO (Observed Prescribing Observed Adherence) group with a mean of 0.17 (0.03 SD); p <0.03. Under the EP scenario, the model predicts a 1,100,000 (80%) of overnight hospitalizations would be averted relative to OO.

Several studies examine the efficacy of interventions aimed at reducing rates of adult asthma hospitalizations. A Cochrane review of 5 studies demonstrated that educational interventions for adults who visit the emergency room for acute asthma led to a reduction in the risk of subsequent hospitalizations (RR 0.50; 95% CI 0.27-0.91; N=572).2 Chamnan et al. (2010), in examining a small study set in Thailand, found that among the 57 patients enrolled in a 12-week disease management program, hospitalizations with acute asthma attacks decreased from 0.14 to 0.04 per patient (p = 0.034) following the intervention.15 However, three studies found limited impact for asthma education efforts. One study examining the effects of home-based education programs, found no significant impact of interventions on asthma hospitalizations among Medicaid-managed care patients.1 Mancuso et al (2010) tested the effect of an educational intervention designed to improve asthma knowledge and self-efficacy among patients with depressive symptoms in a primary care setting, and found no difference in asthma hospitalizations between treatment and control groups.16 Apter et al. (2011) investigated whether an individualized problem-solving intervention improves asthma outcomes over adult education efforts, and found no significant differences between the two groups in hospitalization rates.17

**Seasonal variation, influenza and vaccination**

Asthma-related healthcare utilization is also affected by seasonal factors. One study by Gerke et al. (2014) used NIS data (1998-2008) to reveal that asthma hospitalization rates with a secondary diagnosis of influenza were significantly associated with elevated influenza activity (p<0.0001).18 Trogdon et al. (2010) used MEPS data to show that adults with asthma vaccinated for influenza were 4.4 percentage points less likely to have an inpatient stay due to acute and chronic respiratory conditions (95% CI = -10.8 to -1.0).19

Fitzgerald et al. (2014) examined data from New York State to track seasonal variation of adult asthma-related hospital admissions.20 The authors found asthma admissions in the state decreased during cold spells in the winter months of December through March (-4.9% decline in mean daily asthma admissions, 95% CI -7.83 to -1.88). This decline was stronger in upstate New York (-5.51% change, 95% CI -9.52 to -1.33), which is generally colder than the rest of the state. A different pattern was evident after a cold spell for the transitional months of November and April. In both of these months, there was a significant increase in asthma hospitalizations after a cold spell in New York State (9.63% increase in November, 95% CI 5.51 to 13.92 and a 5.00% increase in April, 95% CI 1.19 to 8.96) and in upstate New York specifically (8.46% increase in November, 95% CI 0.58 to 16.95 and a 7.70% increase in April, 95% CI 0.08 to 15.89).

### References

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