Overuse of Computed Tomography Scans for the Evaluation of Children with a First Generalized Afebrile, Atraumatic Seizure

Section 1. Basic Measure Information

1.A. Measure Name

Overuse of Computed Tomography Scans for the Evaluation of Children with a First Generalized Afebrile, Atraumatic Seizure

1.B. Measure Number

0198

1.C. Measure Description

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

This measure assesses the percentage of children, ages 1 through 17 years, for whom computed tomography *(*CT) imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging. For the purposes of this measure, indications for CT imaging include status epilepticus, signs of increased intracranial pressure, notably different mental state compared with prior exams, or an abnormal neurologic exam. A lower percentage indicates better performance, as reflected by avoiding CT imaging when it is not indicated.

Seizures are common; every year, it is anticipated that up to 40,000 children in the United States will experience a first afebrile seizure (Hirtz, Ashwal, Berg, et al., 2000). Neuroimaging is used in pediatric patients who have experienced a seizure to evaluate for structural brain abnormalities that may require surgical intervention or predispose the patient to future seizures. Clinical guidelines maintain that children who present for evaluation after a first, generalized, afebrile seizure and meet low-risk criteria can be safely discharged without emergent neuroimaging, if follow-up can be assured (Gaillard, Chiron, Cross, et al., 2009; Hirtz, et al., 2000). While widely available, CT imaging for the evaluation of seizure in children has inferior resolution compared with magnetic resonance imaging (MRI) (Gaillard, et al., 2009; Hirtz, et al., 2000) and is generally low-yield (Aprahamian, Harper, Prabhu, 2014; Garvey, Gaillard, Rusin, et al., 1998; Maytal, Krauss, Novak, et al., 2000; Sharma, Riviello, Harper, et al., 2003; Warden, Brownstein, Delbeccaro, 1997), suggesting overuse of this imaging modality.

This measure will address the overuse of CT of the brain among children evaluated for a first, afebrile seizure who return to neurologic baseline after the event. Overuse has been defined as any patient who undergoes a procedure or test for an inappropriate indication (Lawson, Gibbons, Ko, et al., 2012). Imaging overuse subjects children to a number of risks (Malviya, Voepel-

Lewis, Eldevik, et al., 2000; Mathews, Forsythe, Brady, et al., 2013; Pearce, Salotti, Little, 2012; Wachtel, Dexter, Dow, 2009). Children who undergo CT scans in early childhood tend to be at greater risk for developing leukemia, primary brain tumors, and other malignancies later in life (Mathews, et al., 2013; Pearce, et al., 2012). Children are also at risk for complications from sedation or anesthesia, which is often required for longer CT imaging sequences. These complications include compromised airway, hypoxia leading to central nervous system (CNS) injury, and death. Additionally, CT overuse when a follow-up MRI study will be necessary creates cost burdens for the patient, as well as for payers.

This measure uses medical record data after administrative claims data are used to identify the eligible population. It is calculated as the percentage of eligible children, ages 1 through 17 years, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging.

1.D. Measure Owner

The Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC).

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 is part of the Q-METRIC Overuse of Imaging for the Evaluation of Children with Headache or Seizures measures 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 is part of the Q-METRIC Overuse of Imaging for the Evaluation of Children with Headache or Seizures measures

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 the number of children, ages 1 through 17 years, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging.

Eligible children must be 1 through 17 years of age during the measurement year in which CT imaging of the head is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior. Table 1 [=IMG1] lists Current Procedural Terminology (CPT) codes associated with CT imaging of the head. (Note: see the Supporting Documents for Tables 1-9 and Table 11). International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes to identify afebrile, atraumatic seizure are shown in Table 2 [=IMG2]. Seizure must occur on the day of or up to 30 days prior to imaging. Afebrile, atraumatic seizures are those not associated, respectively, with fever or with trauma occurring in the 7 days prior to imaging.

1.H. Numerator Exclusions

The following are excluded from the numerator based on clinical documentation:

- Status epilepticus.
- Neurologic signs of increased intracranial pressure.
- Notably different mental state when compared with the child's own prior exams.
- An abnormal neurologic exam between the time of diagnosis and the time of imaging.

1.I. Denominator Statement

The denominator is the number of children, ages 1 through 17 years, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure.

Eligible children must be 1 through 17 years of age during the measurement year in which CT imaging of the head is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior. Seizure must occur on the day of or up to 30 days prior to imaging. Table 1 [=IMG1] lists CPT codes associated with CT imaging of the head.

ICD-9-CM codes to identify afebrile, atraumatic seizure are shown in Table 2 [=IMG2]. Afebrile, atraumatic seizures are those not associated, respectively, with fever or with trauma occurring in the 7 days prior to imaging (see Supporting Documents for Tables 1 and 2).

1.J. Denominator Exclusions

The following are excluded from the denominator:

- Exclusions based on ICD-9-CM codes captured in administrative claims data (note: see Supporting Documents for Tables 1-9 and Table 11):
  - Partial seizure (Table 2 [=IMG2]) on the day of or with the 365 days before imaging was obtained.
  - Fever (by ICD-9 codes 780.6x) on the day of or day before imaging was obtained.
  - Complex febrile seizure (Table 2 [=IMG2]) on the day of or within the 365 days before the first generalized afebrile, atraumatic seizure in the measurement year.
  - Post-traumatic seizure (Table 2 [=IMG2]) on the day of or day before imaging was obtained.
  - Suspected abuse and neglect or other head trauma (Table 3 [=IMG9] or the presence of an e-code in claims data) on the day of or within 7 days before imaging was obtained.
  - ICD-9 codes 783.40 (lack of expected normal physiological development) or 783.42 (delayed milestones) on the day of or within the 365 days before the first generalized afebrile, atraumatic seizure in the measurement year.
  - Other pre-existing conditions that would warrant imaging (Tables 4-7 [=IMG5-IMG8]) on the day of or within 365 days before imaging was obtained.
  - Infections that would warrant imaging on the day of or within the 365 days before the atraumatic seizure (Table 8 [=IMG4]).
  - Lumbar puncture (Table 9 [=IMG10]) on the day of or day after imaging was obtained.
  - Imaging study obtained on the day of or within the 180 days following neurosurgical intervention (Table 9 [=IMG10]).

- Exclusions based on clinical documentation:
  - Partial seizure.
  - Fever.
  - Complex febrile seizure.
  - Post-traumatic seizure.
  - Trauma such as skull fracture, concussion, intracranial hemorrhage, and suspected abuse.
  - Developmental delay, lack of expected normal physiological development, or delayed milestone.

- Pre-existing conditions that would warrant imaging, such as neoplasm and blood disorder, hydrocephalus and CNS anomalies, hemangioma, phlebitis/thrombophlebitis, occlusion of cerebral arteries, moyamoya disease, tumor, hemorrhage, or tuberous sclerosis.
- Infection, such as meningitis, brain abscess, HIV, and encephalitis.
- Lumbar puncture.
- Imaging as part of surgical evaluation for seizure management (pre-operative or post-operative) on the day of or within the 30 days prior to the generalized afebrile, atraumatic seizure.
- Neurological surgery.

1.K. Data Sources

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

Administrative data (e.g., claims data); paper medical record; electronic medical record.

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

This measure uses medical record data after administrative claims are used to identify the eligible population.

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.

Detailed measure specifications are available; please see 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).**

Prevalence and Incidence of Afebrile, Atraumatic Seizures

The American Academy of Neurology Practice Parameter: Evaluating a First Nonfebrile Seizure in Children estimates that annually, between 25,000 and 40,000 children in the United States experience a first non-febrile seizure (Hirtz, et al., 2000; Hirtz, Berg, Bettis, et al., 2003). Seizures account for roughly 2 percent of visits to emergency departments (EDs) at children's hospitals (Martindale, Goldstein, Pallin, 2011).

Pathology and Severity

In general, a seizure will involve abnormal movements or changes in behavior that occur as a result of uncontrolled electrical activity in the brain (Duvivier, Pollack Jr, 2009). A generalized seizure is associated with altered consciousness because abnormal electrical activity involves all or large parts of the brain. The expected overall recurrence rate after a first unprovoked seizure is around 50 percent, with a minority of children going on to experience multiple recurrent seizures (Hirtz, et al., 2003).

Burdens of Overuse of Imaging

The literature offers many examples of the potential risks associated with overuse of imaging. Chief among these are risks related to radiation (Mathews, et al., 2013; Pearce, et al., 2012),

sedation and/or anesthesia (Malviya, et al., 2000; Wachtel, et al., 2009), and intravenous contrast media (Zo'o, Hoermann, Balassy, et al., 2011). Cost is also an issue.

Radiation-Related Burden and Risk

Radiation exposure associated with CT imaging introduces the possibility of chronic health risks related to malignancies sustained from radiation effects (Berrington de González, Mahesh, Kim, et al., 2009; Mathews, et al., 2013; Pearce, et al., 2012). Radiosensitive organs—including the brain, bone marrow, lens of the eye, and thyroid gland—can be exposed to radiation during CT of the head (Papadakis, Perisinakis, Oikonomou, et al., 2011). In children younger than 5 years of age, about 20 percent of the active bone marrow is in the cranium, compared with 8 percent in adults (Cristy, 1981). CT-based radiation dose for pediatric patients is highly problematic because developing cellular structures and tissues of children are significantly more radiosensitive than those of adults; children, therefore, will be at substantially elevated risk for malignancy (American College of Radiology [ACR] Expert Panel on Pediatric Imaging, Hayes, et al., 2012).

To conduct imaging studies with radiation dosing that is appropriate for children, many facilities follow policies and protocols using the concept of ALARA — As Low As Reasonably Achievable. ALARA principles deem any additional radiation beyond the minimum needed for interpretable images both detrimental and non-efficacious (ACR Statement, 2009). Professional practice and patient advocacy groups, including the ACR, the American Academy of Neurology (AAN), and the American Academy of Pediatrics (AAP), have developed and promoted ALARA protocols and policies; these guidelines support the use of CT imaging in children only when clinically indicated, decreasing the risk of harm from radiation.

Sedation and Anesthesia-Related Burden and Risk

Some children will require sedation to ensure minimal movement during CT studies. Use of sedation is necessary to avoid motion artifacts, which invariably occur if the child moves during image acquisition, thus interfering with image quality. Motion artifacts sometimes undermine imaging quality to the point of rendering images unreadable. In the case of CT imaging, this may result in additional radiation exposure to obtain images sufficient for interpretation. Although the sedation used for pediatric imaging has been identified as low risk, it does have potential attendant complications (Cravero, Bilke, Beach, et al., 2006; Malviya, et al., 2000). Levels of sedation are on a continuum from minimal anxiolysis (administration of an anxiety reduction agent) to deep sedation, in which the patient can be roused only via vigorous stimuli (Arthurs, Sury, 2013). Compared with minimal sedation, moderate and deep sedation carry a greater risk of airway compromise, hypoxia resulting in CNS injury, and death (Cravero, et al., 2006).

In certain instances, sedation may not be sufficient, and anesthesia will be required to complete imaging. Anesthesia includes administration of medication to the extent that there is some degree of respiratory suppression and potential for cardiac depression; the patient cannot be roused by external stimuli or commands (Arthurs, Sury, 2013). Administration of anesthesia raises risks related to the process of intubation for respiratory support. These risks include dental trauma; airway edema (swelling of the windpipe); vocal cord spasm or injury; regurgitation of stomach contents with subsequent aspiration (inhalation) pneumonia; injury to arteries, veins, or nerves;

alterations in blood pressure; and/or irregular heart rhythms (Society for Pediatric Anesthesia [SPA], 2014). The most severe risks, though rare, include brain damage and death (SPA, 2014).

Intravenous Contrast-Related Burden and Risk

During the course of CT and MRI studies, intravenous (IV) contrast media may be used to enhance visualization of vascular structures and provide important information about neurologic anatomy. It is possible a child may experience an allergic reaction to IV contrast or subcutaneous fluid leakage (extravasation) during administration of IV contrast. IV contrast administration also includes the risk of contrast-induced nephrotoxicity (CIN) (Medscape Drugs and Diseases, 2014; Zo'o, et al., 2011). Children with poor kidney function are at greater risk for developing CIN and, in rare cases, will develop renal failure requiring dialysis.

Cost-Related Burden

Overuse of imaging is costly and places additional strain on an already heavily burdened healthcare system (Callaghan, Kerber, Pace, et al., 2014). As an example, charges for a CT of the brain can be as much as $2,000 and can vary substantially by region of the country. In addition, the likelihood that neuroimaging will result in the identification of clinically important structural abnormalities in this patient population is low. Incidental findings, however, may require follow-up testing with associated charges and potential complications (Lumbreras, Donat, Hernández-Aquado, 2010; Rogers, Maher, Schunk, et al., 2013).

Performance Gap

The low yield of neuroimaging studies in children with seizure presenting to EDs has been documented repeatedly (Aprahamian, et al., 2014; Gaillard, et al., 2009; Garvey et al., 1998; Hirtz, et al., 2000; Maytal, et al., 2000; Warden, et al., 1997). The AAN, the International League Against Epilepsy (ILAE), and the ACR generally favor MRI over CT for the evaluation of children who require neuroimaging after a first afebrile seizure, due to the superior resolution and lack of radiation associated with MRI (ACR Expert Panel on Pediatric Imaging, Dory et al., 2012; Gaillard, et al., 2009; Hirtz, et al., 2000). The AAN and ILAE also provide guidance on specific features of childhood seizures that increase or decrease the likely benefit of obtaining neuroimaging studies at all (Gaillard, et al., 2009; Hirtz, et al., 2000).

This measure assesses the percentage of children, ages 1 through 17 years, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging.

A lower percentage indicates better performance, as reflected by avoiding CT imaging when it is not indicated.

Drivers of Overuse

Seizures can be stressful events that may prompt a parent to seek the assistance of a healthcare provider, at times emergently. A seizure generates considerable distress and concern for family members and caregivers who witness it (Baumer, David, Valentine, et al., 1981; Shinnar, Pellock, 2002). Some providers may feel pressured by the parent to order imaging despite a lack

of benefit (ACR Expert Panel on Pediatric Imaging, Dory et al., 2012). This circumstance has a close parallel with parents who seek antibiotics for a child who has viral respiratory symptoms. In these circumstances, the provider may deviate from established practice guidelines to placate the parent. In recent decades, this phenomenon has reached such widespread prominence as to prompt multidisciplinary initiatives targeted at fostering discussion and identifying common practices that should be questioned by parents and providers (AAP Choosing Wisely, 2013). An ongoing dialogue between providers and parents about the risks and benefits of CT imaging continues to be a key feature of minimizing overuse in the setting of seizures.

The practice of defensive medicine is another reason an imaging study may be ordered. Physicians may be uncomfortable facing uncertainty regarding the etiology of seizure in children they are evaluating and treating. Assurance behaviors (e.g., ordering additional tests) are expected when a malpractice-sensitive physician is faced with a potentially worrisome condition that can cause the symptom in question (Carrier, Reschovsky, Katz, et al., 2013). In a survey of physicians from six specialties at high risk of liability, emergency physicians ordered more unnecessary diagnostic tests than clinicians from any other specialty (Studdert, Mello, Sage, et al. 2005). Physicians practicing in the ED have the added challenge of limited access to detailed medical records, which increases uncertainty about prior evaluation of patients who are referred from an out-of-network provider or hospital. Overuse of neuroimaging is a potential result.

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).**

Virtually any alteration in resource utilization or expenditure substantially affects children covered by Medicaid or CHIP; in 2011 alone, 30.6 million or 40 percent of children through the age of 18 years were Medicaid recipients (Tang, 2011). Although there is no study on the number of children who both experience seizures and have Medicaid or CHIP coverage, curtailing the overuse of imaging will favorably reduce radiation exposure, poor sedation/anesthesia outcomes, and costs.

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).

We are unaware of any existing quality measures specific to the overuse of CT imaging for children with afebrile, atraumatic seizures.

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:** No.
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:** No.
g. **Service – other (please specify):** No.
h. **Measure Topic – duration of enrollment:** No.
i. **Measure Topic – clinical quality:** Yes.
j. **Measure Topic – patient safety:** Yes.
k. **Measure Topic – family experience with care:** No.
l. **Measure Topic – care in the most integrated setting:** No.
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; all ages in this range.
r. **Population – school-aged children (6 years through 10 years) (specify age range):** Yes; all ages in this range.
s. **Population – adolescents (11 years through 20 years) (specify age range):** Yes; ages 11-17 years (i.e., younger than age 18 years).
t. **Population – other (specify age range):** No.
u. **Other category (please specify):** Not applicable.

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.

This measure assesses the percentage of children, 1 through 17 years of age, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging. A number of evidence-based reviews have concluded that emergent neuroimaging of a child who has experienced an afebrile, atraumatic (unprovoked seizure) is not indicated. In its Practice Parameter regarding first non-febrile seizure in children, the AAN recommends MRI as the preferred modality if a neuroimaging study is obtained (Hirtz, et al., 2000). The AAN also recommends that emergent neuroimaging be obtained in children who have not returned to baseline within several hours after a seizure. Similarly, the ILAE supports the use of MRI for the imaging of children with seizure, while acknowledging CT is more widely available than MRI and less likely to require sedation for younger children (Gaillard, et al., 2009). The low yield of neuroimaging studies in children with seizure presenting to EDs has been documented repeatedly (Aprahamian, et al., 2004; Gaillard, et al., 2009; Garvey, et al., 1998; Hirtz, et al., 2000; Maytal, et al., 2000; Warden, et al., 1997). In a retrospective chart review of 500 children with new-onset afebrile seizures, Sharma and colleagues found few clinically significant abnormal findings on neuroimaging (Sharma, et al., 2003). They concluded that children who meet low-risk criteria can be safely discharged from the ED, if follow-up can be assured, without emergent neuroimaging.

Table 10 (see Supporting Documents) summarizes key sources of evidence for this measure, using the U.S. Preventive Services Task Force (USPSTF) rankings (criteria denoted in a note to the table). The ACR, in addition to evidence-based guidelines noted below, has also published specific "Appropriateness Criteria" for pediatric seizure (Figures 1 and 2; see Supporting Documents).

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.

Not applicable.

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.

This measure was tested using inter-rater reliability (IRR) of medical record data, as described here.

Abstracted Medical Record Data

Medical record data were obtained through HealthCore, Inc., an independent subsidiary of Anthem, Inc., the largest health benefits company/insurer in the United States. HealthCore owns and operates the HealthCore Integrated Research Database (HIRD), a longitudinal database of medical and pharmacy claims and enrollment information for members from 14 geographically diverse Blue Cross Blue Shield (BCBS) health plans in the Northeast, South, West, and Central regions of the United States, with members living in all 50 States. The HIRD includes automated computerized claims data and enrollment information for approximately 60 million lives with medical enrollment, over 37 million lives with combined medical and pharmacy enrollment information, and 16 million lives with outpatient laboratory data from the BCBS licensed plans.

This measure belongs to the Q-METRIC Overuse of Imaging for the Evaluation of Children with Headache or Seizures measures collection. As part of the initial sampling strategy for testing multiple measures in this collection, approximately 2.1 million children, ages 6 months through 17 years, were identified in the HIRD for the study's 2012 measurement year. Of these, a cohort of children with diagnosis codes for headaches and seizures was identified (n=57,748). Members who did not have continuous eligibility during the 2011 and 2012 calendar years were excluded,

narrowing the group to 36,985. Specifically for this measure, administrative claims were used to identify children, ages 1 through 17 years, who were diagnosed with a first generalized afebrile, atraumatic seizure (4,385, 11.9 percent). From this group, 532 children (12.1 percent) were identified as having CT imaging. After applying claims denominator exclusions, 296 children (55.6 percent) remained eligible for medical record review.

Among the children eligible for the denominator based on claims, providers associated with the eligible children's visits were identified; the final sampling population consisted of 218 children (73.6 percent) who were linked to a provider with available contact information. Once subjects were identified, patient medical records were requested from healthcare providers; records were sent to a centralized location for data abstraction. To ensure an adequate number of cases to test the feasibility of this measure, we set a target sample of 200 abstracted charts.

Trained medical record abstractors reviewed paper copies of the medical records and entered data collected into a password-protected database. To help ensure consistency of data collection, the medical record abstractors were trained on the study's design and presented with a standardized data collection form designed to minimize the need to make subjective judgments during the abstraction process. In addition, data were entered onto forms, which were subsequently scanned and reviewed through a series of quality checks.

Although 200 charts were requested for the target sample, a total of 89 charts were obtained from provider offices and healthcare facilities. These charts were reviewed for the presence of denominator exclusions that were not present in claims. There were 33 children (37.1 percent) with documentation of a condition that met denominator exclusion within the chart, resulting in a total of 56 children (62.9 percent) who met denominator criteria for this measure. Among patients eligible for the denominator, CT imaging was obtained without a documented indication for 44 children (78.6 percent).

Inter-Rater Reliability

Reliability of medical record data was determined through re-abstraction of patient record data to calculate the IRR between abstractors. Broadly, IRR is the extent to which the abstracted information is collected in a consistent manner. Low IRR may be a sign of poorly executed abstraction procedures, such as ambiguous wording in the data collection tool, inadequate abstractor training, or abstractor fatigue. For this measure, the medical record data collected by three abstractors was individually compared with the data obtained by a senior abstractor. IRR was determined by calculating both percent agreement and Cohen's kappa statistic.

Of the 89 medical records received for chart review, 13 records (14.6 percent) were reviewed for IRR. IRR was assessed by comparing the abstractor agreement with a senior abstractor on 16 questions included in the chart abstraction form for this measure. Overall, abstractor agreement was 100 percent; the kappa statistic was 1.0, indicating a perfect level of agreement was achieved. Given this evidence, the data elements needed for calculation of the measure can be abstracted from medical records with a high degree of accuracy.

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).

Face Validity

Face validity is the degree to which the measure construct characterizes the concept being assessed. The face validity of this measure was established by a national panel of experts and parent representatives for families of children with headaches or seizures convened by Q-METRIC. The Q-METRIC panel included nationally recognized experts in the area of imaging children, representing general pediatrics, pediatric radiology, pediatric neurology, pediatric neurosurgery, pediatric emergency medicine, general emergency medicine, and family medicine. In addition, face validity of this measure was considered by experts in State Medicaid program operations, health plan quality measurement, health informatics, and healthcare quality measurement. In total, the Q-METRIC imaging panel included 15 experts, providing a comprehensive perspective on imaging children and the measurement of quality metrics for States and health plans.

The Q-METRIC expert panel concluded that this measure has a high degree of face validity through a detailed review of concepts and metrics considered to be essential to the appropriate imaging of children. Concepts and draft measures were rated by this group for their relative importance. This measure received an average score of 7.6 (with 9 as the highest possible score).

Validity of Exclusion Criteria

Denominator: We tested the validity of administrative claims to exclude cases from the denominator based on the following exclusions that could be identified using ICD-9-CM or CPT codes: partial seizure; fever; complex febrile seizure; post-traumatic seizure; trauma such as skull fracture, concussion, intracranial hemorrhage, and suspected abuse and neglect; developmental delay, lack of expected normal physiological development or delayed milestone; pre-existing conditions that would warrant imaging such as neoplasm and blood disorder, hydrocephalus and CNS anomalies, hemangioma, phlebitis/thrombophlebitis, occlusion of cerebral arteries, moyamoya disease, tumor, hemorrhage, or tuberous sclerosis; infection such as meningitis, brain abscess, HIV and encephalitis; lumbar puncture; and neurological surgery. Children with codes associated with these claims-based exclusions were removed from the chart review sample. In other words, none of the charts sampled for medical record review had administrative claims that contained ICD-9-CM or CPT codes associated with these conditions. We tested the accuracy of the assumption that the absence of these codes in administrative claims would mean the absence of clinical documentation indicative of these exclusionary conditions in the medical record.

Of the 89 charts that were reviewed, 33 (37.1 percent) were excluded based on clinical documentation within the medical record of one of the denominator exclusions listed above.

Therefore, 56 (62.9 percent) were in agreement with the administrative claims regarding the absence of these denominator exclusions. These results demonstrate that a substantial number of additional children were excluded from the denominator based on information only available through chart review.

Therefore, although the use of administrative claims is an appropriate and valid method to narrow the population of charts sampled within this measure specification, the presence of these exclusionary conditions in the medical record indicates that medical record abstraction is necessary to accurately identify denominator exclusions with confidence.

Numerator: We tested the potential to exclude cases from the numerator using administrative claims by comparing information abstracted from the medical record with ICD-9-CM or CPT codes for the following two numerator exclusions:

- Status epilepticus (Table 2 [=IMG2]) on the day of or within the 365 days before imaging was obtained.
- Signs or symptoms of increased intracranial pressure (Table 11 [=IMG11]) on the day of or day before imaging was obtained.

For this comparison, the medical chart was considered the gold standard. Sensitivity, specificity, and negative and positive predictive values were calculated.

Note that the other two numerator exclusions (notably different mental state when compared with prior exams and abnormal neurologic exam findings) must be identified using information abstracted from the medical chart (i.e., these exclusions cannot be determined from claims data; see Numerator Exclusions in Section 1 for more detail).

Among children eligible for the denominator after chart review (n=56), the sensitivity of claims for identification of status epilepticus was (0/3) = 0 percent; the specificity was (53/53) = 100 percent; the positive predictive value (PPV) was (0/0) = 0 percent; and the negative predictive value (NPV) was (53/56) = 95 percent (Table 12). The sensitivity of claims for identification of signs or symptoms of increased intracranial pressure was (0/1) = 0 percent; the specificity was (44/55) = 80 percent; the PPV was (0/11) = 0 percent; and the NPV was (44/45) = 98 percent (Table 13). Our results indicate that chart review is necessary for accurate and complete collection of numerator exclusion criteria. Note: All tables are presented in the Supporting Documents for this measure.

Importance of Abstracted Medical Record Data

This measure is specified using medical record data after administrative claims are used to identify the eligible population. Medical records are considered the gold standard for clinical information; our findings indicate that these data have a high degree of face validity and reliability, as summarized above. As several key numerator exclusions cannot be applied using claims alone, our findings indicate that it is necessary to identify exclusion criteria for this measure within medical records in order to accurately assess the overuse of CT for children with

a first generalized afebrile, atraumatic seizure. For example, there are no ICD-9-CM codes to indicate that the child is exhibiting a notably different mental state compared with prior exams. Further evidence for the necessity of using medical charts can be seen in our data, where an additional 37 percent of cases that would have been included using administrative claims only were excluded from the denominator once chart review was performed. As a consequence, implementing this measure solely using administrative claims data would tend to overstate the degree of overuse of imaging in this population.

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

Race and ethnicity were generally unavailable from the medical records reviewed for this study. However, overall race and ethnicity characteristics of the ZIP codes in which sampled children live can be summarized using demographic characteristics collected for the 2010 United States Census (U.S. Census Bureau, 2010). The summary statistics for race and ethnicity within ZIP code for sampled groups of children with valid ZIP codes are reported in Tables 14 and 15 (see Supporting Documents).

Overall, the proportion of residents in specific racial groups was similar in all groups of sampled children. On average, sampled children reside in ZIP codes reporting primarily white race (range: 78.2 percent-82.5 percent) and within ZIP codes reporting modest levels of Hispanic ethnicity (8.7 percent-11.2 percent).

7.B. Special Health Care Needs

The medical records data abstracted for this study do not include indicators of special healthcare needs.

7.C. Socioeconomic Status

Socioeconomic status was not available from the medical records reviewed for this study. However, the overall median household income of the ZIP codes in which sampled children live can be summarized using demographic characteristics collected for the 2011 American Community Survey (ACS) (U.S. Census Bureau, 2013). The summary statistics for median household income within ZIP code for sampled groups of children with valid ZIP codes and complete census data are reported in Table 16 (see Supporting Documents).

Overall, the ZIP code-level median household income for groups of sampled children ranged from $62,388-$66,597, with the exception of the largest pool of candidates, children with first generalized afebrile, atraumatic seizure, which was slightly higher ($70,000).

7.D. Rurality/Urbanicity

Urbanicity was not available from the medical records reviewed for this study. However, urbanicity of the ZIP codes in which sampled children live can be summarized using demographic characteristics collected for the 2010 United States Census, (U.S. Census Bureau, 2010). The summary statistics for urbanicity within ZIP code for sampled groups of children with valid ZIP codes are provided in Table 17 (see Supporting Documents).

Overall, the ZIP codes of all groups of sampled children were largely categorized as being urban (74.3 percent-79.3 percent).

7.E. Limited English Proficiency (LEP) Populations

The medical records data abstracted for this study do not include indicators of LEP.

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?

This measure was tested using administrative claims data to identify the eligible population for medical record review. Administrative data needed for this measure include date of birth, diagnosis codes, and procedure codes and dates. These data are generally available, although obtaining them may require a restricted-use data agreement and Institutional Review Board (IRB) approval.

Testing this measure using medical record data required the development of an abstraction tool and the use of qualified nurse abstractors. Review of clinical documentation was required to ensure that exclusions were appropriately captured for the determination of overuse of neuroimaging (i.e., status epilepticus, signs of increased intracranial pressure, notably different mental state compared with previous exams, and abnormal neurological exam).

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?

Continuing advances in the development and implementation of electronic health records (EHRs) may prompt providers to document key elements needed for application of inclusion and exclusion criteria necessary for this measure. Advances would further allow for electronic capture of structured clinical information needed to determine if and when neuroimaging has been overused in the evaluation of children experiencing a first generalized afebrile, atraumatic seizure.

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.

To our knowledge, this measure is not currently in use anywhere in the United States.

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?

Not applicable.

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)**

No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

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?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

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

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)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

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?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

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

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)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

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?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

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

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?**
This measure requires medical record abstraction; medical records are maintained by all health services providers. Target population for sampling requires administrative claims data to identify subgroups of potentially eligible cases for medical record review.

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?**
Availability of medical records meeting inclusion criteria will vary by plan. A minimum of approximately 200 abstracted charts for eligible children during the measurement year is recommended.

Our results indicate that among 4,385 members between 1 and 17 years of age with 2 years of continuous eligibility and a diagnosis of a first generalized afebrile, atraumatic seizure, 296 (6.8 percent) were eligible for medical record review. Among 89 sampled charts, we found that 56

(63 percent) met denominator criteria. From these findings, we estimate that (6.8 percent * 63 percent) = 4.3 percent of our test population have denominator-eligible charts.

Based on these results, we estimate that to obtain a target of 200 denominator-eligible charts, approximately (200/0.043) = approximately 4,650 children between the ages of 1 and 17 years with diagnosis codes for first generalized afebrile, atraumatic seizure would be required to meet this target.

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
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?**
Not applicable.

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?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

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?**
This measure requires medical record abstraction; medical records are maintained by all health services providers.

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?**
This measure has not been tested at the hospital level; consequently, the minimum number of patients per hospital has not been determined.

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
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)**
No.

Data Sources: **Are data sources available to support reporting at this level?**
Not applicable.

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?**
Not applicable.

Reliability & Validity: **Is there published evidence about the reliability and validity of the measure when reported at this level of aggregation?**
Not applicable.

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

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 provides a means to assess the extent to which CT studies are being overused for the evaluation of children with a first generalized afebrile, atraumatic seizure. This measure has not been formally assessed for comprehension. However, high rates of overuse are easily understood to be unsatisfactory. The simplicity of the measure likewise makes it a straightforward guide for providers and purchasers to assess overuse of CT for the evaluation of children with a first, afebrile, atraumatic seizure. The primary information needed for this measure is sourced from medical records and administrative claims data and includes basic demographics, diagnostic codes, and procedure codes, all of which are widely available.

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.

Health IT provides a platform that can support various new uses of the measure. First, health IT can show feedback at the time of order entry. Health IT also can provide education about alternatives to imaging. Alerts and reminders, given to patients as well as to providers, might also enhance use of the measure.

11.B. Health IT Testing

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

No.

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.

Our results indicate that these data are already recorded in EHR systems. Order entry systems can provide structured information about orders placed for neuroimaging studies; this furnishes key information necessary for the measure. However, important information required for numerator or denominator exclusion criteria may be recorded in an unstructured format in problem lists, as well as in nursing and physician notes. For this measure to be accurate, it may be necessary to combine data from multiple EHR systems. The use of Health Information Exchange (HIE), especially using the DIRECT protocol for exchange across individual electronic medical records (EMRs), would be an important tactical step to enable this measure.

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)?

Yes.

If yes, please describe.

The ONC's Health IT Standards explicitly address the receipt of CT and MR imaging results and other diagnostic tests into EHRs, which may be relevant in hospitals providing imaging services to children. The ONC standards include the following specific requirements in the Certification criteria (ONC, 2010) pertaining to Stage 2 Meaningful Use requirements:

Stage 2 (beginning in 2013): CMS has proposed that its goals for the Stage 2 meaningful use criteria expand upon the Stage 1 criteria to encourage the use of health IT for continuous quality improvement at the point of care. In addition, the exchange of information in the most structured format possible is encouraged. This can be accomplished through mechanisms such as the electronic transmission of orders entered using computerized provider order entry (CPOE) and the electronic transmission of diagnostic test results, which provide evidence that ordered imaging studies were completed. Electronic transmission of diagnostic test results includes a broad array of data important to quality measurement and, for this measure, specifically includes radiology studies such as CT and MR imaging and the radiation dose delivered.

11.E. Health IT Calculation

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

Missing or ambiguous information in the following areas could lead to missing cases or calculation errors:

1. Child's date of birth.
2. ICD-9-CM codes.
3. Date and time of treatment.
4. Type of tests administered.
5. Date tests performed.
6. Care setting.
7. Lack of a consistent radiation dose monitoring strategy.
8. Possibility of a scanned or electronic clinical document in the medical record.

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?

This measure, as noted above, requires the use of HIE for optimal understanding of previous imaging studies. In many sites, duplicative testing is an alternate to HIE, which may be impossible in the early mornings or at off hours from a primary care site. Implementation of HIE is one aspect that will enhance performance. Another might be the use of clinical decision support to understand when neuroimaging is not indicated. Information buttons could link to educational resources at the point of care to discourage unnecessary ordering, as well, and could be used to link previous study results with the act of ordering, which has been shown to decrease the rate of ordering.

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).

This measure assesses the percentage of children, 1 through 17 years of age, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging. For the purposes of this measure, indications for CT imaging include status epilepticus, signs of increased intracranial pressure, notably different mental state compared with prior exams, or an abnormal neurologic exam. A lower percentage indicates better performance, as reflected by avoiding CT imaging when it is not indicated.

The following considerations may further strengthen this measure and potentially ease the burden of data collection. Some denominator exclusions cannot be reliably identified using administrative claims. This leads us to conclude that this measure cannot reliably be implemented using administrative data alone; doing so would result in miscalculation of the

degree to which CT imaging is overused for the evaluation of children with a first generalized afebrile, atraumatic seizure. Many of the neurologic signs and symptoms that suggest intracranial pathology are only captured in the clinical documentation contained within the medical record. Continuing advances in the development and implementation of EHRs may prompt providers to document key elements needed for application of inclusion and exclusion criteria necessary for this measure. This would allow for electronic capture of clinical information needed to determine if and when neuroimaging has been overused in the evaluation of children experiencing a first generalized afebrile, atraumatic seizure.

In future implementation, we recommend considering the inclusion of the ordering of neuroimaging studies in this measure as opposed to limiting the measure to obtained neuroimaging studies. This would address the potential for delays between the time an order is placed and the time that a study can be scheduled. Including orders for neuroimaging studies decreases the potential for underestimation of overuse that would occur if a study could not be obtained within the 30-day timeframe set for this measure. In addition, future specifications may consider including a denominator exclusion of a documented contraindication to MRI, as CT would be the only imaging option in this population.

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 measure assesses the percentage of children, ages 1 through 17 years, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging. For the purposes of this measure, indications for neuroimaging include status epilepticus, signs of increased intracranial pressure, notably different mental state compared with prior exams, or an abnormal neurologic exam. A lower percentage indicates better performance, as reflected by avoiding CT imaging when it is not indicated. This measure was tested using medical record data after administrative claims were used to identify the eligible population. There currently are no known existing quality measures specific to CT imaging of children with seizure.

First seizures are common; every year, it is anticipated that up to 40,000 children in the United States will experience a first seizure. Neuroimaging is used in pediatric patients who have experienced a seizure to evaluate for structural brain abnormalities that may require surgical intervention or predispose to future seizures. However, clinical guidelines maintain that children who present for evaluation after a first generalized, afebrile seizure and meet low-risk criteria can be safely discharged without emergent neuroimaging if follow-up can be assured. While widely available, CT imaging for the evaluation of seizure in children has inferior resolution compared with MRI and is generally low-yield, suggesting overuse of this imaging modality.

Further, children who have CT scans in early childhood tend to be at greater risk for developing leukemia, primary brain tumors, and other malignancies later in life.

Q-METRIC testing results indicate that this measure is feasible using existing data sources. The measure was tested with information abstracted from medical records after administrative claims were used to identify the eligible population. In total, 89 charts were reviewed; 56 (62.9 percent) met denominator criteria for this measure. Among these, 44 children (78.6 percent) received CT imaging without a documented indication. This measure provides a means to assess the extent to which CT studies are being overused for the evaluation of children with a first generalized afebrile, atraumatic seizure. High rates of overuse are easily understood to be unsatisfactory. The primary information needed for this measure includes basic demographics, diagnostic codes, and procedure codes, all of which are widely available, though access may require a restricted-use data agreement and IRB approval. Certain limitations were observed during measure testing: not all exclusions are captured in administrative claims data, and neurologic examinations were not always documented.

Continuing advances in the development and implementation of EHRs may prompt providers to document key elements needed for application of inclusion and exclusion criteria necessary for this measure. Advances would further allow for electronic capture of clinical information needed to determine if and when neuroimaging has been overused in the evaluation of children experiencing a first generalized afebrile, atraumatic seizure.

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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.

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