SBP measurement below goal (ARR, 1.74; 95% CI, 1.07-2.83; \( P = .03 \)), adjusting for adherence counseling (ARR, 1.49; 95% CI, 1.10-2.04; \( P = .01 \)) and excluding patients with DM with SBP 140 mm Hg or lower (ARR, 1.49; 95% CI, 0.99-2.23; \( P = .06 \)).

**Discussion** | Among patients with uncontrolled hypertension, clinical inertia was more likely in those with a diagnosis of depression. Hence, clinical inertia may be 1 mechanism by which depressed patients have worse cardiovascular outcomes. Research has shown that patients with mental illness receive less intensive medical care, such as coronary revascularization\(^1\); our study extends this literature by demonstrating differences in clinician behavior with respect to cardiovascular risk factor management in this population. Future studies should explore the underlying processes that affect clinician treatment practices when managing a patient with depression. In the meantime, PCPs should be cautious about undertreating cardiovascular risk factors among patients identified as having depression.

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- **Study concept and design:** Moise, Davidson, Kronish.
- **Acquisition of data:** Moise, Shea, Kronish.
- **Analysis and interpretation of data:** Moise, Chaplin, Shea, Kronish.
- **Drafting of the manuscript:** Moise, Kronish.
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forts to improve the efficiency of health care utilization, such as the Choosing Wisely campaign (ABIM [American Board of Internal Medicine] Foundation; http://www.choosingwisely.org), have identified these tests as a target. However, little is known about recent headache neuroimaging utilization, associated expenditures, and temporal trends in the United States.

Methods | Institutional review board exemption was obtained from the University of Michigan Health System. We utilized the National Ambulatory Medical Care Survey (NAMCS), a nationally representative survey that uses a 3-stage sampling design (geographic regions, physician practices stratified within specialties, and patient visits within practices) to characterize all outpatient office-based care in the United States. We analyzed all headache visits for patients 18 years or older identified using the Healthcare Cost and Utilization Project (HCUP) Single-level Clinical Classification System (CCS) ([ICD-9-CM](https://www.icd10data.com)) codes 339.xx, 784.0x, 346.xx, and 307.81). For migraine, ICD-9-CM codes 346.xx were used.

To characterize recent headache neuroimaging utilization, the proportion of headache visits with computed tomography (CT) or magnetic resonance imaging (MRI) ordered from 2007 through 2010 was estimated using descriptive statistics for multiple visit categories: all headache visits, all migraine visits, and visits with a primary diagnosis of headache or migraine. Neuroimaging use (CT or MRI) was directly entered onto the NAMCS survey instrument by physicians or their staff. Neuroimaging payments were determined using the Medicare physician fee schedule. To evaluate for trends over time, we identified headache neuroimaging utilization in years where these tests were directly abstracted onto the NAMCS survey instrument (1995-2000 and 2005-2010) in all headache visits. Survey weights were applied for all analyses.

Results | Of all visits, 88% were by patients younger than 65 years and 78% were by female patients. Most visits were to primary care physicians (54.8%), followed by neurologists (20%), other specialists (12.9%), and nonprimary care generalists (12.4%). Over 4 years, a total of 51.1 million headache visits were identified, including 25.4 million migraine visits. Neuroimaging was obtained in 12.4% (95% CI, 10.5-14.7) of all headache visits and 9.8% (95% CI, 7.4-12.9) of migraine visits ([Table](#table)). Headache neuroimaging utilization was higher if the headache or migraine diagnosis was listed as the primary diagnosis for the visit. Total neuroimaging expenditures were estimated at $3.9 billion over 4 years, including $1.5 billion from migraine visits. Between 1995 and 2010, neuroimaging utilization increased from 5.1% (95% CI, 2.7%-7.5%) to 14.7% (95% CI, 9.4%-20.0%) of all annual headache visits ([Figure](#figure)).
Discussion | In the United States, neuroimaging is frequently ordered during outpatient headache visits (12%), contributes substantial cost (nearly $1 billion in annual costs), and is increasing over time. Since 2000, multiple guidelines have recommended against routine neuroimaging in patients with headaches because a serious intracranial pathologic condition is an uncommon cause. Consequently, the magnitude of per-visit neuroimaging use found in this study suggests considerable overuse. Perhaps guidelines have not curbed utilization because patients, as opposed to health care providers, may be the primary drivers of utilization. If so, efforts such as the Choosing Wisely campaign, which seeks to empower patients with knowledge regarding unwarranted testing, may be more effective than guidelines alone. Requiring preauthorization of these costly tests and/or value-based insurance designs that shift the cost burden for costly, low-yield tests to patients are alternative strategies. Given that headache neuroimaging is common, costly, and likely substantially overused, interventions to curb utilization of these tests have the potential to substantially reduce health care expenditures while improving guideline concordance. Therefore, optimizing headache neuroimaging practices should be a major national priority.

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Editor’s Note
Coping With Headaches

It is not news that neuroimaging is overordered for patients with headache. In fact, as the authors have alluded to, the American College of Radiology, as part of the Choose Wisely campaign (ABIM [American Board of Internal Medicine] Foundation), has placed “Don’t do imaging for uncomplicated headache” on its top 5 list of things physicians and patients should question. However, because neuroimaging actually increased between 1995 and 2010 despite published guidelines discouraging the ordering of neuroimaging with simple headaches since 2000, the Editors thought the findings of this Research Letter are noteworthy.

As the authors demonstrate, the financial costs of neuroimaging for headaches are substantial. But the costs we should care most about as physicians are the unnecessary radiation (in the case of computed tomographic scans) and incidental findings that lead to unnecessary medical procedures and great anxiety on the part of our patients.

Because professional guidelines themselves appear to have limited impact on ordering of neuroimaging, we need to focus more on educating our patients about headaches and the dangers of neuroimaging. Headaches are frightening to patients and can conjure thoughts of brain tumors. It is therefore sensible that patients would seek neuroimaging to reassure themselves. Signs to us that the headache does not require further evaluation (ie, no change in the nature of headache for multiple years) may mean to the patient that the headache is serious (ie, it must be serious because I have had these pains for many years). If a physician simply says “you don’t need a scan” patients may think that the physician does not understand how great the pain is, or worse yet, that the physician is saving money for an insurance company.

I always begin my evaluation of patients with headache by acknowledging that headaches are frightening and can be disabling and that many people suffer from them their
entire lives. I perform a thorough neurologic examination so that patients know that I take the symptom seriously, and if there are no neurologic deficits, I explain that we need to develop a strategy for dealing with the headaches because they are likely to recur. I explain that I do not want them to have neuroimaging because of the dangers of radiation and incidental findings. Although there will always be patients who will insist on having a test that is not supported by evidence, most patients are reassured when they feel that their physician understands their condition and is working with them to develop a strategy for coping with the problem.

Mitchell H. Katz, MD

COMMENT & RESPONSE

Gender Income Disparities Can Be Explained by Alternative Factors

To the Editor In response to the Research Letter titled “Trends in Earnings of Male and Female Health Care Professionals in the United States, 1987-2010” and the accompanying Invited Commentary, the decision by Seabury et al1 and Cooke2 to control for variables such as demographic characteristics, state, work hours, and tenure is well-constructed and laudable. However, their conclusion that gender inequities in compensation are “persistent” is premature. Neither Seabury et al1 nor Cooke2 present data on clinical collections, relative value units, or benefit packages, all of which can be critical elements of total compensation. Years of experience and practice location type (private practice, satellite clinic vs hospital based, multiphysician office vs solo) are completely ignored, when such factors contribute materially in terms of productivity, entrepreneurship, and risk. Extramural research funding and philanthropic or investment fundraising are also neglected. A recent study commissioned by the US Department of Labor states “Research indicates that women may value non-wage benefits more than men do, and as a result prefer to take a lesser portion of their compensation in the form of health insurance and other fringe benefits.” In summary, this letter and commentary do not control for many relevant, non-discriminatory, and potentially explanatory variables in physician compensation.

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In Reply The purpose of our study4 was to assess whether differences in income between male and female physicians present in the late 1980s are still present today. We found that gender differences in physician earnings have not substantially changed in 25 years. Dr Ambati notes that physician earnings come from a number of sources (eg, relative value units, benefit packages), which is true. However, our estimates of income from the Current Population Survey (CPS) (https://www.census.gov/cps/data/) were designed to capture all sources of labor earnings. While the CPS does not break down labor earnings by source, most if not all of these sources should be included. And if any were missing, we have no reason to suspect that any items that are not reported differ systematically by gender in ways that could explain the persistent male-female earnings gap.

Dr Ambati also correctly identifies that at any given point in time a number of factors may “explain” why male physicians earn more than female physicians, and our data were not rich enough to allow us to study these factors. Some of these factors could reflect differences in preferences between male and female physicians (as suggested in research quoted by Dr Ambati). It is certainly true that the mere existence of an earnings gap is not evidence of discrimination. But it is important to understand that one must be thoughtful about which factors to “adjust for” in statistical analysis. For example, if female medical school graduates are more likely than male medical school graduates to enter historically lower paying fields such as family medicine or pediatrics, one should carefully consider whether to adjust for specialty choice in the analysis. If there are barriers to entry for women in higher-paying specialties, one should not adjust for specialty because differences in average earnings between male and female physicians reflect these barriers to entry. If, instead, these choices are made with equal opportunity, it would be important to adjust for specialty choice. The same logic extends to the types of practices that female physicians choose. If female physicians work in lower-volume practices that are more conducive to lifestyle, do choices reflect barriers to entry into these practices (eg, difficulties being hired into higher-volume practices) or preferences of female physicians for better lifestyle? Ultimately, research on gender differences in physician earnings should attempt to understand the contribution of factors that are preference based vs those that reflect barriers to earnings. Doing so will require new data that include information on not only specialty and practice patterns but also stated preferences of male and female physicians for both of these contributors to earnings.

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