

---

## Views and Perspectives

---

### Choosing Wisely in Headache Medicine: The American Headache Society's List of Five Things Physicians and Patients Should Question

Elizabeth Loder, MD, MPH; Emma Weizenbaum, BA; Benjamin Frishberg, MD; Stephen Silberstein, MD;  
on behalf of the American Headache Society Choosing Wisely Task Force

In an effort to draw attention to tests and procedures associated with low-value care in headache medicine, the American Headache Society (AHS) joined the Choosing Wisely initiative of the American Board of Internal Medicine Foundation. The AHS president appointed an ad hoc "Choosing Wisely" task force of the AHS. The committee surveyed AHS members to develop a candidate list of items for the AHS "Top 5" list of low-value care in headache medicine. Through a process of literature review and consensus, the final list of five items was chosen. Draft recommendations went through several rounds of revision and a process of outside review. The AHS Board of Directors approved the final list of "Five Things." The five recommendations approved by the AHS Board of Directors are: (1) don't perform neuroimaging studies in patients with stable headaches that meet criteria for migraine; (2) don't perform computed tomography imaging for headache when magnetic resonance imaging is available, except in emergency settings; (3) don't recommend surgical deactivation of migraine trigger points outside of a clinical trial; (4) don't prescribe opioid- or butalbital-containing medications as a first-line treatment for recurrent headache disorders; and (5) don't recommend prolonged or frequent use of over-the-counter pain medications for headache. We recommend that headache medicine specialists and other physicians who evaluate and treat headache disorders should use this list when discussing care with patients.

**Key words:** headache, Choosing Wisely, imaging, migraine surgery, medication overuse

(*Headache* 2013;53:1651-1659)

---

From the John R. Graham Headache Center, Boston, MA, USA (E. Loder and E. Weizenbaum); Division of Headache and Pain, Department of Neurology, Brigham and Women's Hospital, Boston, MA, USA (E. Loder and E. Weizenbaum); The Neurology Center, San Diego, CA, USA (B. Frishberg); Department of Neurology, Jefferson Headache Center, Thomas Jefferson University, Philadelphia, PA, USA (S. Silberstein).

Address all correspondence to E. Loder, Department of Neurology, Brigham and Women's Faulkner Hospital, 1153 Centre Street, Suite 4970, Boston, MA 02130, USA.

Accepted for publication September 6, 2013.

In 2012, the American Board of Internal Medicine (ABIM) Foundation launched a campaign called *Choosing Wisely*. The goal of the project was to encourage discussion about medical care that might be unnecessary or even harmful.<sup>1</sup> Project leaders

---

*Conflict of Interest:* We have no conflicts of interest relevant to this paper.

*Financial Support:* No financial support.

Members of the American Headache Society Choosing Wisely Task Force: Elizabeth Loder, AHS President, Chair; Stephen Silberstein, Chair of the Guidelines and Position Statements Committee; Benjamin Frishberg; Randolph W. Evans; Scott Litin; Josif Stakic; Donald Dwork; Jessica Ailani.

invited physician specialty societies to submit lists of five things that “physicians and patients should question” in order to make “wise decisions about the most appropriate care based on the individual situation.” The head of the ABIM Foundation, Dr. Christine Cassel, remarked that these lists were “intended to start a national conversation about eliminating waste and unnecessary tests and procedures that don’t benefit the patient and can even cause harm.”<sup>2</sup>

The first set of lists by nine societies was released in April 2012. The announcement generated substantial attention in the lay press as well as the medical community.<sup>3</sup> The second set of lists by 16 societies was released in early 2013 and generated a similar amount of attention. The American Headache Society (AHS) has joined roughly 30 other specialty societies that are participating in the creation of the third set of lists. This paper describes the AHS list development process and provides the rationale and supporting evidence for each recommendation.

## **METHODS**

The ABIM requested that each participating specialty society identify commonly used tests, medications, or other treatments in their specialty for which harms often outweigh benefits, or which are known to be misused or overused. Participating societies were free to develop their own methods for list creation as long as the process was documented and described.

The AHS president appointed an ad hoc AHS “Choosing Wisely” committee of eight headache specialists. The committee was intended to be broadly representative of the AHS membership, and included trainee members, members in private practice, as well as academic headache specialists with expertise in evidence appraisal and synthesis. Committee members were: Elizabeth Loder, AHS President and Chair; Stephen Silberstein, Chair of the AHS Guidelines and Position Statement Committee; Benjamin Frishberg; Randolph W. Evans; Jessica Ailani; Scott Litin; Josif Stakic; and Donald Dworek.

The committee sent an electronic survey to AHS members in order to generate a list of candidate items for the list. The survey asked members to identify tests, procedures, or treatments in headache medicine that were commonly overused or misused.

The committee reviewed the items via email and in person discussions, and reached consensus about the five to undergo further development. These items were selected based on situations commonly encountered in headache medicine that were associated with poor patient outcomes, low value care, or documented overuse or misuse of resources.

In accordance with ABIM guidelines for list development, individual committee members developed draft recommendations for each of the five items, along with supporting evidence statements. Among other things, the ABIM guidelines specified that each item should be “presented as a single, action-oriented sentence” no more than 15 words long. Evidentiary statements of less than 75 words were to follow each recommendation to give a brief overview of the “evidence and thinking behind the recommendation.”

The draft recommendations were reviewed and discussed by the full committee. The committee considered multiple iterations of each recommendation and reached consensus on a final list of five. This proposed list was submitted to the ABIM Foundation, which sent it to two outside physician reviewers who provided feedback on the list. Based on suggestions from these reviewers, minor revisions and changes in wording were made to several items on the list. The AHS executive committee and board of directors then unanimously approved the five recommendations.

## **RESULTS**

Thirty-six AHS members suggested over 100 candidate items for the list. The overuse or misuse of imaging studies for headache was the most commonly mentioned problem. The vast majority of these responses identified overuse of plain computed tomography (CT) scans of the head as the problem, with some mentioning that these should only be used if intracranial hemorrhage is suspected. Overuse of plain skull films, sinus films, and cervical spine imaging were also nominated as candidate items for the list. Many of the responses were similar or identical. Consolidation resulted in a list of 11 items (Table 1). The final five recommendations were chosen from this list (Table 2). They are listed below,

**Table 1.—Candidate Items for the AHS “Five Things” List of Overused or Misused Tests and Treatments in Headache Medicine**

---



---

1. Overuse of imaging – the most commonly mentioned – (26/36 respondents)
2. Overuse of opioids – the second most commonly mentioned – some respondents specified overuse in emergency department setting
3. Overuse of butalbital-containing compounds
4. Overuse of EEGs in cases of headache
5. Problems relating to triptans, such as underdosing or requiring an EKG or cardiac clearance before prescribing triptans even to people at low risks for cardiovascular disease
6. Overuse of caffeine-containing medications
7. Overuse of surgery for headache – some specified rhizotomy, occipital nerve procedures, sinus surgery, or surgery for presumed Chiari malformation
8. Overuse of facet injections and radiofrequency procedures for headache
9. Misuse of botulinum toxin for episodic migraine and nonmigraine headache
10. Overuse of dietary manipulation, allergy testing, homeopathy, craniosacral therapy, or chiropractic treatment
11. Bioidentical hormone treatment for menstrual migraine

---

followed by the evidentiary statement that will be published after the recommendation, and commentary providing a more detailed explanation and review of the evidence supporting each statement.

### Recommendations

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

**Table 2.—The American Headache Society “Choosing Wisely” Recommendations**

---



---

1. Don't perform neuroimaging studies in patients with stable headaches that meet criteria for migraine
2. Don't perform CT imaging for headache when MRI is available, except in emergency settings
3. Don't recommend surgical deactivation of migraine trigger points outside of a clinical trial
4. Don't prescribe opioid or butalbital-containing medications as first-line treatment for recurrent headache disorders
5. Don't recommend prolonged or frequent use of over-the-counter pain medications for headache

---

- Numerous evidence-based guidelines agree that the risk of intracranial disease is not elevated in migraine. However, not all severe headaches are migraine. To avoid missing patients with more serious headaches, a migraine diagnosis should be made after a clinical history and an examination that documents the absence of any neurologic findings, such as papilledema. Diagnostic criteria for migraine are contained in the International Classification of Headache Disorders.<sup>4,7</sup>

*Comment.*—In clinical practice, it is common to encounter patients with headache who have undergone multiple imaging procedures. These often involve exposure to ionizing radiation. The reasons for these repeated and unnecessary scans are not well understood, but probably include physician fear of missing a dangerous cause of headache and a desire to allay patient anxiety over possible missed abnormalities, especially when treatment is unsuccessful. In some cases, duplicate scans may be ordered because the physician is unaware of previous testing. The risk of unneeded testing may be especially high in the emergency department, where physicians are unfamiliar with the patient and fear missing serious causes of headache.

In ordering diagnostic tests, though, the possible adverse effects of testing must be balanced against the likely benefits to the patient. In particular, the potential adverse health effects of radiation exposure should be taken into consideration when ordering diagnostic testing for headache. In many situations, it is very unlikely that a repeat imaging study of the head will identify any abnormality that will alter management. The radiation risks of CT scanning are not negligible. Younger people are at higher risk of radiation adverse effects than older people. The authors of a recent review of the risks of diagnostic CT scans concluded, “In summary, there is direct evidence from epidemiologic studies that the organ doses corresponding to a common CT study . . . result in an increased risk of cancer. The evidence is reasonably convincing for adults and very convincing for children.”<sup>8</sup> A single CT scan of the head exposes patients to an average of 2 mSV of radiation, the equivalent of 8 months of background radiation.<sup>9</sup>

A recently published article noted that 24 of the initial 45 Choosing Wisely recommendations concerned diagnostic radiology tests or procedures. The authors suggested that this emphasis is appropriate in view of the known risks of radiation exposure. They noted that “if Choosing Wisely is successful and dissuades only nonindicated examinations, it may save lives in addition to money.”<sup>10</sup>

One other professional society has also released a recommendation relating to appropriate use of imaging studies for headache. The American College of Radiology Five Things List includes a recommendation that states, “Don’t do imaging for uncomplicated headache.”<sup>11</sup> The AHS recommendation is more specific and limited to patients who meet diagnostic criteria for migraine. The committee did not find sufficient high-quality evidence to make a broader recommendation about headaches that do not meet criteria for migraine.

Previous recommendations on chronic headache and neuroimaging found sufficient evidence to state that the incidence of imaging abnormalities in migraine patients is not greater than in nonmigraine patients, but for headaches that are not consistent with migraine, there is insufficient evidence to make a recommendation.<sup>12</sup> It is not easy to define what constitutes an “uncomplicated” headache. The committee found that it was important that decisions about imaging be based on a clear diagnosis and a thorough history and physical examination rather than subjective impressions about the stability or complexity of a headache disorder.

2. *Don’t perform CT imaging for headache when MRI is available, except in emergency settings.*

- When neuroimaging for headache is indicated, MRI is preferred over CT, except in emergency settings when hemorrhage, acute stroke, or head trauma are suspected. MRI is more sensitive than CT for the detection of neoplasm, vascular disease, posterior fossa and cervicomedullary lesions, and high and low intracranial pressure disorders. CT of the head is associated with substantial radiation exposure that may elevate the risk of later cancers, while there are no known biologic risks from MRI.<sup>6,8,13,14</sup>

*Comment.*—When neuroimaging is needed for the evaluation of headache, good quality evidence supports the view that MRI is more sensitive than CT scanning to detect most serious underlying causes of headache. The exception is settings in which acute intracranial bleeding is suspected. A Canadian government health technology assessment group recently reviewed the evidence and cost-effectiveness of the use of CT and MRI scanning for the evaluation of patients with headache. The researchers found that when performed for the indication of headache, the diagnostic yield of CT scans was 2%, while that of MRI scans was 5%. Because MRI was better at detecting abnormalities, the cost per abnormal finding of CT scans was \$2409 compared with \$957 for MRI.<sup>6</sup>

Despite the better yield of MRI scans in most settings, CT scans continue to be more commonly ordered than MRI scans. In a review of tests ordered for evaluation of headache in Canadian hospitals, researchers found that MRI accounted for just 13% of imaging studies, while CT accounted for 26.8%.<sup>15</sup> Another reason to prefer MRI to CT scans in situations where a choice is available is that MRI does not expose patients to ionizing radiation. The rationale for avoiding unnecessary radiation exposure is particularly compelling in the case of patients with chronic headache disorders, which are conditions of long duration that often present in early adulthood.<sup>16</sup> The harms of unnecessary exposure to ionizing radiation, particularly from repeated examinations, may be considerable in this group of headache patients.

3. *Don’t recommend surgical deactivation of migraine trigger points outside of a clinical trial.*

- The value of this form of “migraine surgery” is still a research question. Observational studies and a small controlled trial suggest possible benefit. However, large multicenter, randomized controlled trials with long-term follow-up are needed to provide accurate estimates of the effectiveness and harms of surgery. Long-term side effects are unknown but potentially a concern.<sup>17-20</sup>

*Comment.*—This statement includes the phrase “migraine surgery,” because recent publicity about

these procedures uses this terminology. Committee members thought that this term would make it easier for doctors and patients to recognize the procedures in question. The idea of a surgical “solution” to migraine is inherently attractive to patients. Interest in surgical approaches to migraine has been motivated by serendipitous improvement in headaches noted in patients who have undergone various plastic surgery “forehead rejuvenation” procedures. These procedures are based on the premise that contraction of facial or other muscles impinges on peripheral branches of the trigeminal nerve.

The procedures involved are often referred to collectively as “migraine deactivation surgery,” although a variety of surgical sites and procedures are involved. These include resection of the corrugator supercillii muscle with the placement of fat grafts in the site, “temporal release” procedures involving dissection of the glabellar area, transection of the zygomatic temporal branch of the trigeminal nerve, and resection of the semispinalis capitis muscle with placement of fat grafts in the area with the aim of reducing pressure on the occipital nerve. Finally, some surgeons also perform nasal septoplasty or otherwise attempt to address possible intranasal trigger points.<sup>17</sup>

Because the decision about which surgical procedure to perform is often made on an individual basis, it is difficult to objectively study the outcomes of surgery. When initial surgery is unsuccessful, patients may undergo additional procedures to deactivate other trigger points. Patients are often selected for surgery on the basis of improvement in headaches with the injection of OnabotulinumtoxinA and/or occipital nerve blockade, on the theory that response to such temporary procedures is proof of nerve impingement.<sup>18</sup>

However, there is limited evidence to support the view that such surgery is effective or safe. Several randomized studies have been performed, but these have serious methodological weaknesses. Additionally, most studies in the literature have been performed by the same group of surgical proponents and published in a single subspecialty journal.<sup>18,21</sup>

Despite the lack of good quality evidence about the balance of benefits and harms from surgical treatments of migraine, the procedures are becoming more

common. A recent survey of members of the American Society of Plastic Surgeons found that 18% of respondents had performed migraine surgery. Sixty percent of those who had not performed the surgery said they “would be interested if an appropriate patient was referred to them by a neurologist.”<sup>19</sup>

The American Headache Society has issued a statement urging “patients, healthcare professionals and migraine treatment specialists themselves, to exercise caution in recommending or seeking such therapy.” This statement went on to say “In our view, surgery for migraine is a last-resort option and is probably not appropriate for most sufferers. To date, there are no convincing or definitive data that show its long-term value. Besides replacing the use of more appropriate treatments, surgical intervention also may produce side effects that are not reversible and carry the risks associated with any surgery. It also can be extremely expensive and may not be covered by insurance.”<sup>21</sup> Because the value of migraine surgery is still uncertain, the AHS and the Choosing Wisely Task force believe that patients should undergo such treatment only in the context of properly designed clinical trials that are aimed at developing good quality evidence about the harms and benefits of treatment.

4. *Don't prescribe opioid or butalbital-containing medications as first-line treatment for recurrent headache disorders.*

- These medications impair alertness and may produce dependence or addiction syndromes, an undesirable risk for the young, otherwise healthy people most likely to have recurrent headaches. They increase the risk that episodic headache disorders such as migraine will become chronic, and may produce heightened sensitivity to pain. Use may be appropriate when other treatments fail or are contraindicated. Such patients should be monitored for the development of chronic headache.<sup>22-25</sup>

*Comment.*—This recommendation is not meant to imply that opioid or butalbital medications are always inappropriate treatments for recurrent headache treatments. Rather, it is meant to address the appropriate order in which medication classes should

typically be used. The American Academy of Neurology Five Things List includes a similar recommendation “Don’t use opioid or butalbital treatment for migraine except as a last resort.”<sup>26</sup> In the membership survey, the overuse of butalbital-containing and opioid medications was identified as a common problem. The committee felt there is strong evidence that these should be avoided as first-line treatment in all recurrent headache disorders, not just migraine.

Although treatment for individual headaches is used intermittently, the primary recurrent headache disorders (of which migraine, tension-type, and cluster headache are the most common) are conditions of long duration for which such treatment will be used repetitively over many years. Risks and harms that are unimportant in treating a single attack can become important when treatment is used for long periods of time. Once established, medication overuse can be difficult to treat and recidivism is common. Thus, treatments such as triptans or nonsteroidal anti-inflammatory drugs, which are not associated with dependence or sedation, are preferred first-line.

The committee recognized, however, that there are many clinical situations in which the use of these treatments is appropriate, including some situations where they are first-line treatments. These include patients for whom triptans or nonsteroidal anti-inflammatory drugs are contraindicated or ineffective.

5. *Don’t recommend prolonged or frequent use of over-the-counter (OTC) pain medications for headache.*

- OTC medications are appropriate treatment for occasional headaches if they work reliably without intolerable side effects. Frequent use (especially of caffeine-containing medications) can lead to an increase in headaches, resulting in “medication overuse headache” (MOH). To avoid this, OTC medication should be limited to no more than 2 days per week. In addition to MOH, prolonged overuse of acetaminophen can cause liver damage, while overuse of nonsteroidal anti-inflammatory drugs can lead to gastrointestinal bleeding.<sup>5,27-29</sup>

*Comment.*—This recommendation is not intended to discourage appropriate intermittent use of OTC medications for headache. OTC medications are appropriate when they are reliably effective and used sparingly. However, most medications that produce good short-term pain relief can paradoxically worsen headache over time when used too often, a situation termed medication overuse headache. Medication overuse is a strong risk factor for the development of chronic forms of headache. One of the most important tasks of the physician is to help patients balance the desire for immediate relief of pain with longer term goals of preventing medication overuse headache or other complications from medication use.

In the case of OTC medications, it is difficult for physicians to monitor the frequency of medication use. It is easy for medication overuse to develop, especially when patients have frequent headache and perceive that medications sold without a prescription are likely to be safe. Thus, physician inquiry and advice about the frequency and type of medications patients are using to treat headache is very important. Evidence is lacking about the type and amount of medication that can produce medication overuse headache, and individual susceptibility probably varies. Most experts believe, however, that limiting use of medication to 2 days per week makes medication overuse headache unlikely.

## DISCUSSION AND CONCLUSIONS

Headache is among the principal reasons for physician visits and a common cause of emergency department visits. The costs of tests and treatments for headache are not insubstantial, and when unwarranted, they needlessly expose patients to potential harm. In a recent study of the treatments and procedures that contribute most to the \$13 billion dollar annual cost of outpatient neurology visits, migraine alone was the diagnostic category with the second highest costs. For example, using data from the National Ambulatory Medical Care Survey, the authors estimated that CT scans ordered at neurology visits (many of which were probably done to evaluate headache) resulted in costs of roughly \$358 million dollars (95% confidence interval \$197–\$519 million).<sup>30</sup>

The American Headache Society encourages its members and all practitioners who treat people with headache disorders to help address the problem of low value care as we enter an age of medical scarcity and limited resources. It is important to think critically about the evidence for commonly used tests and procedures, and whether possible harms are likely to exceed potential benefits. We recommend that clinicians use the AHS Choosing Wisely list when recommending and discussing care with patients.

*Acknowledgments: We gratefully acknowledge the help of Dr. W.E. Anderson, who provided commentary on a draft version of the list.*

## STATEMENT OF AUTHORSHIP

### Category 1

#### (a) Conception and Design

Elizabeth Loder, Stephen Silberstein

#### (b) Acquisition of Data

Elizabeth Loder, Stephen Silberstein, Benjamin Frishberg, Randolph Evans

#### (c) Analysis and Interpretation of Data

Elizabeth Loder, Stephen Silberstein, Benjamin Frishberg, Randolph Evans, Emma Weizenbaum, Jessica Ailani, Scott Litin, Josif Stakic, Donald Dworek

### Category 2

#### (a) Drafting the Manuscript

Elizabeth Loder, Emma Weizenbaum

#### (b) Revising It for Intellectual Content

Elizabeth Loder, Emma Weizenbaum, Stephen Silberstein, Benjamin Frishberg, Randolph Evans, Jessica Ailani, Scott Litin, Josif Stakic, Donald Dworek

### Category 3

#### (a) Final Approval of the Completed Manuscript

Elizabeth Loder, Emma Weizenbaum, Benjamin Frishberg, Stephen Silberstein, Jessica Ailani, Randolph Evans, Scott Litin, Josif Stakic, Donald Dworek

## APPENDIX

**Output Template.**—We have developed the following guidelines for formatting your “Five Things” lists

of Choosing Wisely recommendations. Please try to adhere to these as it will expedite the subsequent vetting and design steps of the campaign. All the resulting “Five Things” lists will be placed into a uniform design template and provided as web- and print-ready PDFs to you. The content of your lists is requested by September 4, 2012 and can be sent to Daniel Wolfson at [dewolfson@abim.org](mailto:dwolfson@abim.org).

A. Please provide exactly five recommended interventions that include the elements described below. Each recommendation should be presented as a single, action-oriented sentence that is no more than 15 words in length. This will help us focus consistent messages being delivered to physicians and the public as well as provide all of the partnering organizations an equal part in the campaign. The goal is to provide a clear intervention for physicians and patients to consider. Here is an example of a recommendation sentence:

1 Don't do imaging for low back pain within the first 6 weeks unless red flags are present.

B. *Support your recommendation sentences with concise evidentiary statements, less than 75 words in length.* These should provide the evidence and thinking behind the recommendation, and should also specify when the highlighted intervention *is* appropriate. If there are any conditional clauses or stipulations that physicians might need to consider in implementing, be sure to address them. Each statement should flow logically from the headline. Here is an example of the supporting evidentiary statement from the aforementioned headline examples:

1 Don't do imaging for low back pain within the first 6 weeks unless red flags are present.

Imaging of the lumbar spine before 6 weeks does not improve outcomes but does increase costs. Low back pain is the fifth most common reason for all physician visits.

C. For each recommendation, provide a synthesized listing of the primary organization(s) whose resources or research was used as evidence. The designed lists are meant to be very short synopses and not mimic an academic publication. They will include synthesized, informal, nonacademic citations identifying the key sources used in developing the recommendations. If additional or more

detailed information on sources is requested, we will have the full citations and background you provided available to share. Some examples of source lists and appropriate formatting are:

- Sources: American Academy of Family Physicians Guidelines; U.S. Preventive Services Task Force; Institutes of Medicine; *Journal of the American Medical Association*.

D. Try to avoid using complex or clinical terminology – but not at the risk of reducing the value and credibility of the recommendations made. The more accessible and easy-to-understand these lists are, the more likely it is that they will be clearly understood and have a lasting impact. We want physicians, patients, policymakers, reporters, and others to be able to reference them and have a conversation about the wise use of resources, tests, and procedures. That said, please do not feel the need to simplify the recommendations so much that they lack the relevant clinical details and attributes that your peers would expect

**Background Information on List Creation.**—Each participating society can decide what methodology to use in creating its list. In order to allow the campaign to respond to any questions that may be asked by the media or others about methodology, we ask each society to respond to the question below:

Please describe the methodology that you used in creating the list, and list the individuals who participated in the process of selecting the chosen interventions. Please also provide any written guidance that was given to participants.

## REFERENCES

1. Choosing Wisely. Available at: <http://www.choosingwisely.org/> Accessed September 2, 2013.
2. Cassel CK, Guest JA. Choosing Wisely: Helping physicians and patients make smart decisions about their care. *JAMA*. 2012;307:1801-1802. doi: 10.1001/jama.2012.476.
3. Doctors unveil Choosing Wisely campaign to cut unnecessary medical tests. Available at: [http://www.cbsnews.com/8301-504763\\_162-57409204-10391704/doctors-unveil-choosing-wisely-campaign-to-cut-unnecessary-medical-tests/](http://www.cbsnews.com/8301-504763_162-57409204-10391704/doctors-unveil-choosing-wisely-campaign-to-cut-unnecessary-medical-tests/) Accessed September 2, 2013.
4. Frishberg BM. The utility of neuroimaging in the evaluation of headache in patients with normal neurologic examinations. *Neurology*. 1994;44:1191-1197.
5. 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.
6. Health Quality Ontario. Neuroimaging for the evaluation of chronic headaches: An evidence-based analysis. *Ont Health Technol Assess Ser*. 2010;10:1-57.
7. International classification of headache disorders. Available at: [http://www.ihs-headache.org/upload/ct\\_clas/ihc\\_II\\_main\\_no\\_print.pdf](http://www.ihs-headache.org/upload/ct_clas/ihc_II_main_no_print.pdf) Accessed September 2, 2013.
8. Brenner DJ, Hall EJ. Computed tomography – an increasing source of radiation exposure. *N Engl J Med*. 2007;357:2277-2284.
9. Rao VM, Levin DC. The overuse of diagnostic imaging and the Choosing Wisely initiative. *Ann Intern Med*. 2012;157:574-576.
10. Mahesh M, Durand DJ. The Choosing Wisely campaign and its potential impact on diagnostic radiation burden. *J Am Coll Radiol*. 2013;10:65-66.
11. American College of Radiology. Five things patients and physicians should question. Available at: <http://www.choosingwisely.org/doctor-patient-lists/american-college-of-radiology/> Accessed September 2, 2013.
12. Frishberg B. The utility of neuroimaging in the evaluation of headache in patients with normal neurologic examinations. *Neurology*. 1994;44:1191-1197.
13. Evans R. Diagnostic testing for migraine and other primary headaches. *Neurol Clin*. 2009;27:393-414.
14. Semelka RC, Armao DM, Elias J Jr, et al. Imaging strategies to reduce the risk of radiation in CT studies, including selective substitution with MRI. *J Magn Reson Imaging*. 2007;25:900-909.
15. You JJ, Purdy I, Rothwell DM, Przybysz R, Fang J, Laupacis A. Indications for and results of outpatient computed tomography and magnetic resonance imaging in Ontario. *Can Assoc Radiol J*. 2008;59:135-143.
16. Smitherman TA, Burch R, Sheikh H, Loder E. The prevalence, treatment and impact of migraine and severe headaches in the United States. *Headache*. 2013;53:427-436.



17. Gaul C, Holle D, Sandor PS, et al. The value of “migraine surgery.” Overview of the pathophysiological concept and current evidence. *Nervenarzt*. 2010;81:463-470.
18. Guyuron B, Reed D, Kriegler JS, Davis J, Pashmini N, Amini S. A placebo-controlled surgical trial of the treatment of migraine headaches. *Plast Reconstr Surg*. 2009;124:461-468.
19. Kung TA, Pannucci CJ, Chamberlain JL, Cederna PS. Migraine surgery practice patterns and attitudes. *Plast Reconstr Surg*. 2012;129:623-628.
20. American Headache Society urges caution in using any surgical intervention in migraine treatment. Position Statement of the American Headache Society. [http://www.americanheadachesociety.org/american\\_headache\\_society\\_urges\\_caution\\_in\\_using\\_any\\_surgical\\_intervention\\_in\\_migraine\\_treatment/](http://www.americanheadachesociety.org/american_headache_society_urges_caution_in_using_any_surgical_intervention_in_migraine_treatment/) Accessed January 11, 2013.
21. Guyuron B, Kriegler JS, Davis J, Amini SB. Comprehensive surgical treatment of migraine headaches. *Plast Reconstr Surg*. 2005;115:1-9.
22. Bigal ME, Lipton RB. Excessive opioid use and the development of chronic migraine. *Pain*. 2009;142:179-182.
23. Bigal ME, Serrano D, Buse D, Scher AI, Stewart WF, Lipton RB. Migraine medications and evolution from episodic to chronic migraine: A longitudinal population-based study. *Headache*. 2008;48:1157-1168.
24. Scher AI, Stewart WF, Ricci JA, Lipton RB. Factors associated with the onset and remission of chronic daily headache in a population-based study. *Pain*. 2003;106:81-89.
25. Katsarava Z, Schneeweiss S, Kurth T, et al. Incidence and predictors for chronicity of headache in patients with episodic migraine. *Neurology*. 2004;62:788-790.
26. Langer-Gould AM, Anderson WE, Armstrong MJ, et al. The American Academy of Neurology’s TOP Five Choosing Wisely recommendations. *Neurology*. 2013;81:1004-1011.
27. Bigal ME, Serrano D, Buse D, Scher A, Stewart WF, Lipton RB. Acute migraine medications and evolution from episodic to chronic migraine: A longitudinal population-based study. *Headache*. 2008;48:1157-1168.
28. Bigal ME, Lipton RB. Excessive acute migraine medication use and migraine progression. *Neurology*. 2008;71:1821-1828.
29. Zwart JA, Dyb G, Hagen K, Svebak S, Holmen J. Analgesic use: A predictor of chronic pain and medication overuse headache – the Head-HUNT study. *Neurology*. 2003;61:160-164.
30. Burke JF, Skolarus LE, Callaghan BC, Kerber BA. Choosing Wisely: Highest-cost tests in outpatient neurology. *Ann Neurol*. 2013;73:679-683. doi: 10.1002/ana.23865.