

Overuse of Imaging for the Evaluation of Children with Primary Headache

Section 1. Basic Measure Information

1.A. Measure Name

Overuse of Imaging for the Evaluation of Children with Primary Headache

1.B. Measure Number

0194

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 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without indications for neuroimaging, including neurologic deficit lasting longer than 60 minutes, signs and symptoms of increased intracranial pressure, or lumbar puncture. Primary headache must be diagnosed on the day of or during the 30 days prior to imaging. A lower percentage indicates better performance, as reflected by avoiding imaging when it is not indicated.

Headaches are divided into two main classifications: primary headaches, such as migraine or tension headaches, and secondary headaches, which represent headaches attributed to a separate condition, such as infection, trauma, tumors, or vascular problems (International Headache Society [IHS], 2014). Headaches are common in the pediatric population (Lateef, Merikangas, He, et al., 2009b). Children with headaches are frequently evaluated in emergency departments (EDs) and primary care settings (Centers for Disease Control and Prevention [CDC], 2011; DeVries, Young, Wall, et al., 2013). Although most headaches are not symptomatic of underlying disease, the differential diagnosis list for headache is long, with over 300 different types and causes (Evans, 1996).

CT and MRI of the brain are radiologic modalities used to create images of internal structures in a slice-by-slice manner. CT uses X-ray radiation (hereafter simply called radiation), and MR uses magnetic fields and radio waves. Rationales for obtaining neuroimaging to characterize headache include evaluation for suspected secondary causes, such as arteriovenous malformation or tumor, patient and parental anxiety about the potential for underlying vascular problems, or tumor related to severe and/or recurrent head pain, as well as legal concerns for a missed diagnosis on the part of health care providers.

Neuroimaging is increasingly used to evaluate pediatric patients who experience headache (Broder, Fordham, Warshauer, 2007; Graf, Kayyali, Alexander, et al., 2008; Larson, Johnson, Schnell, et al., 2011). The yield of neuroimaging in the evaluation of patients with primary

headache and a normal neurologic examination is quite low (ACR Expert Panel on Pediatric Imaging, Hayes, Coley, et al., 2012; Chu, Shinnar, 1992; Evans, 1996; Gandhi, Lewis, Evans, et al., 2015; Lateef, Grewal, McClintock, et al., 2009a; Lateef, Kriss, Carpenter, et al., 2012) and exposes children to unnecessary risks.

To decrease unnecessary neuroimaging, evidence-based practice guidelines have been developed. These guidelines advise against neuroimaging for headaches unless specific clinical criteria are met (ACR Expert Panel on Pediatric Imaging, et al., 2012). For children with neurologic deficits lasting longer than 60 minutes or with signs and symptoms of increased intracranial pressure, neuroimaging is indicated.

This measure is focused on the overuse of CT and MRI for the evaluation of children with headache, a problem that has gained national attention in recent years (Loder, Weizenbaum, Frishberg, et al., 2013). 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 are exposed to radiation as a result of CT scans in early life are at greater risk for developing leukemia, primary brain tumors, and other malignancies later in life (Mathews, et al., 2013; Pearce, et al., 2012). Children who require sedation or anesthesia for longer CT imaging sequences and almost universally for MRI studies are also at risk for complications. These complications include compromised airway, hypoxia leading to central nervous system injury, and death. Additionally, CT and MRI overuse creates cost burdens for the patient, as well as for payers.

This measure uses administrative claims data to identify the eligible population for medical record review; it assesses the percentage of children, ages 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without indications for neuroimaging. Primary headache must be diagnosed on the day of or in the 30 days prior to 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 measures 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 children, ages 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without indications for neuroimaging.

Eligible children are 4 through 17 years old during the measurement year for which imaging of the head is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior. Primary headache must be diagnosed on the day of or 30 days prior to imaging. Table 1 [=IMG1] lists Current Procedural Terminology (CPT) codes associated with brain imaging. Table 2 [=IMG3] lists types of primary headaches and the associated International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes: migraines, tension headaches, and cluster headaches. Children with secondary headaches, attributable to a separate condition such as infection, trauma, tumors, or blood vessel problems, are not eligible for inclusion in this measure. See Supporting Documents for tables.

1.H. Numerator Exclusions

Exclusions based on clinical documentation:

- Neurologic deficits lasting 60 minutes or longer on the day of or day prior to imaging.

- Abnormal neurologic exam between the time of diagnosis and the time of imaging.
- Signs or symptoms of increased intracranial pressure.
- Lumbar puncture on the day of or day after neuroimaging.

1.I. Denominator Statement

The denominator is the number of children, ages 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache.

Eligible children are 4 through 17 years old during the measurement year for which imaging of the head is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior. Primary headache must be diagnosed on the day of or 30 days prior to imaging. Table 1 [=IMG1] lists CPT codes associated with brain imaging. Table 2 [=IMG3] lists ICD-9-CM codes for types of primary headaches: migraines, tension headaches, and cluster headaches. See Supporting Documents for Tables. Children with secondary headaches, attributable to a separate condition such as infection, trauma, tumors, or blood vessel problems, are not eligible for inclusion in this measure.

1.J. Denominator Exclusions

Children with secondary headaches attributable to a separate condition, such as infection, trauma, tumors, or blood vessel problems, are excluded from this measure.

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

- Seizure or convulsions (Table 3 [=IMG2], see Supporting Documents) diagnosed during a visit on the day of or day before imaging was obtained.
- Head trauma (Table 4 [=IMG9], see Supporting Documents, or the presence of an E-code) on the day of or within 7 days before imaging was obtained.
- Neurosurgical intervention (Table 5 [=IMG10], see Supporting Documents) on the day of or within 180 days before imaging was obtained.
- Secondary headache (Table 2 [=IMG3], see Supporting Documents) diagnosed during a visit on the day of or within the 365 days before imaging was obtained.
- Medical conditions that could warrant imaging in the setting of headache on the day of or within the 365 days before imaging was obtained (Tables 6-10 [=IMG4-IMG8], see Supporting Documents).

Exclusions based on clinical documentation:

- Seizure or convulsions as the indication for imaging.
- Trauma.
 - Suspected child abuse.
 - Concussion.
 - Skull fracture.

- Intracranial hemorrhage.
- Neurological surgery.
- Secondary headache.
- Medical conditions that could warrant imaging in the setting of a headache:
 - Infection, such as meningitis, brain abscess, HIV, and encephalitis.
 - Neoplasm, tumor.
 - Tuberos sclerososis.
 - Blood disorder.
 - Hemangioma, phlebitis/thrombophlebitis, occlusion of cerebral arteries, moyamoya disease.
 - Hydrocephalus and CNS anomalies, dwarfism.

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.

Note: This measure uses administrative claims data to identify the eligible population for medical record review.

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.

Please see the Supporting Documents for detailed measure specifications.

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).**

Primary Headache Prevalence and Incidence

Headaches are common in the pediatric population (Lateef, et al., 2009b). Children with headaches are frequently evaluated in EDs and primary care settings (DeVries, et al., 2013; CDC, 2011). Headaches occur more often as children grow older (ACR Expert Panel on Pediatric Imaging, et al., 2012). At age 7 years, prevalence ranges from 37 percent to 51 percent. By age 15 years, 57 percent to 82 percent of children have experienced a headache, and among 16-year-olds, 93 percent or more have reported experiencing a severe headache (ACR Expert Panel on Pediatric Imaging, et al., 2012). Before puberty, boys are more likely than girls to experience headache. The situation is reversed after puberty, when headaches are more commonly reported in girls (ACR Expert Panel on Pediatric Imaging, et al., 2012).

Primary Headache Pathology and Severity

The precise pathophysiology of primary headaches is still not fully understood, but research suggests that complex interactions between the neural and vascular systems are involved (Edvinsson, 2001). The manifestation and perception of headache is unique and specific to the child who experiences it. Correspondingly, the management approach for children with primary headaches often focuses on reassurance and education by the clinician who evaluates the child (Brna, Dooley, 2006; Raieli, Compagno, Pandolfi, et al., 2010).

Burden of Overuse of Imaging for Primary Headache

Radiation, Sedation/Anesthesia, and Intravenous Contrast Risks; Costs

The literature offers many examples of the potential risks associated with 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 (Callaghan, Kerber, Pace, et al., 2014).

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). Children have developing cellular structures and tissues that are significantly more radio-sensitive than those of adults; children, therefore, will be at substantially elevated risk for malignancy following radiation exposure from CT imaging (ACR Expert Panel on Pediatric Imaging, et al., 2012). Radio-sensitive 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 (Christy, 1981).

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, 2009). Professional practice and patient advocacy groups including the American College of Radiation (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

Use of sedation may be 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 a greater 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, though rare, risks 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) (Basu, 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 health care system (Callaghan, 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 yield of neuroimaging in the evaluation of patients with primary headache and a normal neurologic examination is quite low (ACR Expert Panel on Pediatric Imaging, 2012; Chu, Shinnar, 1992; Evans, 1996; Gandhi, et al., 2015; Lateef, et al., 2009a; Lateef, et al., 2012) and exposes children to unnecessary risks. Currently, professional guidelines do not support neuroimaging for primary headache in the absence of persistent neurologic deficits or documented neurologic signs or symptoms that suggest increased intracranial pressure (ACR Expert Panel on Pediatric Imaging, et al., 2012; Alexiou, Argyropoulou, 2013; Lewis, Ashwal, Dahl, et al., 2002). While many children with headaches will not benefit from neuroimaging, children experiencing headaches associated with new neurologic deficits or signs and symptoms of increased intracranial pressure may have underlying pathology that can be identified through imaging.

This measure assesses overuse as the percentage of children, ages 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without

indications for neuroimaging. Primary headache must be diagnosed on the day of or within 30 days prior to imaging. A lower percentage indicates better performance, as reflected by avoidance of imaging when it is not indicated.

Drivers of Overuse

Primary headache experienced by a child, especially when recurrent, can be a stressful event that may prompt a parent to seek the assistance of a health care provider, at times emergently. Some providers may feel pressured by the parent to order imaging despite a lack of benefit (Daymont, McDonald, Wittmeier, et al., 2014; Raieli, et al., 2010). 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 wide-spread prominence as to prompt multidisciplinary initiatives targeted at fostering discussion and identifying common practices that should be questioned by parents and providers (American Academy of Pediatrics [AAP], 2013). An ongoing dialogue between parents and providers continues to be a key feature of optimal outcomes in the setting of primary headache.

The practice of defensive medicine is another reason an imaging study may be ordered. Physicians may be uncomfortable facing uncertainty about missing intracranial pathology in children they are evaluating and treating for headache. Assurance behaviors (e.g., ordering of additional tests) are expected when a malpractice-sensitive physician is faced with a potentially worrisome condition (e.g., intracranial hemorrhage) that can cause the symptom in question (e.g., a headache) (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. Unnecessary ordering 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).**

Overuse of Imaging for Primary Headaches and Medicaid/CHIP

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 with headache who are enrolled in Medicaid or CHIP, curtailing the overuse of imaging will reduce radiation exposure, poor anesthesia 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 overuse of imaging in children with headache.

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; children ages 4-5 years.
- 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 percentage of children, ages 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without indications for neuroimaging. Primary headache must be diagnosed on the day of or in the 30 days prior to imaging.

Well-established evidence shows that neuroimaging to characterize primary headache in the absence of documented neurologic signs or symptoms that suggest intracranial pathology is rarely clinically indicated and is potentially harmful (ACR Expert Panel on Pediatric Imaging, et al., 2012; Lateef, et al., 2009a). Table 11 (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 headache (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.

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 and/or 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 individuals with medical enrollment, over 37 million individuals with combined medical and pharmacy enrollment information, and 16 million individuals 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 were 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 determine the number of children 4 through 17 years of age who had a primary headache (26,991, 73.0 percent). From this group, 4,390 children (16.3 percent) were identified as having either CT or MRI. After applying claims denominator exclusions, 2,674 children (60.9 percent) remained eligible for the denominator. Among those children, a total of 478 children (17.9 percent) were excluded from the numerator based on information available from claims data for either receipt of lumbar puncture (n=35) or indicators of increased intracranial pressure (n=443), resulting in a rate of overuse of imaging for primary headache of $2,196/2,674 = 82.1$ percent.

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 2,007 children (75.1 percent) who were linked to a provider with available contact information. Once subjects were identified, patient medical records were requested from provider offices and health care 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.

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.

In total, 191 charts were reviewed for the presence of denominator exclusions that were not present in claims. There were 36 children (18.8 percent) with documentation of a condition that met denominator exclusion within the chart, resulting in a total of 155 (81.2 percent) children who met denominator criteria for this measure. Among patients eligible for the denominator, imaging was obtained without a documented indication for 132 children (132/155=85.2 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. Any differences were remedied by review of the chart. IRR was determined by calculating both percent agreement and Cohen's kappa statistic.

Of the 191 medical records received for chart review, 30 records (15.7 percent) were reviewed for IRR. IRR was assessed by comparing abstractor agreement with a senior abstractor on 11 data elements 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 IRR 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 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 health care 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 appropriately imaging children. Concepts and draft measures were rated by this group for their relative importance. This measure received an average score of 5.6 (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 five exclusions that could be identified using ICD-9-CM or CPT codes: (1) seizure or convulsions; (2) head trauma; (3) neurosurgical intervention; (4) secondary headache; and (5) medical condition that could warrant neuroimaging in the setting of headache. 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 contained ICD-9-CM or CPT codes associated with these claims-based exclusions. 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 191 charts that were reviewed, 36 (18.8 percent) had clinical documentation of one of the five denominator exclusions listed above. Therefore, 81.2 percent (155 of 191) of the charts reviewed were in agreement with the administrative claims regarding the absence of these denominator exclusions. These results demonstrate that additional children were excluded from the denominator based on 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 these five 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:

- Lumbar puncture (by ICD-9-CM/CPT) codes in Table 5 [=IMG10]; see Supporting Documents) during the visit (same date or day after) when the imaging study was obtained.
- Documented signs or symptoms of increased intracranial pressure (related ICD-9-CM codes provided in Table 12 [=IMG11]; see Supporting Documents) between the date of diagnosis and the imaging study.

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 (neurologic deficits lasting greater than 60 minutes and abnormal neurologic exam findings) should be identified using information abstracted from the medical chart (i.e., these exclusions cannot be determined from claims data). See Numerator Exclusions (Section 1.H in this report) for more detail.

Among children eligible for the denominator after chart review (n=155), the sensitivity of claims for identification of indicators of increased intracranial pressure was $(13/18) = 72.2$ percent (95 percent CI; 46.5, 90.3) and the specificity was $(115/137) = 83.9$ percent (95 percent CI; 76.7, 89.7); positive predictive value was $(13/35) = 37.1$ percent (95 percent CI; 21.5, 55.1) and negative predictive value was $(115/120) = 95.8$ percent (95 percent CI; 90.5, 98.6). The sensitivity of claims for identification of lumbar puncture was 100 percent, and the specificity was 100 percent; positive predictive value could not be calculated because there were no true or false positives, and negative predictive value was 100 percent. Contingency tables for both variables are shown in Tables 13 and 14 (see Supporting Documents). Our results indicate that chart review is necessary for the accurate and complete collection of numerator exclusion criteria.

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 15 and 16 (see Supporting Documents).

Overall, sampled children reside in ZIP codes reporting primarily white race (range: 78.1 percent-81.3 percent) and within ZIP codes reporting modest levels of Hispanic ethnicity (8.9 percent-12.2 percent).

7.B. Special Health Care Needs

The medical records data abstracted for this study did not include indicators of special health care 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 17 (see Supporting Documents).

Overall, the ZIP code-level median household income ranged from \$67,768 to \$71,828 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 18 (see Supporting Documents).

Overall, the ZIP codes of all groups of sampled children were largely categorized as being urban (73.6 percent-78.5 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 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., imaging obtained in the absence of neurologic deficit lasting longer than 60 minutes, signs and symptoms of increased intracranial pressure, or lumbar puncture).

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 primary headache. Note that the use of ICD-10-CM codes is now required.

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 with a diagnosis of primary headache and a CT or MRI within 30 days during the measurement year is recommended. Our results indicate that among 26,991 members between 4 and 17 years of age with 2 years of continuous eligibility and a diagnosis of primary headache, 2,674 (9.9 percent) were eligible for medical record review. Among 191 sampled charts, we found that 155 (81.2 percent) met denominator criteria. From these findings we estimate that 8.0 percent (9.9 percent * 81.2 percent) of our test population had denominator-eligible charts. Based on these results, we estimate that to obtain a target of 200 denominator-eligible charts, approximately 2,500 children between 4 and 17 years of age, with diagnosis codes for primary headache, would be required to meet this target (200 eligible charts / 0.080 eligible charts per population = 2,500 population).

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

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 required per hospital has not been determined.

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

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 straightforward means to assess the extent to which neuroimaging studies (CT and MRI) are being overused for the evaluation of children with primary headache. High percentages of overuse are easily understood to be unsatisfactory. 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 information technology (IT) provides a platform that could support various new uses of the measure. First, health IT can show feedback at the time of imaging order entry. Health IT can also provide education about alternatives to imaging. Alerts and reminders, given to patients as well as 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. Importantly, 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 MRI 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 provides 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.

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/CPT codes.
3. Date and time of treatment.
4. Type of tests administered.
5. Date of tests performed.
6. Care setting.
7. Lack of a consistent radiation dose moderation strategy.
8. 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?

This measure, as noted above, requires the use of HIE for optimal understanding of previous imaging studies to evaluate headache. For 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 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, ages 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without indications for neuroimaging. Primary headache must be diagnosed on the day of or in the 30 days prior to imaging. A lower percentage indicates better performance, as reflected by avoidance of imaging when it is not indicated.

The following considerations may further strengthen this measure and potentially ease the burden of data collection. Our administrative data results indicate high levels of imaging overuse; these high levels reflect the limitation that some numerator exclusions cannot reliably be 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 an overestimation of the degree to which neuroimaging is overused for the evaluation of children with primary headache. 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 and to allow for electronic capture of clinical information needed to determine if and when neuroimaging has been overused in the evaluation of children experiencing a primary headache.

In addition, lumbar puncture was a rare event (documented in 1 percent of claims among children meeting denominator inclusion), and none of the charts received for medical record review contained documentation to indicate that lumbar puncture was performed. It is possible that lumbar puncture is inconsistently coded; however, the sample size of charts included for the testing of this measure was insufficient to capture any children who experienced a lumbar puncture in conjunction with their neuroimaging. Our results for the sensitivity and specificity of chart review to detect the presence of lumbar puncture should be interpreted in light of this small sample size.

In future implementation, we recommend considering 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.

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 4 through 17 years, for whom imaging of the head (CT or MRI) is obtained for the evaluation of primary headache without indications for neuroimaging, including neurologic deficit lasting longer than 60 minutes, signs and symptoms of increased intracranial pressure, or lumbar puncture. Primary headache must be diagnosed on the day of or in the 30 days prior to imaging. A lower percentage indicates better performance, as reflected by avoidance of imaging when it is not indicated. This measure was tested using

administrative claims data to identify the eligible population for medical record review. There are currently no known existing quality measures specific to the overuse of imaging in children with headache.

Headaches are a common problem in the pediatric population, and while most headaches are not symptomatic of underlying disease, children with headaches are frequently evaluated in the ED and primary care settings. Neuroimaging is increasingly used to evaluate for structural abnormalities of the brain in pediatric patients who experience headache, but the benefit of these studies in the evaluation of patients with primary headache and a normal neurologic examination is quite low. One of the most worrisome prospects for overuse of neuroimaging relates to the radiation exposure associated with CT scans and the resultant increased risk for malignancy later in life.

Q-METRIC testing results indicate that this measure is feasible using existing data sources. The measure was tested with data abstracted from medical records after administrative claims were used to identify the eligible population. In total, 191 charts were reviewed; 155 (81.2 percent) met denominator criteria for this measure. Among these children, 132 (85.2 percent) received imaging without an indication documented in the medical record. This measure was also tested to determine the feasibility of using administrative claims data exclusively. We found that overuse of imaging calculated solely from administrative claims data (82.1 percent) was comparable to that calculated by using medical record data (85.2 percent); however there are clinical indications for imaging that can only be captured using chart review, as there are no associated ICD-9-CM or ICD-10-CM codes.

This measure provides a means to assess the extent to which neuroimaging studies (CT and MRI) are being overused for the evaluation of children with headache by providers within a health plan or Medicaid program. High percentages of overuse are easily understood to be unsatisfactory. 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 available, though access may require a restricted-use data agreement and IRB approval. Certain limitations were observed during measure testing. Most importantly, data contained in administrative claims are insufficient to capture all of the specified exclusions. 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 primary headache.

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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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