Ratio of Magnetic Resonance Imaging Scans to Computed Tomography Scans for the Evaluation of Children with Atraumatic Seizure

Section 1. Basic Measure Information

1.A. Measure Name

Ratio of Magnetic Resonance Imaging Scans to Computed Tomography Scans for the Evaluation of Children with Atraumatic Seizure

1.B. Measure Number

0197

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 ratio of the number of magnetic resonance imaging (MRI) scans to the number of computed tomography (CT) scans obtained on or within 30 days after the date of evaluation for atraumatic seizure among children ages 1 through 17 years within the measurement year. A higher ratio of MRI to CT scans indicates better performance, as reflected by a smaller number of children being exposed to radiation as a result of neuroimaging.

First seizures are common; every year, it is anticipated that up to 40,000 children in the United States will experience a first seizure (Hirtz, Ashwal, Berg, et al., 2000). Epilepsy, a recurrent seizure disorder, has a lifetime prevalence of 10.2 per 1,000 children (Russ, Larson, Halfon, 2012). Neuroimaging is used to evaluate for structural brain abnormalities in individuals who experience seizures.

Head CT and MRI of the brain are the neuroimaging modalities at the center of this overuse measure. CT and MRI are both radiologic modalities that are used to create images of internal organs and structures in a slice-by-slice manner. CT uses X-ray radiation (hereafter simply called radiation), and MRI uses magnetic fields and radio waves. CT scans are simple to order because the technology is readily available (Ginde, Foianini, Renner, et al., 2008), fast, and less expensive than MRI. However, MRI is favored over CT in the evaluation of individuals who require neuroimaging after a seizure due to its superior resolution and lack of radiation exposure (Gaillard, Chiron, Cross, et al., 2009; Hirtz, et al., 2000). Use of MRI is limited by availability of scanners and the frequent need for sedation or anesthesia to obtain high-quality images of children.

This measure addresses the overuse of CT of the brain when MRI would be a reasonable alternative. 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, et al., 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 are often required for longer CT imaging sequences and almost universally for MRI studies. These complications include compromised airway, hypoxia leading to central nervous system 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. Providers should be careful not to order neuroimaging unnecessarily, and, when possible, to select MRI over CT for evaluation of children with atraumatic seizure for whom imaging has been deemed necessary.

This measure uses administrative claims data and is calculated as the ratio of MRI scans to CT scans obtained on or within 30 days after the date of evaluation for atraumatic seizure among eligible children, ages 1 through 17 years, within the measurement year.

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 Seizures measure 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 the number of MRI scans of the head obtained on or within 30 days after the date of evaluation for atraumatic seizure among children, ages 1 through 17 years, within the measurement year.

Eligible children must be 1 through 17 years of age during the measurement year for which imaging is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior. Imaging may be obtained in any department of the hospital or at sites outside the hospital, such as free-standing imaging facilities and emergency departments (EDs). Each scan obtained on or within 30 days after the date of evaluation of atraumatic seizure is an event used in the calculation. Table 1 [=IMG1] lists Current Procedural Terminology (CPT) codes associated with brain imaging (MRI). (Note: please see Supporting Documents for Tables), International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes to identify atraumatic seizure are shown in Table 2 [=IMG2]. Atraumatic seizure must be diagnosed on the day of or up to 30 days prior to imaging. Atraumatic seizures are those not associated with trauma occurring in the past 7 days.

1.H. Numerator Exclusions

Exclusions based on ICD-9-CM codes captured in administrative claims data:

- Vascular disease (Table 3[=IMG8]) on the day of or within 365 days prior to imaging.
- Post-traumatic seizure (Table 2 [=IMG2]) on the day of or day prior to imaging.
- Other indication of trauma (Table 4 [=IMG9]) or by the presence of an E-code on the day of or within the 7 days prior to imaging.

1.I. Denominator Statement

The denominator is the number of CT scans of the head obtained on or within 30 days after the date of evaluation for atraumatic seizure among children, ages 1 through 17 years, within the measurement year.

Eligible children must be 1 through 17 years of age during the measurement year for which imaging is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior. Imaging may be obtained in any department of the hospital

or at sites outside the hospital, such as free-standing imaging facilities and EDs. Each scan obtained on or within 30 days after the date of evaluation of atraumatic seizure is the event used in the calculation. A list of codes for imaging studies of the head (CT) are shown in Table 1 [=IMG1]; codes to identify atraumatic seizure are shown in Table 2 [=IMG2]. Atraumatic seizure must be diagnosed on the day of or up to 30 days prior to imaging. Atraumatic seizures are those not associated with trauma occurring in the past 7 days.

1.J. Denominator Exclusions

Exclusions based on ICD-9-CM codes captured in administrative claims data:

- Vascular disease (Table 3[=IMG8]) on the day of or within 365 days prior to imaging.
- Post-traumatic seizure (Table 2 [=IMG2]) on the day of or day prior to imaging.
- Other indication of trauma (Table 4 [=IMG9]) or by the presence of an E-code on the day of or within the 7 days prior to imaging.
- Relative contraindications to MRI (Table 5 [=IMG12]) on the day of or within 365 days prior to imaging. (Note: some contraindications are guidelines rather than strict rules. As such, a provider may determine that a child should undergo an MRI despite a contraindication.)

1.K. Data Sources

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

Administrative data (e.g., claims data, specified and tested); 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.

For detailed measure specifications, 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 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 nonfebrile seizure (Hirtz, et al., 2000; Hirtz, Berg, Bettis, et al., 2003). Seizures account for roughly 2 percent of ED visits at children's hospitals (Martindale, Goldstein, Pallin, 2011).

Pathology and Severity of Atraumatic Seizure

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). 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). Although atraumatic seizures are generally associated with little to no increased risk of subsequent epilepsy (American Academy of Pediatrics [AAP], 2011; Berg, Jallon, Preux, 2013; Shinnar, Pellock, 2002), the seizure event generates considerable distress and concern for family members and caregivers who witness it (Baumer, David, Valentine, et al., 1981; Shinnar, Pellock, 2002).

Burdens of Using CT Instead of MRI for Characterization of Atraumatic Seizure

MRI is generally preferred to CT because of its superior resolution, versatility, and lack of radiation dose (ACR Expert Panel on Pediatric Imaging, Dory, et al., 2012; Gaillard, Cross, Duncan, et al., 2011). An MRI for optimally resolving neurologic structures takes approximately 30 minutes or more and will often require sedation to successfully image younger children. CT can be favored in some situations, for example when imaging must be obtained emergently or there is concern for intracranial hemorrhage.

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).

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, 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 the 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 (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 American College of Radiology (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 only when clinically indicated in children, 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 and MRI studies. Use of sedation is necessary to avoid motion artifacts, which invariably occur if the child moves during the 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 risk of airway compromise, hypoxia resulting in central nervous system 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 that results in 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, 2014). The most severe risks, though rare, include brain damage and death (Society for Pediatric Anesthesia, 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, Hernandez-Aquado, 2010; Rogers, Maher, Schunk, et al., 2013).

Performance Gap

The American Academy of Neurology (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).

The ACR Appropriateness Criteria (ACR Expert Panel on Pediatric Imaging, Dory et al., 2012) rank MRI as more appropriate than CT in patients with atraumatic seizure. Even though MRI has innately better structural resolution and provides a more detailed visualization of structural abnormalities that cause seizures, there are clinical scenarios in which CT will be preferred over MRI. CT is usually the imaging study of choice for identification of intracranial hemorrhage, despite the radiation dose (ACR Expert Panel on Pediatric Imaging, Ryan, et al., 2014).

Access and availability of CT versus MRI is relevant to this measure. CT imaging is readily available in most EDs (Ginde, et al., 2008). However, MRI may be a reasonable alternative to CT for children with atraumatic seizure, even for the evaluation of time-sensitive conditions such as failure of a ventricular-peritoneal shunt (Boyle, Sturm, 2013; Kim, Torrey, Milla, et al., 2015).

This measure assesses the extent to which MRI is used in relation to CT for neuroimaging of children with atraumatic seizure. A higher ratio of MRI scans to CT scans for the neuroimaging of children with atraumatic seizure indicates better performance, as reflected by a smaller number of children being exposed to radiation as a result of neuroimaging.

Drivers of Overuse

Seizures can be stressful events that may prompt a parent to seek the assistance of a healthcare provider, at times urgently. A seizure generates considerable distress and concern for family members and caregivers who witness it (Baumer, et al., 1981; Shinnar, Pellock, 2002). Some providers may feel pressured by a 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 about tests and treatments that should be questioned by parents and providers (AAP Choosing Wisely, 2013). An ongoing dialogue between providers and parents regarding the risks and benefits of neuroimaging for the evaluation of children who experience an atraumatic seizure is a key feature of avoiding overuse.

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 18 years of age or younger were Medicaid recipients (Tang, 2011). Although there is no study on the number of children with seizure who are enrolled in Medicaid or CHIP, efforts to curtail the overuse of imaging will reduce radiation exposure, poor anesthesia and/or sedation 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 imaging with CT when MRI would be a reasonable alternative for the evaluation of children with 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:** Yes.
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:** 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:** 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; adolescents ages 11-17 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 overuse of CT scans among children, ages 1 through 17 years, being evaluated for atraumatic seizure, by calculating a ratio comparing the number of MRI and CT scans obtained in this population.

A number of evidence-based reviews have concluded that emergency neuroimaging of a child who has experienced an atraumatic (unprovoked) seizure is not indicated. The low yield of neuroimaging studies in children with seizure presenting to EDs has been documented repeatedly (Aprahamian, Harper, Prabhu, et al., 2014; Gaillard, et al., 2009; Garvey, Gaillard, Rusin, et al., 1998; Hirtz, et al., 2000; Maytal, Krauss, Novak, et al., 2000; Warden, Brownstein, DelBeccaro, 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. 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 (Sharma, Riviello, Harper, et al., 2003).

In their Practice Parameter regarding a first nonfebrile seizure in children, the AAN recommends that MRI is the preferred modality if a neuroimaging study is obtained (Hirtz, et al., 2000). They also recommend that emergent neuroimaging be obtained in children who have not returned to baseline within several hours after a seizure but do not specify CT over MRI in this case. Similarly, the ILAE supports the use of MRI for 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).

Table 6 (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 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.

To evaluate the reliability of using administrative claims for the calculation of this measure, we conducted a signal-to-noise analysis. This analysis was focused on assessing the ability to confidently distinguish the performance of one State health plan from that of another State. To perform the signal-to-noise analysis, we used the Medicaid Analytic eXtract (MAX) administrative claims data provided by the Centers for Medicare & Medicaid Services (CMS) from 2006 to 2010 for seven State Medicaid programs: Colorado, Florida, Illinois, Massachusetts, Michigan, Texas, and Utah. The number of MRI and CT scans per State and year are summarized in Table 7 (see Supporting Documents). Ratios varied between States, ranging from a low of 0.58 in Illinois (2006) to a high of 1.17 in Utah (2006). Lowest to highest ratios of MRI to CT imaging within each State across the 5-year period were as follows: Colorado (0.61 vs. 1.01), Florida (0.85 vs. 1.06), Illinois (0.58 vs. 0.85), Massachusetts (0.99 vs. 1.13), Michigan (0.72 vs. 1.12), Texas (0.70 vs. 0.87), and Utah (0.89 vs. 1.17).

For this approach, reliability was estimated with a beta-binomial model (RAND Corporation, TR-653-NCQA, 2009). This approach is applicable in instances where the numerator is a subset of the denominator; for reliability testing, the numerator was defined as the number of MRIs and the denominator was defined as the number of CTs + number of MRIs. We tested the reliability using aggregate data from the same seven States for 2006-2010.

Reliability Results

Reliability results are detailed in Table 8 (see Supporting Documents). These results show that the reliability based on signal-to-noise analysis ranged from 0.99 to 0.81, with a media of 0.98.

Reliability Conclusions

The reliability is very good; observed reliability was consistently greater than 0.90. In general, reliability scores can range from 0.0 (all variation is attributable to measurement error) to 1.0 (all variation is caused by real differences). While there is not a clear cut-off for a minimum reliability level, values above 0.7 are considered sufficient to distinguish differences between some health plans and the mean; reliability values above 0.9 are considered sufficient to see differences between health plans (RAND Corporation, TR-653-NCQA, 2009). The median reliability observed across State Medicaid programs tested for this measure was 0.98 (range: 0.81-0.99), which is consistent with a high degree of reliability.

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 concept was established by a national panel of experts and parent representatives for families of children with headaches and 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 appropriate imaging of children. Concepts and draft measures were rated by this group for their relative importance. This measure received an average score of 7.0 (with 9 as the highest possible score).

Validity of Performance Measure Score: Overview

We assessed the validity of the measure performance score using administrative claims compared with the gold standard of the medical record.

Identification of the Study Population

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 (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, 1 through 17 years of age, who had an atraumatic seizure (5,099, 13.8 percent). From this group, 557 children (10.9 percent) had received an MRI, and 539 children (10.6 percent) had received a CT scan on or within 30 days after the date of diagnosis of an atraumatic seizure.

Providers associated with the eligible children's visits were identified; the final sampling population consisted of children who were linked to a provider with available contact information, resulting in 428 children (76.8 percent) who had received an MRI and 396 children (73.5 percent) who had a CT scan. Once subjects were identified, patient medical records were requested from provider offices and healthcare facilities; 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. In total, 199 charts (104 charts for children receiving an MRI and 95 charts for children receiving a CT scan) were abstracted.

Trained medical record abstractors collected and entered information from paper copies of the medical records 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.

To facilitate comparisons between administrative claims and information abstracted from a medical chart, this validation study used the ratio of the total number of children with at least one MRI scan within the measurement year to the total number of children with at least one CT scan within the measurement year.

Ratio of MRI to CT Using Administrative Claims Data

After applying claims-based exclusions to cases in the HIRD, 498 children were identified as being eligible for the numerator (MRI obtained), and 434 children were identified as being eligible for the denominator (CT obtained). The ratio of MRI to CT scans of eligible children using the first imaging event on or within 30 days after the date of diagnosis of an atraumatic seizure was (498/434) = 1.15.

Ratio of MRI to CT Using Abstracted Medical Record Data

Within the sample of medical records received for chart review (n=199, see identification of study population above), 104 children (52.3 percent) had received an MRI, and 95 children (47.7 percent) had received a CT scan. Of the 104 children who received an MRI, 91 (87.5 percent) met criteria for inclusion in the numerator population. Of the 95 children who received a CT scan, 76 (80.0 percent) met criteria for inclusion in the denominator population. Among children who were included in chart review, the ratio of MRI to CT scans obtained for the evaluation of children within 30 days of diagnosis of an atraumatic seizure was 91/76 = 1.20, similar to the ratio calculated from administrative claims data.

Accuracy of Administrative Claims

The sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) of administrative claims to identify the presence of exclusions were calculated; the medical charts were the gold standard for comparison. In addition, the reliability of the data elements abstracted from the medical chart was assessed by identifying a subset of the charts to be re-abstracted by another trained medical record abstractor; the results of the two abstractors were compared using percent agreement and kappa.

Numerator (MRI): Among children with at least one MRI (n=104), three children had exclusion criteria present in both claims and charts, and 87 children had no exclusion criteria present in either claims or charts. Four children had evidence of exclusion criteria in claims but not in charts; 10 children had evidence of exclusion criteria in charts but not in claims (Table 9; see Supporting Documents). The sensitivity of claims for identification of exclusion criteria was 23 percent (95 percent CI: 5 to 54), the specificity was 96 percent (95 percent CI: 89 to 99), the PPV was 43 percent (95 percent CI: 10 to 82), and the NPV was 90 percent (95 percent CI: 82 to 95).

Denominator (CT): Among children with at least one CT (n=95), six children had exclusion criteria present in both claims and charts, and 70 children had no exclusion criteria present in either claims or charts. Six children had evidence of exclusion criteria in claims but not in charts; 13 children had evidence of exclusion criteria in charts but not in claims (Table 10; see Supporting Documents). The sensitivity of claims for identification of exclusion criteria was 32 percent (95 percent CI: 13 to 57), the specificity was 92 percent (95 percent CI: 84 to 97), the PPV was 50 percent (95 percent CI: 21 to 79), and the NPV was 84 percent (95 percent CI: 74 to 91).

Reliability of Abstracted Medical Record Data

Reliability of medical record data was determined through re-abstraction of patient record data to calculate the inter-rater reliability (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 were individually compared with the data obtained by a senior abstractor. Any differences were remedied by review of the chart. IRR was determined by calculating both percent agreement and Cohen's kappa statistic. In total, data were abstracted from the medical records of 199 eligible children; 104 who had received an MRI and 95 who had received a CT scan. Of these, 15 records (14.4 percent) from the MRI group and 15 records (15.8 percent) from the CT group were reviewed for IRR. IRR was assessed by comparing abstractor agreement with a senior abstractor on 10 questions included in the chart abstraction form for this measure. Overall, abstractor agreement was 100 percent; the kappa statistic was 1.0, indicating that a perfect level of agreement was achieved.

Conclusion

The ratio of MRI to CT derived from the gold standard of medical records (1.20) compared with the ratio of MRI to CT obtained solely from administrative claims (1.15) suggests that administrative claims have a high degree of validity. In addition, administrative claims are highly specific in respect to the exclusion criteria compared with the gold standard of medical records. Therefore, we conclude that administrative claims alone can be used to calculate this measure.

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

Census Characteristics

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 11 and 12 (see Supporting Documents).

On average, sampled children reside in ZIP codes reporting primarily white race (range: 78.1 percent - 80.1 percent) and within ZIP codes reporting modest levels of Hispanic ethnicity (9.6 percent - 10.9 percent).

7.B. Special Health Care Needs

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

7.C. Socioeconomic Status

Census Characteristics

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 13 (see Supporting Documents).

Overall, the ZIP code-level median household income ranged from $65,002 - $71,383 for our groups of sampled children.

7.D. Rurality/Urbanicity

Census Characteristics

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 reported in Table 14 (see Supporting Documents).

Overall, the ZIP codes of all groups of sampled children were largely categorized as being urban (65.6 percent - 79.6 percent).

7.E. Limited English Proficiency (LEP) Populations

The medical records data abstracted for this study did 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 is specified using administrative claims. Administrative data needed for this measure include date of birth, diagnosis codes, procedure codes, and dates. These data generally are available, although obtaining them may require a restricted-use data agreement and institutional review board (IRB) approval.

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?

The use of ICD-10-CM codes is now required. For future implementation, the ICD-9-CM codes used in this measure will need to be converted to ICD-10-CM. The measure will then need to be revalidated using the ICD-10-CM codes.

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 administrative claims data.

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 number of children meeting inclusion criteria will vary by plan. Given the reliability results in Section 6, we expect the reliability of this measure to diminish if fewer than 800 total imaging studies are performed. Our results indicate that among children ages 1-17 who are continuously enrolled in their health plan and had an atraumatic seizure (n=5,099), there were a total of 1,096 CTs and MRIs (0.21 per child). Approximately 15 percent of those scans were excluded from the numerator and/or denominator, leaving a total of 932 imaging studies available for this calculation (932/5099 = 0.18 scans per child). Therefore, to reach the target of 800 total imaging studies, approximately 4,400 children (800/0.18) with atraumatic seizure within the measurement year are necessary for a minimum sample size to calculate this measure.

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?**
Not applicable.

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 administrative claims data.

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?**

Not applicable.

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 when MRI would be a reasonable and potentially preferable alternative for the evaluation of children with seizure in whom neuroimaging is warranted. Higher use of MRI will yield a higher ratio that is easily understood to be preferable. The simplicity of the measure likewise makes it a straightforward guide for providers and purchasers to assess overuse of CT when MRI would be

preferable for the evaluation of children with seizure in whom neuroimaging is warranted. The primary information needed for this measure is sourced from 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 information technology (IT), such as computerized provider order entry (CPOE), may improve the use of this measure. CPOE will provide an actual order for imaging, the date ordered, and prescribers' signature. However, those data will not furnish information regarding whether the child ever received imaging; the subsequent results reported to the electronic health record (EHR) will furnish an indicator of completed scans. Technologies that support the capture and query of structured data fields from EHRs, such as CPOE, and imaging study results will facilitate future enhancements to this measure.

Although individual providers will increasingly have access to information within their respective EHR systems for children, the completeness of imaging studies within their respective EHRs may be limited by interoperability with other providers' EHRs that may likewise capture imaging events for these patients. This interoperability will be influenced by health information exchange (HIE) technologies that are rapidly becoming operational throughout the United States.

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

The information needed to calculate this measure will be captured through order entry systems. For this measure to be accurate, it may be necessary to combine data from multiple EHRs. The use of HIE, especially using the DIRECT protocol for exchange across electronic medical records (EMRs), would be an important tactical step to enable this measure. Another change is the need to identify when a neurological baseline has been achieved, so that orders after that time can be recorded for the 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 imaging results and other diagnostic tests into EHRs, which may be relevant to determining ALARA policies 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 CPOE and the electronic transmission of diagnostic test results. 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.

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 or ICD-10-CM codes.
3. Date and time of treatment.
4. Type of tests administered.
5. Date tests performed.

6. Care setting.
7. Possibly 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?

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 CT/MRI is not indicated. Information buttons could link to educational resources at the point of care to discourage unnecessary ordering 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 ratio of the number of MRI scans to the number of CT scans obtained on or within the 30 days after the date of evaluation for atraumatic seizure among children, ages 1 through 17 years, within the measurement year. A higher ratio of MRI to CT scans indicates better performance, as reflected by a smaller number of children being exposed to radiation as a result of imaging.

This measure can be implemented with administrative claims data. Although we saw a slight difference in rates using administrative claims alone compared with the gold standard of medical records, the efficiency of using administrative claims to calculate these ratios may outweigh the benefit of medical record review to capture additional exclusions. In addition, our testing indicates that a large eligible population of children may be required to adequately implement this measure, thereby limiting its applicability among smaller populations.

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 a neuroimaging 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.

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 ratio of the number of MRI scans to the number of CT scans obtained on or within 30 days after the date of evaluation for atraumatic seizure among children, ages 1 through 17 years, within the measurement year. A higher ratio of MRI to CT scans indicates better performance, as reflected by a smaller number of children being exposed to radiation as a result of neuroimaging. This measure uses administrative claims data and is calculated as the ratio of MRI to CT scans obtained among eligible children who are evaluated for atraumatic seizure. There are currently no known existing quality measures specific to minimizing radiation exposure for children undergoing neuroimaging.

First seizures are common; every year, it is anticipated that up to 40,000 children in the United States will experience a first seizure. Epilepsy, a recurrent seizure disorder, has a lifetime prevalence of 10.2 per 1,000 children. As a diagnostic tool, CT scans are simple to order because the technology is readily available, fast, and less expensive than an MRI. MRI, however, is favored over CT due to its superior resolution and lack of radiation exposure. 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. Young children are also at risk for complications from sedation or anesthesia, which are often required for longer CT imaging sequences, as well as for MRI.

Q-METRIC testing results indicate that this measure is feasible using existing data sources. This measure is specified using administrative claims. The ratio of MRI to CT derived from the gold standard of medical records (1.20) compared with the ratio of MRI to CT obtained solely from administrative claims (1.15) suggests that administrative claims have a high degree of validity. In addition, administrative claims are highly specific in respect to the exclusion criteria compared with the gold standard of medical records.

This measure provides a means to assess the extent to which CT studies are being overused when MRI would be a reasonable and potentially preferable alternative for the evaluation of children with seizure in whom neuroimaging is warranted. 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. Continuing advances in the development and implementation of EHRs may enable the use of clinical decision support to understand when neuroimaging is not indicated.

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Section 14: Identifying Information for the Measure Submitter

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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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