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

Section 1. Basic Measure Information

1.A. Measure Name

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

1.B. Measure Number

0239

1.C. Measure Description

Please provide a non-technical description of the measure that conveys what it measures to a broad audience.

This measure estimates the proportion of emergency department (ED) visits for asthma that meet criteria for the ED being the appropriate level of care among all ED visits for asthma in children and adolescents with identifiable asthma.

1.D. Measure Owner

Collaboration for Advancing Pediatric Quality Measures (CAPQuaM).

1.E. National Quality Forum (NQF) ID (if applicable)

Not applicable.

1.F. Measure Hierarchy

Please note here if the measure is part of a measure hierarchy or is part of a measure group or composite measure. The following definitions are used by AHRQ:

1. **Please identify the name of the collection of measures to which the measure belongs (if applicable). A collection is the highest possible level of the measure hierarchy. A collection may contain one or more sets, subsets, composites, and/or individual measures.**

   This measure belongs to the PQMP Measures of Emergency Department Use for Children with Asthma—Process Collection.

2. **Please identify the name of the measure set to which the measure belongs (if applicable). A set is the second level of the hierarchy. A set may include one or more subsets, composites, and/or individual measures.**

   This measure belongs to the PQMP Measures of Emergency Department Use for Children with Asthma—Appropriateness Set.

3. **Please identify the name of the subset to which the measure belongs (if applicable). A subset is the third level of the hierarchy. A subset may include one or more composites, and/or individual measures.**

   Not applicable.

4. **Please identify the name of the composite measure to which the measure belongs (if applicable). A composite is a measure with a score that is an aggregate of scores from other measures. A composite may include one or more other composites and/or individual measures. Composites may comprise component measures that can or cannot be used on their own.**

   Not applicable.

1.G. Numerator Statement

The numerator is defined as the number of denominator events that also satisfy at least one of the explicit appropriate use criteria and are in the random sample specified in Section 2, Technical Specifications. Separate numerators and denominators are reported for children ages 2-5 years, 6-11 years, 12-18 years, and optionally, 19-21 years.

Numerator Elements:

The presence or absence of documented evidence of any of the following:

- The child or adolescent was transferred or admitted to an inpatient hospital directly from the ED (may be administrative or chart review evidence).
- The child or adolescent was referred to the ED by his/her primary care clinician or other clinician after being evaluated.
- Prior to arrival in the ED, the child received two or more doses of inhaled rescue medications for the episode without clinical improvement (documentation of parent/caregiver report is sufficient).
- Prior to arrival in the ED, the child was found to be in a pre-defined and individualized "red zone" of peak flow measurement (documentation of parent/caregiver report is sufficient).
- Physical exam evidence of respiratory distress or labored breathing in the ED, such as:
  - Retractions.
  - Accessory muscle use.

- Markedly decreased breath sounds.

- An oxygen (0_2) saturation < 90 percent.
- An arterial blood gas (ABG) test was obtained.
- A consult with a pulmonologist or other asthma specialist was obtained in the ED.

1.H. Numerator Exclusions

Numerator events occurring in patients who do not meet denominator criteria or are not in the random sample for inclusion.

1.I. Denominator Statement

The denominator represents a random sample of the patients in each age stratum who have visited the ED for asthma (as a first or second diagnosis) and meet the specified criteria for having identifiable asthma.

Separate numerators and denominators are reported for children ages 2-5, 6-11, 12-18, and optionally, 19-21 years.

Denominator Elements:

The presence of identifiable asthma is established each month from administrative data using the specified algorithm and evidence including:

- 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 a 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 5th birthday, OR
  - Two or more ambulatory visits after the 5th 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 5th birthday, OR
  - Two or more ambulatory visits with a diagnosis of bronchitis after the 5th 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 mat cell stabilizers.

All events in the administrative data should be associated with a date of service.

1.J. Denominator Exclusions

1. Children with concurrent or pre-existing:
    a. Chronic obstructive pulmonary disease (COPD) diagnosis (ICD-9 code 496; ICD-10-CM code J44).
    b. Cystic fibrosis diagnosis (ICD-9 codes 277.0, 277.01, 277.02, 277.03, 277.09; ICD-10-CM code E84).
    c. Emphysema diagnosis (ICD-9 code 492xx; ICD-10-CM code J43).
2. Children without a prior established medical history of an asthma diagnosis at time of visit.
3. Any child that does not meet the age requirement.
4. Failure to have 3 months of continuous enrollment, including the reporting month.

1.K. Data Sources

Check all the data sources for which the measure is specified and tested.

Administrative data; paper medical record, electronic medical record (EMR).

If other, please list all other data sources in the field below.

Not applicable.

Section 2: Detailed Measure Specifications

Provide sufficient detail to describe how a measure would be calculated from the recommended data sources, uploading a separate document (+ Upload attachment) or a link to a URL. Examples of detailed measure specifications can be found in the CHIPRA Initial Core Set Technical Specifications Manual 2011 published by the Centers for Medicare & Medicaid Services. Although submission of formal programming code or algorithms that demonstrate how a measure would be calculated from a query of an appropriate electronic data source are not requested at this time, the availability of these resources may be a factor in determining whether a measure can be recommended for use.

The technical specifications and Table 1 (codes for identifying children meeting the measure criteria) are provided in the Supporting Documents.

Section 3. Importance of the Measure

In the following sections, provide brief descriptions of how the measure meets one or more of the following criteria for measure importance (general importance, importance to Medicaid and/or CHIP, complements or enhances an existing measure). Include references related to specific points made in your narrative (not a free-form listing of citations).

3.A. Evidence for General Importance of the Measure

Provide evidence for all applicable aspects of general importance:

- **Addresses a known or suspected quality gap and/or disparity in quality (e.g., addresses a socioeconomic disparity, a racial/ethnic disparity, a disparity for Children with Special Health Care Needs (CSHCN), a disparity for limited English proficient (LEP) populations).**
- **Potential for quality improvement (i.e., there are effective approaches to reducing the quality gap or disparity in quality).**
- **Prevalence of condition among children under age 21 and/or among pregnant women.**
- **Severity of condition and burden of condition on children, family, and society (unrelated to cost).**
- **Fiscal burden of measure focus (e.g., clinical condition) on patients, families, public and private payers, or society more generally, currently and over the life span of the child.**
- **Association of measure topic with children's future health – for example, a measure addressing childhood obesity may have implications for the subsequent development of cardiovascular diseases.**
- **The extent to which the measure is applicable to changes across developmental stages (e.g., infancy, early childhood, middle childhood, adolescence, young adulthood).**

Asthma matters for pediatrics (Adams, Smith, Ruffin, 2000; American Lung Association [ALA], 2012; Bahadori, Doyle-waters, Marra, et a., 2009; Cerdan, Alpert, Moonie, et al., 2012; Coventry, Weston, Collins, 1996; Fiese, Winter, Anbar, et al., 2008; Fuhrman, Dubus, Marguet, et al., 2011; Manice, 2013; Okelo, Wu, Krishnan, et al., 2004; Sawicki, Vilk, Schatz, et al, 2010; Weiss, Gergen, Hodgson, 1992; World Health Organization [WHO], 2011). Asthma is one of the most common chronic diseases in children, affecting an estimated 7.1 million children in the United States (National Center for Health Statistics [NCHS], 2011). In 2011, 4.1 million children experienced an asthma attack or episode. It is the second most common reason (after allergy) for children to be classified as having a special healthcare need, accounting for nearly 38.8 percent of such children. Pediatric asthma is more prevalent in minority populations. Lifetime prevalence rates of asthma in Hispanic and black children are 12.4 percent and 15.8 percent, respectively (Lara, Akinbami, Flores, et al., 2006).

We analyzed Healthcare Cost and Utilization Project (HCUP) data to estimate that children between 1 and 17 years old had more than 673,000 emergency department (ED) visits with asthma as the first diagnosis; almost 11 percent (or > 71,000) of these visits resulted in hospitalization. Considering all ages, asthma ED visits are common in all regions of the country, with a plurality in the South and fewer in the West. Such visits are relatively evenly split between teaching and non-teaching hospitals, and nearly 86 percent of visits occur for patients who live in metropolitan areas. Specifically, about 56 percent of visits are in large metropolitan or suburban areas, 29 percent in smaller metropolitan areas, and almost 15 percent in areas considered rural. Asthma exacerbations (including ED visits and subsequent hospitalizations) are consequential for the health and well-being of children and their families and may cost as much as $18 billion per year across all ages (Cerdan, et al., 2012; Fiese, et al., 2008; Manice, 2013; Okelo, et al., 2004).

Appropriate use of the ED for asthma care has been debated for decades. In a seminal article published more than three decades ago, DeAngelis and colleagues included an asthma attack as an appropriate indication for use of the ED (DeAngelis, Fosarelli, Duggan, 1985).

In this current context, AHRQ and the Centers for Medicare & Medicaid Services (CMS) charged CAPQuaM to develop measures under the heading of "Overuse – ED asthma." We have previously developed a measure that assesses the rate of ED use for children with identifiable asthma that counts the number of children with identifiable asthma and the number who have at least one ED visit and a measure that looks at connections with the primary care system before and after the index ED visit. With this measure, CAPQuaM advances DeAngelis' work by implementing systematically developed, explicit criteria to assess whether or not there is information to document that the ED was the appropriate level of care for the specific presentation of a given child.

A child may present to the ED with asthma for any number of reasons ranging from acute and life-threatening respiratory distress, to an acute exacerbation that may or may not respond readily to rescue medication, to running out of medication, or to anxiety or uncertainty. Visits may be precipitated by exposure to an environmental trigger, inability to reach or access a lower level of care, or clinical symptoms. The ED is typically a 24/7 reliable source of care that may or may not be more convenient than other options. We seek to disentangle some of the complex reasons that children with asthma are in the ED by seeking to identify reasons that make the ED an appropriate level of care for a given child at a particular moment. When such reasons are found, we call the visit appropriate. When we are unable to identify such a reason, we term the visit questionable, recognizing that we are only specifying some of the potentially appropriate indications within this measure. Our measure for appropriate use of the ED for asthma exacerbations was developed using explicit criteria developed using the RAND/UCLA Appropriateness Method (RUAM) as part of CAPQuaM's 360 Degree Method. Appropriateness is distinct from assessing whether or not the ED visit could have been preventable in the counterfactual circumstance of idealized care.

The literature points to two general characteristics of asthma care delivery systems that correlate with ED utilization. One is the effective use of preventive and routine care measures, such as multidisciplinary practice or a medical home model, the presence of an asthma action plan, and the use of controller medications supplemented by judicious use of rescue medications (Auger, Kahn, Davis, et al., 2013; Ducharme, Zemek, Chalut, et al., 2011; Farber, 2010; Smith, Wakefield, Cloutier, 2007; Talreja, Soubani, Sherwin, et al., 2012). The other is the availability of primary care or urgent care visits as a step before ED use in the context of either a general pediatric or an asthma specialty practice (Parchman, Culler, 1994; Smith, et al., 2007). Conversely, a lack of comprehensive asthma care, which includes primary and secondary prevention schemas, and a lack of available urgent care services are both commonly cited as reasons for preventable ED visits. It has been demonstrated that the children who used the ED underutilized primary care services (Smith, et al., 2007), and it has also been demonstrated that interventions that attempt to provide comprehensive, multidisciplinary care are able to decrease ED utilization for asthma care (Centers for Disease Control and Prevention [CDC], 2009). We acknowledge that environmental management and control represent a nonclinical opportunity to improve the quality of life for children with asthma and to reduce healthcare utilization, but we do not focus on these issues in this report.

High rates of asthma visits to the ED suggest widespread deficiencies in asthma care. The literature shows that lack of proper asthma care is disparate, with minority children bearing undue burden (Finkelstein, Brown, Schneider, et al., 1995; Homer, Szilagyi, Rodewald, et al., 1996; Price, Khubchandani, McKinney, et al., 2013).

The literature also presents different perspectives on appropriate use of the ED for pediatric asthma. Pediatric asthma is one of the leading conditions associated with avoidable ED visits (Flores, Abreu, Chaisson, et al., 2003). Asthma has been classified both as an avoidable hospitalization condition (AHC) and as an ambulatory care sensitive (ACS) condition; this signifies that many ED visits or hospital admissions could have been avoided with proper outpatient care (Flores, et al., 2003; Knudson, Casey, Burlew, et al., 2009). As noted, the availability of primary care can reduce such inappropriate visits (Bindman, Grumbach, Osmond, et al., 1995; Flores, et al., 2003; Parchman, Culler, 1994). Parents may choose to come to the ED if they cannot get a timely appointment with their primary care provider (PCP), have had poor experience with their PCP, or feel the ED offers higher quality and/or safer treatment than the ambulatory office. Parents may also panic when a child suddenly has trouble breathing and simply believe the child's symptoms require emergency care. This measure shows that undesirable utilization outcomes may reflect suboptimal primary care. Still, a potentially preventable visit is not the same as an inappropriate or unnecessary visit – sick asthmatic children may require ED care.

It is well understood that children who receive optimal asthma management and those who are well connected with their primary care practice are less likely to require an ED visit or a hospitalization than those who are less well managed or lack effective primary care. Well-developed scientific guidelines exist (National Heart, Lung, and Blood Institute [NHLBI], 2011).

Reducing the relative number of ED visits for care provided to asthmatic children remains a high priority on the national agenda and holds the promise of both financial savings and improved health-related quality of life. Overuse of the ED for all diagnoses is estimated to cost approximately $38 billion per year (New England Healthcare Institute [NEHI], 2010). One study illustrated the financial burden of non-urgent ED visits by calculating that treatment of an upper respiratory infection cost twice as much in the ED as compared to a family practitioner's office (Martin, 2000). Other detriments of ED overuse include overcrowding, long wait times, and an unnecessary workload on staff who provide care in a high pressure environment; overuse detracts from patients who truly need this level of care.

Assessing the extent to which ED use for asthma is appropriate can inform health policy, manpower planning, and clinical quality improvement activities. It can help to answer the question of how much of ED use potentially may be prevented by better management of the underlying asthma, versus how much requires other process or structural improvements to reduce use of the ED when a lower level of care would meet the clinical needs of the child. Refractory asthma or those with unavoidable environmental exposures leading to an acute exacerbation requiring medical care are likely to be identified as appropriate, reminding us that not all asthma ED visits are preventable, even with optimal care.

With a better understanding of ED use, healthcare organizations and policymakers could develop better informed approaches to optimizing services for children with asthma. Hopefully, children and their families may increasingly be spared the inconvenience, risk, and costs of ED visits for asthma.

3.B. Evidence for Importance of the Measure to Medicaid and/or CHIP

Comment on any specific features of this measure important to Medicaid and/or CHIP that are in addition to the evidence of importance described above, including the following:

- **The extent to which the measure is understood to be sensitive to changes in Medicaid or CHIP (e.g., policy changes, quality improvement strategies).**
- **Relevance to the Early and Periodic Screening, Diagnostic and Treatment benefit in Medicaid (EPSDT).**
- **Any other specific relevance to Medicaid/CHIP (please specify).**

Children with asthma comprise a critically important population for Medicaid. Our analysis of the 2011 National Survey of Children's Health (NSCH) suggests that more than 2.65 million children ages 2 and above in Medicaid have at one time been told they have asthma. Further, of all children whose parents report them to be in fair or poor health, 40 percent have asthma. Also, children with asthma are 23 percent less likely than children without asthma to have their health reported as very good or excellent. Asthma spans the country, with rates among Medicaid children ranging from 10.1 percent in Alaska to 28.8 percent in Kentucky, according to the NSCH. As a point of reference, 22.2 percent of Medicaid children in New York State have been told they have asthma. Asthma is prevalent in white, black, and Hispanic children in Medicaid

and in all age groups. Nationally, more than 35 of every 1,000 Medicaid children will visit the ED for asthma, with about 11 percent resulting in hospitalization (according to HCUP data).

Among children with special healthcare needs, using the 2007 National Survey of Children with Special Health Care Needs (NS-CSHCN), we found minority children to be overrepresented with asthma; 38 percent of children with asthma have public insurance. About one quarter (26 percent) live in households under the Federal poverty line, 28 percent are twice under the Federal poverty line, and only 24 percent have income more than four times the Federal poverty line. Nearly three quarters of these children have at least one sibling, and more than one-third of those siblings also have a special healthcare need, using the Health Resources and Services Administration's (HRSA's) screening tool to identify a CSHCN. We also found that race, income, and household educational attainment were independent predictors of ED utilization among children with asthma. Our analysis of New York State Medicaid data also shows about a 2.5-fold increase in the rate of using the ED of non-Hispanic blacks compared to non-Hispanic whites (non-Hispanic black > all Hispanic > non-Hispanic white > Asian). Asthma matters for all sorts of children in Medicaid.

A study compared children insured by Medicaid to children insured by commercial payers in the same health maintenance organization and found that Medicaid-insured children were 1.4 times as likely to visit the ED for asthma and 1.3 times as likely to be hospitalized for asthma as children with commercial insurance (Finkelstein, Barton, Donahue, et al., 2000). In addition, almost half of all hospitalizations of children for asthma are billed to Medicaid (Owens, Thompson, Elixhauser, et al., 2003). Recent estimates using National Hospital Ambulatory Medical Care Survey (NHAMCS) data put the overall costs of ED care for childhood asthma at $272 million in 2010 (Pearson, Goates, Harrykissoon, et al., 2014), even though their estimate of the number of ED visits is less than our estimation, which used HCUP data. Asthma ED use matters for Medicaid programs. Evidence from Oregon suggests that Medicaid ED visits increase with Medicaid expansion (Taubman, Allen, Wright, et al., 2014). There may be supply shortages of PCPs, or some doctors may be unwilling to see Medicaid patients.

ED use and hospitalization are considered to be potentially undesirable outcomes of asthma care. Some of these outcomes are challenging to prevent, resulting from refractory disease, unavoidable exposures, or environmental conditions that are outside the realm of clinical prevention. Many visits are avoidable, predicated upon optimal care delivery – that is, appropriate well-coordinated and continuous primary care that incorporates shared decision-making to optimize individual management using effective controller medications as appropriate, articulated in a written asthma management plan. Others are preventable when high quality acute care services are readily available. Environmental control writ small (e.g., avoiding exposure to cigarette smoke, wrapping mattresses in protective covers) and writ large (e.g., air quality) can reduce asthma exacerbations – these activities are typically outside of the clinical realm (Dick, Doust, Cowie, et al., 2014; Downes, Roy, McGinn, et al., 2010; Kearney, Johnson, Xu, 2014; Roy, Downes, Wisnievsky, 2011; Roy, Sheffield, Wong, et al., 2011; Roy, Wisnievsky, 2010a; Roy, Wisnievsky, 2010b).

We have previously developed a measure that uses an algorithm validated by an expert panel to identify children who have asthma, have required healthcare services in the recent past, and have asthma that should have been identified and managed by the healthcare system. Only children who have such identified asthma are considered eligible for this current measure. Previously, we used 2010 and 2011 data and found that more than 196,000 such children in New York State have identifiable asthma; more than 40,000 of those children generated nearly 60,000 asthma-related ED visits in 2011. We have further developed measures that assess proxies for linkages between the primary care and ED systems. This measure fills a gap by further distinguishing those ED visits for which one can identify in the medical record an indication that makes the ED visit an appropriate level of care and those for which such an indication cannot be identified. We call the former circumstance "appropriate" and the latter "questionable" to reflect our uncertainty about legitimate reasons for using the ED that may not be recorded routinely in the medical record (including several patient-centered reasons identified by our expert panel).

A recent RAND systematic review of non-urgent ED use lamented the lack of a standardized definition for what constitutes a non-urgent ED visit (Uscher-Pines, Pines, Kellermann, et al., 2013). In the context of our assignment to develop measures related to "asthma ED overuse" we have translated the RAND observation into a well-specified approach to assess whether or not the ED is an appropriate level of service for a specified child given the totality of their current circumstances. We assess this using explicit criteria developed by an expert panel incorporated into a modified RAND-UCLA Appropriateness Method.

As a common chronic illness characterized by remissions and potentially preventable exacerbations that may require costly services such as ED visits, undesirable utilization outcomes for asthma have been a frequent target for measurement for more than three decades. Reducing the relative number of ED visits during the care for asthmatic children remains a high priority on the national agenda. The universal delivery of optimal asthma care has the potential to lower costs and improve quality of life. Understanding which ED visits represent failures of clinical prevention and which instead represent a mismatch of service level to clinical need can help to move these goals forward. This measure represents a step in this direction.

3.C. Relationship to Other Measures (if any)

Describe, if known, how this measure complements or improves on an existing measure in this topic area for the child or adult population, or if it is intended to fill a specific gap in an existing measure category or topic. For example, the proposed measure may enhance an existing measure in the initial core set, it may lower the age range for an existing adult-focused measure, or it may fill a gap in measurement (e.g., for asthma care quality, inpatient care measures).

This measure is unique in that it describes a qualitative aspect of EDs for identifiable pediatric asthma—that is, what proportion can be found to have documented reasons that make the visit appropriate. This measure assesses both outcomes (ED visits) and process (appropriateness of level of care). It uses explicit appropriateness criteria developed by an expert panel that adopts a modified Delphi RAND/UCLA method. This method of development borrows from other development of appropriateness measures for medical or surgical procedures (Kleinman,

Kosecoff, Dubois, et al., 1994; Park, Fink, Brook, et al., 1986). This measure is part of a measure set developed by CAPQuaM and intended to distinguish the ED as an appropriate level of care. The definition of appropriate represents the judgment of the expert panel regarding whether or not the ED represents an appropriate level of care for the given clinical scenario. This measure is unique in that it assesses the appropriateness of a level of care for a specific chronic medical condition rather than the likely usefulness of a specific diagnostic procedure or therapeutic maneuver. While inappropriate ED visits may deliver beneficial care and improve outcomes, they are not efficient when compared to the counterfactual of an equally effective primary care visit.

This measure complements our asthma ED outcomes measures (one a count measure and one a rate measure) and the definition of events and of identifiable asthma are identical. In that sense, this measure is well-harmonized. Unlike the CAPQuaM asthma measures developed previously, this is a hybrid measure that requires chart review as well as administrative data analysis.

Section 4. Measure Categories

CHIPRA legislation requires that measures in the initial and improved core set, taken together, cover all settings, services, and topics of health care relevant to children. Moreover, the legislation requires the core set to address the needs of children across all ages, including services to promote healthy birth. Regardless of the eventual use of the measure, we are interested in knowing all settings, services, measure topics, and populations that this measure addresses. These categories are not exclusive of one another, so please indicate "Yes" to all that apply.

Does the measure address this category?

a. **Care Setting – ambulatory:** Yes.
b. **Care Setting – inpatient:** No.
c. **Care Setting – other – please specify:** Yes; Emergency Department.
d. **Service – preventive health, including services to promote healthy birth:** No.
e. **Service – care for acute conditions:** Yes.
f. **Service – care for children with special health care needs/chronic conditions:** Yes.
g. **Service – other (please specify):** No.
h. **Measure Topic – duration of enrollment:** No.
i. **Measure Topic – clinical quality:** Yes.
j. **Measure Topic – patient safety:** No.
k. **Measure Topic – family experience with care:** No.
l. **Measure Topic – care in the most integrated setting:** Yes.
m. **Measure Topic other (please specify):** No.
n. **Population – pregnant women:** No.
o. **Population – neonates (28 days after birth) (specify age range):** No.
p. **Population – infants (29 days to 1 year) (specify age range):** No.
q. **Population – pre-school age children (1 year through 5 years) (specify age range):** Yes; ages 2-5 years.

r. **Population – school-aged children (6 years through 10 years) (specify age range):** Yes; ages 6-10 years.
s. **Population – adolescents (11 years through 20 years) (specify age range):** Yes; ages 11-20 years.
t. **Population – other (specify age range):** Yes; age 21 years optional.
u. **Other category (please specify):** No.

Section 5. Evidence or Other Justification for the Focus of the Measure

The evidence base for the focus of the measures will be made explicit and transparent as part of the public release of CHIPRA deliberations; thus, it is critical for submitters to specify the scientific evidence or other basis for the focus of the measure in the following sections.

5.A. Research Evidence

Research evidence should include a brief description of the evidence base for valid relationship(s) among the structure, process, and/or outcome of health care that is the focus of the measure. For example, evidence exists for the relationship between immunizing a child or adolescent (process of care) and improved outcomes for the child and the public. If sufficient evidence existed for the use of immunization registries in practice or at the State level and the provision of immunizations to children and adolescents, such evidence would support the focus of a measure on immunization registries (a structural measure).

Describe the nature of the evidence, including study design, and provide relevant citations for statements made. Evidence may include rigorous systematic reviews of research literature and high-quality research studies.

Asthma is one of the most common indications for ED visits by children (Kharbanda, Hall, Shah, et al., 2013). Our analysis of AHRQ's HCUP data found that children between 1 and 17 years of age had more than 673,000 ED visits for asthma, with almost 11 percent (or > 71,000) resulting in hospitalization.

While ED use and its potential overuse has been debated for decades, the fact that the number of ED visits in the United States is increasing is clear: at approximately 134 million visits per year (Adams, 2013), one estimate suggests that 56 percent of all visits were avoidable (NEHI, 2010) and another that overuse of the ED costs $38 billion annually (Adams, 2013). NEHI rates ED overuse as the fourth largest category of healthcare waste, asserting that the ED is serving as overflow for an overburdened primary care system (NEHI, 2010). Undesirable consequences of questionable use include direct financial costs, ED overcrowding and delayed receipt of urgent and emergent care, fragmentation of care, lost productivity of children (school days) and parents/caregivers (work), side effects from management, and potentially, avoidable hospitalizations.

Evidence suggests that hospitalizations in children with asthma vary systematically by how well-equipped their communities are to provide primary care, and by the quality of primary care delivered (Homer, et al, 1996; Perrin, Greenspan, Bloom, et al., 1996; Perrin, Homer, Berwick, et al., 1989). There is an abundance of literature illustrating that ED visits and hospitalizations are each undesirable utilization outcomes from poorly managed asthma. There is not a large literature that assesses whether or not pediatric ED visits were appropriate (Berns, Linakis, Lewander, et al., 1994; DeAngelis, et al., 1985).

This topic is salient for Medicaid. Medicaid enrollment has been increasing since the economic recession in December 2008 and has continued to grow. The Congressional Budget Office estimates the total number of enrollees to approach 93 million by 2024, of which 41 percent are projected to be children (Rudowitz, 2014). Recent evidence shows that increases in ED visits go hand in hand with increases in Medicaid enrollment (Smulowitz, O'Malley, Yang, et al., 2014; Taubman, et al., 2014).

A body of literature has explored the value and feasibility of measuring the appropriateness of medical activities using data available in the medical record (Brook, Chassin, Fink, et al, 1986; Fitch, Bernstein, Aguilar, et al., 2001; Kosecoff, Fink, Brook, et al., 1987; Park, et al., 1986). Early work in adults included assessment of hysterectomy, carotid endarterectomy, and cardiac interventions. An independent research project brought the construct of appropriateness to children (Kemper, 1988), while Kleinman and colleagues were the first to assess the appropriateness of specific pediatric procedures (Kleinman, Boyd, Heritage, 1997; Kleinman, Kosecoff, et al., 1994). A later study demonstrated the feasibility of medical record data for such an assessment (Keyhani, Herbert, Ross, et al., 2008). DeAngelis pioneered studies of what constitutes a good reason to use the ED (DeAngelis, et al., 1985). All of these studies used a definition of appropriateness that compared benefit to likely risk without specific consideration of costs. The need for more studies looking for overuse was recently reviewed (Keyhani, Siu, 2008). The use of RAND-type Delphi panels is accepted around the world as a method for developing criteria to assess appropriateness (Basger, Chen, Moles, 2012; Bernstein, McGlynn, Siu, et al., 1993; Taylor, Cerqueira, Hodgson, et al., 2010). Research demonstrates that:

- ED visits are an important issue for Medicaid, with clinical and financial consequences.
- An overcrowded primary care system contributes to ED use for non-emergent and even non-urgent conditions.
- Pediatric hospitalizations for asthma vary by primary care availability and quality.
- ED visits are common for children with asthma, including those enrolled in Medicaid.
- Assessment of appropriateness using information in the medical record is a well-established and validated method that has been successfully applied to children.

The literature suggests that a measure that assesses whether or not the ED is an appropriate level of care for a child with asthma at the time that they present has intrinsic value. Such a measure would:

- Characterize the process of care in a way that assesses whether a particular ED visit represents overuse.
- Allow the outcomes of asthma care to be better characterized in a manner that describes performance and promotes targeted improvement. Inappropriate ED visits represent failures of primary care delivery, availability, and/or access. Appropriate visits may represent a failure to control asthma. These have distinct and distinguishable meanings.

An abstract describing the proposed measure was peer-reviewed and subsequently presented to a national audience at the Academy Health 2014 Annual Research Meeting in San Diego as part of the section on Measuring the Safety, Quality, and Value.

Research evidence supports the importance and need for this measure, which assesses whether the ED represents an appropriate level of care for children with asthma who are seen in the ED.

5.B. Clinical or Other Rationale Supporting the Focus of the Measure (optional)

Provide documentation of the clinical or other rationale for the focus of this measure, including citations as appropriate and available.

Asthma outcomes are sensitive to clinical management. The National Asthma Education and Prevention Program (NAEPP), coordinated by NHLBI, released guidelines in 2007 that are evidence based and offer well-demonstrated opportunities to improve care (NAEPP, 2007). Care is less than optimal and can be improved (Donahue, Fuhlbrigge, Finkelstein, et al., 2000; Lozano, Finkelstein, Carey, et al., 2004). Effective clinical, population, community, and school-based interventions are also possible (ALA, 2012; Benavides, Rodriguez, Maniscalco-Feichtl, 2009; Blaakman, Tremblay, Halterman, et al., 2013; Carrillo Zuniga, Kirk, Mier, et al., 2012; Cazzola, Matera, 2007; CDC, 2011; Cloutier, Hall, Wakefield, et al., 2005; Crocker, Kinyuota, Dumitru, et al., 2011; DiSantostefano, Davis, Yancey, 2008; Fisher, Strunk, Highstein, et al., 2009; Halm, Mora, Leventhal, 2006; Halterman, Fagnano, Montes, et al., 2012; Leventhal, Leventhal, Breland, 2011a; Leventhal, Leventhal, Breland, 2011b; Martin, Catrambone, Kee, et al., 2009; McAndrew, Musumeci-Szabo, Mora, et al., 2008; NAEPP, 2007; Okelo, Eakin, Patino, et al., 2013; President's Task Force, 2012; Seid, D'Amico, Varni, et al., 2012; Weinstein, 2011; Wennergren, Strannegard, 2002; Wisnievsky, Lorenzo, Lyn-Cook, et al., 2008). A team of researchers collaborating across Boston, Rochester, and New Haven have demonstrated differences in asthma hospitalization across communities that are associated with structures and processes of care (Homer, Klatka, Romm, et al., 2008; Homer, et al., 1996; Perrin, et al., 1996; Perrin, et al., 1989). While a few children who show up to the ED with asthma are there because of intractable disease that is optimally managed, most do not. They may not need to be in the ED (overuse), are there because of suboptimal management prior to coming, or have been exposed to an environmental trigger that may or may not have been avoidable.

Elsewhere in this document we have demonstrated the general importance of asthma for child health, healthcare, and quality (Mattke, Martorell, Sharma, et al., 2009). Similarly, we have demonstrated elsewhere the importance of ED visits as an outcome measure in asthma and the

value of distinguishing those that are for meaningful exacerbations requiring ED care from those that are not. In addition, asthma visits cost a lot of money to Medicaid throughout the country (Pearson, et al., 2014).

Section 6. Scientific Soundness of the Measure

Explain the methods used to determine the scientific soundness of the measure itself. Include results of all tests of validity and reliability, including description(s) of the study sample(s) and methods used to arrive at the results. Note how characteristics of other data systems, data sources, or eligible populations may affect reliability and validity.

6.A. Reliability

Reliability of the measure is the extent to which the measure results are reproducible when conditions remain the same. The method for establishing the reliability of a measure will depend on the type of measure, data source, and other factors.

Explain your rationale for selecting the methods you have chosen, show how you used the methods chosen, and provide information on the results (e.g., the Kappa statistic). Provide appropriate citations to justify methods.

Our approach to developing this measure stems from several vibrant and scientifically sound traditions. We first discuss research involving the soundness of our data sources, which include both administrative data to identify cases (and a fraction of numerator qualifications) and chart review (medical record audit) to confirm some denominator inclusions and to identify most of the numerator inclusions. This is a generally accepted and standard approach with acceptable reliability. We go on to talk about the assessment of appropriateness, which is also highlighted in the research evidence section of this report (see Section 5.a).

Brook and Davies-Avery (1977) trace the early history of quality measurement and remind us of the importance of medical chart audit as an approach to quality measurement. Lohr and Brook at RAND and Roos in Manitoba, Canada pioneered the use of electronically available administrative data (generated by routine healthcare operations, such as billings) as proxies for healthcare processes. Administrative data carefully used reduces the burden of quality measurement (Brook, Lohr, 1985; Lohr, 1990; Roos, Nicol, Cageorge, 1997; Roos, Nicol, Johnson, et al., 1979; Roos, Roos, Cageorge, et al., 1982).

As the National Committee for Quality Assurance (NCQA) developed the Healthcare Employee Data Information Set (HEDIS) as the de facto measurement system for managed care, attention turned to the use of administrative data for routine performance measurement. Research demonstrated that administrative data could have a role in producing quality measures, with augmentation by chart review often necessary. Administrative data are not typically sufficient for detailed clinical assessment (Angier, Gold, Gallia, et al., 2014; Dresser, Feingold, Rosenkranz, et al., 1997; Newton, Wagner, Ramsey et al., 1999; Thompson, O'Connor, Boyle, et al., 2001; Weiskopf, Weng, 2013). HEDIS developed a hybrid approach, using administrative data and

chart review, and we borrow from it heavily for this measure (NCQA, 2014; Pawlson, Scholle, Powers, 2007).

The explicit criteria that we use were developed using a slightly modified version of the RAND/UCLA Appropriateness Method that maintained the key aspects of that approach, including a detailed literature review, a multidisciplinary and geographically diverse expert panel that comprised both clinicians and researchers, and the two-round Modified Delphi Process. The general reliability of this approach is well established (Coventry, et al., 1996; Kosecoff, et al., 1987), and it has been applied successfully to pediatric services previously (Keyhani, Kleinman, Rothschild, et a., 2008; Kleinman, et al., 1997; Kleinman, et al., 1994). In order to enhance the validity of the meaning of appropriate, we have limited criteria used for this measure to those items that have a median rating of 8 or 9, the two highest ratings.

In our testing of the criteria during chart audit used a paper data collection instrument that was largely a checklist of yes/no for the various items. After a brief training by the physician who organized the testing, three non-clinical research assistants (one MPH, two Bachelors) conducted chart audits. Kappa on 10 random charts with the gold standard of the physician lead, were .696, .577, and .593 respectively, with a group kappa of .431. A second training session included identifying potential synonyms, particularly for labored breathing, such as "in respiratory distress," "notably increased respiratory effort," "nasal flaring," and "increased work of breathing or (WoB)." Synonyms for markedly decreased breath sounds were defined to include poor "air exchange" or "air entry." A subsequent reevaluation of kappa on 10 different random charts found kappas with the physician lead to be .969, .954 and .938, with a group kappa of .923, indicating excellent agreement in the reliability of the chart audit to identify numerator events after two training sessions with review practiced in between.

Testing our administrative data analysis approach in New York State Medicaid (analyses performed by the New York State Department of Health [DOH]), we identified 62,052 ED visits or hospitalizations for asthma, of which 59,469 (95.8 percent) were identified using ED data alone; 2,583 were identified on the basis of hospital codes alone. A distinct analysis conducted for CAPQuaM by the New York State DOH team using SPARCS data found that approximately 81 percent of all Medicaid hospitalizations for asthma came from the ED. Performing the calculations suggests that failure to look at hospitalizations for asthma in addition to ED visits would miss 2,087 ED visits in the denominator, all of which would also qualify for the numerator.

6.B. Validity

Validity of the measure is the extent to which the measure meaningfully represents the concept being evaluated. The method for establishing the validity of a measure will depend on the type of measure, data source, and other factors.

Explain your rationale for selecting the methods you have chosen, show how you used the methods chosen, and provide information on the results (e.g., R2 for concurrent validity).

Note that the Reliability section, above, also contains information related to validity.

This measure assesses the appropriateness of the ED as a level of care for children with asthma who present to the ED with a primary or secondary diagnosis of asthma. In the reliability and research evidence sections we have described the appropriateness method and its validity. We have used rigorous and transparent methods to assemble a national expert panel that included pediatricians, family physicians, pediatric and general emergency room specialists, a pediatric pulmonologist, and a pediatric allergist from practices and medical schools around the country. This work was conducted in collaboration with national clinical societies (the American Academy of Pediatrics [AAP], the American Academy of Family Physicians [AAFP]) and CAPQuaM's other diverse partner organizations, including the New York State DOH/Medicaid. NCQA is an important technical consultant and partner. The specific criteria that we operationalize in this measure were all rated by the expert panel with a median score of 8 or 9 on a 9 point scale (9 high) as circumstances for which the ED is an appropriate level of care. The use of Expert Panels has been demonstrated to be useful in measure development and healthcare evaluation, including for children (Brook, et al., 1986).

Use of the medical record as a valid source of information to judge appropriateness is well accepted (Kosecoff, et al., 1987). Chart audits are used frequently to generate research in emergency medicine (Gilbert, Lowenstein, Koziol-McLain, et al., 1996; Worster, Bledsoe, Cleve, et al., 2005).

We worked closely with our New York State DOH/Medicaid partners to develop the specifications for identifying hospitalizations and ED visits in administrative data. Our specifications borrow heavily from approaches pioneered by HEDIS, including structuring this as a hybrid measure. We analyzed HCUP data and New York State data to determine that to identify all ED visits that result in hospitalization we needed to seek out hospitalizations as well. When we find hospitalizations in administrative data we seek evidence that it resulted from an ED visit before including it in the denominator. Based on New York State data, about 80.8 percent of all asthma hospitalizations in Medicaid were admitted from the ED. National HCUP data find a slightly smaller percentage.

We have described in a previous PQMP measure report the criteria for identifiable asthma, which also were developed using guidance from the expert panel. Further, we have found that our definition identifies approximately double the number of children as the (intentionally) restrictive HEDIS persistent asthma definition and a bit more than half of the number of children with asthma believed to be in New York Medicaid. As such, it appears to succeed in finding an intermediate denominator that is broad enough to have meaning across the spectrum of asthmatics who get sick but not to include either children whose initial presentation is in the ED or whose asthma is very mild and doesn't require ongoing management.

CAPQuaM's 360 degree method is highly engaged with collaborators and partners and is supported by the literature. Potential measures emerge from the process and are tested to the extent that time and resources permit. For this measure we conducted a single site, age-stratified chart audit of patients with asthma seen in Mount Sinai's ED. Reliability information regarding our chart audit is described in the reliability section above.

We randomly identified up to three ED visits per child over a 4-year period (October 2009 – November, 2013). Inclusion criteria included an ED visit with asthma as a primary or secondary diagnosis as documented in the medical record. We developed three samples stratified by age: 2-5 years, 6-11 years, and 12-18 years.

For children ages 2-5: 181 of 335 audits (54.0 percent) were deemed appropriate based on information in the chart audit. Reasons for meeting the criteria included low oxygen saturation (2.1 percent), referral from their PCP (8.4 percent), and various manifestations of respiratory distress (labored breathing/retractions 46.6 percent, accessory muscle use 13.4 percent, markedly decreased breath sounds 13.1 percent). No arterial blood gasses or specialist consultations were ordered in the ED; 14.0 percent were admitted to the hospital.

For children ages 6-11: 209 of 477 audits (43.8 percent) were deemed appropriate based on information in the chart audit. Reasons for meeting the criteria included low oxygen saturation (1.9 percent), referral from their PCP (4.4 percent), and various manifestations of respiratory distress (labored breathing/retractions 36.1 percent, accessory muscle use 7.5 percent, markedly decreased breath sounds 15.9 percent). No arterial blood gasses or specialist consultations were ordered in the ED; 11.5 percent were admitted to the hospital.

Adolescents ages 12-18: 165 of 341 audits (48.4 percent) were deemed appropriate based on information in the chart audit. Reasons for meeting the criteria included low oxygen saturation (0.3 percent), referral from their PCP (2.3 percent), and various manifestations of respiratory distress (labored breathing/retractions 35.1 percent, accessory muscle use 6.4 percent, markedly decreased breath sounds 22.5 percent). No arterial blood gasses or specialist consultations were ordered in the ED; 12.9 percent were admitted to the hospital.

Appropriateness varied by age (Chi^2=8.2, p=.02), with younger (p=.01) and school aged (p=.01) children each being significantly different. Adolescents experienced a level of appropriateness intermediate to the other two groups and were not significantly different from them when combined (that is, comparing adolescents to all others). We also found racial differences with Hispanics at 44.1 percent appropriateness, non-Hispanic blacks at 51.3 percent, whites at 56.5 percent, and all others at 72.2 percent. Chi square with 3 degrees of freedom was 15.4, with p=.0015. The appropriateness of ED visits for Hispanic children was less than for other children (p=.002).

In summary, this measure was developed using a rigorous process that integrated the literature, stakeholder perspectives, an expert panel, and a rigorous testing process. We have previously demonstrated the validity of identifiable asthma as a meaningful construct. We used well accepted methods to identify ED visits, and we performed a rigorous test to demonstrate both the reliability of the chart audit and the capacity to identify variations in performance across categorical variables such as age and race.

Section 7. Identification of Disparities

CHIPRA requires that quality measures be able to identify disparities by race, ethnicity, socioeconomic status, and special health care needs. Thus, we strongly encourage nominators to have tested measures in diverse populations. Such testing provides evidence for assessing measure's performance for disparities identification. In the sections below, describe the results of efforts to demonstrate the capacity of this measure to produce results that can be stratified by the characteristics noted and retain the scientific soundness (reliability and validity) within and across the relevant subgroups.

7.A. Race/Ethnicity

Our medical chart audit found that the measure varies by race/ethnicity. Hispanic children had higher rates of questionable use of the ED (55.9 percent of visits) when compared to non-Hispanic children (46.8 percent), p=.002. Black children showed a trend toward more questionable use compared to all other children (53.6 percent questionable vs. 48.7 percent, p=.10).

7.B. Special Health Care Needs

The Maternal and Child Health Bureau (MCHB) has defined CSHCN as children "who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally" (McPherson, Arango, Fox et al., 1998). Considering this definition, children with identifiable asthma typically are CSHCN. This measure describes the care for such children.

7.C. Socioeconomic Status

The measure is specified to be stratified in two ways to assess aspects related to socioeconomic status: Public versus Commercial Insurance, and by five strata defined by the percent of the population in poverty in their county of residence. During our feasibility assessment phase, we asked institutions whether the payment source was available in the medical chart (EMR or paper) and the difficulty of abstracting this information from those charts. We found that payment source is generally available in the medical chart and overall is not difficult to abstract. As we expect this measure to be generated primarily by insuring entities, these data are expected to be present and available in the administrative data. Zip codes of residence are typically available in both medical charts and administrative data sets and can be linked to county of residence as described in the specifications. Ecological data, such as the five poverty strata that we specify, have been found to be independent predictors of health outcomes and are readily available using U.S. Department of Agriculture (USDA) data (Kawachi, Berkman, 2003). The five strata represent the three quartiles of lowest poverty each as one stratum, and the highest quartile divided into two strata, the 75th-90th percentiles and the highest 10 percent. In New York State, only quartiles 1 through 3 are present, so we were not able to demonstrate the sensitivity of the measure specifically, but we were able to demonstrate the practicality of the method.

7.D. Rurality/Urbanicity

These measures are specified to be reported by Urban Influence Codes (UIC), which have been developed by the USDA based on a number of criteria to describe the levels of urbanicity and rurality. This is intended not only to report within plan differences but also to allow for aggregation as appropriate. While each UIC has its own meaningful definition, some researchers choose to aggregate various codes. We recommend consideration of the aggregation schema of Bennett and colleagues at the South Carolina Rural Research Center (Bennett, Olatosi, Probst, 2008). Their aggregation scheme brings together Codes 1 and 2 as Urban; 3, 5, and 8 as micropolitan rural; 4, 6, and 7 as rural adjacent to a metro area; and 9, 10, 11, and 12 as remote rural. We observe that UIC 5 might as well be aggregated with 4, 6, and 7 as an adjacent rural area. Further, while this approach to rurality does not map exactly to the population density based definition of frontier (fewer than six persons per square mile) as articulated in the ACA, use of such categories is consistent with the ACA's intent that the Secretary ask that data collected for racial and ethnic disparities also look at underserved frontier counties. Frontier healthcare may be approximated by analysis of the remote rural categories (Hart, 2012).

This judgment was confirmed after CAPQuaM consulted with Gary Hart, Director of the Center for Rural Health at the University of North Dakota School of Medicine & Health Sciences, who led a HRSA-funded project to develop new methods to analyze frontier health. We clarified that his work suggests that UIC 9-12 is the best overall approach to using county level data to study frontier health. Inclusion of UIC 8 would make the analysis more sensitive to including frontier areas but at a meaningful cost in sensitivity.

Those interested in care specific to large cities may wish to aggregate the rural area and analyze UIC 1 and 2 separately. Frontier healthcare may be approximated by analysis of the remote rural categories (Hart, 2012). The New York State Medicaid data were sensitive to urbanicity, with higher rates of ED utilization in the most urban areas and lowest in the most rural areas and other areas intermediate between the two.

For aggregation and as an imperfect approximation one can also group as urban (1 and 2), suburban (3-6) and rural (7-9). This is what we have used for our New York Medicaid analysis to demonstrate that variations are observed for this measure using UIC codes. For example, both medication measures and the 6-month primary care visit measure are met for 13.8 percent (N=806) of those in rural counties, 14.7 percent (N=4,066) of those in suburban counties, and 16.9 percent (N=26,327) of those in urban counties.

7.E. Limited English Proficiency (LEP) Populations

We have not tested or specified this measure for this specific purpose. There is no reason that the measure would not apply equally well for those in LEP populations.

Section 8. Feasibility

Feasibility is the extent to which the data required for the measure are readily available, retrievable without undue burden, and can be implemented for performance measurement. Using the following sections, explain the methods used to determine the feasibility of implementing the measure.

8.A. Data Availability

1. What is the availability of data in existing data systems? How readily are the data available?

The definitions were specified to allow their use with data elements that are usually available in electronic form as administrative data to a responsible entity such as a health plan or State Medicaid program. While zip code is sometimes a hidden or non-public variable when such data sets are released, it generally is available to a responsible entity. While race and ethnicity are typically available to Medicaid programs and are in institutional medical records (e.g., hospitals), they may or may not be in an individual physician practice's chart. They are often but not always recorded in insurance databases. We have data from a feasibility study confirming that zip code, race, and ethnicity data elements are generally available in the hospital medical chart, frequently electronically. The rapid expansion of data gathering from electronic health charts can help augment administrative data review in measure assessment (Gold, Angier, Mangione-Smith, et al., 2012). This is particularly helpful when determining the population denominator. The CHIPRA legislation that funded this work indicates that measures are to be able to assess racial and ethnic disparities. We have demonstrated that New York State Medicaid is able to identify and utilize the criteria for finding children with identifiable asthma, assessing their length of continuous enrollment, and identifying ED visits and hospitalizations with a first or second diagnosis of asthma as intended and with the anticipated limitations that were outlined.

Qualification for inclusion in the numerator typically will be identified via chart audit, using a slight variation from the hybrid schemes pioneered and made feasible by HEDIS. The appropriate use criteria were derived from a set developed by an expert panel. The entire set includes:

1. Hospitalization directly from the ED.
2. Documented physical findings consistent with respiratory distress, including:
    a. Labored breathing with retractions and/or evidence of accessory muscle use.
    b. Markedly decreased breath sounds.
3. Oxygen saturation level less than 90 percent on percutaneous assessment.
4. An ABG obtained (or ordered).
5. Consultation obtained with a pulmonologist specialist, an order of an ABG, or a consult with a pulmonary or asthma specialist.
6. Parent/caregiver referred to the ED after evaluation by the PCP or other office/clinic.

7. Parent/caregiver report of administering two or more doses of inhaled rescue medications without meaningful clinical improvement.
8. Parent/caregiver report that the child was in a pre-defined "red zone" of peak flow measurement as part of an asthma action or similar plan.
9. Parent/caregiver report of a rapid and life-threatening deterioration after a similar prior episode. Note that this criterion is not included in the specifications for this measure.

Referring to each criterion by its number:

1. May be found in administrative data; when not, in the chart.
2. Needs to be documented from chart audit as part of the note of an assessing clinician, including physician, nurse, nurse practitioner, physician's assistant, or respiratory therapist.

3, 4, 5. Identifiable in chart audit in clinical notes, results, vital signs, or orders.

6, 7, 8. Should be documented in history of present illness by one or more clinicians and thus be found in chart audit.

9. Would be better obtained via patient-centered data collection and is not included in this measure.

2. If data are not available in existing data systems or would be better collected from future data systems, what is the potential for modifying current data systems or creating new data systems to enhance the feasibility of the measure and facilitate implementation?

One limitation of the use of medical charts is that documentation habits vary by institutions and by clinicians. Once this measure achieves more widespread use there may develop a rationale for enhancing electronic data in EMRs to reduce the burden of data collection. There are no technical barriers to incorporating structured fields to help assess the appropriateness of the visits in conjunction with the criteria outlined above and implemented in this measure.

8.B. Lessons from Use of the Measure

1. Describe the extent to which the measure has been used or is in use, including the types of settings in which it has been used, and purposes for which it has been used.

This measure is not currently in use.

2. If the measure has been used or is in use, what methods, if any, have already been used to collect data for this measure?

Not applicable.

3. What lessons are available from the current or prior use of the measure?

This measure is not currently in use.

Section 9. Levels of Aggregation

CHIPRA states that data used in quality measures must be collected and reported in a standard format that permits comparison (at minimum) at State, health plan, and provider levels. Use the following table to provide information about this measure's use for reporting at the levels of aggregation in the table.

For the purpose of this section, please refer to the definitions for provider, practice site, medical group, and network in the Glossary of Terms.

If there is no information about whether the measure could be meaningfully reported at a specific level of aggregation, please write "Not available" in the text field before progressing to the next section.

Level of aggregation (Unit) for reporting on the quality of care for children covered by Medicaid/ CHIP†:

State level* Can compare States

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Yes.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
At 9.3 visits per 100 children (Nath, Hsia, 2015); asthma ED visits are common, and a sufficient number of visits are expected to be available in each State.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Unknown.

Other geographic level: Can compare other geographic regions (e.g., MSA, HRR)

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Possibly.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not assessed. The frequency of these visits suggests that any geographic area with sufficient child population (or aggregating smaller entities over several years) is likely to yield meaningful sample size.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Unknown.

Medicaid or CHIP Payment model: Can compare payment models (e.g., managed care, primary care case management, FFS, and other models)

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Yes.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
The frequency of these visits suggests that any area with sufficient child population (or aggregating smaller rural areas over several years) is likely to yield meaningful sample size.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**

No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Unknown.

Health plan*: Can compare quality of care among health plans.

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Yes; typically via electronic health record (EHR).

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not assessed. Plans that provide care to children will have adequate numbers, certainly when aggregating over several years. These are among the most common reasons for ED visits in children.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Unknown.

Provider Level
Individual practitioner: Can compare individual health care professionals

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
No.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not applicable.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Not applicable.

Provider Level
Hospital: Can compare hospitals

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Only with the addition of billing data or registries.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Assessed and sufficient in one large urban teaching hospital. The frequency of asthma ED visits suggests that a sample size in institutions serving children should be achievable but may require aggregating longer periods of time.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
This measure has implications for the adequacy of primary and ambulatory care services in the catchment area of a hospital. As such it measures system performance more directly than hospital performance. To the extent that hospitals shape and influence the performance of their clinicians, it reflects this aspect of hospital performance. It is not designed to be an accountability measure of the institution per se.

Provider Level

Practice, group, or facility:** Can compare: (i) practice sites; (ii) medical or other professional groups; or (iii) integrated or other delivery networks

Intended use: **Is measure intended to support meaningful comparisons at this level? (Yes/No)**
Yes.

Data Sources: **Are data sources available to support reporting at this level?**
Yes.

Sample Size: **What is the typical sample size available for each unit at this level? What proportion of units at this level of aggregation can achieve an acceptable minimum sample size?**
Not assessed.

In Use: **Have measure results been reported at this level previously?**
No.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
No.

Unintended consequences: **What are the potential unintended consequences of reporting at this level of aggregation?**
Better for integrated delivery systems. Payers could look at large practices to assess appropriateness of ED use for those practices, but there is danger without large sample sizes.

Section 10. Understandability

CHIPRA states that the core set should allow purchasers, families, and health care providers to understand the quality of care for children. Please describe the usefulness of this measure toward achieving this goal. Describe efforts to assess the understandability of this measure (e.g., focus group testing with stakeholders).

This measure assesses whether or not an ED visit for a child with identifiable asthma meets criteria such that the ED can be identified as an appropriate level of care for that child in the given clinical circumstances.

As such, this measure is uniquely informative. It can help stakeholders understand the extent to which ED visits for children with asthma result from potentially inappropriate use—that is, a lower level of care could have been expected to safely and effectively provide the care that the child needed—and the extent to which ED visits represent an appropriate level of care. Inappropriate use is potentially preventable, and reducing it may protect children from other unnecessary or inappropriate care that may be stimulated by an ED visit. It helps to distinguish between potential failures in the management of the chronic disease asthma (whether due to suboptimal care, challenging disease, or environmental exposure, etc.), and issues of care

organization or delivery, such as insufficient availability of primary care to provide acute care services or misunderstanding by families or clinicians about the circumstances for which the ED is indicated for children with asthma.

In the language of this measure we term visits that are potentially inappropriate to be of "questionable" appropriateness. We do this as an explicit acknowledgement that certain information that the expert panel considered helpful to assess appropriateness is not routinely recorded in the medical record: we do not expect that circumstance to be encountered frequently relative to other indications.

The distinction between appropriate and questionable ED visits can inform accountability considerations as well as improvement activities. The appropriateness criteria are straightforward indicators developed using an adaptation of the RAND/UCLA Appropriateness Method. These criteria assess the clinical need for the level of care provided and should be readily understood by a wide variety of stakeholders from patients to clinicians to health planners.

Section 11. Health Information Technology

Please respond to the following questions in terms of any health information technology (health IT) that has been or could be incorporated into the measure calculation.

11.A. Health IT Enhancement

Please describe how health IT may enhance the use of this measure.

Integrated administrative data sets that include clinical services (billing, procedure, diagnosis codes, pharmacy data, and patient demographics), including patient (parent) reported race/ethnicity, and State and county of residence will enhance use of this measure. Incorporation of appropriateness criteria into defined fields in the electronic health record (EHR) would support e-measure development, as could development of a patient-centered data collection instrument.

11.B. Health IT Testing

Has the measure been tested as part of an electronic health record (EHR) or other health IT system?

Not tested for health IT; tested using administrative data with manual review of EHR data.

If so, in what health IT system was it tested and what were the results of testing?

Not applicable.

11.C. Health IT Workflow

Please describe how the information needed to calculate the measure may be captured as part of routine clinical or administrative workflow.

Not applicable.

11.D. Health IT Standards

Are the data elements in this measure supported explicitly by the Office of the National Coordinator for Health IT Standards and Certification (ONC) criteria (see healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__standards_ifr/1195)?

No.

If yes, please describe.

Not applicable.

11.E. Health IT Calculation

Please assess the likelihood that missing or ambiguous information will lead to calculation errors.

Not specified for health IT calculation.

11.F. Health IT Other Functions

If the measure is implemented in an EHR or other health IT system, how might implementation of other health IT functions (e.g., computerized decision support systems in an EHR) enhance performance characteristics on the measure?

Not applicable.

Section 12. Limitations of the Measure

Describe any limitations of the measure related to the attributes included in this CPCF (i.e., availability of measure specifications, importance of the measure, evidence for the focus of the measure, scientific soundness of the measure, identification of disparities, feasibility, levels of aggregation, understandability, health information technology).

Many ED visits that lead to hospitalization are coded as hospitalizations only in administrative data. Thus, we review sampled asthma hospitalizations to look for associated ED visits to assess eligibility for the measure. This enhances validity at the expense of efficiency.

We identify documentation of many of the factors that satisfy the explicit appropriateness criteria by review (audit) of the medical record. Chart review requires training of abstractors to establish both reliability and validity. Our explicit criteria were developed using an adaptation of the RAND/UCLA Appropriateness Method (RUAM). The RUAM is reliable and valid but subject to

limitations. Our selection of a diverse and multidisciplinary expert panel enhances the validity of our findings.

Our measure of appropriate use of the ED could benefit from the incorporation of patient centered data to affirmatively explore some of the criteria that represent patient history, as well as to allow us to include a historical aspect that was endorsed by the panel but excluded from our specifications – a previous episode by the child that began similarly and rapidly declined. Hence, instead of using the term inappropriate in contradistinction to appropriate visits, we use the term questionable or phrase "of questionable appropriateness."

Documentation in the medical record can vary from site to site, but the items we incorporate into this measure are important and should be a part of the clinical documentation.

Interpretation of this measure should be restricted to assessing whether or not the level of care available at an ED was appropriate for the patient, given their specific clinical presentation. While it may help to distinguish between whether or not a presenting child is significantly ill with an asthma exacerbation, it does not specifically reflect upon the prior quality of care for any individual patient. At a population level, higher rates of appropriate visits may suggest more failures in clinical asthma management, while lower rates of appropriate use may suggest more concerns regarding the delivery of more appropriate levels of care (such as acute office visits) for children who may require timely clinical services for their asthma management.

Section 13. Summary Statement

Provide a summary rationale for why the measure should be selected for use, taking into account a balance among desirable attributes and limitations of the measure. Highlight specific advantages that this measure has over alternative measures on the same topic that were considered by the measure developer or specific advantages that this measure has over existing measures. If there is any information about this measure that is important for the review process but has not been addressed above, include it here.

This is a feasible, reliable and valid measure that also has limitations. Identifiable asthma is established using analysis of administrative data that have been found to be valid and reliable for identifying asthma, if imperfect.

Asthma is often termed one of the most common chronic diseases in children, with a high prevalence in Medicaid. Asthma visits to the ED are common and expensive. ED use and hospitalizations are considered to be potentially undesirable outcomes of asthma care. Identifying whether an asthma ED visit results because the child is sick and needs to be in the ED is valuable and actionable information.

This measure identifies whether or not the ED is an appropriate level of care for the clinical circumstance for which the child presents. It incorporates explicit appropriateness criteria that were developed by an expert panel using a well validated process in the context of CAPQuaM's

stakeholder-engaged 360 degree method. We have previously validated our approach to case finding to identify ED visits in children with identifiable asthma.

For this measure we demonstrated that chart audit was capable of identifying the presence of a broad set of clinical indicators of appropriateness with high levels of reliability. We further demonstrated that our measure was able to identify differences in the proportion appropriate, such as those associated with age and race. For example, the overall level of appropriateness for children aged 2-5 was 54 percent, for children aged 6-11 it was 44 percent, and for adolescents between 12 and 18 years of age, it was 48 percent.

In summary, we went through a rigorous, transparent, and highly engaged measure development process to develop a feasible and efficient approach to produce reliable and valid measurement. The appropriate use measure estimates the degree to which ED visits for asthma represents the delivery of an appropriate level of care for children with identifiable asthma. The measures were successfully tested with the administrative component demonstrated, using Medicaid data and the chart audit in a single site chart audit of more than 1,150 charts. The process, measures, and findings demonstrate the potential for our measures to enhance both accountability and improvement activities.

References

Adams JG. Emergency department overuse: Perceptions and solutions. JAMA 2013; 309(11):1173-4.

Adams RJ, Smith BJ, Ruffin RE. Factors associated with hospital admissions and repeat emergency department visits for adults with asthma. Thorax 2000; 55(7):566-73.

American Lung Association Fact Sheet on Asthma and Children. October 2012 (updated May 2019). Available at https://www.lung.org/lung-health-and-diseases/lung-disease-lookup/asthma/learn-about-asthma/asthma-children-facts-sheet.html. Accessed May 22, 2019.

American Lung Association (ALA). Trends in asthma morbidity and mortality 2012. Washington, DC: ALA; 2012.

Angier H, Gold R, Gallia C, et al. Variation in outcomes of quality measurement by data source. Pediatrics 2014; 133(6):e1676-82.

Auger KA, Kahn RS, Davis MM, et al. Medical home quality and readmission risk for children hospitalized with asthma exacerbations. Pediatrics 2013; 131(1):64-70.

Bahadori K, Doyle-Waters MM, Marra C, et al. Economic burden of asthma: A systematic review. BMC Pulm Med 2009; 9:24.

Basger BJ, Chen TF, Moles RJ. Validation of prescribing appropriateness criteria for older Australians using the RAND/UCLA appropriateness method. BMJ Open 2012; 2(5).

Benavides S, Rodriguez JC, Maniscalco-Feichtl M. Pharmacist involvement in improving asthma outcomes in various healthcare settings: 1997 to present. Ann Pharmacother 2009; 43(1):85-97.

Bennett KJ, Olatosi B, Probst JC. Health disparities: A rural-urban chartbook. Columbia, SC: South Carolina Rural Health Research Center; 2008.

Berns SD, Linakis JG, Lewander WJ, et al. Appropriate use of a pediatric emergency department: Is the pediatrician called before the visit? Pediatr Emerg Care 1994; 10(1):13-7.

Bernstein SJ, McGlynn EA, Siu AL, et al. The appropriateness of hysterectomy. A comparison of care in seven health plans. Health Maintenance Organization Quality of Care Consortium. JAMA 1993; 269(18):2398-402.

Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. JAMA 1995; 274(4):305-11.

Blaakman S, Tremblay PJ, Halterman JS, et al. Implementation of a community-based secondhand smoke reduction intervention for caregivers of urban children with asthma: Process evaluation, successes and challenges. Health Educ Res 2013; 28(1):141-52.

Brook RH, Chassin MR, Fink A, et al. A method for the detailed assessment of the appropriateness of medical technologies. Int J Technol Assess Health Care 1986; 2(01):53-63.

Brook RH, Davies-Avery A. Mechanisms for assuring quality of U.S. medical care services: Past, present, and future. Santa Monica, CA: RAND; 1977.

Brook RH, Lohr KN. Efficacy, effectiveness, variations, and quality. Boundary-crossing research. Med Care 1985; 23(5):710-22.

Carrillo Zuniga G, Kirk S, Mier N, et al. The impact of asthma health education for parents of children attending head start centers. J Community Health 2012; 37(6):1296-300.

Cazzola M, Matera MG. Safety of long-acting beta2-agonists in the treatment of asthma. Ther Adv Respir Dis 2007; 1(1):35-46.

Centers for Disease Control and Prevention (CDC). Home-based Multi-trigger, Multi-component interventions. Web page; 2009. Available at http://www.cdc.gov/asthma/interventions.htm. Accessed May 22, 2019.

Centers for Disease Control and Prevention (CDC). Vital signs: Asthma prevalence, disease characteristics, and self-management education: United States, 2001-2009. MMWR Morb Mortal Wkly Rep 2011; 60(17):547-52.

Cerdan NS, Alpert PT, Moonie S, et al. Asthma severity in children and the quality of life of their parents. Appl Nurs Res 2012; 25(3):131-7.

Cloutier MM, Hall CB, Wakefield DB, et al. Use of asthma guidelines by primary care providers to reduce hospitalizations and emergency department visits in poor, minority, urban children. J Pediatr 2005; 146(5):591-7.

Coventry JA, Weston MS, Collins PM. Emergency room encounters of pediatric patients with asthma: Cost comparisons with other treatment settings. J Ambul Care Manag 1996; 19(2):9-21.

Crocker DD, Kinyota S, Dumitru GG, et al. Effectiveness of home-based, multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity: A community guide systematic review. Am J Prev Med 2011; 41(2 Suppl 1):S5-32.

DeAngelis C, Fosarelli P, Duggan AK. Use of the emergency department by children enrolled in a primary care clinic. Pediatr Emerg Care 1985; 1(2):61-5.

Dick S, Doust E, Cowie H, et al. Associations between environmental exposures and asthma control and exacerbations in young children: A systematic review. BMJ Open 2014; 4(2):e003827.

DiSantostefano RL, Davis KY, Yancey S, et al. Ecologic analysis of asthma-related events and dispensing of inhaled corticosteroid- and salmeterol-containing products. Ann Allergy Asthma Immunol 2008; 100(6):558-65.

Donahue JG, Fuhlbrigge AL, Finkelstein JA, et al. Asthma pharmacotherapy and utilization by children in 3 managed care organizations. The Pediatric Asthma Care Patient Outcomes Research Team. J Allergy Clin Immunol 2000; 106(6):1108-14.

Downes MJ, Roy A, McGinn TG, et al. Factors associated with furry pet ownership among patients with asthma. J Asthma 2010; 47(7):742-9.

Dresser MV, Feingold L, Rosenkranz SL, et al. Clinical quality measurement. Comparing chart review and automated methodologies. Med Care 1997; 35(6):539-52.

Ducharme FM, Zemek RL, Chalut D, et al. Written action plan in pediatric emergency room improves asthma prescribing, adherence, and control. Am J Respir Crit Care Med 2011; 183(2):195-203.

Farber HJ. Optimizing maintenance therapy in pediatric asthma. Curr Opin Pulm Med 2010; 16(1):25-30.

Fiese B, Winter M, Anbar R, et al. Family climate of routine asthma care: Associating perceived burden and mother-child interaction patterns to child well-being. Fam Process 2008; 47(1):63-79.

Finkelstein JA, Barton MB, Donahue JG, et al. Comparing asthma care for Medicaid and non-Medicaid children in a health maintenance organization. Arch Pediatr Adolesc Med 2000; 154(6):563-8.

Finkelstein JA, Brown RW, Schneider LC, et al. Quality of care for preschool children with asthma: The role of social factors and practice setting. Pediatrics 1995; 95(3):389-94.

Fisher EB, Strunk RC, Highstein GR, et al. A randomized controlled evaluation of the effect of community health workers on hospitalization for asthma: the asthma coach. Arch Pediatr Adolesc Med 2009; 163(3):225-32.

Fitch K, Bernstein SJ, Aguilar MD, et al. The RAND/UCLA Appropriateness Method User's Manual. Santa Monica, CA: RAND; 2001.

Flores G, Abreu M, Chaisson CE, et al. Keeping children out of hospitals: Parents' and physicians' perspectives on how pediatric hospitalizations for ambulatory care-sensitive conditions can be avoided. Pediatrics 2003; 112(5):1021-30.

Fuhrman C, Dubus JC, Marguet C, et al. Hospitalizations for asthma in children are linked to undertreatment and insufficient asthma education. J Asthma 2011; 48(6):565-71.

Gilbert EH, Lowenstein SR, Koziol-McLain J, et al. Chart reviews in emergency medicine research: Where are the methods? Ann Emerg Med 1996; 27(3):305-8.

Gold R, Angier H, Mangione-Smith R, et al. Feasibility of evaluating the CHIPRA care quality measures in electronic health record data. Pediatrics 2012; 130(1):139-49.

Halm EA, Mora P, Leventhal H. No symptoms, no asthma: The acute episodic disease belief is associated with poor self-management among inner-city adults with persistent asthma. Chest 2006; 129(3):573-80.

Halterman JS, Fagnano M, Montes G, et al. The school-based preventive asthma care trial: Results of a pilot study. J Pediatr 2012; 161(6):1109-15.

Hart G. Frontier/Remote, Island, and Rural Literature Review. Grand Forks, ND: University of North Dakota; 2012.

Homer CJ, Klatka K, Romm D, et al. A review of the evidence for the medical home for children with special health care needs. Pediatrics 2008; 122(4):e922-37.

Homer CJ, Szilagyi P, Rodewald L, et al. Does quality of care affect rates of hospitalization for childhood asthma? Pediatrics 1996; 98(1):18-23.

Kawachi I, Berkman LF. Neighborhoods and Health. New York, NY: Oxford University Press; 2003.

Kearney GD, Johnson LC, Xu X, `et al. Eastern Carolina Asthma Prevention Program (ECAPP): An environmental intervention study among rural and underserved children with asthma in Eastern North Carolina. Environ Health Insights 2014; 8:27-37.

Kemper KJ. Medically inappropriate hospital use in a pediatric population. N Engl J Med 1988; 318(16):1033-7.

Keyhani S, Herbert PL, Ross JS, et al. Electronic health record components and the quality of care. Med Care 2008; 46(12):1267-72.

Keyhani S, Kleinman LC, Rothschild M, et al. Overuse of tympanostomy tubes in New York metropolitan area: Evidence from five hospital cohort. BMJ 2008; 337:a1607.

Keyhani S, Siu AL. The underuse of overuse research. Health Serv Res 2008; 43(6):1923-30.

Kharbanda AB, Hall M, Shah SS, et al. Variation in resource utilization across a national sample of pediatric emergency departments. J Pediatr 2013; 163(1):230-6.

Kleinman LC, Boyd EA, Heritage JC. Adherence to prescribed explicit criteria during utilization review. An analysis of communications between attending and reviewing physicians. JAMA 1997; 278(6):497-501.

Kleinman LC, Kosecoff J, Dubois RW, et al. The medical appropriateness of tympanostomy tubes proposed for children younger than 16 years in the United States. JAMA 1994; 271(16):1250-5.

Knudson A, Casey M, Burlew M, et al. Disparities in pediatric asthma hospitalizations. J Public Health Manag Pract 2009; 15(3):232-7.

Kosecoff J, Fink A, Brook RH, et al. The appropriateness of using a medical procedure. Is information in the medical record valid? Med Care 1987; 25(3):196-201.

Lara M, Akinbami L, Flores G, et al. Heterogeneity of childhood asthma among Hispanic children: Puerto Rican children bear a disproportionate burden. Pediatrics 2006; 117(1):43-53.

Leventhal H, Leventhal EA, Breland JY. Cognitive science speaks to the "common-sense" of chronic illness management. Ann Behav Med 2011a; 41(2):152-63.

Leventhal H, Leventhal EA, Breland JY. Modeling health and illness behavior: The approach of the commonsense model. In Baum RA, Singer J (Eds.) Handbook of Health Psychology. London: Psychology Press; 2011b.

Lohr KN. Use of insurance claims data in measuring quality of care. Int J Technol Assess Health Care 1990; 6(2):263-71.

Lozano P, Finkelstein JA, Carey VJ, et al. A multisite randomized trial of the effects of physician education and organizational change in chronic-asthma care: health outcomes of the Pediatric Asthma Care Patient Outcomes Research Team II Study. Arch Pediatr Adolesc Med 2004; 158(9):875-83.

Manice M. Exploring the relationship between parental shared decision-making practices and acute asthma exacerbations among children age 0-17 (Dissertation). New York, NY: Icahn School of Medicine at Mount Sinai; 2013.

Martin BC. Emergency medicine versus primary care: A case study of three prevalent, costly, and non-emergent diagnoses at a community teaching hospital. J Health Care Finance 2000; 27(2):51-65.

Martin MA, Catrambone CD, Kee RA, et al. Improving asthma self-efficacy: Developing and testing a pilot community-based asthma intervention for African American adults. J Allergy Clin Immunol 2009; 123(1):153-159.e3.

Mattke S, Martorell F, Sharma P, et al. Quality of care for childhood asthma: Estimating impact and implications. Pediatrics 2009; 123(Suppl 3):S199-204.

McAndrew LM, Musumeci-Szabo TJ, Mora PA, et al. Using the common sense model to design interventions for the prevention and management of chronic illness threats: From description to process. Br J Health Psychol 2008; 13(Pt 2):195-204.

McPherson M, Arango P, Fox H, et al. A new definition of children with special health care needs. Pediatrics 1998; 102(1 Pt 1):137-40.

Nath JB, Hsia RY. Children's emergency department use for asthma 2001-2010. Acad Pediatr 2015; 15:225-30.

National Asthma Education and Prevention Program (NAEPP). Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma-Summary Report 2007. J Allergy Clin Immunol 2007; 120(5 Suppl):S94-138.

National Center for Health Statistics (NCHS). National Health Interview Survey 2011, Analysis of Raw Data by the American Lung Association Research using SPSS and SUDAAN software; 2011.

National Committee for Quality Assurance (NCQA). HEDIS and Performance Measurement. Washington, DC: NCQA; 2014 (updated 2019). Available at https://www.ncqa.org/hedis/. Accessed June 5, 2019.

National Heart, Lung and Blood Institute (NHLBI). Asthma Guidelines, 2011. Available at https://www.nhlbi.nih.gov/health-pro/resources/lung/naci/asthma-info/asthma-guidelines.htm. Accessed May 22, 2019.

New England Healthcare Institute. A Matter of Urgency: Reducing Emergency Department Overuse; NEHI Research Brief; 2010. Available at https://www.nehi.net/writable/publication_files/file/nehi_ed_overuse_issue_brief_032610finaledits.pdf. Accessed May 22, 2019.

Newton KM, Wagner EH, Ramsey SD, et al. The use of automated data to identify complications and comorbidities of diabetes: A validation study. J Clin Epidemiol 1999; 52(3):199-207.

Okelo SO, Eakin MN, Patino CM, et al. The Pediatric Asthma Control and Communication Instrument asthma questionnaire: For use in diverse children of all ages. J Allergy Clin Immunol 2013; 132(1):55-62.

Okelo SO, Wu AW, Krishnan JA, et al. Emotional quality-of-life and outcomes in adolescents with asthma. J Pediatr 2004; 145(4):523-9.

Owens PL, Thompson J, Elixhauser A, et al. Care of children and adolescents in U.S. hospitals. HCUP Fact Book No. 4. Rockville, MD: Agency for Healthcare Research and Quality; 2003.

Parchman ML, Culler S. Primary care physicians and avoidable hospitalizations. J Fam Pract 1994; 39(2):123-8.

Park RE, Fink A, Brook RH, et al. Physician ratings of appropriate indications for six medical and surgical procedures. Am J Public Health 1986; 76(7):766-72.

Pawlson LG, Scholle SH, Powers A. Comparison of administrative-only versus administrative plus chart review data for reporting HEDIS hybrid measures. Am J Manag Care 2007; 13(10):553-8.

Pearson WS, Goates SA, Harrykissoon SD, et al. State-based Medicaid costs for pediatric asthma emergency department visits. Prev Chronic Dis 2014; 11:e108.

Perrin JM, Greenspan P, Bloom SR, et al. Primary care involvement among hospitalized children. Arch Pediatr Adolesc Med 1996; 150(5):479-86.

Perrin JM, Homer CJ, Berwick DM, et al. Variations in rates of hospitalization of children in three urban communities. N Engl J Med 1989; 320(18):1183-7.

President's Task Force on Environmental Health Risks and Safety Risks to Children. Coordinated Federal action plan to reduce racial and ethnic asthma disparities. Washington, DC: Environmental Protection Agency; 2012. Available at

https://www.epa.gov/sites/production/files/2014-08/documents/federal_asthma_disparities_action_plan.pdf. Accessed June 4, 2019.

Price JH, Khubchandani J, McKinney M, et al. Racial/ethnic disparities in chronic diseases of youths and access to health care in the United States. Biomed Res Int 2013; 2013:787616.

Roos LL, Nicol JP, Cageorge SM. Using administrative data for longitudinal research: Comparisons with primary data collection. J Chronic Dis 1987; 40(1):41-9.

Roos LL, Nicol JP, Johnson CF, et al. Using administrative data banks for research and evaluation: A case study. Eval Rev 1979; 3(2):236-55.

Roos LL, Roos NP, Cageorge SM, et al. How good are the data? Reliability of one health care data bank. Med Care 1982; 20(3): 266-76.

Roy A, Downes MJ, Wisnivesky JP. Comprehensive environmental management of asthma and pediatric preventive care. Pediatr Allergy Immunol 2011; 22(3):277-82.

Roy A, Sheffield P, Wong K, et al. The effects of outdoor air pollutants on the costs of pediatric asthma hospitalizations in the United States, 1999 to 2007. Med Care 2011; 49(9):810-7.

Roy A, Wisnivesky JP. Comprehensive use of environmental control practices among adults with asthma. Allergy Asthma Proc 2010a; 31(5):72-7.

Roy A, Wisnivesky JP. Racial and ethnic differences in the use of environmental control practices among children with asthma. J Asthma 2010b; 47(5):507-12.

Rudowitz R. A Look at CBO projections for Medicaid and CHIP. The Kaiser Commission on Medicaid and the Uninsured. Washington, DC: The Henry J. Kaiser Family Foundation; 2014.

Sawicki GS, Vilk Y, Schatz M, et al. Uncontrolled asthma in a commercially insured population from 2002 to 2007: Trends, predictors, and costs. J Asthma 2010; 47(5):574-80.

Seid M, D'Amico EJ, Varni JW, et al. The in vivo adherence intervention for at risk adolescents with asthma: Report of a randomized pilot trial. J Pediatr Psychol 2012; 37(4):390-403.

Smith SR, Wakefield DB, Cloutier MM. Relationship between pediatric primary provider visits and acute asthma ED visits. Pediatr Pulmonol 2007; 42(11):1041-7.

Smulowitz PB, O'Malley J, Yang X, et al. Increased use of the emergency department after health care reform in Massachusetts. Ann Emerg Med 2014; 64(2):107-15.

Talreja N, Soubani AO, Sherwin RL, et al. Modifiable factors associated with severe asthma exacerbations in urban patients. Ann Allergy Asthma Immunol 2012; 109(2):128-32.

Taubman SL, Allen HL, Wright BJ, et al. Medicaid increases emergency-department use: Evidence from Oregon's health insurance experiment. Science 2014; 343(6168):263-8.

Taylor AJ, Cerqueira M, Hodgson JM, et al. Appropriate use criteria for cardiac computed tomography. J Cardiovasc Comput Tomogr 2010; 4(6):407.e1-33.

Thompson BL, O'Connor P, Boyle R, et al. Measuring clinical performance: Comparison and validity of telephone survey and administrative data. Health Serv Res 2001; 36(4):813-25.

Uscher-Pines L, Pines J, Kellermann A, et al. Emergency department visits for nonurgent conditions: Systematic literature review. Am J Manag Care 2013; 19(1):47-59.

Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. N Engl J Med 1992; 326(13):862-6.

Weinstein AG. The potential of asthma adherence management to enhance asthma guidelines. Ann Allergy Asthma Immunol 2011; 106(4):283-91.

Weiskopf NG, Weng C. Methods and dimensions of electronic health record data quality assessment: Enabling reuse for clinical research. JAMIA 2013; 20(1):144-51.

Wennergren G, Strannegard IL. Asthma hospitalizations continue to decrease in schoolchildren but hospitalization rates for wheezing illnesses remain high in young children. Acta Paediatr 2002; 91(11):1239-45.

Wisnivesky JP, Lorenzo J, Lyn-Cook R, et al. Barriers to adherence to asthma management guidelines among inner-city primary care providers. Ann Allergy Asthma Immunol 2008; 101(3):264-70.

World Health Organization Fact Sheet #307. May 2011 (updated August 2017). Available at http://www.who.int/mediacentre/factsheets/fs307/en/. Accessed May 22, 2019.

Worster A, Bledsoe RD, Cleve P, et al. Reassessing the methods of medical record review studies in emergency medicine research. Ann Emerg Med 2005; 45(4):448-51.

Section 14: Identifying Information for the Measure Submitter

First Name: Lawrence

Last Name: Kleinman

Title:	Director, Mount Sinai CAPQuaM
Organization:	Icahn School of Medicine at Mount Sinai
Mailing Address:	One Gustave L Levy Place, Box 1077
City:	New York
State:	NY
Postal Code:	10029
Telephone:	212-659-9556
Email:	Lawrence.kleinman@mssm.edu

The CHIPRA Pediatric Quality Measures Program (PQMP) Candidate Measure Submission Form (CPCF) was approved by the Office of Management and Budget (OMB) in accordance with the Paperwork Reduction Act.

The OMB Control Number is 0935-0205 and the Expiration Date is December 31, 2015.

Public Disclosure Requirements

Each submission must include a written statement agreeing that, should U.S. Department of Health and Human Services accept the measure for the 2014 and/or 2015 Improved Core Measure Sets, full measure specifications for the accepted measure will be subject to public disclosure (e.g., on the Agency for Healthcare Research and Quality [AHRQ] and/or Centers for Medicare & Medicaid Services [CMS] websites), except that potential measure users will not be permitted to use the measure for commercial use. In addition, AHRQ expects that measures and full measure specifications will be made reasonably available to all interested parties. "Full measure specifications" is defined as all information that any potential measure implementer will need to use and analyze the measure, including use and analysis within an electronic health record or other health information technology. As used herein, "commercial use" refers to any sale, license or distribution of a measure for commercial gain, or incorporation of a measure into any product or service that is sold, licensed or distributed for commercial gain, even if there is no actual charge for inclusion of the measure. This statement must be signed by an individual authorized to act for any holder of copyright on each submitted measure or instrument. The authority of the signatory to provide such authorization should be described in the letter.

AHRQ Publication No. 19-0040
September 2019