NATIONAL QUALITY FORUM
National Voluntary Consensus Standards for Imaging Efficiency
Measure Summary

Measure Number: IEP-013-10

Measure Title: Use of Brain Computed Tomography (CT) in the Emergency Department (ED) for

Atraumatic Headache

Description: This measure calculates the percentage of Emergency Department (ED) visits for headache

with a coincident brain computed tomography (CT) study for Medicare beneficiaries. The results are

segmented and reported at the facility level.

Numerator Statement: Of ED visits identified in the denominator, visits with a coincident Brain CT study
(i.e. Brain CT studies on the same day for the same patient).

Denominator statement: ED patient visits with a primary diagnosis code of headache who are not
admitted to the hospital and with no secondary diagnosis codes related to:
•   lumbar puncture,
•   dizziness, paresthesia,
•   lack of coordination,
•   subarachnoid hemorrhage,
•   complicated or thunderclap headache
•   focal neurologic deficit
•   pregnancy
•   trauma
•   HIV
•   tumor/mass
For patients visiting the ED with a primary diagnosis of headache and one of the above secondary

diagnoses, the presence of these secondary diagnoses potentially indicates that a CT brain imaging study

may be indicated, depending upon the individual physician assessment of the particular patient.

Level of Analysis: Clinicians: Other, Population: national, Program: Other, Facility/Agency Outpatient
Hospital Outpatient Imaging Efficiency (OIE)

Data Source: Electronic administrative data/claims

Measure developer: The Lewin Group

Type of Endorsement (full or time-limited): Full Endorsement

Attachments: LEWINVA-#498098-v2-CMS-OIENQFSupplementBrainCTinED PDF-v1-499260

NATIONAL QUALITY FORUM

Measure Evaluation 4.1
January 2010

This form contains the measure information submitted by stewards. Blank fields indicate no information was provided. Attachments also may have been submitted and are provided to reviewers. The sub-criteria and most of the footnotes from the evaluation criteria are provided in Word comments and will appear if your cursor is over the highlighted area (or in the margin if your Word program is set to show revisions in balloons). Hyperlinks to the evaluation criteria and ratings are provided in each section.

TAP/Workgroup (if utilized): Complete all <mark>yellow highlighted</mark> areas of the form. Evaluate the extent to which each sub-criterion is met. Based on your evaluation, summarize the strengths and weaknesses in each section.

Note: *If there is no TAP or workgroup, the SC also evaluates the* sub-criteria (*yellow highlighted areas*).

Steering Committee: Complete all <mark>pink</mark> highlighted areas of the form. Review the workgroup/TAP assessment of the sub-criterion, noting any areas of disagreement; then evaluate the extent to which each major criterion is met; and finally, indicate your recommendation for the endorsement. Provide the rationale for your ratings.

Evaluation ratings of the extent to which the criteria are met
C = Completely (unquestionably demonstrated to meet the criterion)
P = Partially (demonstrated to partially meet the criterion)
M = Minimally (addressed BUT demonstrated to only minimally meet the criterion)
N = Not at all (NOT addressed; OR incorrectly addressed; OR demonstrated to NOT meet the criterion)
NA = Not applicable (only an option for a few sub-criteria as indicated)

(for NQF staff use) **NQF Review #:** IEP-013-10   **NQF Project:** Efficiency: Imaging Efficiency
MEASURE DESCRIPTIVE INFORMATION
De.1 Measure Title: Use of Brain Computed Tomography (CT) in the Emergency Department (ED) for Atraumatic Headache
De.2 Brief description of measure: This measure calculates the percentage of Emergency Department (ED) visits for headache with a coincident brain computed tomography (CT) study for Medicare beneficiaries. The results are segmented and reported at the facility level.
1.1-2 Type of Measure: efficiency/cost   **De.3 If included in a composite or paired with another measure, please identify composite or paired measure**   Not Applicable
De.4 National Priority Partners Priority Area: Overuse, safety   **De.5 IOM Quality Domain**: efficiency, safety   **De.6 Consumer Care Need:** Living With Illness

CONDITIONS FOR CONSIDERATION BY NQF	
Four conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards:	**NQF Staff**
A. The measure is in the public domain or an intellectual property (measure steward agreement) is signed. *Public domain only applies to governmental organizations. All non-government organizations must sign a measure steward agreement even if measures are made publicly and freely available.* **A.1 Do you attest that the measure steward holds intellectual property rights to the measure and the right to use aspects of the measure owned by another entity (e.g., risk model, code set)?** Yes **A.2 Indicate if** Proprietary Measure (*as defined in measure steward agreement*): **A.3 Measure Steward Agreement:** government entity- public domain- No Agreement	A Y ☐ N ☐

A.4 Measure Steward Agreement attached:	
B. The measure owner/steward verifies there is an identified responsible entity and process to maintain and update the measure on a schedule that is commensurate with the rate of clinical innovation, but at least every 3 years. Yes, information provided in contact section	B Y☐ N☐
C. The intended use of the measure includes <u>both</u> public reporting <u>and</u> quality improvement. ▶**Purpose:** public reporting, quality improvement Accountability, Patient safety through reduction in radiation exposure	C Y☐ N☐
D. The requested measure submission information is complete. Generally, measures should be fully developed and tested so that all the evaluation criteria have been addressed and information needed to evaluate the measure is provided. Measures that have not been tested are only potentially eligible for a time-limited endorsement and in that case, measure owners must verify that testing will be completed within 12 months of endorsement. **D.1 Testing:** Yes, fully developed and tested **D.2** Have NQF-endorsed measures been reviewed to identify if there are similar or related measures? Yes	D Y☐ N☐
(for NQF staff use) **Have all conditions for consideration been met?** **Staff Notes to Steward** (*if submission returned*):	Met Y☐ N☐
Staff Notes to Reviewers (*issues or questions regarding any criteria*):	
Staff Reviewer Name(s):	

TAP/Workgroup Reviewer Name:	
Steering Committee Reviewer Name:	
1. IMPORTANCE TO MEASURE AND REPORT	
Extent to which the specific measure focus is important to making significant gains in health care quality (safety, timeliness, effectiveness, efficiency, equity, patient-centeredness) and improving health outcomes for a specific high impact aspect of healthcare where there is variation in or overall poor performance. *Measures must be judged to be important to measure and report in order to be evaluated against the remaining criteria.* (<u>evaluation criteria</u>) **1a. High Impact**	Eval Rati ng
(for NQF staff use) <u>**Specific NPP goal**</u>:	
1a.1 Demonstrated High Impact Aspect of Healthcare: other, high resource use **1a.2** Safety **1a.3 Summary of Evidence of High Impact:** The lifetime prevalence of headache is over 90 percent for men and women and, according to some studies, accounts for 16 million physician visits in the U.S. annually.(1) According to a study conducted by Goldstein et al. on U.S. Emergency Departments from 1992 to 2001, headaches represent approximately two percent of Emergency Department (ED) visits.(2) An analysis of 2007 Medicare claims data found that approximately 200,000 Medicare beneficiaries had a visit to an ED with a primary diagnosis of headache, with about half of these patients (not taking exclusions into account) receiving a Brain CT coincident with the ED visit.(3) As CT exposes the patient to higher doses of radiation than conventional x-ray and increases their risk of cancer, unnecessary or duplicative studies are sources of both inefficiency and lower quality care.(4) Concern over the inappropriate use of CT Imaging in the Emergency Department setting has been driven by three primary factors: false positive interpretations, radiation exposure, and cost. In a recent and yet unpublished article reported in "Diagnostic Imaging" magazine, Dr. Joshua Broder, an assistant professor of emergency medicine at the University of North Carolina at Chapel Hill, reported on his institution's study of utilization of CT in the ED from 2000 to 2005 and found dramatic growth significantly outpacing their admission trend of 13 percent annual growth, during a time when the severity of injury and illness changed	1a C☐ P☐ M☐ N☐

Comment [KP1]: 1a. The measure focus addresses:
•a specific national health goal/priority identified by NQF's National Priorities Partners; OR
•a demonstrated high impact aspect of healthcare (e.g., affects large numbers, leading cause of morbidity/mortality, high resource use (current and/or future), severity of illness, and patient/societal consequences of poor quality).

Rating: C=Completely; P=Partially; M=Minimally; N=Not at all; NA=Not applicable

little.(5)

In the North Carolina study, a total of about 200,000 patients were admitted to the ED in a five-year period. Over 46,000 CT studies were performed on 27,000 of these patients. Researchers found that Head CT utilization had increased by 51 percent during this time period.

A recent report in the New England Journal of Medicine raised serious concerns about the use, and overuse, of CT scanning. It is estimated that 62 million scans are performed per year. The researchers further estimate that a third of those CT scans are entirely unnecessary, many of them now performed by cautious doctors on worried patients in the ED setting.(4)   This results in patient safety issues including:

- Unnecessary radiation exposure
- Unnecessary contrast exposure
- The danger of "false-positive" findings

An analysis of Medicare claims data found that radiation exposure for Medicare beneficiaries increased by 5 percent annually from 1997 through 2006 and declined by about 5 percent in 2007. From 1997 to 2007, annual radiation exposure per radiation inducing imaging service procedure increased by 164 percent in emergency departments and 90 percent in physician offices. The growth in radiation exposure was fairly consistent across socio-demographic groups from 1997 to 2007. The increase in CT procedures and nuclear medicine over the study period contributed to the vast majority of the increase in radiation exposure due to imaging services.(6)

1a.4 Citations for Evidence of High Impact: 1.) Mellion ML, Jayaraman MV. August 2007. Use of neuroimaging in the workup of headache. Med Health R I.; 90(8):249-50.

2.) Goldstein JN, CA Camargo, AJ Pelletier, JA Edlow. 2006. Headache in the United States Emergency Departments: demographics, work-up and frequency of pathological diagnoses. Cephalalgia; 26 (6) 684-690.

3.) The Lewin Group, "NQF Supplemental Brain CT in the ED for Atraumatic Headache," analysis of Medicare Calendar Year 2007 claims data prepared for the Centers for Medicare & Medicaid Services, HHS Contract No: HHSM-500-2005-0024I, Order No. 0002.

"NQF Supplemental Brain CT in the ED for Atraumatic Heacache", See Exhibits 1 and 2, pages 1-2, available at:

URL: ftp.lewin.com
User Name: CMS.2009
Password: OIE2009=
*This secure FTP site is available Monday through Friday from 7:30 AM – 9:00 PM (EST)
Special Note: If using Internet Explorer 7 or 8 please follow the following instructions to access the site:

1. In Internet Explorer (IE), enter ftp://ftp.lewin.com
2. Enter the above user name and password and click "Log On."
3. You will receive the "cannot display webpage" message in your browser.
4. Click the "View" drop-down menu and choose "Open FTP site in Windows Explorer."
5. You should be prompted a second time for the username and password credentials. Enter these again.
6. Once this is done, the familiar explorer view will open, and you will be able to access files on the site.

4.) Brenner D and E Hall. November 29, 2007. Computed Tomography — An Increasing Source of Radiation Exposure. N Engl J Med;357(22):2277-84, Nov 29, 2007.

5.) Hayes E, Doctors debate soaring emergency CT utilization. Diagnostic Imaging Nov 26, 2006.
http://www.diagnosticimaging.com/webcast06/showArticle.jhtml?articleID=196513436 Accessed June 2007.

6.) Namrata Sen, Sophie Shen, Mark Zezza, Susan Arday, Joan DaVanzo, Thomas Dehn, Michael Pentecost, Staci Barnett, "Trends in Radiation Exposure Due to Diagnostic Imaging Services among Fee-For-Service

Medicare Beneficiaries from 1997 through 2007", AcademyHealth Annual Research Meeting poster session, June 2009.

1b. Opportunity for Improvement

1b.1 Benefits (improvements in quality) envisioned by use of this measure: Analysis of Medicare claims data indicates variation in use of CT Brain in the emergency department for Medicare patients with a diagnosis of atraumatic headache (see discussion under 1b.2, Summary of Data Demonstrating Performance Gap). Because of a lower threshold for ordering neuroimaging for headache in the emergency department (see discussion under 1.c.4 Summary of Evidence), the measurement of the use of CT Brain in the ED for patients with a diagnosis of atruamatic headache can help to raise the awareness of the need for quality improvement on the appropriate use of CT brain imaging in the ED, and as a result improve patient safety through reduction in unnecessary radiation exposure.

1b.2 Summary of data demonstrating performance gap (variation or overall poor performance) across providers:
Analysis of Medicare claims data indicates broad variation in provision of service for this measure. After taking exclusions into account, the measure ratio ranged from a minimum value of 0.000 to a maximum of 0.800 with a weighted average ratio of 0.348. Ten percent of hospitals had a measure ratio above 0.570, 5 percent of hospitals had a ratio above 0.619, and 1 percent of hospitals had a ratio above 0.695.

Subgroup analysis was performed for geographic area, teaching status, and bed size. Compared to rural areas (average ratio of 0.254), hospitals in urban areas had a higher ratio at 0.376. Major teaching hospitals (average ratio of 0.425) had a higher ratio than non-teaching hospitals (average ratio of 0.321). Further, the measure ratio increased by bed size where hospitals with 0-50 beds had a measure ratio of 0.168 and hospitals with more than 500 beds had a measure ratio of 0.431.(1)

By state, the measures ranged from 0.19 in Alaska to 0.55 in New Jersey. Consistent with the trend for urban areas to have higher rates, we see that states with larger metropolitan areas such as New York (0.47) and Florida (0.49) had higher ratios.

1b.3 Citations for data on performance gap:
1.) The Lewin Group, "NQF Supplemental Brain CT in the ED for Atraumatic Headache," analysis of Medicare Calendar Year 2007 claims data prepared for the Centers for Medicare & Medicaid Services, HHS Contract No: HHSM-500-2005-0024I, Order No. 0002.

"NQF Supplemental Brain CT in the ED for Atraumatic Headache", for detailed data tables and graphs, See Exhibits 3 - 6, pages 3 – 6 available at:

URL: ftp.lewin.com
User Name: CMS.2009
Password: OIE2009=
*This secure FTP site is available Monday through Friday from 7:30 AM – 9:00 PM (EST)
Special Note: If using Internet Explorer 7 or 8 please follow the following instructions to access the site:

1. In Internet Explorer (IE), enter ftp://ftp.lewin.com
2. Enter the above user name and password and click "Log On."
3. You will receive the "cannot display webpage" message in your browser.
4. Click the "View" drop-down menu and choose "Open FTP site in Windows Explorer."
5. You should be prompted a second time for the username and password credentials. Enter these again.
6. Once this is done, the familiar explorer view will open, and you will be able to access files on the site.

1b.4 Summary of Data on disparities by population group:
Not Applicable

1b.5 Citations for data on Disparities:
Not Applicable

1c. Outcome or Evidence to Support Measure Focus

1b
C ☐
P ☐
M ☐
N ☐

1c

Comment [KP2]: 1b. Demonstration of quality problems and opportunity for improvement, i.e., data demonstrating considerable variation, or overall poor performance, in the quality of care across providers and/or population groups (disparities in care).

Comment [k3]: 1 Examples of data on opportunity for improvement include, but are not limited to: prior studies, epidemiologic data, measure data from pilot testing or implementation. If data are not available, the measure focus is systematically assessed (e.g., expert panel rating) and judged to be a quality problem.

Comment [k4]: 1c. The measure focus is:
●an outcome (e.g., morbidity, mortality, function, health-related quality of life) that is relevant to, or associated with, a national health goal/priority, the condition, population, and/or care being addressed;
OR
●if an intermediate outcome, process, structure, etc., there is **evidence** that supports the specific measure focus as follows:
o<u>Intermediate outcome </u>– evidence that the measured intermediate outcome (e.g., blood pressure, Hba1c) leads to improved health/avoidance of harm or cost/benefit.
o<u>Process</u> – evidence that the measured clinical or administrative process leads to improved health/avoidance of harm and
if the measure focus is on one step in a multi-step care process, it measures the step that has the greatest effect on improving the specified desired outcome(s).
o<u>Structure</u> – evidence that the measured structure supports the consistent delivery of effective processes or access that lead to improved health/avoidance of harm or cost/benefit.
o<u>Patient experience</u> – evidence that an association exists between the measure of patient experience of health care and the outcomes, values and preferences of individuals/ the public.
o<u>Access</u> – evidence that an association exists between access to a health service and the outcomes of, or experience with, care.
o<u>Efficiency </u>– demonstration of an association between the measured resource use and level of performance with respect to one or more of the other five IOM aims of quality.

1c.1 Relationship to Outcomes (*For non-outcome measures, briefly describe the relationship to desired outcome. For outcomes, describe why it is relevant to the target population*): The use of this measure is expected to reduce unnecessary imaging and thus improve patient safety through reduction in radiation exposure, without compromising quality of care.

C ☐
P ☐
M ☐
N ☐

1c.2-3. Type of Evidence: evidence based guideline, systematic synthesis of research

1c.4 Summary of Evidence (*as described in the criteria; for outcomes, summarize any evidence that healthcare services/care processes influence the outcome*):
Estimates of the percentage of patients presenting to the ED with a primary complaint of atraumatic headache range from 2.2 to 4.5 percent in studies focusing in the United States.(1,2) Most of these cases are determined to be benign, but a noteworthy portion are diagnosed with a secondary pathology.

There is generally lower threshold for ordering neuroimaging for headache in the emergency department because of physician time constraint and the need to operate efficiently in the ED as well as a lack of ED physician familiarity with headache presentation.(3) Moreover, it may be theorized that the patients who self-select to attend the ED would have a higher prevalence of secondary etiology.

In the ED environment, using the International Classification of Headache Disorders (ICHD) system is difficult and time-consuming. In a retrospective study of 480 patients in an urban emergency department, Friedman et al. found that more than one third of acute headache patients could not readily be given a specific ICHD diagnosis in the ED.(4) Amongst these undiagnosable patients, 25 percent were found to have a secondary headache disorder and another 10 percent had a coexisting primary and secondary headache disorder.

Goldstein et al (2006) used the National Hospital Ambulatory Medical Care Survey (NHAMCS) for 1992 through 2001 to examine headache work-ups and diagnoses in US emergency department visits. Of the 14 percent of headache ED patients who underwent neuroimaging, 5.5 percent received a pathological diagnosis (95 percent of this imaging was CT). Overall pathology diagnosis was low (2 percent). When stratified by age, patients over 50 had a rate of 6 percent while patients under 50 had 1 percent. Access issues were also identified, as patients without private health insurance and patients presenting at off-peak hours had a decreased rate of neuroimaging (as presented in multivariate analysis).(1)

1c.5 Rating of strength/quality of evidence (*also provide narrative description of the rating and by whom*):
Not Applicable

1c.6 Method for rating evidence: Not Applicable

1c.7 Summary of Controversy/Contradictory Evidence: Not Applicable

1c.8 Citations for Evidence (*other than guidelines*): 1.) Goldstein JN, Camargo CA, Pelletier AJ, Edlow JA. Headache in the United States Emergency Departments: demographics, work-up and frequency of pathological diagnoses. Cephalalgia 2006; 26: 684-690.

2.) Morgenstern LB, Huber JC, Luna-Gonzales H, et al. Headache in the emergency department. Headache 2001; 41: 537-41.

3.) Ward TN, Leven M, Phillips JM. Evaluation and management of headache in the emergency department. Med Clin N Am 2001; 85(4): 971-85.

4.) Friedman, BW, Hochberg ML, Esses D, et al. Applying the international classification of headache disorders to the emergency department: An assessment of reproducibility and the frequency with which a unique diagnosis can be assigned to every acute headache presentation. Annals of Emergency Medicine 2007; 49(4): 409-419.

1c.9 Quote the Specific guideline recommendation (*including guideline number and/or page number*):
Several organizations /collaborations have created guidelines or appropriateness criteria for determining when computed tomography is appropriate for the brain/head. The Technical Expert Panel (TEP) and

Comment [k5]: 4 Clinical care processes typically include multiple steps: assess → identify problem/potential problem → choose/plan intervention (with patient input) → provide intervention → evaluate impact on health status. If the measure focus is one step in such a multi-step process, the step with the greatest effect on the desired outcome should be selected as the focus of measurement. For example, although assessment of immunization status and recommending immunization are necessary steps, they are not sufficient to achieve the desired impact on health status – patients must be vaccinated to achieve immunity. This does not preclude consideration of measures of preventive screening interventions where there is a strong link with desired outcomes (e.g., mammography) or measures for multiple care processes that affect a single outcome.

Comment [k6]: 3 The strength of the body of evidence for the specific measure focus should be systematically assessed and rated (e.g., USPSTF grading system http://www.ahrq.gov/clinic/uspstf07/methods/benefit.htm). If the USPSTF grading system was not used, the grading system is explained including how it relates to the USPSTF grades or why it does not. However, evidence is not limited to quantitative studies and the best type of evidence depends upon the question being studied (e.g., randomized controlled trials appropriate for studying drug efficacy are not well suited for complex system changes). When qualitative studies are used, appropriate qualitative research criteria are used to judge the strength of the evidence.

measure development team considered the issue of whether the use of CT brain in the measure might result in a substitution of MRI Brain for CT Brain occurring in the emergency department. It was concluded that this was not a likely impact, as the type of neurologic cases that present in the ED are nearly always adequately assessed with CT technology and much more rapidly than with the use of MRI. There is general consensus that patients presenting with migraine and who have normal neurological examinations (no focal symptoms), no change in headache pattern, and no history of seizure do not warrant routine neuroimaging. Patients presenting with atypical headache may warrant such imaging.

1) U.S. Headache Consortium (2000)(1)

In collaboration with the American Academy of Neurology (AAN), the US Headache Consortium released guidelines on neuroimaging for non-acute headaches in primary practice in 2000. Six recommendations were provided:

a. Neuroimaging should be considered in patients with non-acute headache and an unexplained abnormal finding on the neurological examination (Grade B, Page 14).
b. Evidence is insufficient to make specific recommendations regarding neuroimaging in the presence or absence of neurological symptoms (Grade C; Page 15).
c. Neuroimaging is not usually warranted for patients with migraine and normal neurological examination. (Grade B, Page 15).
d. For patients with atypical headache features or patients who do not fulfill the strict definition of migraine (or have some additional risk factor), a lower threshold for neuroimaging may be applied (Grade C; Page 16).
e. Data were insufficient to make an evidence-based recommendation regarding the use of neuroimaging for tension-type headache (Grade C; Page 16).
f. Data were insufficient to make any evidence-based recommendations regarding the relative sensitivity of MRI compared with CT in the evaluation of migraine or other non-acute headache (Grade C; Page 16).

These six recommendations were also published in 2000 by the American Academy of Neurology, under the guideline "Practice Parameter: Evidence-Based Guidelines for Migraine Headache (An Evidence-Based Review)".(2) The recommendations published in these guidelines replace an earlier practice parameter released by AAN, originally published in 1994.

2) Singapore Ministry of Health (2007)(3)

The Singapore Ministry of Health, the ministry guiding the Country's public healthcare system, updated guidelines of the diagnosis and treatment of headache in 2007. The document includes two recommendations regarding neuroimaging, both of which are based on well-conducted observational studies:

a. Neuroimaging should be considered in patients with non-acute headache and an unexplained abnormal finding on neurological examination (Grade C, Level 2+; Page 42).
b. Neuroimaging is not warranted for patients diagnosed with migraines and having a normal neurological examination (Grade C, Level 2+; Page 43).

3) American College of Emergency Physicians (2008)(4)

The American College of Emergency Physicians (ACEP) updated its 2002 recommendations for patients presenting to the emergency department with acute non-traumatic headache in October of 2008. ACEP makes the following recommendations:

a. Patients presenting to the ED with headache and new abnormal findings in a neurologic examination (e.g. focal deficit, altered mental status, altered cognitive function) should undergo emergent (i.e. immediate) noncontrast head computed tomography (Level B; Page 410);
b. Patients presenting with new sudden-onset severe headache should undergo an emergent head CT (Level B; Page 410);
c. HIV+ patients with a new type of headache should be considered for an emergent neuroimaging study (Level B; Page 410); and,
d. Patients who are older than 50 years and presenting with new type of headache but with a normal neurologic examination should be considered for an urgent (i.e. arranged prior to discharge from the ED)

neuroimaging study (Level C; Page 410).

4) American College of Radiology (2009)(5)

In addition to the above guidelines, ACR first released appropriateness criteria for neuroimaging for headache in 1996, with the most recent update to the criteria occurring in 2009. ACR assigns procedures a score from 1 to 9, with the larger numbers being the most appropriate care. The criteria review evidence for several procedures available to assess headache pathology, including MRI, CTA, and MRA. Of the types of headaches reviewed, CT (without contrast) is the most appropriate of the technologies listed only for thunderclap headache (Page 2). CT without contrast is also appropriate (i.e., has an appropriateness score of = 7) for sudden onset of unilateral headache, headache with suspected complication of sinusitis and/or mastoiditis, and new headache in either a pregnant patient or in a patient suspected of having meningitis or encephalitis (Pages 2-4).

1c.10 Clinical Practice Guideline Citation: 1.) Frishberg BM, Rosenberg JH, Matchar DB, et al. Evidence-Based Guidelines in the Primary Care Setting: Neuroimaging in Patients with Nonacute Headache. Washington, DC: American Academy of Neurology, 2000. Accessed September 16, 2009 at http://www.aan.com/professionals/practice/pdfs/gl0088.pdf.

2.) Silberstein SD. Practice parameter: Evidence-based guidelines for migraine headache (an evidence-based review): Report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 2000;55:754-762. Accessed December 1, 2009 at http://www.neurology.org/cgi/reprint/55/6/754.

3.) Singapore Ministry of Health. Diagnosis and management of headache. Singapore: Singapore Ministry of Health; 2007 Sep.

4.) Edlow JA, Panagos PD, Godwin SA, Thomas TL, Decker WW, American College of Emergency Physicians. Clinical Policy: Critical issues in the evaluation and management of adult patients presenting to the emergency department with acute headache. Annals of Emergency Medicine 2008 Oct;52(4):407-36.

5.) ACR Appropriateness Criteria – Headache. Reston, VA: American College of Radiology, 2009. Accessed November 25, 2009 at http://www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria.aspx
1c.11 National Guideline Clearinghouse or other URL: 1) The Headache Consortium : http://www.aan.com/professionals/practice/pdfs/gl0088.pdf 2) Singapore Ministry of Health: http://www.moh.gov.sg/mohcorp/uploadedFiles/Publications/Guidelines/Clinical_Practice_Guidelines/Headache%20CPG%20Booklet.pdf 3) American College of Emergency Physicians: http://www.acep.org/workarea/downloadasset.aspx?id=8802 4) American College of Radiology: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria/pdf/ExpertPanelonNeurologicImaging/HeadacheDoc6.aspx

1c.12 Rating of strength of recommendation (*also provide narrative description of the rating and by whom*):
1) The Headache Consortium a. Grade B b. Grade C c. Grade B d. Grade C e. Grade C f. Grade C 2) Singapore Ministry of Health a. Grade C, Level 2+ b. Grade C, Level 2+ 3) American College of Emergency Physicians a. Level B b. Level B c. Level B d. Level C 4) American College of Radiology ACR appropriateness ratings are provided as scores between 1 and 9 depending on the appropriateness of a particular procedure for a specified variant of a condition (e.g., CT head without contrast for a headache with new features has an appropriateness of 5). CT head (with, without, or with and without contrast) has appropriateness ratings ranging from 3 to 9 for the different variants of the condition "Headache". Because of the methodology used by ACR to establish appropriateness criteria, all recommendations have the same rating strength, regardless of appropriateness score.

1c.13 Method for rating strength of recommendation (*If different from* USPSTF system, *also describe rating and how it relates to USPSTF*):
1) The Headache Consortium

The US Headache Consortium tasked with establishing the aforementioned neuroimaging guideline consisted of experts from the following medical specialty societies: American Academy of Family Physicians, American

Comment [k7]: USPSTF grading system http://www.ahrq.gov/clinic/uspstf/grades.htm: **A -** The USPSTF recommends the service. There is high certainty that the net benefit is substantial. **B -** The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial. **C -** The USPSTF recommends against routinely providing the service. There may be considerations that support providing the service in an individual patient. There is at least moderate certainty that the net benefit is small. Offer or provide this service only if other considerations support the offering or providing the service in an individual patient. **D -** The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits. **I -** The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.

Academy of Neurology, American Headache Society, American College of Emergency Physicians, American College of Physicians—American Society of Internal Medicine, American Osteopathic Association, and National Headache Foundation. The Consortium conducted a comprehensive review and meta-analysis of scientific evidence related to non-acute headache, ultimately including 28 studies for use in the development of guidelines. The entire Consortium reviewed and voted on developed guideline documents (including evidence tables, narrative descriptions and treatment recommendations), and consensus was reached only with unanimous agreement among all Consortium members. It should be noted that the Consortium excluded studies that (1) involved emergency patients only, and (2) were performed in the acute treatment setting, from consideration in the development of the guidelines.

Depending on the level of evidence supporting each recommendation, a different grade was assigned:

Grade   Recommendation
Grade A: Multiple well-designed clinical studies, in cohorts of patients directly relevant to the recommendation, yielded a consistent pattern of findings.
Grade B: Some evidence from clinical trials in appropriate cohorts of patients supported the recommendation, but the scientific support was not optimal. For instance, either few studies existed or the studies that did exist were small or somewhat inconsistent.
Grade C: The US Headache Consortium achieved consensus on the recommendation in the absence of clinical studies or based on studies that were conducted using a study group that differed from the target group for the recommendation.

After approval by the US Headache Consortium members, guideline drafts were reviewed by the appropriate representative of each of the Consortium's member organizations. The US Headache Consortium responded to all comments from the reviewers, and revised versions of the Guidelines were resubmitted to each member organization's governing body for approval.

2) Singapore Ministry of Health

The Singapore Ministry of Health developed clinical practice guidelines for headache through a committee of neurologists, psychiatrists, and family practitioners using current evidence and expert opinion; US Headache Consortium guidelines were also included in the development of recommendations. The following levels of evidence and grades of recommendations have been established by the Singapore Ministry of Health:

Level of Evidence

Level   Type of Evidence
1++   High quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias.
1+   Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.
1-   Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2++   High quality systematic reviews of case control or cohort studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+   Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-   Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3   Non-analytic studies, e.g. case reports, case series
4   Expert opinion

Grade of Recommendation

Grade   Recommendation
Grade A: At least one meta-analysis, systematic review of RCTs, or RCT rated as 1+ + and directly applicable to the target population; or
A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
Grade B: A body of evidence including studies rated as 2++, directly applicable to the target

population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1+ + or 1+
Grade C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2+ +
Grade D: Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+

GPP   Good Practice Points: Recommended best practice based on the clinical experience of the guideline development group.

3) American College of Emergency Physicians

The American College of Emergency Physicians performed a careful review and critical analysis of medical literature related to evaluation and management of adult patients presenting to the emergency department (ED) with acute, nontraumatic headache. Expert review, professional society comment, and physician consensus was used to augment the guideline development process. All articles used in the formulation of the ACEP clinical policy were graded by at least 2 subcommittee members for strength of evidence and classified by the subcommittee members into 3 classes of evidence on the basis of the design of the study; articles were then graded on 6 dimensions thought to be most relevant to the development of a clinical guideline. Articles received a final grade (Class I, II, III) on the basis of a predetermined formula, taking into account design and quality of study, and clinical findings and strength of recommendations regarding patient management were made:

Class of article /study

Class	Study Design
I	Prospective cohort using a criterion standard
II	Retrospective observational
III	Case series
	Case report
	Other (e.g., consensus, review)

Level of Recommendation

A: Generally accepted principles for patient management that reflect a high degree of clinical certainty (i.e., based on strength of evidence Class I or overwhelming evidence from strength of evidence Class II studies that directly address all of the issues).

B: Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty (i.e., based on strength of evidence Class II studies that directly address the issue, decision analysis that directly addresses the issue, or strong consensus of strength of evidence Class III studies).

C: Other strategies for patient management that are based on preliminary, inconclusive, or conflicting evidence, or in the absence of any published literature, based on panel consensus.

4) American College of Radiology

The American College of Radiology uses a Delphi-type method to develop appropriateness criteria. In its development process, ACR uses attributes supported by the Agency for Healthcare Research and Quality (AHRQ) and the Institute of Medicine (IOM), including:

- Validity: Guidelines should lead to better outcomes
- Reliability /Reproducibility: Another set of experts should be able to produce similar guidelines using similar methodology
- Clinical Applicability: Guidelines should include an explicit description of the intended patient population
- Clinical Flexibility: Known or expected exceptions should be specified
- Clarity: Guidelines must be unambiguous and presented in a logical manner
- Multidisciplinary Process: Affected provider groups should have representation in the development process

- Scheduled Review: All guidelines should undergo a scheduled review and use current scientific evidence
- Documentation: The process of development, including methods, participants and evidence, should be documented

A literature search of peer-reviewed medical journals is conducted for each clinical condition, from which a table is developed depicting the evidence gathered from major applicable articles. This evidence table, along with questionnaires and condition narrative, are distributed to panel experts assigned to a condition. Panel experts vote on each imaging or therapeutic procedure and give the procedure a score of 1-9 depending on each expert's opinion of its appropriateness. At least eighty percent of a panel must agree on the appropriateness of a procedure in order for the rating to be published in ACR consensus based criteria. The criteria are reviewed annually and updated as needed.

1c.14 Rationale for using this guideline over others:
There was no need to choose among the guidelines as all were in accordance.

TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Importance to Measure and Report?*	1
Steering Committee: Was the threshold criterion, *Importance to Measure and Report*, **met?** **Rationale:**	1 Y ☐ N ☐

2. SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, <u>as specified</u>, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. (<u>evaluation criteria</u>)	<u>Eval Rati ng</u>

2a. MEASURE SPECIFICATIONS

S.1 Do you have a web page where current detailed measure specifications can be obtained?
S.2 If yes, provide web page URL:

2a. Precisely Specified

2a.1 Numerator Statement (*Brief, text description of the numerator - what is being measured about the target population, e.g. target condition, event, or outcome*):
Of ED visits identified in the denominator, visits with a coincident Brain CT study (i.e. Brain CT studies on the same day for the same patient).

2a.2 Numerator Time Window (*The time period in which cases are eligible for inclusion in the numerator*):
Brain CT studies must be conducted on the same day that the patient is seen in the ED.

2a.3 Numerator Details (*All information required to collect/calculate the numerator, including all codes, logic, and definitions*):
Brain CT CPT Codes:
70450 - CT head or brain, without contrast material;
70460 – CT head or brain; with contrast material(s);
70470 – CT head or brain; without contrast material followed by contrast material(s) and further sections

CPT® only copyright 2008 American Medical Association. All rights reserved.

2a.4 Denominator Statement (*Brief, text description of the denominator - target population being measured*):
ED patient visits with a primary diagnosis code of headache who are not admitted to the hospital and with no secondary diagnosis codes related to:
•   lumbar puncture,
•   dizziness, paresthesia,
•   lack of coordination,
•   subarachnoid hemorrhage,

Comment [KP8]: 2a. The measure is well defined and precisely specified so that it can be implemented consistently within and across organizations and allow for comparability. The required data elements are of high quality as defined by NQF's Health Information Technology Expert Panel (HITEP) .

2a-specs
C ☐
P ☐
M ☐
N ☐

- complicated or thunderclap headache
- focal neurologic deficit
- pregnancy
- trauma
- HIV
- tumor/mass

For patients visiting the ED with a primary diagnosis of headache and one of the above secondary diagnoses, the presence of these secondary diagnoses potentially indicates that a CT brain imaging study may be indicated, depending upon the individual physician assessment of the particular patient.

2a.5 Target population gender: Female, Male
2a.6 Target population age range: Medicare population

2a.7 Denominator Time Window (*The time period in which cases are eligible for inclusion in the denominator*):
Any day within a one-year window of claims data.

2a.8 Denominator Details (*All information required to collect/calculate the denominator - the target population being measured - including all codes, logic, and definitions*):
ED patient visit revenue codes:
0450-0459 and 0981

Billed with any of the following ICD-9 Diagnosis codes:
307.81 – Tension headache
339.00 – Cluster headache syndrome, unspecified
339.01 – Episodic cluster headache
339.02 – Cluster chronic headache
339.03 – Episodic paroxysmal hemicrania
339.04 – Chronic paroxysmal hemicrania
339.05 – Short lasting unilateral neuralgiform headache with conjuctival injection and tearing
339.10 – Tension headache, unspecified
339.11 – Episodic tension headache
339.12 – Chronic tension headache
339.3 – Drug induced headache
339.42 – New daily persistent headache
339.81 – Hypnic headache
339.82 – Headache associated with sexual activity
339.83 – Primary cough headache
339.84 – Primary exertional headache
339.85 – Primary stabbing headache
339.89 – Other headache syndromes
346.0 - Migraine
346.00 – Migraine, classical, not intractable
346.01 – Migraine with aura with intractable migraine, without mention of status migrainosus
346.10 – Migraine without aura without mention of intractable migraine without mention of status migrainosus
346.11 - Migraine without aura with intractable migraine, without mention of status migrainosus
346.2 – Variants of migraine
346.20 – Variants of migraine, not elsewhere classified, without mention of intractable migraine without mention of status migrainosus
346.21 – Variants of migraine, not elsewhere classified, with intractable migraine, without mention of status migrainosus
346.8 – Other forms of migraine
346.80 – Other forms of migraine without mention of intractable migraine without mention of status migrainosus
346.81 - Other forms of migraine with intractable migraine, with status migrainosus
346.9 – Migraine, unspecified
346.90 – Migraine unspecified without mention of intractable migraine without mention of status migrainosus

346.91 - Migraine unspecified with intractable migraine, so stated, with status migrainosus
627.2 – Menopausal state, symptomatic
784.0 – Headache

2a.9 Denominator Exclusions (*Brief text description of exclusions from the target population*): Claims with secondary diagnosis codes related to:

- lumbar puncture,
- dizziness, paresthesia,
- lack of coordination,
- subarachnoid hemorrhage,
- complicated or thunderclap headache
- focal neurologic deficit
- pregnancy
- trauma
- HIV
- tumor/mass

Imaging studies for ED patients admitted to the hospital.

2a.10 Denominator Exclusion Details (*All information required to collect exclusions to the denominator, including all codes, logic, and definitions*):
Excluded ICD-9 diagnosis codes:

780.4 - DIZZINESS AND GIDDINESS
780.2 - SYNCOPE AND COLLAPSE
349.0 - LUMBAR PUNCTURE REACTION
781.0 - ABN INVOLUN MOVEMENT NEC
781.1 - SMELL & TASTE DISTURB
781.2 - ABNORMALITY OF GAIT
781.3 - LACK OF COORDINATION
782.0 - SKIN SENSATION DISTURB
430 - SUBARACHNOID HEMORRHAGE
339.43 - PRIM THNDERCLAP HEADACHE
339.44 - COMP HEADACHE SYND NEC
140-239 - NEOPLASMS/MASS
784.2 - SWELLING, MASS, OR LUMP IN HEAD AND NECK
042-044 - HUMAN IMMUNODEFICIENCY VIRUS (HIV)
800 - TRAUMA
839 - TRAUMA
850-854 - TRAUMA
860-869 - TRAUMA
905-909 - TRAUMA
926.11 - TRAUMA
926.12 - TRAUMA
929 - TRAUMA
952 - TRAUMA
958 - TRAUMA
959 - TRAUMA
630-676.9 - PREGNANCY
342 - HEMIPLESIA AND HEMIPARESIS
434 - OCCLUSION OF CEREBRAL ARTERIES
435 - TRANSIENT CEREBRAL ISCHEMIA
436 - ACUTE,BUT ILL-DEFINED, CEREBROVASCULAR DISEASE
438 - LATE EFFECT OF CEREBROVASCULAR DISEASE

Applying specifications to the outpatient file only will exclude ED patients subsequently admitted to the hospital. Claims related to patients visiting the ED but ultimately admitted are captured on the inpatient

Comment [k9]: 11 Risk factors that influence outcomes should not be specified as exclusions.
12 Patient preference is not a clinical exception to eligibility and can be influenced by provider interventions.

file.

2a.11 Stratification Details/Variables (*All information required to stratify the measure including the stratification variables, all codes, logic, and definitions*):
Not Applicable

2a.12-13 Risk Adjustment Type: no risk adjustment necessary

2a.14 Risk Adjustment Methodology/Variables (*List risk adjustment variables and describe conceptual models, statistical models, or other aspects of model or method*):
Not Applicable

2a.15-17 Detailed risk model available Web page URL or attachment:

2a.18-19 Type of Score: ratio
2a.20 Interpretation of Score: better quality = lower score
2a.21 Calculation Algorithm (*Describe the calculation of the measure as a flowchart or series of steps*):
For the purposes of this measure calculation, we assume that a visit is equal to a day. Therefore, if a patient had multiple Brain CTs in the ED the same day, the patient would only be included in the denominator once and in the numerator once. However, if the multiple Brain CTs were conducted on different days the patient would be included in the denominator and numerator more than once.

Denominator is: ED visits with a primary diagnosis code of headache. For visits to be counted in the measure, headache must be the primary diagnosis on the ED claim.

The Numerator is: Of ED visits identified in the denominator, visits with a coincident Brain CT study (i.e., Brain CT studies on the same day for the same patient).

Given these parameters, to calculate this measure:

1. Identify patients seen in the ED for headache using Medicare hospital outpatient claims data on a specific day, including only those claims where headache is the primary diagnosis on the ED claim.
    a. This is the denominator prior to exclusions.
2. Apply the measure exclusions to the denominator.
    a. Exclusions include codes for lumbar puncture, dizziness, paresthesia, lack of coordination, subarachnoid hemorrhage, complicated or thunderclap headache, focal neurologic deficit, pregnancy, trauma, HIV, tumor/mass. These exclusion codes must be included on the ED claim.
    b. Further, exclude all patients admitted to the hospital.
    c. This is the final denominator.
3. Of the patients remaining in the denominator, determine which patients also received a Brain CT on the same day using Medicare hospital outpatient claims data.
    a. This is the numerator.
4. Calculate the measure ratio of the numerator to the denominator.

2a.22 Describe the method for discriminating performance (*e.g., significance testing*):
Comparison to the national average to determine variation from the average and comparison to the 90th percentile to identify outliers in performance.

2a.23 Sampling (Survey) Methodology *If measure is based on a sample (or survey), provide instructions for obtaining the sample, conducting the survey and guidance on minimum sample size (response rate)*:
Not Applicable

2a.24 Data Source (*Check the source(s) for which the measure is specified and tested*)
Electronic adminstrative data/claims

2a.25 Data source/data collection instrument (*Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.*):
This measure was constructed using the 100 percent Medicare fee-for-service (FFS) outpatient standard-analytical files (SAFs) for 2007. These Outpatient SAFs contain the claims data on the imaging utilization performed in outpatient departments (including emergency department services), which are necessary to

attribute the measures to specific facilities. In addition, analyses were conducted using the 5 percent SAF files for 2003-2007.

2a.26-28 Data source/data collection instrument reference web page URL or attachment: URL http://www.cms.hhs.gov/IdentifiableDataFiles/02_StandardAnalyticalFiles.asp

2a.29-31 Data dictionary/code table web page URL or attachment: URL http://www.cms.hhs.gov/IdentifiableDataFiles/02_StandardAnalyticalFiles.asp

2a.32-35 Level of Measurement/Analysis (*Check the level(s) for which the measure is specified and tested*)
Clinicians: Other, Population: national, Program: Other, Facility/Agency Outpatient Hospital Outpatient Imaging Efficiency (OIE)

2a.36-37 Care Settings (*Check the setting(s) for which the measure is specified and tested*)
Ambulatory Care: Emergency Dept, Ambulatory Care: Hospital Outpatient

2a.38-41 Clinical Services (*Healthcare services being measured, check all that apply*)
Imaging, Clinicians: Physicians (MD/DO)

TESTING/ANALYSIS

2b. Reliability testing

2b.1 Data/sample (*description of data/sample and size*): This measure was constructed using the 100 percent Medicare FFS outpatient standard-analytical-files (SAFs) for 2007. In addition, analyses were conducted for 2003-2007 using the 5 percent SAF data.

2b.2 Analytic Method (*type of reliability & rationale, method for testing*):
Certain precautions were taken to ensure that procedures were not counted multiple times. When calculating the measures, the measure developers were only concerned with procedures associated with technical and global modifiers, as these modifiers refer to services provided by the facility. This reduces the possibility of double-counting procedures, since a single procedure may result in both a technical and professional record on the Medicare claims files. There were very few instances when this occurred as it related to procedures applicable to the measures.

Further using the 5 percent SAF claims data, initial measure testing was conducted to look for consistencies in measure calculations over the years of analysis (2003 -2007) and between geographic locations (i.e., urban, rural, state) and hospital bed size.

In addition, for purposes of the measure ratio estimation specific parameters were established for adequate case counts at individual facilities. Minimum case count requirements were developed for each facility in order to assure a 90 percent confidence level for the observed facility rate. Case count requirements ranged between 31 and 67 and varied based on the observed facility rate and the required precision.

"NQF Supplemental Data Analysis Methodology and Case Count Requirements" provides a detailed description of the data analysis methods (pages 1 -2) and the case count requirements calculations (pages 2 -8). This supplemental material is available at:

URL: ftp.lewin.com
User Name: CMS.2009
Password: OIE2009=
*This secure FTP site is available Monday through Friday from 7:30 AM - 9:00 PM (EST)

Special Note: If using Internet Explorer 7 or 8 please follow the following instructions to access the site:

1. In Internet Explorer (IE), enter ftp://ftp.lewin.com
2. Enter the above user name and password and click "Log On."
3. You will receive the "cannot display webpage" message in your browser.
4. Click the "View" drop-down menu and choose "Open FTP site in Windows Explorer."

2b
C ☐
P ☐
M ☐
N ☐

Comment [KP10]: 2b. Reliability testing demonstrates the measure results are repeatable, producing the same results a high proportion of the time when assessed in the same population in the same time period.

Comment [k11]: 8 Examples of reliability testing include, but are not limited to: inter-rater/abstractor or intra-rater/abstractor studies; internal consistency for multi-item scales; test-retest for survey items. Reliability testing may address the data items or final measure score.

5. You should be prompted a second time for the username and password credentials. Enter these again.
6. Once this is done, the familiar explorer view will open, and you will be able to access files on the site.

2b.3 Testing Results *(reliability statistics, assessment of adequacy in the context of norms for the test conducted)*:
The results of initial measure testing were consistent over the years of analysis (2003-2007) and between geographic locations (i.e., urban, rural, state) and hospital bed size.

2c. Validity testing

2c.1 Data/sample *(description of data/sample and size)*: This measure was constructed using the 100 percent Medicare FFS outpatient standard-analytical claims files (SAFs) for 2007.

2c.2 Analytic Method *(type of validity & rationale, method for testing)*:
The Medicare claims data are used for payment purposes for services rendered by a provider. The data undergo prepayment claims analysis and post-payment audits as part of the CMS administrative process. The analytic files used by the measure developer were post-adjudicated claims.

2c.3 Testing Results *(statistical results, assessment of adequacy in the context of norms for the test conducted)*:
The measure is based on analysis of administrative claims data. The data were considered to have face validity as representing services rendered by the hospital. Additional data testing was not involved.

2c
C ☐
P ☐
M ☐
N ☐

2d. Exclusions Justified

2d.1 Summary of Evidence supporting exclusion(s):
Exclusions for this measure were proposed and reviewed by the Technical Expert Panel (TEP)during the October 2008 and again during an October 2009 Outpatient Imaging Efficiency (OIE) TEP meeting. The exclusions were validated using ACR appropriateness criteria and other relevant guidelines. Exclusions for this measure include ED visits with secondary diagnosis codes related to:

- lumbar puncture,
- dizziness, paresthesia,
- lack of coordination,
- subarachnoid hemorrhage,
- complicated or thunderclap headache
- focal neurologic deficit
- pregnancy
- trauma
- HIV
- tumor/mass.

The rationale behind these is to exclude patients presenting with atypical headaches that may warrant imaging. As described by the guidelines, it is generally agreed upon that patients with normal neurological examinations (no focal symptoms), no change in headache pattern, and no history of seizure do not warrant routine neuroimaging. It is for these patients, where it is not clear that neuroimaging is necessary from the claims data, that we are most interested in measuring the variation in practice patterns.

2d.2 Citations for Evidence:
ACR Appropriateness Criteria – Headache. Reston, VA: American College of Radiology, 2009. Accessed November 25, 2009 at http://www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria.aspx

Edlow JA, Panagos PD, Godwin SA, et al. American College of Emergency Physicians. Clinical Policy: Critical issues in the evaluation and management of adult patients presenting to the emergency department with acute headache.

Singapore Ministry of Health. Diagnosis and management of headache. Singapore: Singapore Ministry of Health; 2007 Sep.

2d
C ☐
P ☐
M ☐
N ☐
NA ☐

Comment [KP12]: 2c. Validity testing demonstrates that the measure reflects the quality of care provided, adequately distinguishing good and poor quality. If face validity is the only validity addressed, it is systematically assessed.

Comment [k13]: 9 Examples of validity testing include, but are not limited to: determining if measure scores adequately distinguish between providers known to have good or poor quality assessed by another valid method; correlation of measure scores with another valid indicator of quality for the specific topic; ability of measure scores to predict scores on some other related valid measure; content validity for multi-item scales/tests. Face validity is a subjective assessment by experts of whether the measure reflects the quality of care (e.g., whether the proportion of patients with BP < 140/90 is a marker of quality). If face validity is the only validity addressed, it is systematically assessed (e.g., ratings by relevant stakeholders) and the measure is judged to represent quality care for the specific topic and that the measure focus is the most important aspect of quality for the specific topic.

Comment [KP14]: 2d. Clinically necessary measure exclusions are identified and must be:
•supported by evidence of sufficient frequency of occurrence so that results are distorted without the exclusion;
AND
•a clinically appropriate exception (e.g., contraindication) to eligibility for the measure focus;
AND
•precisely defined and specified:
–if there is substantial variability in exclusions across providers, the measure is specified so that exclusions are computable and the effect on the measure is transparent (i.e., impact clearly delineated, such as number of cases excluded, exclusion rates by type of exclusion);
if patient preference (e.g., informed decision-making) is a basis for exclusion, there must be evidence that it strongly impacts performance on the measure and the measure must be specified so that the information about patient preference and the effect on the measure is transparent (e.g., numerator category computed separately, denominator exclusion category computed separately).

Comment [k15]: 10 Examples of evidence that an exclusion distorts measure results include, but are not limited to: frequency of occurrence, sensitivity analyses with and without the exclusion, and variability of exclusions across providers.

Frishberg BM, Rosenberg JH, Matchar DB, et al. Evidence-Based Guidelines in the Primary Care Setting: Neuroimaging in Patients with Nonacute Headache. Washington, DC: American Academy of Neurology, 2000. Accessed September 16, 2009 at http://www.aan.com/professionals/practice/pdfs/gl0088.pdf

2d.3 Data/sample *(description of data/sample and size)*: Not Applicable

2d.4 Analytic Method *(type analysis & rationale)*:
Not Applicable

2d.5 Testing Results *(e.g., frequency, variability, sensitivity analyses)*:
Not Applicable

2e. Risk Adjustment for Outcomes/ Resource Use Measures

2e.1 Data/sample *(description of data/sample and size)*: Not Applicable

2e.2 Analytic Method *(type of risk adjustment, analysis, & rationale)*:
Not Applicable

2e.3 Testing Results *(risk model performance metrics)*:
Not Applicable

2e.4 If outcome or resource use measure is not risk adjusted, provide rationale: Beyond specific exclusions, risk adjustment was determined not to be necessary as guidelines did not indicate further need for case mix adjustments.

2e
C ☐
P ☐
M ☐
N ☐
NA ☐

2f. Identification of Meaningful Differences in Performance

2f.1 Data/sample from Testing or Current Use *(description of data/sample and size)*: This measure was constructed using the 100 percent Medicare FFS outpatient SAFs for 2007.

2f.2 Methods to identify statistically significant and practically/meaningfully differences in performance *(type of analysis & rationale)*:
One impediment to achieving high levels of precision and accuracy at the facility level is small case counts. This is an issue for many facilities identified in the data, as they do not perform a high volume of relevant services. In the situation where a facility has a low case volume eligible for a measure, the results of the measure may be significantly impacted and skewed by one or two additional cases. Minimum case count requirements were developed for each facility in order to assure a 90 percent confidence level for the observed facility rate.

There are two different processes for determining required case counts depending on whether the facility rate is less than 0.05 or greater than 0.95 (i.e., towards the end of the range of possible rate values) or somewhere between 0.05 and 0.95 (inclusive). Each process has three steps: (1) determine reasonable levels of precision; (2) determine the level of confidence to be required for the measures; and (3) calculate the minimum case count needed to meet precision requirements. For facility rates less than 0.05 or greater than 0.95, the case count needed to attain the required precision was calculated to be 45 cases. For facility rates between 0.05 and 0.95, the case count needed to attain the required precision ranged from 31 to 67 cases. For more details on the minimum case count determinations, please see the supplemental materials:

"NQF Supplemental Data Analysis Methodology and Case Count Requirements" provides a detailed description of the case count calculations (pages 2-8). This supplemental material is available at:

URL: ftp.lewin.com
User Name: CMS.2009
Password: OIE2009=
*This secure FTP site is available Monday through Friday from 7:30 AM - 9:00 PM (EST)

Special Note: If using Internet Explorer 7 or 8 please follow the following instructions to access the site:

2f
C ☐
P ☐
M ☐
N ☐

Comment [KP16]: 2e. For outcome measures and other measures (e.g., resource use) when indicated:
●an evidence-based risk-adjustment strategy (e.g., risk models, risk stratification) is specified and is based on patient clinical factors that influence the measured outcome (but not disparities in care) and are present at start of care;Error! Bookmark not defined. OR rationale/data support no risk adjustment.

Comment [k17]: 13 Risk models should not obscure disparities in care for populations by including factors that are associated with differences/inequalities in care such as race, socioeconomic status, gender (e.g., poorer treatment outcomes of African American men with prostate cancer, inequalities in treatment for CVD risk factors between men and women). It is preferable to stratify measures by race and socioeconomic status rather than adjusting out differences.

Comment [KP18]: 2f. Data analysis demonstrates that methods for scoring and analysis of the specified measure allow for identification of statistically significant and practically/clinically meaningful differences in performance.

Comment [k19]: 14 With large enough sample sizes, small differences that are statistically significant may or may not be practically or clinically meaningful. The substantive question may be, for example, whether a statistically significant difference of one percentage point in the percentage of patients who received smoking cessation counseling (e.g., 74% v. 75%) is clinically meaningful; or whether a statistically significant difference of $25 in cost for an episode of care (e.g., $5,000 v. $5,025) is practically meaningful. Measures with overall poor performance may not demonstrate much variability across providers.

1. In Internet Explorer (IE), enter ftp://ftp.lewin.com
2. Enter the above user name and password and click "Log On."
3. You will receive the "cannot display webpage" message in your browser.
4. Click the "View" drop-down menu and choose "Open FTP site in Windows Explorer."
5. You should be prompted a second time for the username and password credentials. Enter these again.
6. Once this is done, the familiar explorer view will open, and you will be able to access files on the site.

Measure ratios were calculated for all hospitals facilities that are eligible in Hospital Outpatient Quality Data Reporting Program (HOP QDRP), regardless of whether the facility chooses to participate in the program or not. There are a total of 3,680 eligible facilities in HOP QDRP, which include short-term acute care hospitals as well as critical access hospitals (CAHs). Case count requirements were applied to exclude the hospitals that did not have a significant number of cases for this measure. After applying the limitations, 2,199 hospitals were eligible for measure calculation.

2f.3 Provide Measure Scores from Testing or Current Use *(description of scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningfully differences in performance)*:
As noted previously, the measure ratio ranged from a minimum value of 0.000 to a maximum of 0.800 with a weighted average ratio of 0.348. Ten percent of hospitals had a measure ratio above 0.570, 5 percent of hospitals had a ratio above 0.619, and 1 percent of hospitals had a ratio above 0.695. A table with detailed descriptive statistics is available in:

"NQF Supplemental Brain CT in the ED for Atraumatic Headache", for descriptive statistics table See Exhibit 3 on pages 2-3. This supplemental material is available at:

URL: ftp.lewin.com
User Name: CMS.2009
Password: OIE2009=
*This secure FTP site is available Monday through Friday from 7:30 AM – 9:00 PM (EST)
Special Note: If using Internet Explorer 7 or 8 please follow the following instructions to access the site:

1. In Internet Explorer (IE), enter ftp://ftp.lewin.com
2. Enter the above user name and password and click "Log On."
3. You will receive the "cannot display webpage" message in your browser.
4. Click the "View" drop-down menu and choose "Open FTP site in Windows Explorer."
5. You should be prompted a second time for the username and password credentials. Enter these again.
6. Once this is done, the familiar explorer view will open, and you will be able to access files on the site.

2g. Comparability of Multiple Data Sources/Methods **2g.1 Data/sample** *(description of data/sample and size)*: Not Applicable **2g.2 Analytic Method** *(type of analysis & rationale)*: Not Applicable **2g.3 Testing Results** *(e.g., correlation statistics, comparison of rankings)*: Not Applicable	2g C ☐ P ☐ M ☐ N ☐ NA ☐
2h. Disparities in Care **2h.1 If measure is stratified, provide stratified results** *(scores by stratified categories/cohorts)*: Not Applicable **2h.2 If disparities have been reported/identified, but measure is not specified to detect disparities, provide follow-up plans:** Not Applicable	2h C ☐ P ☐ M ☐ N ☐ NA ☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria for *Scientific Acceptability of Measure Properties?*	2
Steering Committee: Overall, to what extent was the criterion, *Scientific Acceptability of Measure*	*2*

Comment [KP20]: 2g. If multiple data sources/methods are allowed, there is demonstration they produce comparable results.

Comment [KP21]: 2h. If disparities in care have been identified, measure specifications, scoring, and analysis allow for identification of disparities through stratification of results (e.g., by race, ethnicity, socioeconomic status, gender);OR rationale/data justifies why stratification is not necessary or not feasible.

Properties, met? Rationale:	C ☐ P ☐ M ☐ N ☐

3. USABILITY

Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making. ([evaluation criteria](#))

Eval Rating

3a. Meaningful, Understandable, and Useful Information

3a.1 Current Use: not in use but testing completed

3a.2 Use in a public reporting initiative (disclosure of performance results to the public at large) (*If used in a public reporting initiative, provide name of initiative(s), locations, Web page URL(s). If not publicly reported, state the plans to achieve public reporting within 3 years*):
To promote higher quality, more efficient health care for Medicare beneficiaries, the Centers for Medicare & Medicaid Services (CMS) has implemented quality measure reporting programs for multiple settings of care. The Outpatient Prospective Payment System (OPPS) final rule released November 1, 2007 outlined the initial implementation of the Hospital Outpatient Quality Data Reporting Program (HOP QDRP), under which hospitals would report data for 2008 services on the quality of hospital outpatient care. The final rule was based on Section 109(a) of the Medicare Improvements and Extension Act, under Title 1 of the Tax Relief and Health Care Act of 2006 (MIEA-TRHCA). Amending section 1833(t) of the Social Security Act, MIEA-TRHCA requires that hospitals submit quality data on outpatient services using standardized measures. Failure to submit such data will result in a 2.0 percentage point reduction in the hospital's OPPS annual payment update factor, beginning in calendar year (CY) 2009; however, because Medicare claims data are used for analysis for this measure, no active data submission is required of hospitals above and beyond the normal procedures used to submit claims for Medicare payment purposes.

The Act requires that the quality measures used are (1) appropriate for the measurement of quality of care furnished by hospitals in outpatient settings; (2) reflect consensus among affected parties; and (3) to the extent feasible, include measures set forth by one or more national consensus building entities.

3a.3 If used in other programs/initiatives (*If used in quality improvement or other programs/initiatives, name of initiative(s), locations, Web page URL(s). If not used for QI, state the plans to achieve use for QI within 3 years*):
Not Applicable

Testing of Interpretability (*Testing that demonstrates the results are understood by the potential users for public reporting and quality improvement*)
3a.4 Data/sample (*description of data/sample and size*): Not Applicable

3a.5 Methods (*e.g., focus group, survey, QI project*):
Not Applicable

3a.6 Results (*qualitative and/or quantitative results and conclusions*):
Not Applicable

	3a C ☐ P ☐ M ☐ N ☐

3b/3c. Relation to other NQF-endorsed measures

3b.1 NQF # and Title of similar or related measures:

(for NQF staff use) Notes on similar/related [endorsed](#) or submitted measures:

3b. Harmonization
If this measure is related to measure(s) already [endorsed by NQF](#) (e.g., same topic, but different target population/setting/data source or different topic but same target population):
3b.2 Are the measure specifications harmonized? If not, why?

	3b C ☐ P ☐ M ☐

Rating: C=Completely; P=Partially; M=Minimally; N=Not at all; NA=Not applicable   18

Comment [KP22]: 3a. Demonstration that information produced by the measure is meaningful, understandable, and useful to the intended audience(s) for <u>both</u> public reporting (e.g., focus group, cognitive testing) <u>and</u> informing quality improvement (e.g., quality improvement initiatives). An important outcome that may not have an identified improvement strategy still can be useful for informing quality improvement by identifying the need for and stimulating new approaches to improvement.

Comment [KP23]: 3b. The measure specifications are harmonized with other measures, and are applicable to multiple levels and settings.

Comment [k24]: 16 Measure harmonization refers to the standardization of specifications for similar measures on the same topic (e.g., *influenza immunization* of patients in hospitals or nursing homes), or related measures for the same target population (e.g., eye exam and HbA1c for *patients with diabetes*), or definitions applicable to many measures (e.g., age designation for children) so that they are uniform or compatible, unless differences are dictated by the evidence. The dimensions of harmonization can include numerator, denominator, exclusions, and data source and collection instructions. The extent of harmonization depends on the relationship of the measures, the evidence for the specific measure focus, and differences in data sources.

	N ☐
	NA ☐
3c. Distinctive or Additive Value **3c.1** Describe the distinctive, improved, or additive value this measure provides to existing NQF-endorsed measures: **5.1 Competing Measures** If this measure is similar to measure(s) already endorsed by NQF (i.e., on the same topic and the same target population), describe why it is a more valid or efficient way to measure quality:	3c C ☐ P ☐ M ☐ N ☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria for *Usability*?	3
Steering Committee: Overall, to what extent was the criterion, *Usability*, met? Rationale:	3 C ☐ P ☐ M ☐ N ☐
4. FEASIBILITY	
Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)	Eval Rating
4a. Data Generated as a Byproduct of Care Processes **4a.1-2** How are the data elements that are needed to compute measure scores generated? coding/abstraction performed by someone other than person obtaining original information,	4a C ☐ P ☐ M ☐ N ☐
4b. Electronic Sources **4b.1** Are all the data elements available electronically? (*elements that are needed to compute measure scores are in defined, computer-readable fields, e.g., electronic health record, electronic claims*) Yes **4b.2** If not, specify the near-term path to achieve electronic capture by most providers.	4b C ☐ P ☐ M ☐ N ☐
4c. Exclusions **4c.1** Do the specified exclusions require additional data sources beyond what is required for the numerator and denominator specifications? No **4c.2** If yes, provide justification.	4c C ☐ P ☐ M ☐ N ☐ NA ☐
4d. Susceptibility to Inaccuracies, Errors, or Unintended Consequences **4d.1** Identify susceptibility to inaccuracies, errors, or unintended consequences of the measure and describe how these potential problems could be audited. If audited, provide results. This measure is a claims-based measure using CMS hospital outpatient claims data. Inaccuracies and errors may arise from errors in the coding used to retrieve the claims data used to calculate the measure. The measures development team has made sure to check the quality of their code to ensure that the retrieval coding is as accurate as possible. Further inaccuracies may arise from variation in claims coding at the different hospitals. CMS conducts prepayment claims analysis and post payment audits that should prevent this factor from having a major impact on the measure calculations performed on claims data.	4d C ☐ P ☐ M ☐ N ☐

Comment [KP25]: 3c. Review of existing endorsed measures and measure sets demonstrates that the measure provides a distinctive or additive value to existing NQF-endorsed measures (e.g., provides a more complete picture of quality for a particular condition or aspect of healthcare).

Comment [k26]: 5. Demonstration that the measure is superior to competing measures – new submissions and/or endorsed measures (e.g., is a more valid or efficient way to measure).

Comment [KP27]: 4a. For clinical measures, required data elements are routinely generated concurrent with and as a byproduct of care processes during care delivery. (e.g., BP recorded in the electronic record, not abstracted from the record later by other personnel; patient self-assessment tools, e.g., depression scale; lab values, meds, etc.)

Comment [KP28]: 4b. The required data elements are available in electronic sources. If the required data are not in existing electronic sources, a credible, near-term path to electronic collection by most providers is specified and clinical data elements are specified for transition to the electronic health record.

Comment [KP29]: 4c. Exclusions should not require additional data sources beyond what is required for scoring the measure (e.g., numerator and denominator) unless justified as supporting measure validity.

Comment [KP30]: 4d. Susceptibility to inaccuracies, errors, or unintended consequences and the ability to audit the data items to detect such problems are identified.

Rating: C=Completely; P=Partially; M=Minimally; N=Not at all; NA=Not applicable

4e. Data Collection Strategy/Implementation

4e.1 Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data/missing data, timing/frequency of data collection, patient confidentiality, time/cost of data collection, other feasibility/ implementation issues:
This measure is a claims-based measure using CMS hospital outpatient claims data. There was a significant change in coding that took place after the implementation of the outpatient prospective payment system (OPPS) beginning in calendar year 2000. This occurred as there was a change from using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9) procedure codes during the cost-based reimbursement system prior to OPPS to the Healthcare Common Procedure Coding System (HCPCS) codes and the ambulatory payment classification (APC) fee schedule after implementation of OPPS. HCPCS are used by Medicare and maintained by the CMS. They are based on the CPT (Current Procedural Technology) codes developed by the American Medical Association. The change to HCPCS does not seem to become fully implemented until mid-year 2002, which is why the measure development team chose 2003 through 2007 as the preferred time period of investigation.

Special attention needs to be taken when counting procedures on the Medicare claims files. The biggest issue is how to deal with modifier codes. Modifiers are two digit indicators (alpha or numeric) that represent a service or procedure that has been altered by some specific circumstance, which typically will impact the payment amount.

Procedure modifier code "26" represents the professional component of a procedure and includes the clinician work (i.e., the reading of the image by a physician), associated overhead and professional liability insurance costs. This modifier corresponds to the human involvement in a given service or procedure.

The procedure modifier code "TC" represents the technical component of a service or procedure and includes the cost of equipment and supplies to perform that service or procedure. This modifier corresponds to the equipment/facility part of a given service or procedure.

In most cases, unmodified codes represent a global procedure which includes both the professional and technical components.   There are also other modifier codes. All other modifier codes have been counted as a technical code for our purposes. When calculating the measures, we are only concerned with procedures associated with technical and global modifiers, as these modifiers refer to services provided by the facility. This reduces the possibility of double-counting procedures, since a single procedure may result in both a technical and professional record on the claims files. There were very few instances when this occurred as it related to procedures applicable to the measures.

When developing counts of procedures, the objective is to avoid double-counting procedures that may have been billed through multiple revenue centers within a facility. Billing through multiple centers leads to multiple records in the Medicare claims files (i.e., the SAFs). For instance, there may be multiple bills for a single CT with contrast. On one bill, the charges relate to the application of a radiopharmaceutical, which could have a technical modifier code and come from the pharmacy revenue center. On the other bill, the charges relate to the imaging study and may fall under a technical bill from the imaging center revenue center. In this case, we only count the CT scan once, since only one CT scan was performed.   However, if we were summing up the Medicare paid amounts for this procedure, we would include the Medicare paid amounts from both bills, as they each represent payments for services directly related to the particular CT scan. Further, this measure is calculated grouping procedures by ED visit on a specific day rather than services rendered as the unit of measurement.

4e.2 Costs to implement the measure (*costs of data collection, fees associated with proprietary measures*):
These measures are based on administrative claims data. For providers, there is no additional data collection required to support these measures and therefore no additional cost.

4e.3 Evidence for costs:
NA

4e.4 Business case documentation: NA

4e
C ☐
P ☐
M ☐
N ☐

TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria for *Feasibility?*	4
Steering Committee: Overall, to what extent was the criterion, *Feasibility*, met? Rationale:	4 C ☐ P ☐ M ☐ N ☐

RECOMMENDATION	
(for NQF staff use) Check if measure is untested and only eligible for time-limited endorsement.	Time-limite d ☐
Steering Committee: Do you recommend for endorsement? Comments:	Y ☐ N ☐ A ☐

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)
Co.1 Organization
Centers for Medicare & Medicaid Services | 7500 Security Blvd | Baltimore | Maryland | 21244-1850

Co.2 Point of Contact
Susan | Arday, BSPH, MHS, CHES | susan.arday@cms.hhs.gov | 410-786-3141

Measure Developer If different from Measure Steward
Co.3 Organization
The Lewin Group | 3130 Fairview Park Drive, Suite 800 | Falls Church | Virginia | 22042

Co.4 Point of Contact
Charlie | Bruetman, MD, MBA | charlie.bruetman@lewin.com | 703-269-5569

Co.5 Submitter If different from Measure Steward POC
Sharman | Stephens, BSN, MPH, RN | sharman.stephens@lewin.com | 703-269-5575- |The Lewin Group

---

Co.6 Additional organizations that sponsored/participated in measure development
The Lewin Group worked with subcontractors National Imaging Associates, Inc. (NIA) and Dobson|DaVanzo, LLC to develop the measures. The following individuals from each organization contributed to the measures development process:

NIA
Staci L. Barnett
Director, Research and Analysis
Magellan Health NIA

Thomas G. Dehn, MD, FACR
Executive Vice President, Chief Medical Officer
National Imaging Associates, Inc

Kariena Greiten
SVP, Product Innovation
National Imaging Associates

Michael J. Pentecost, MD
Associate Chief Medical Officer
Magellan Health NIA

Dobson|DaVanzo, LLC
Joan DaVanzo, PhD, MSW

Rating: C=Completely; P=Partially; M=Minimally; N=Not at all; NA=Not applicable   21

ADDITIONAL INFORMATION

Workgroup/Expert Panel involved in measure development
Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.
The technical expert panel (TEP) consisted of the following individuals:

Augustine E. Agocha, MD, PhD, MBA
Chief of Cardiology and Chairman
Department of Cardiovascular Medicine
Deborah Heart and Lung Hospital Center
Clinical Associate Professor of Medicine
University of Medicine and Dentistry
Robert Wood Johnson Medical School

Thomas Ebert, MD
Health New England
Chief Medical Officer

Frank J. Rybicki MD, PhD
Dir, Cardiac CT & Vascular CT/MRI
Dir, Applied Imaging Sciences Laboratory
Brigham and Women's Hospital
Assoc Prof, Harvard Medical School

John Freedman, MD, MBA
Principle, Freedman HealthCare LLC

John Eng, MD
Associate Professor of Radiology
Joint Appointment in Health Sciences Informatics Department of Radiology and Radiological Science
Johns Hopkins University School of Medicine

Bruce J. Hillman, MD, FACR
Editor in Chief
American Journal of Radiology

Robert Haralson III, MD, MBA
Medical Director of DeRoyal Industries

Paul R. Sierzenski, MD, RDMS FACP
Director, Emergency, Trauma and Critical Care Ultrasound
Director, Emergency Ultrasound Fellowship
Department of Emergency Medicine
Christiana Care Health System
Associate Professor, Emergency Medicine
Thomas Jefferson University

Jeffrey K. Levin-Scherz, MD, MBA
Principal, Towers Perrin

Gregory M. Kusiak, MBA
President
California Medical Business Services, Inc

Allyson Ross Davies, PhD, MPH
Principal

ARD Consulting LLC

Barbara McNeil, MD, PhD
Ridley Watts Professor and Head
Professor of Radiology
Department of Health Care Policy
Harvard University

Pamela S. Douglas MD, MACC, FASE, FAHA
Ursula Geller Professor of Research in Cardiovascular Diseases
Director, DCRI CV Imaging Program
Duke University

Michael Hutchinson, MD, PhD
Associate Professor of Neurology
Diplomate, Neuroimaging
Diplomate, American Board of Psychiatry and Neurology
New York University School of Medicine

The TEP met once in October 2008 to determine which of the proposed imaging efficiency measures the measures development team should pursue for NQF endorsement. Following the TEP meeting, TEP members were consulted on an individual basis depending on their area of expertise to clarify technical issues surrounding and provide recommendations regarding the measures under development. A second TEP meeting was held in October 2009 to provide the results of data analysis for each proposed measure. During this meeting the TEP provided additional feedback and the measure specifications were adjusted accordingly.

Ad.2 If adapted, provide name of original measure: NA
Ad.3-5 If adapted, provide original specifications URL or attachment

---

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.6 Year the measure was first released:
Ad.7 Month and Year of most recent revision:
Ad.8 What is your frequency for review/update of this measure? Annually
Ad.9 When is the next scheduled review/update for this measure? 2010-08

Ad.10 Copyright statement/disclaimers:

Ad.11 -13 Additional Information web page URL or attachment: URL User Name: CMS.2009 Password: OIE2009= ftp.lewin.com   This secure FTP site is available Monday through Friday from 7:30 AM – 9:00 PM (EST). If using Internet Explorer 7 or 8 please follow previous instructions.

Date of Submission (*MM/DD/YY*): 05/17/2010

NQF Supplemental Materials:

Brain CT in the Emergency Department (ED) for Atraumatic Headache

Outpatient Imaging Efficiency (OIE)

Prepared for:

Centers for Medicare & Medicaid Services (CMS)

Submitted by:

The Measure Development Team

**The Lewin Group, Inc.
Dobson DaVanzo & Associates, LLC
National Imaging Associates, Inc.**

1. Background Statistics

The data presented in this supplemental material are based on analysis of 2007 Medicare claims.

Exhibit 1 summarizes the utilization for the relevant ED codes and Brain CT procedures for records on the 2007 Medicare outpatient claims file that are associated with an atraumatic headache diagnosis.

Exhibit 1: Summary Statistics for Brain CT and ED Visits associated with a Primary Diagnosis of Atraumatic Headache

Revenue Center / HCPCS Code	Revenue Center / HCPCS Code Label	Medicare Beneficiaries	Procedure Count	Medicare Total Amount Paid	Average Amount Paid per Medicare Beneficiary	Average Amount Paid per Procedure
Emergency Department Visit with a primary diagnosis code of Headache (Denominator)						
0450	Emergency Room	197,651	558,661	$42,810,021	$216.59	$76.63
0451	Emergency Room: EM/EMTALA	2,995	3,975	$178,914	$59.74	$45.01
0452	Emergency Room: ER/ Beyond EMTALA	2,300	3,112	$666,421	$289.75	$214.15
0456	Emergency Room: Urgent care	1,587	3,970	$171,048	$107.78	$43.09
0459	Emergency Room: Other emergency room	359	711	$54,990	$153.18	$77.34
0981	Professional fees (096x) Emergency room	8,667	16,041	$886,247	$102.26	$55.25
Coincident Brain CT in the ED with a primary diagnosis code of Headache (Numerator)						
70450	CT head or brain, without contrast material	108,246	115,923	$13,223,460	$122.16	$114.07
70460	CT head or brain, with contrast material(s)	259	262	$43,968	$169.76	$167.82
70470	CT head or brain, without contrast material followed by contrast material(s) and further sections	1,641	1,680	$316,910	$193.12	$188.64

Note: Counts are prior to applying exclusion criteria

Exhibit 2 lists the frequency counts of the atraumatic headache ICD-9 codes that are used as a primary diagnosis for an emergency department visit that also resulted in a Brain CT.

Exhibit 2: Frequency of Atraumatic Headache Primary Diagnosis Codes in the ED with a Brain CT on the same day, from the 2007 Outpatient Claims File

ICD-9 Code		Number of Claims with ICD-9 Code
784.0	HEADACHE	101,772
346.90	MIGRAINE NOS-NOT INTR (Begin 1992)	11,560
307.81	TENSION HEADACHE	2,452
346.80	MIGR NEC-NOT INTR (Begin 1992)	708
346.20	VARIANTS OF MIGR-NOT INTR (Begin 1992)	449
346.10	COMMON MIGR-NOT INTR (Begin 1992)	396
346.91	MIGRAINE NOS-INTRACT (Begin 1992)	258
346.00	CLASSICAL MIGR-NOT INTR (Begin 1992)	186
346.81	MIGR NEC-INTRACT (Begin 1992)	39
346.21	VARIANTS OF MIGR-INTRACT (Begin 1992)	16
346.01	CLASSICAL MIGR-INTRACT (Begin 1992)	14
346.11	COMMON MIGR-INTRACT (Begin 1992)	13
627.2	FEMALE CLIMACTERIC STATE	2

2. Measure Ratios and Descriptive Statistics

This measure is limited to procedures occurring in the hospital ED. We identified ED services with the emergency department revenue center codes listed as part of the outpatient claim.[1] The measure estimates ED visits with a presenting complaint of atraumatic headache with a coincident Brain CT study. Exclusions include patients with a lumbar puncture, dizziness, paresthesia, lack of coordination, subarachnoid hemorrhage, complicated or thunderclap headache, focal neurologic deficit, pregnancy, trauma, HIV, or tumor/mass. We should also note that imaging studies for ED patients who are hospitalized (admitted) are excluded from the measure.

For the actual measure calculation, it is assumed that a visit is equal to a day. Therefore, if a patient was to have multiple Brain CTs in the ED the same day, the patient would only be included in the numerator once. However, if the multiple Brain CTs were conducted on different days, the patients may be included in the numerator more than once, as long as they were in the ED on those days as well.[2]

Exhibit 3 presents the descriptive statistics for the Brain CT for atraumatic headache in the ED measure. The number of facilities meeting the case count requirements is 2,199.

---

[1]   To find these claims in the Outpatient SAF, use revenue center code values of 0450-0459 and 0981.

[2]   There were a limited number of cases where multiple Brain CTs were conducted in an ED on the same day for patients with a headache.

The weighted average facility measure is 0.348. The coefficient of variation is relatively low for this measure meaning that the variation across facilities is relatively low. There were a handful of facilities that did not bill for a Brain CT with a primary atraumatic headache diagnosis in the emergency department, as well as hospitals at the other end of the spectrum that ordered a Brain CT nearly every time a patient presented to the ED with an atraumatic headache diagnosis.

Exhibit 3: Descriptive Statistics of Brain CT in ED for Atraumatic Headache Measure (n = 2,199)*

Statistic	Denominator	Numerator	Ratio
Standard Deviation	66	25	0.154
Weighted Average** (i.e., a national measure)	111	39	0.348
Coefficient of Variation	0.60	0.65	0.416
Minimum	32	0	0.000
1st Percentile	38	3	0.035
5th Percentile	46	11	0.108
10th Percentile	52	16	0.160
25th Percentile	67	21	0.259
Median	94	33	0.373
75th Percentile	135	50	0.479
90th Percentile	188	68	0.570
95th Percentile	236	86	0.619
99th Percentile	353	130	0.695
Maximum	1,041	252	0.800
*n = Number of Facilities			
**Weighted Average adjusts for case volumes at the facility level.			

Exhibit 4 displays the distribution of facilities related to the Brain CT in ED for Atraumatic Headache measure ratios. As can be seen, the facilities at the tails of the distribution are outliers. In the figure, the more steep (i.e., vertical) the line, the more spread out hospitals are from the average ratio. That is, a few hospitals are covering a wide range of measure ratios. In the case of the Brain CT in the ED for atraumatic headache measure, the line gets very steep around the 95th percentile and particularly after the 99th percentile.

**Exhibit 4: Distribution of Facilities for Brain CT in ED
for Atraumatic Headache Measure: 2007**

National average = 0.348

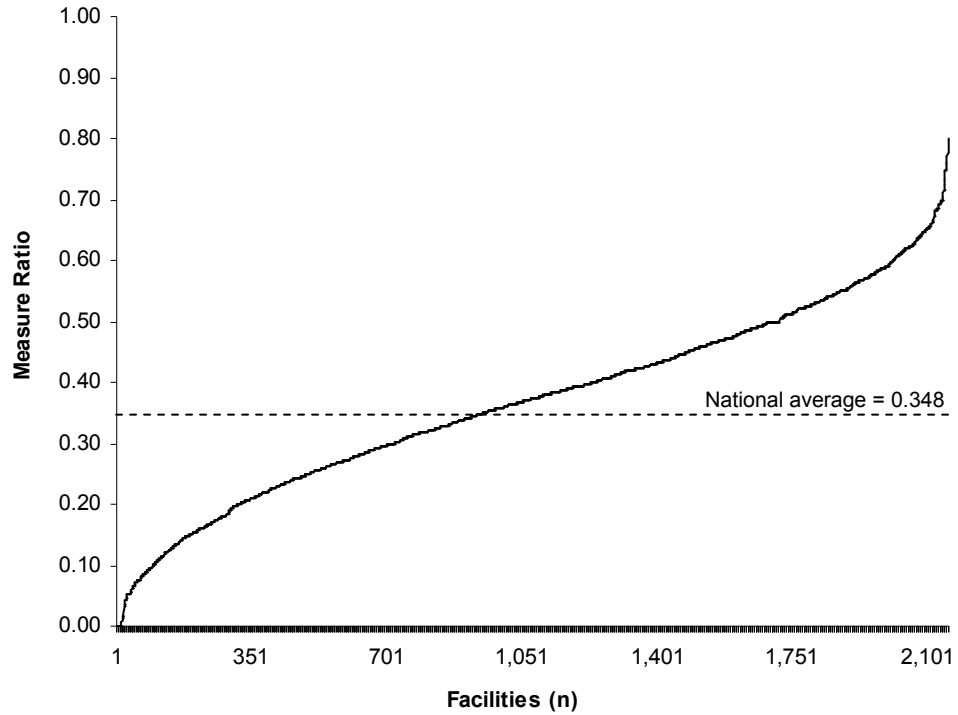Measure Ratio

Facilities (n)

Exhibit 5 presents the measure ratios by geographic area, teaching status, and bed size cohorts. In this case, it appears that facilities in urban areas, as well as teaching facilities have higher ratios. Also, there clearly is an increasing trend in the ratio as hospital bed size increases.

Exhibit 5: CT Brain in ED for Atraumatic Headache Measure Ratios by Geographic Area, Teaching Status, and Bed Size Cohorts: 2007

Characteristic	Ratio
United States	0.348
Geographic Area	
Rural	0.254
Urban	0.376
Teaching Status	
Non-Teaching	0.321
Teaching	0.377
Major Teaching	0.425
Bed Size	
0 – 50	0.168
51 – 100	0.259
101 – 250	0.336
251 – 500	0.406
Greater than 500	0.431

Exhibit 6 displays the state level variation in the CT Brain in ED for atraumatic headache measure. The state measure ratios range from 0.19 in Alaska to 0.55 in New Jersey. For this measure, urban areas tend to have higher ratios, as evidenced by states with larger metropolitan areas such as New York (0.47) and Florida (0.49).

Exhibit 6: State Level Variation in CT Brain in ED for Atraumatic Headache Measure: 2007
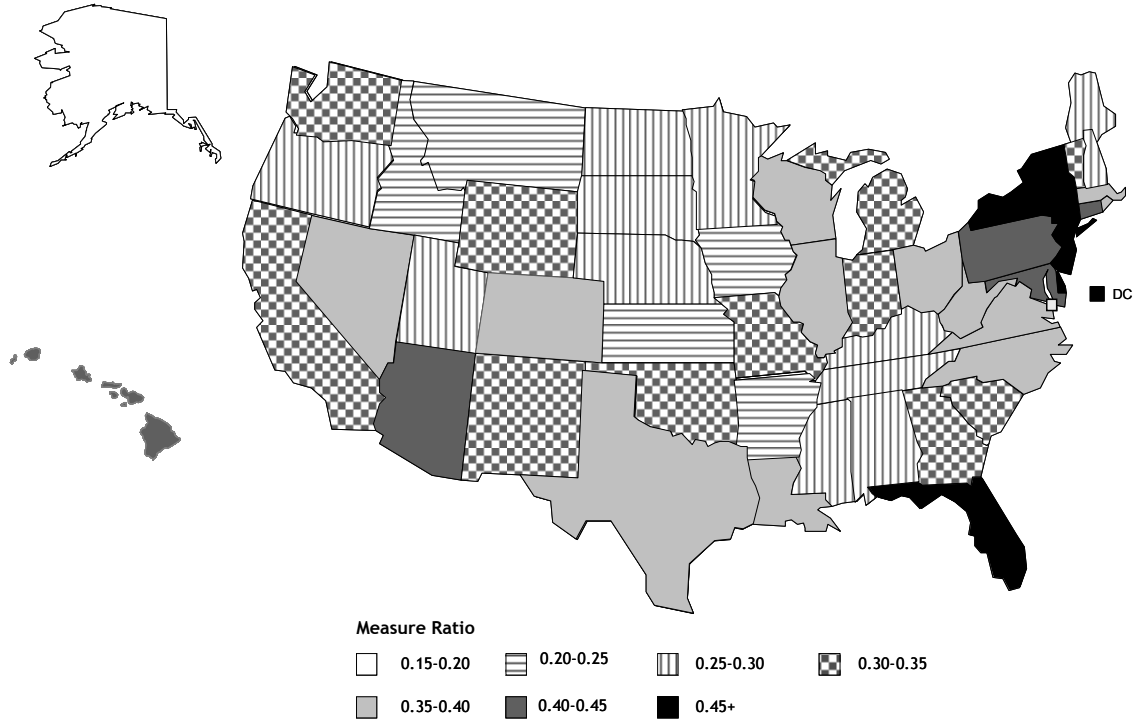
Measure #/Title/Steward

#IEP-013-10 Use of Brain Computed Tomography (CT) in the Emergency Department (ED) for Atraumatic Headache/CMS

Description

This measure calculate the percentage of Emergency Department (ED) visits for headache with a coincident brain computed tomography (CT) study for Medicare beneficiaries. The results are segmented and reported at the facility level.

Initial In-person Vote
Recommend for endorsement with conditions – 15
Not recommend for endorsement - 4

Steering Committee Questions/Conditions for Measure Developer:	Abbreviated Response from Measure Developer:
• Develop a set of implementation instructions to provide guidance on how to implement the measure	• CMS is amenable to and is pursuing clarifications for the implementation steps and guidance • Please see detailed implementation instructions below.

Detailed Response from Measure Developer:
For the purposes of this measure calculation, we assume that a visit is equal to a day. Therefore, if a patient had multiple Brain CTs in the ED the same day, the patient would only be included in the denominator once and in the numerator once. However, if the multiple Brain CTs were conducted on different days the patient would be included in the denominator and numerator more than once.

For visits to be counted in the measure, headache must be the primary diagnosis on the ED claim.

Given these parameters, to calculate this measure:

1. Identify patients seen in the ED for headache using Medicare hospital outpatient claims data on a specific day, including only those claims where headache is the primary diagnosis on the ED claim.
    a. This is the denominator prior to exclusions.
2. Apply the measure exclusions to the denominator.
    a. Exclusions include codes for lumbar puncture, dizziness, paresthesia, lack of coordination, subarachnoid hemorrhage, complicated or thunderclap headache, focal neurologic deficit, pregnancy, trauma, HIV, tumor/mass. These exclusion codes must be included on the ED claim.
    b. Further, exclude all patients admitted to the hospital.

      c.   This is the final denominator.
3. Of the patients remaining in the denominator, determine which patients also received a Brain CT on the same day using Medicare hospital outpatient claims data.
      a.   This is the numerator.
4. Calculate the measure ratio of the numerator to the denominator.

The measure developer believes confusion over this measure stems from the way the denominator and exclusions are written. As such, we propose to rewrite the denominator statement to make sure it is clear that the exclusions are the indications for use of Brain Computed Tomography (CT).

O**riginal Denominator:** ED patient visits with a primary diagnosis code of headache

Original Exclusions: Claims with secondary diagnosis codes related to:

- lumbar puncture,
- dizziness, paresthesia,
- lack of coordination,
- subarachnoid hemorrhage,
- complicated or thunderclap headache
- focal neurologic deficit
- pregnancy
- trauma
- HIV
- tumor/mass

Imaging studies for ED patients admitted to the hospital.

Proposed Revised Denominator: ED patient visits with a primary diagnosis code of headache who are not admitted to the hospital and with no secondary diagnosis codes related to:

- lumbar puncture,
- dizziness, paresthesia,
- lack of coordination,
- subarachnoid hemorrhage,

- complicated or thunderclap headache
- focal neurologic deficit
- pregnancy
- trauma
- HIV
- tumor/mass

For patients visiting the ED with a primary diagnosis of headache and one of the above secondary diagnoses, the presence of these secondary diagnoses potentially indicates that a CT brain imaging study may be indicated, depending upon the individual physician assessment of the particular patient.