

# **Appropriateness of Emergency Department Visits for Children and Adolescents with Identifiable Asthma**

## **Technical Specifications**

### **A. Description**

The measure distinguishes between those ED visits by children and adolescents for asthma that do and do not have documented evidence indicating that the ED is an appropriate level of care for the visit, according to explicit criteria. The criteria were developed by an expert panel using a modified RAND/UCLA approach as part of the work performed in the pediatric Quality Measures Program by the Mount Sinai Collaboration for Advancing Pediatric Quality Measures (CAPQuaM).

We specify visits as appropriate or of questionable appropriateness (questionable) after review of both administrative and chart audit data, using a variation of the HEDIS approach for hybrid measures.

### **B. Eligible Population**

Children and adolescents ages 2-21 years with asthma who:

- Have received sufficient medical services for asthma to meet the specified criteria for identifiable asthma prior to the month assessed.
- Have 3 consecutive months of enrollment in the responsible entity, including the month being assessed.
- Have an ED visit associated with asthma as the first or second diagnosis.

This measure is specified for children and adolescents up to age 21. The oldest age cohort of 19-21 years is optional, and its inclusion or exclusion should be context specific, including the needs of the reporting entity and the entity to whom the reports are being submitted.

Descriptive definitions for being managed for identifiable asthma are as follows. Specifications follow the descriptive definitions. Identifiable asthma is present in any child who has:

- Any prior hospitalization with asthma as the primary or secondary diagnosis; OR
- Other qualifying events, all ages:
  - Three or more ambulatory visits with a diagnosis of asthma or bronchitis; OR
  - Two or more ambulatory visits with a diagnosis of asthma and/or bronchitis AND one or more asthma-related prescriptions.
- OR, for children older than age 5 who have an ED visit for asthma (as first or second diagnosis) in the reporting month and prior to the reporting month who have had:

- One or more prior ambulatory visits with asthma as the primary diagnosis after the 5<sup>th</sup> birthday, OR
- Two or more ambulatory visits after the 5<sup>th</sup> birthday with asthma as a diagnosis, OR
- One ambulatory visit with asthma as a diagnosis AND at least one asthma-related prescription, both occurring after the 5<sup>th</sup> birthday, OR
- Two or more ambulatory visits with a diagnosis of bronchitis after the 5<sup>th</sup> birthday.

For eligibility purposes, asthma-related medicine means long-acting beta-agonist (alone or in combination) or inhaled corticosteroid (alone or in combination), anti-asthmatic combinations, methylxanthines (alone or in combination), and/or mast cell stabilizers.

### **C. Specific Exclusions**

1. Children with current or pre-existing:
  - Chronic obstructive pulmonary disease (COPD) diagnosis (ICD-9 code 496; ICD-10-CM code J44).
  - Cystic fibrosis diagnosis (ICD-9 codes 277.0, 277.01, 277.02, 277.03, 277.09; ICD-10-CM code E84).
  - Emphysema diagnosis (ICD-9 code 492xx; ICD-10-CM code J43).
2. Events occurring in patients who have not been enrolled in the reporting plan for at least 2 consecutive months before the index reporting month (a total of 3 consecutive months).

### **D. Data and Sources**

This is a hybrid administrative data and chart review measure. Administrative review establishes eligibility for randomization into the sample. Not all events identified for the sample or subject to chart review will qualify for inclusion in the measures.

#### **Administrative Data (billing, diagnosis, procedure codes, pharmacy data) with Medical Record (electronic or paper)**

General data elements include:

- Personal Demographics: Age, Sex or Gender, Race and Ethnicity.
- Zip code or State and County of residence (Record FIPS where available).
- Insurance type: Medicaid/CHIP (or other government issued such as military), Private, Workers Compensation, Uninsured (includes self-pay).

General data elements should be identified using administrative data when they are known to be reliable; otherwise they should be obtained from the medical record (chart audit) after inclusion in the random sample.

Administrative data elements include:

- CPT and revenue codes (Table 1) to establish identifiable asthma and to identify qualifying emergency department visits and hospitalizations.
- Pharmacy fill data when available to incorporate into the identifiable asthma algorithms.
- Dates of service for indicated events.

Medical record data elements include:

Assessing the relationship between ED visits and hospitalizations:

- Establishing whether the disposition of the ED visit was admission to the hospital.
- Establishing whether the hospitalization identified through administrative data can be attributed to admission from a unique ED visit not already in the sample.

Findings from the ED visit only:

- Documented physical findings consistent with respiratory distress, including:
  - Labored breathing (including moderate or severe increased work of breathing).
  - Retractions, grunting, and/or evidence of accessory muscle use.
  - Markedly decreased breath sounds.
- Low oxygen (O<sub>2</sub>) saturation level (dichotomized, < 90% qualifies);
- An arterial blood gas (ABG) was obtained;
- The child had a consultation with a pulmonologist or asthma specialist;
- There is documentation that prior to arrival in the ED:
  - The child was referred to the ED after evaluation by the PCP or other clinician.
  - The child received two or more doses of inhaled rescue medications without sufficient clinical improvement.
  - The child was assessed with an objective instrument such as a peak flow meter and was found to be in a pre-defined “red zone” of peak flow measurement as part of an asthma action or similar plan.

## **E. Calculation**

### **Step 1: Select starting cohort**

Identify the upper age limit to be used, either 18 or 21. The measure is specified from 2 to 21 years, with 19-21 year olds considered optional.

**Step 2: Conduct analysis of administrative data using the specifications described in B. Eligible Population (above) to identify children within the specified age range with identifiable asthma using criteria above (and using indicated exclusions).**

The analysis should be conducted on a month by month basis as described herein:

Within the group of children who meet the criteria for identifiable asthma, identify and maintain a unique patient identifier, age, and all stratification variables described below.

Determine eligibility for each patient, as of the last day of the month prior to the reporting month.

For example, if the goal is to report for January 2011, first identify children with identifiable asthma (above), and analyze all of calendar year 2010 when doing so. Continuous enrollment criterion requires that the child was enrolled in November and December of 2010.

Next, for February analyze all of calendar year 2010 AND January 2011. Continuous enrollment criterion requires that the child was enrolled in December 2010 and January 2011.

Repeat this progression monthly so that for December, one would identify children with identifiable asthma and analyze all of calendar year 2010 AND January through November 2011 when doing so. Continuous enrollment criterion requires that for December the child was enrolled in October 2011 and November 2011.

### **Step 3: Identify ED visits and hospitalizations for asthma in eligible children**

Considering only the children who were identified as eligible in the given month according to Step 2, perform a month-by-month analysis to identify and log all ED visits with asthma as a primary or secondary diagnosis and all hospitalizations with asthma as a primary or secondary diagnosis for each reporting month. Maintain stratification variables, age, and unique identifiers.

### **Step 4: Stratify by age and develop random samples.**

Stratify by age group (use age at month of qualifying event):

- Age 2-5 years (second birthday to the day before the 6th birthday);
- Age 6-11 years (sixth birthday to the day before the 12th birthday);
- Age 12-18 years (twelfth birthday to the day before the 18th birthday); and
- Age 19-21 years (nineteenth birthday to the day before the 21st birthday).

Within each age group, randomly select 500 records.

Analyze each age group's random sample distinctly; sort into three groups:

- Group A: Those with asthma ED visits ONLY and no associated asthma hospitalization to the same hospital on the same date. These ED visits are INCLUDED in the *Denominator* and Receive Medical Record Review to assess eligibility for the *Numerator*;
- Group B: Those with both Asthma ED Visits and Asthma Hospitalizations at the same facility on the same date and for whom the hospital discharge date is after the ED date of service. These ED visits are INCLUDED in the *Denominator* and in the *Numerator*. No further review is necessary to establish appropriateness;
- Group C: Those with asthma Hospitalizations ONLY and no associated asthma ED Visit to the same hospital on the same date. Please note that children admitted to the ED one date and admitted to the hospital the next day (from the same ED visit) will be identified in this group. Group C Hospitalizations are subject to Medical Record Review to assess eligibility for the

*Denominator.* If they are eligible for the denominator they will be included in BOTH the *Numerator* and *Denominator*.

Please note that the terms medical chart and medical record are used interchangeably, as are the terms audit and review in this context.

### **Step 5: Collect data elements from administrative data**

Collect the following data elements for all eligible children in each randomized sample. These data elements are used for reporting stratified results. Entities that are interested in assuring large samples for specific stratified analyses may choose to incorporate a further stratified sampling scheme and oversample to assure that there is a sample size of 100-500 per stratification category (e.g. race or ethnicity of interest). Such a sampling scheme must employ an appropriate weighting system (using the reciprocal of the likelihood for selection as a weight, c.f. Rao, P., 2000. *Sampling Methodologies with Applications*. New York: Chapman & Hall) to estimate overall performance. Alternatively, the stratified samples may be used only for reporting stratum specific performance comparison and not for estimating the overall performance. Approximate 95% confidence interval widths (assuming a rate of 50% appropriateness) are shown here. We oversample by 25% to account for potential loss in our event identifications.

<b>Relationship Between Sample Size and Width of 95 % Confidence Interval</b>
N= 50, + / - 13%
N= 75, + / - 11%
N= 100, + / - 10%
N= 150, + / - 8%
N= 200, + / - 7%
N= 250, + / - 6%
N= 400, + / - 5%

Stratification Variables should include:

- Race
- Ethnicity
- Insurance type (Public, Commercial, Uninsured)
- Benefit type (if insured): HMO, PPO, Medicaid Primary Care Case Management
- (PCCM) Plan, Fee for Service (FFS), other
- Zip code, state and county or equivalent area of parent/caregiver's residence. Record FIPS if available.

### **Step 6: Create stratification variables**

- Race/Ethnicity: Hispanic, Non-Hispanic Black, Non-Hispanic White; Non-Hispanic Asian/Pacific Islander, other Non-Hispanic.
- Public vs Commercial (Private Insurance).

- HMO vs PPO vs FFS vs PCCM vs other; Within Medicaid, States may ask for reporting of FFS vs Managed Care or other relevant enrollment categories.
- Urban Influence Code. Identify the Urban Influence Code or UIC. (2013 urban influence codes available at: <http://www.ers.usda.gov/data-products/urbaninfluence-codes.aspx#.UZUvG2cVoj8>). Use parent or primary caregiver's place of residence to determine UIC. State and county names can be linked or looked up directly or zip codes can be linked to county indirectly, using the Missouri Census Data Center (<http://mcdc.missouri.edu/>). These data will link to county or county equivalents as used in various states.
- Identify the Level of Poverty in the parent or primary caregiver's county of residence. The percent of all residents in poverty by county or county equivalent are available from the U.S. Department of Agriculture at <http://www.ers.usda.gov/data-products/county-level-data-sets/downloaddata.aspx>. Our stratification standards are based on 2011 US population data that we have analyzed with SAS 9.3. Using parent or primary caregiver's state and county of residence (or equivalent) or FIPS code, use the variable PCTPOVALL\_2011 to categorize into one of 5 Strata:

- Lowest Quartile of Poverty if percent in poverty is  $\leq 12.5\%$ .
- Second Quartile of Poverty if percent in poverty is  $> 12.5\%$  and  $\leq 16.5\%$ .
- Third Quartile of poverty if percent in poverty is  $> 16.5\%$  and  $\leq 20.7\%$ .
- First Upper Quartile (75th-90th) if percent in poverty is  $> 20.7\%$  and  $\leq 25.7\%$ .
- Second Upper Quartile ( $> 90$ th percentile).

Note: if needed, the Missouri Census Data Center may be used to link zip codes to county equivalents. <http://mcdc.missouri.edu/>.

### **Step 7. Conduct Chart Audit (Medical Record Review) of Group A ED Visits.**

Group A ED visits that have been selected for inclusion in the sample require a chart audit to assess eligibility for the numerator based on the explicit appropriateness criteria. They have already qualified for inclusion in the denominator.

Eligibility for the numerator is established based on documentation of any of the following items. Review may be terminated once *any* qualification for the numerator is identified.

- Disposition of the child from the ED was to an inpatient hospital.
- Documented physical findings consistent with respiratory distress, including:
  - Labored breathing with retractions and/or grunting;
  - Labored breathing with evidence of accessory muscle use; or,
  - Markedly decreased breath sounds;
- Low O<sub>2</sub> saturation level, defined as  $< 90\%$ .
- An ABG obtained and reported.
- A consultation obtained in the ED with a pulmonologist or other physician asthma specialist.
- Specific documentation that:
  - The child was referred to the ED after evaluation by the PCP or other licensed clinician practitioner; OR

- The child received two or more doses of inhaled rescue medications without sufficient clinical improvement; OR
- The child was assessed with an objective instrument such as a peak flow meter and was found to be in a pre-defined “red zone” of peak flow measurement as part of a pre-specified asthma action or similar plan.

There is no specified order for review. Some institutions may prefer to record all reasons for numerator qualification to support ongoing or planned improvement activities.

**Note 1:** Evidence for hospitalization above requires that the child was admitted to any hospital as an inpatient. This includes admission directly to a medical or pediatric ICU or inpatient floor or transfer directly to an inpatient facility. If a child is transferred to another hospital, confirmation that the child actually was admitted directly (i.e., was not first admitted to another ED prior to admission) is necessary prior to qualifying for the numerator. Such confirmation may include evidence from the administrative data review in Step 2. Other potential sources for this information include ED discharge summary, disposition on a flow, admit, or discharge form, or documentation by doctors, nurses, nurse practitioners or physician assistants.

**Note 2:** Evidence that the child was referred to the ED requires documentation of both of two requirements. The requirements are:

- The child/adolescent was referred by a clinician to come to the ED; and
- The child/adolescent was evaluated by the clinician prior to referral. Generally such evaluations will be in person. Assessment of respiratory distress by listening or speaking to the child/adolescent over the telephone is sufficient if such an examination is clearly documented.

Report of each requirement being met by the child/adolescent or parent/caregiver is sufficient to meet this criterion. Report of contact from the referring physician can also fulfill this criterion. Nursing notes, triage notes and clinician notes, particularly history of present illness (HPI) are common sources for this data.

**Note 3:** Evidence of a parent or caregiver report that the child received two or more doses of an inhaled rescue medication with insufficient clinical improvement typically will be found in triage, nursing, clinician, or respiratory therapy notes. It may also be documented as a part of medication reconciliation during intake. It requires documentation:

- That multiple treatments of medication were provided by inhalation or injection prior to arrival in the ED;
- That the medication(s) provided were specifically rescue medications and are not a part of the of the child/adolescent’s preventive or maintenance regimen; and,
- That the child continued to be in distress following the treatments (alternately that the child did not improve substantially).

**Note 4:** Parent/caregiver report that their child was in a pre-defined “red zone” of peak flow measurement includes documentation:

- That a pre-specified asthma plan (action plan) exists and defines a “red zone” based upon an objective respiratory measurement, such as a peak flow rate; and

- That the objective assessment was made prior to coming to the ED and that the results were in the pre-specified “red zone.”

**Note 5:** Reports of the physical exam typically may be found on triage, nursing, physician, nurse practitioner, physician assistant, or respiratory therapist notes. Diverse language may be used to describe similar findings, for example:

- The term pulling may be used to describe retractions. Retractions may be described as nasal flaring (particularly in infants), or by location (see below);
- Increased work of breathing may be indicated or it may be described by physical findings such as the use of accessory muscles, such as sub or intercostal muscles, supraclavicular or suprasternal. “Mildly” increased work of breathing or “minimal” retractions do not meet these criteria.
- Labored breathing, significant increased work of breathing, respiratory distress (moderate or greater), difficulty breathing, poor air entry (or air exchange or air movement) may all describe findings that meet this criterion. Grunting indicates that the child or adolescent is generating clearly audible sounds with each breath concomitant with apparent increased work of breathing. These may be found in the general description or respiratory section of the physical exam.
- Markedly (or severely) reduced breath sounds and descriptions of poor air movement are typically a part of an auscultation during the pulmonary exam.

**Note 6:** Documented evidence of the percent oxygen (O<sub>2</sub>) saturation from a transcutaneous assessment can be located in a flow sheet, nursing, respiratory therapy, or physician/nurse practitioner/physical assistant note or may be recorded as part of the physical exam. The O<sub>2</sub> saturation may be obtained initially at triage and is often assessed periodically during the visit. Any O<sub>2</sub> saturation less than 90 satisfies the criteria.

**Note 7:** An ABG requires drawing of a blood specimen from an artery and is distinguished from a venous blood gas, which would not fulfill this criterion.

This typically would be found in a laboratory results section of the record or commented as a finding in a clinician’s note, such as a respiratory therapist, doctor, PA, NP, or RN. An ABG is typically comprised of at least a pO<sub>2</sub>, pCO<sub>2</sub>, and pH.

**Note 8:** Consultation with a pulmonary specialist or other asthma specialist requires both an order for such a physician consultation and evidence that the consultation occurred, including a note from the consultant specialist. Typically a consultation from a pulmonologist, pediatric pulmonologist, allergist, or pediatric allergist would fill this criterion.

*Identify which ED visits meet at least one criterion for the Numerator. Maintain stratification variables.*

**Step 8: Conduct Chart Audit (Medical Record Review) to Assess Eligibility of Group C Hospitalizations for Inclusion in Denominator.**

Within each stratification group (as determined above), identify the asthma hospitalizations for which there were not associated ED visits (Group C). An asthma ED visit and asthma



hospitalization are said to be associated on the basis of the administrative data review only if they occur on the same service data and at the same institutions and if the hospital discharge date is after the ED service date. Such hospitalizations should have been included in Group B. Other hospitalizations require a review of the medical record to determine if they were admitted or transferred directly from an ED visit that was not otherwise in the sample (i.e., was not identified via the administrative data analysis).

The chart audit/medical record review seeks evidence that the child was admitted to the hospital directly from the ED or transferred directly from another hospital's ED. Evidence may include an ED note (physician, nurse, physician assistant, nurse practitioner), flow, or face sheet that indicates the disposition of the ED visit was hospital admission.

It may also include a note from within the hospitalization (including the admission note or any physician, nurse, physician assistant, nurse practitioner note), flow sheet, face sheet, or discharge summary that indicates that the hospitalization came directly from (was admitted from or transferred directly from) an ED.

In either case, the ED visit is only eligible for inclusion if the chart review specifies the date and institution of the ED visit sufficiently to assure that it can be uniquely identified and all duplication avoided. Others are excluded.

For example if an ED visit was identified in Group A and the resulting hospitalization appeared in Group C (either because of a different service date or different institution), the Group A ED visit would be included and the Group C hospitalization excluded as a duplicate (even though there was a preceding ED visit). If the child is uniquely included in the sample for that month and there is clear evidence that the admission came directly from an ED (e.g., was not transferred from another hospital after having been admitted from the ED) this measure can be satisfied.

De-duplication requires the elimination of any duplications that remain in the sample, considering the unit of analysis to be the ED visit. In other words, all ED visits must be included only once. Further, an ED visit identified via the hospitalization that also was a transfer from another ED visit already in the sample should have been removed as a duplicate. Similarly all hospitalizations lacking sufficient document that the child was admitted or transferred directly from an ED visit or lacking sufficient detail to allow confirmation that the ED visit referred to in the notes is not already in the sample elsewhere (e.g., from Group A) should have been removed.

Those Group C hospitalizations that can be identified as resulting from a unique (unduplicated) ED visit are included in BOTH the numerator and the denominator.

### **Step 9: Calculate and report the measure.**

- a) For each age stratum, count the number of events in the sample that qualify for the denominator (ND).
- b) For each age stratum, count the number of events in the sample and in the denominator that qualify for the numerator (NN).
- c) For each stratum, calculate the percent of appropriate ED visits as  $\text{Percent Appropriate} = 100 * (\text{NN} / \text{ND})$ . Report to one decimal place.

**Step 10: Report each stratification category listed below, that have an N of at least 50.**

- a) Race and ethnicity.
- b) Insurance type (Public/Medicaid, Private/Commercial, None, other).
- c) Benefit type: HMO vs PPO vs FFS vs PCCM vs other.
- d) Urban Influence Code or UIC.
- e) Level of poverty in the county of residence.

**Step 11. Calculate and report 95% confidence intervals (using binomial distribution for each stratum) for each age specific stratum and for all of the Step 9 stratifications.**

- a) Calculate the standard error as the square root of each proportion by [1-the same proportion] divided by the number in the denominator.
- b) Multiply the standard error by 1.96.
- c) Subtract that value from the measured proportion. Report the greater of 0 and that number as the lower bound of the 95% confidence interval.
- d) Add the product from b to the measured proportion. Use the lesser of that sum or 1 as the upper bound of the 95% confidence interval.