



# Choosing Wisely® Recommendation Analysis: Prioritizing Opportunities for Reducing Inappropriate Care

---

IMAGING FOR UNCOMPLICATED HEADACHE

Sarah Jane Reed, MSc and Steven Pearson, MD, MSc  
INSTITUTE FOR CLINICAL AND ECONOMIC REVIEW

---

# IMAGING FOR UNCOMPLICATED HEADACHE

---

## Evidence Justification

*The American College of Radiology (ACR) and the American Headache Society recommend against the use of imaging for uncomplicated or stable headaches. We summarize the reasoning provided by these clinical societies to justify the inclusion of this service, including assignment of this service into one of 5 evidentiary categories of “wasteful” services arising from the evidence on benefits, risks, and costs (Gliwa, 2014).*

### American College of Radiology

**Don’t do imaging for uncomplicated headache.**

### American Headache Society

**Don’t perform neuroimaging studies in patients with stable headaches that meet criteria for migraine.**

### Specialty Society Rationale

*Headaches are among the most common clinical ailments in the United States. Physicians perform tests such as computed tomography (CT) and magnetic resonance imaging (MRI) for headaches to identify serious life-threatening events, such as brain tumors or subarachnoid hemorrhage. Clinical guidelines state that imaging for headaches is typically not needed and most underlying causes can be adequately diagnosed through clinical examination, though special consideration is warranted in the following instances: headaches with sudden onset and maximum severity; presence of neurological symptoms indicating a secondary cause; signs suggesting a systemic disorder; headaches that are worsened by exertion; or headaches that are new or different than a patient’s typical pattern of headaches, especially for individuals aged 50 and over (Douglas et al., 2013; Beithon et al., 2013; Sandrini et al., 2011; Frishberg et al., 2000; Edlow et al., 2008).*

*For patients with uncomplicated headaches, however, imaging studies are unlikely to alter clinical management or improve patient outcomes (American College of Radiology, 2012). Diseases or*

structural disorders that present with headache are exceedingly rare, with most headaches stemming from benign conditions. According to the American College of Radiology, the annual incidence of brain tumors in is 46 per 100,000 individuals, while the annual incidence of subarachnoid hemorrhage is even less common, occurring in 9 per 100,000 persons in the U.S. (2012). Studies estimate that neuroimaging in patients with chronic headaches identifies significant abnormalities in only 1% to 3% of cases (Clarke et al., 2010; Sempere et al., 2005; Wang et al., 2001).

Imaging studies may also cause adverse events, including unnecessary exposure to radiation and increased chances for false-positive test results that lead to unnecessary follow-up testing that may be expensive and cause patient anxiety. The cost of nuclear imaging studies can also be substantial. The cost of a CT scan is approximately \$340, and can rise to over \$800 if used with a contrasting agent to provide a clearer image (healthcarebluebook.com). MRI scans are also expensive, costing between \$660 and \$1000 if used with a contrasting agent (healthcarebluebook.com). Since many health plans require coinsurance for imaging tests, unnecessary scans can also pose a significant financial burden to patients.

**Table 1. “Wasteful Care” Evidence Category**

1. Insufficient evidence to evaluate comparative benefit for any indication
2. Insufficient evidence to evaluate comparative benefit for use beyond the boundaries of established indications, frequency, intensity, or dosage
<b>3. Adequate evidence demonstrating equivalent benefit with higher risk, higher cost, or both</b>
4. Adequate evidence demonstrating a small comparative benefit not large enough to justify the higher risk to patients, higher cost, or both
5. Adequate evidence demonstrating improved comparative benefit, lower risk, lower cost, or both when using the intervention

Source: Gliwa and Pearson, 2014

## Current Use and Variation in Practice

- *Estimated population affected: 544,000– 817,000\**
- *Excess Cost of Practice: \$146 million – \$211 million\**

*\*Estimates are for Medicare population only*

*Source: Schwartz AL, Landon BE, Elshaug AG, et al., Measuring Low-Value Care in Medicare. JAMA Intern Med. 2014;174(7):1067-1076.*

Even though several clinical specialty society guidelines recommend against the use of imaging for uncomplicated headache, neuroimaging remains an area of substantial overuse. One study using National Ambulatory Medical Survey data between 2007 and 2010 estimated that among 51.1 million outpatient headache visits, neuroimaging with CT or MRI was utilized in approximately 6 million (12%) of general headache visits and 2.5 million (10%) of all migraine headache visits (Callaghan et al., 2014). This study also found that the rate of neuroimaging increased between 2007 and 2010 from approximately 10% to 15% for all headache visits. A recent study of Medicaid beneficiaries in Washington state also found significant levels of overuse, estimating that among beneficiaries with a health care visit for a primary diagnosis of acute, uncomplicated headache, 25% of enrollees received a CT scan or MRI test (Washington Health Alliance, 2014). Another retrospective study of Medicare claims data from 2009 evaluating the prevalence of low-value services found that among a representative sample of approximately 1.4 million beneficiaries, 30,000 - 42,000 (2% - 3%) of all individuals had an uncomplicated headache visit with a CT scan or MRI (Schwartz et al., 2014). When these results are applied to the entire Medicare population, it was estimated that 544,000 – 817,000 patients per year undergo unnecessary neuroimaging for uncomplicated headache.

The costs of non-indicated neuroimaging can be significant. One study estimated that national annual expenditures on neuroimaging studies during outpatient headache visits accounts for nearly \$1 billion (Callaghan et al., 2014). The Schwartz study found that annual Medicare spending on imaging for uncomplicated headache ranged from \$146 million - \$211 million depending on certain underlying assumptions (2014). These estimates do not include any costs associated with follow-up care yielded by test results, so the potential for cost-savings from reducing overuse may be higher.

## Sociology of Practice

*We conducted unstructured interviews with national clinical experts representing the fields of radiology and internal medicine to understand the multi-faceted influences that drive the use of the neuroimaging studies for uncomplicated headache, as well as the most effective methods to reduce inappropriate use of these services. Key themes and lessons from these conversations are summarized below.*

Several factors combine to make imaging for uncomplicated headache an area of significant overuse. Interviewees considered patient preferences and lack of education to be major contributors to unnecessary care, as many patients want reassurance against brain tumors, aneurysms, or other serious conditions, but have little understanding that uncomplicated headaches are so infrequently associated with these conditions that neuroimaging is extremely unlikely to find anything or to alter management. Patients also have poor appreciation of the potential harms of radiation exposure or the potential for unnecessary downstream testing caused by false positive results. Experts acknowledge the work of Consumer Reports® and the American College of Radiology as part of the Choosing Wisely® initiative to create informational materials to help patients better identify when imaging for headache may be necessary, though experts felt more campaigns and resources are needed to support the uptake and use of these materials in practice.

Experts also noted that due to cuts to reimbursement, physicians have increased patient caseloads and now have less time to adequately explain the harms of over-testing in a way that assuages patient concerns. Radiology experts highlighted the challenge of explaining to a patient after a test has been ordered that imaging is not required. Since the physician performing the imaging study is typically not the same person who ordered it, experts noted that they often do not realize that a study is unnecessary until the patient is already in their office. Clinicians are also increasingly provided bonuses for patient satisfaction, making doctors more inclined to overprescribe or perform additional tests since high patient satisfaction ratings tend to correlate with performing more, costlier care.

Though patient demand was consistently raised as the major driver of overuse in this area, experts noted that provider education and training also play a role. Radiologists interviewed reiterated that they are often unaware of the details of a patient's evaluation and whether or not imaging was indicated until after the study has been completed, signaling a need for greater provider education and decision support at the point of test ordering. Though there is

consensus across clinical specialty society guidelines that imaging for uncomplicated headaches is unnecessary, some ordering physicians may not be familiar with these standards or may not have an understanding of how infrequently headaches are caused by structural factors. Experts therefore suggested that more publicity and education around the guidelines would be beneficial, as well as training for clinicians on how to take a comprehensive medical history and perform adequate clinical follow-up for headaches. A medical history and neurologic exam should make it easy for a clinician to determine when imaging is necessary. Additional guidance would particularly support primary care clinicians, who sometimes receive limited training on neuroimaging during their medical education and may be less confident in judging when further evaluation is unnecessary.

Ironically, EMRs were raised as another potential driver of overuse, since in the short term some new systems make it more complicated to find information on medical history that helps clinicians determine that neuroimaging is unnecessary. Physicians interviewed recognized that over time EMR systems will simplify how information is coded and organized, but for now these systems can add a layer of complexity to physician decision-making. Other experts noted that the transition to EMR may provide additional opportunities to curb overuse, as some software integrates decision-support tools that default to appropriate testing options based on clinical standards. This innovation will make it more difficult for a physician to justify unnecessary testing and easier for health systems to identify outliers.

Experts perceived financial incentives to be a less important source of waste in this area, since the physician who orders a neuroimaging test does not typically gain revenue by performing the study. Interviewees recognized, however, that clinicians who have MRI or CT scan machines in their office may have an economic self-interest to provide further testing if they are able to self-refer.

Physicians interviewed identified emergency departments as a unique environment that foster overuse in this area. First, emergency physicians typically have less knowledge of a patient's medical history and less time to perform a comprehensive medical evaluation to identify the source of the headache. Moreover, the fear of potentially missing a life-threatening condition is heightened in the urgent care or emergency care environment. Emergency departments also face unique financial incentives, as physicians are especially motivated to clear patients quickly in order to free up rooms for additional patients and to maximize potential revenue. Referring a patient for imaging is the quickest way to clear a patient for discharge from the emergency department, and since emergency departments are scored and often receive financial bonuses based on waiting times, the financial incentive to provide unnecessary imaging is magnified.

Lastly, interviewees consistently emphasized the importance of tort reform to reduce overuse, as many doctors continue to practice medicine defensively out of fear of liability. However, a growing body of evidence suggests that malpractice reform would have a marginal impact on health care spending and the provision of wasteful services (Carroll, 2014).

Though imaging for uncomplicated headache remains an area of waste, physicians interviewed agreed that progress has been made to reduce unnecessary care in this area. First, health plans commonly require preauthorization for outpatient imaging services, including MRI and CT scans, or contract with Radiology Benefits Management Programs (RBMPs) to help control overutilization (ACR RBMA, 2012). Non-indicated imaging for headache is identifiable using existing claims codes to help payers identify when imaging is performed unnecessarily, making it feasible to recognize overuse and target outliers accordingly. Physicians interviewed also mentioned that preauthorization policies can be helpful when managing pressure from patients wanting an imaging test that is non-indicated. Some experts cautioned, however, that efforts should be made to make preauthorization policies as streamlined as possible, since the administrative burden on clinicians to receive approval for indicated imaging tests can be a separate source of inefficiency. Experts also emphasized that payment reform and the evolution towards capitated reimbursement and accountable care delivery systems may further reduce financial incentives for over testing.

## Summary Statement: Drivers of Overuse and Opportunities for Improvement

*Based on our research and conversations with national experts, this section synthesizes the major factors related to overuse, as well as any opportunities for improvement or existing best practices for reducing wasteful care.*

Factors Related to Overuse		
<i>Patient Factors</i>	<i>Physician Factors</i>	<i>Payer Factors</i>
<ul style="list-style-type: none"> <li>• Patient demand/lack of knowledge that structural causes for headaches are exceptionally rare and that diagnostic testing is unlikely to alter clinical management</li> <li>• Patient inconvenience and dissatisfaction when tests are cancelled by the radiologist</li> </ul>	<ul style="list-style-type: none"> <li>• Inadequate education and awareness of guidelines at the point of order</li> <li>• Challenges with patient engagement on risks/harms of over testing</li> <li>• Financial incentives that reward the provision of costly procedures, particularly in the area of emergency medicine</li> <li>• Complicated EMR systems that make it difficult to access a patient’s medical history and determine whether testing is necessary</li> <li>• Concerns for liability</li> </ul>	<ul style="list-style-type: none"> <li>• Payment models that reward volume of services</li> </ul>
Opportunities for Improvement/Current Best Practices		
Opportunities for Improvement	Current Best Practices	
<ul style="list-style-type: none"> <li>• Further Disseminate and develop further talking points for physicians on the risks/harms of unnecessary screening</li> <li>• Provide further guidance at the point of order, emphasizing how infrequently structural disorders present with headache</li> <li>• Provide additional training to physicians on how to perform a comprehensive neurological examination and follow-up to help providers distinguish when further imaging is necessary</li> <li>• Make greater use of global payment arrangements that reduce incentives to over test patients</li> <li>• Explore options for tort reform that reduce physician’s liability for applying appropriate clinical criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Prior authorization policies for outpatient MRI and CT scan services to control overutilization</li> <li>• Capitated reimbursement and accountable care delivery systems that help reduce financial incentives for over testing</li> </ul>	



## Summary Rating

This section synthesizes the information provided previously and presents a recommended priority ranking of whether this service is likely to represent the best opportunity for policy makers to improve practice and drive change. These rankings are based on considerations of 5 factors illustrated in the table below.

<i>Criteria</i>	<i>Ranking</i>
<i>Level of overuse</i>	★ = Limited overuse ★ ★ = Moderate overuse ★ ★ ★ = Substantial overuse
<i>Magnitude of individual patient harm</i>	★ = Limited harm ★ ★ = Moderate harm ★ ★ ★ = Substantial harm
<i>Ease of overcoming patient, clinician, and system barriers to reduce inappropriate care</i>	★ = Limited ease ★ ★ = Moderate ease ★ ★ ★ = Substantial ease
<i>Potential to leverage existing change programs and policy efforts</i>	★ = Limited potential ★ ★ = Moderate potential ★ ★ ★ = Substantial potential
<i>Amount of potential savings</i>	★ = Limited savings ★ ★ = Moderate savings ★ ★ ★ = Substantial savings

<i>Category</i>	<i>Score</i>	<i>Rationale</i>
<i>Level of overuse</i>	★★★	<ul style="list-style-type: none"> <li>• Determined to be a significant level of overuse according to multiple studies comparing areas of low value care among Medicare beneficiaries</li> <li>• Headaches are among the most common medical conditions in the U.S.</li> </ul>
<i>Magnitude of individual patient harm</i>	★★	<ul style="list-style-type: none"> <li>• Can potentially lead to downstream testing that causes patient anxiety and unnecessary exposure to radiation</li> </ul>
<i>Ease of overcoming patient, clinician, and system barriers to reduce inappropriate care</i>	★★	<ul style="list-style-type: none"> <li>• Diagnostic codes available to identify unnecessary use with existing billing codes</li> <li>• Payer policies already limit unindicated use</li> </ul>
<i>Opportunity to leverage existing change programs and policy efforts</i>	★★★	<ul style="list-style-type: none"> <li>• Patient education materials available through Choosing Wisely® initiative with opportunities for greater dissemination</li> <li>• Consensus across clinical guidelines suggest opportunity for uniformed messaging and training for provider at point of order</li> </ul>
<i>Amount of potential savings</i>	★★★	<ul style="list-style-type: none"> <li>• Tests are costly, and eligible patient population is large</li> </ul>

# References

American College of Radiology and Radiology Business Management Association. Best practice guidelines on radiology benefits management programs. <http://www.acr.org/~media/ACR/Documents/PDF/Economics/Managed%20Care/ACRRBMARBMGuidelines>. Published 2012. Accessed November 2014.

American College of Radiology. Imaging tests for headaches: when you need them – and when you don't, 2012. Available at: <http://www.choosingwisely.org/doctor-patient-lists/imaging-tests-for-headaches/>. Accessed November 2014.

Beithon J, Gallenberg M, Johnson K, et al. Diagnosis and treatment of headache. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2013 Jan. 90 p.

Callaghan BC, Kerber KA, Pace RJ, Skolarus LE, Burke JF. Headaches and neuroimaging: High utilization despite and costs despite guidelines. *JAMA Intern Med*. 2014;174(5):819-821.

Carroll A. Malpractice reform won't do much to reduce health spending. *The New York Times: The Upshot*. Published November 3, 2014. <http://www.nytimes.com/2014/11/04/upshot/malpractice-reform-wont-do-much-to-reduce-health-spending.html?smid=tw-share&r=2&abt=0002&abg=0>. Accessed November 2014.

Clarke CE, Edwards J, Nicholl DJ, Sivaguru A. Imaging results in a consecutive series of 530 new patients in the Birmingham Headache Service. *J Neurol*. 2010;257(8):1274-1278.

Douglas AC, Wippold, FJ II, Broderick DF, Aiken AH, et al., Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® headache. Reston (VA): American College of Radiology (ACR); 2013. Available at <http://www.guideline.gov/content.aspx?id=47673>. Accessed November 2014.

Edlow J, Panagos P, Godwin S, Thomas T, and Decker W. Clinical policy: critical issue in the evaluation and management of adult patients presenting in the emergency department with acute headache. *Annals of Emergency Medicine*. 2008;51(4):407-436.

Frishberg BM, Rosenberg JH, Matchar DB, et al. Evidence-based guidelines in the primary care setting: Neuroimaging in patients with nonacute headache. *American Academy of Neurology*. Available at <http://tools.aan.com/professionals/practice/pdfs/gl0088.pdf>. Accessed November 2014.

Gliwa C, Pearson SD. Evidentiary rationales for the Choosing Wisely “Top 5” lists. *JAMA*. 2014;311(14):1443-1444.

Healthcare Bluebook. Brain CT (no contrast). 2014. Accessed at [https://healthcarebluebook.com/page\\_ProcedureDetails.aspx?id=130&dataset=MD&g=Brain+CT+\(no+contrast\)](https://healthcarebluebook.com/page_ProcedureDetails.aspx?id=130&dataset=MD&g=Brain+CT+(no+contrast)). November 2014.

Healthcare Bluebook. Brain CT (with contrast). 2014. Accessed at [https://healthcarebluebook.com/page\\_ProcedureDetails.aspx?id=139&dataset=MD&g=Chest+CT+\(with+contrast\)](https://healthcarebluebook.com/page_ProcedureDetails.aspx?id=139&dataset=MD&g=Chest+CT+(with+contrast)). November 2014.

Sandrini G, Friberg L, Coppola, G. Neuropsychological tests and neuroimaging procedures in non-acute headache (2<sup>nd</sup> edition). *Eur J Neurol*. 2011;18(3):373-381.

Schwartz AL, Landon BE, Elshaug AG, et al., Measuring Low-Value Care in Medicare. *JAMA Intern Med.* 2014;174(7):1067-1076.

Sempere AP, Porta-Etessam J, Medrano V. Neuroimaging in the evaluation of patients with non-acute headache. *Cephalalgia.* 2005;25(1):30-35.

Wang SJ, Fuh JL, Juang KD. Quality of life differs among headache diagnoses: Analysis of SF-36 survey in 901 headache patients. *Pain.* 2001;89(2):285-292.

Washington Health Alliance. Less waste. Less harm. Choosing Wisely® in Washington State, 2014. Available at: <http://wahealthalliance.org/wp-content/uploads/2014/09/Choosing-Wisely-in-Washington-state.pdf>. Accessed November 2014.