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Original Contribution

Trends in advanced imaging and hospitalization for emergency department syncope care before and after ACEP clinical policy☆

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ABSTRACT

Objectives: To describe recent trends in advanced imaging and hospitalization of emergency department (ED) syncope patients, both considered "low-value", and examine trend changes before and after the publication of American College Emergency Physician (ACEP) syncope guidelines in 2007, compared to conditions that had no changes in guideline recommendations.
Methods: We analyzed 2002–2015 National Hospital Ambulatory Medical Care Survey data using an interrupted-time series with comparison series design. The primary outcomes were advanced imaging among ED visits with principal diagnosis of syncope and headache and hospitalization for ED visits with principal diagnosis of syncope, chest pain, dysrhythmia, and pneumonia. We adjusted annual imaging and hospitalization rates using survey-weighted multivariable logistic regression, controlling for demographic and visit characteristics. Using adjusted outcomes as datapoints, we compared linear trends and trend changes of annual imaging and hospitalization rates before and after 2007 with aggregate-level multivariable linear regression.
Results: From 2002 to 2007, advanced imaging rates for syncope increased from 27.2% to 42.1% but had no significant trend after 2007 (trend change: −3.1%; 95%CI −4.7, −1.6). Hospitalization rates remained at approximately 37% from 2002 to 2007 but declined to 25.7% by 2015 (trend change: −2.2%; 95%CI −3.0, −1.4). Similar trend changes occurred among control conditions versus syncope, including advanced imaging for headache (difference in trend change: −0.6%; 95%CI −2.8, 1.6) and hospitalizations for chest pain, dysrhythmia, and pneumonia (differences in trend changes: 0.1% [95%CI −1.9, 2.0]; −0.9% [95%CI −3.1, 1.3]; and −1.2% [95%CI −5.3, 2.9], respectively).
Conclusions: Before and after the release of 2007 ACEP syncope guidelines, trends in advanced imaging and hospitalization for ED syncope visits had similar changes compared to control conditions. Changes in syncope care may, therefore, reflect broader practice shifts rather than a direct association with the 2007 ACEP guideline. Moreover, utilization of advanced imaging remains prevalent. To reduce low-value care, policymakers should augment society guidelines with additional policy changes such as reportable quality measures.

1. Introduction

Each year there is an average of 1.2 million syncope emergency department (ED) visits in the United States [1]. Research, to date, has not identified a validated or widely adopted risk-stratification scheme for ED syncope patients [2]. Perhaps driven by this management uncertainty, emergency physicians increasingly utilize advanced imaging for over 40% of syncope patients, and hospitalize more than one in three [1]. However, evidence reviewed in the 2017 American Heart Association syncope guidelines demonstrated that for syncope patients, who otherwise have no indication for neuroimaging, less than 1% of brain

Abbreviations: ED, emergency department; ACEP, American College of Emergency Physicians; NHAMCS, National Hospital Ambulatory Medical Care Survey; NCHS, National Center for Health Statistics; CT, computer tomography; MRI, magnetic resonance imaging; CCS, clinical classification software; AHRQ, Agency for Healthcare Research and Quality.

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MRI and CT scans yielded clinically significant findings [3]. Similarly, hospitalization of ED syncope patients who had a negative ED evaluation often provides no additional diagnostic insight [4-6]. This evidence provided the impetus for reducing the prevalent use of these high-cost, low-value services for ED syncope patients.

Over the past decade, reducing low-value syncope care in the ED has become one of the policy priorities for the American College of Emergency Physicians (ACEP). ACEP first issued a clinical policy on ED syncope care in 2007, which recommended avoiding routine brain imaging unless other indications are present and suggested that, after a negative ED evaluation, only select high-risk patients should be hospitalized [7]. In 2014, ACEP then contributed to the Choosing Wisely Campaign, a national effort to gather expert recommendations about what services constitute low-value care and promote reductions in their use, by recommending against use of head CT for syncope evaluation when patients do not have other concerning signs or symptoms [8]. The effects of specialty society recommendations since 2007 on low-value ED syncope care remains unclear.

In this analysis, we described the recent trends in low-value ED syncope care and examined the impact of the 2007 ACEP Clinical Policy. We examined trends in advanced imaging use and hospitalization rates among ED patients diagnosed with syncope versus other conditions, for which ACEP had no new or changed advanced imaging or hospitalization guidelines. These comparison groups help to characterize secular trends allowing us to examine the effect of the ACEP guideline on ED syncope care. We hypothesized that trends in a) advanced imaging rates and b) hospitalization rates among patient visits with a principal ED diagnosis of syncope decreased significantly after 2007 relative to changes in patient visits with comparison diagnoses.

Table 1
Recommendations from ACEP 2007 clinical policy for syncope.

High-risk features in history and physical exam
- Heart failure signs and symptoms (level A recommendation)
- Older age, structural heart disease, coronary artery disease (level B recommendation)
Diagnostic tests
- Electrocardiogram (level A recommendation)
- Laboratory, echocardiography, or head CT should not be routinely obtained unless indicated by specific findings in history or physical exam. (Level C recommendation)
Hospitalization – Consider in…
- Patients with heart failure or structural heart disease (level B recommendation)
- Patients with advanced age, abnormal electrocardiogram (level B recommendation)

2. Material and methods

2.1. Data source

We analyzed the 2002–2015 public-use datasets of the National Hospital Ambulatory Medical Care Survey (NHAMCS) ED sample. NHAMCS is an annual survey conducted by the Ambulatory and Hospital Care Statistics Branch of the National Center for Health Statistics (NCHS). NHAMCS consists of multistage, probability samples of visits to hospital-based EDs in the United States. Each encounter was assigned a weight and corresponding design variables to generate nationally representative estimates and standard errors. Detailed sampling and survey methodologies are available on the NCHS website [9]. Because NCHS employed new single stage design variables in 2002, we analyzed data from 2002 to 2015. This study was exempted from review by the institutional review boards of authors' respective institutions.

2.2. Study design

We used an interrupted time-series with comparison series study design [10]. The pre-intervention period was 2002–2007 and the post-intervention period was 2008–2015, corresponding to the publication of ACEP syncope guidelines in April of 2007 (Table 1) [7].

2.3. Advanced imaging utilization – cohort and outcome definitions

For the syncope cohort, we included ED visits with a principal diagnosis of syncope and collapse (International Classification of Diseases-9 Clinical Modification [ICD-9-CM] 780.2).

To compare imaging rates for syncope visits to secular trends, we used ED visits with primary diagnosis of headache as a control series, defined using ICD-9-CM codes included under headache according to the Clinical Classification Software (CCS) by Agency of Healthcare Research and Quality (AHRQ; Appendix A) [11]. During the study period, ACEP released clinical policies for acute headache evaluation in the ED in 2002 and 2008, in which the recommendations of limiting neuroimaging to patients with neurological findings and thunderclap headache remained unchanged. These indications are also similar to the imaging recommendations for syncope [12]. Therefore, patients presenting with headache to the ED should serve as an appropriate control that can reflect the secular trend.

To better capture and quantify low-value advanced imaging in both syncope and headache visits, we excluded visits with secondary diagnoses that would have likely required brain imaging such as intracranial hemorrhage, stroke, and cancer (Appendix A), consistent with prior study examining low-value advanced imaging in syncope [13]. We further performed a sensitivity analysis by additionally excluding all syncope visits with any traumatic diagnosis (ICD9-CM 800– to 959—).

We defined our outcome of advanced imaging as ED visits in which patient received any computer tomography (CT) or magnetic resonance imaging (MRI). We used this definition to maintain continuity throughout the study period because 2002–2004 NHAMCS only included a single indicator variable for any CT or MRI.

2.4. Hospitalization–cohort and outcome definitions

We used the same definition of ED syncope visits as above and assessed the rate of subsequent hospitalization. Prior studies have used similar definitions to examine trends in syncope hospitalizations from the ED. [1,3] Since ED diagnoses were likely determined at the end of the visit, visits with a principal diagnosis of syncope likely did not uncover a significant alternative etiology of patients' syncope event.

We further examined hospitalization rates among ED visits that had a principal diagnosis of chest pain, dysrhythmia, or pneumonia, defined using CCS by AHRQ, to serve as comparisons to syncope visits (Appendix A). We chose these conditions because there is substantial variation in hospitalizations among these ED visits [14]. Specifically, we included chest pain and dysrhythmia because, like syncope, these conditions are often benign but can infrequently indicate major adverse cardiac events. Additionally, during the study period, there was no new guideline recommendations specific to the indication for hospitalization of ED patients with these conditions. However, in 2006, ACEP release guidelines recommending accelerated pathways for ruling out acute coronary syndrome, which may have reduced hospitalizations for chest pain [15]. Despite this limitation, trends across multiple conditions would better reflect the general secular trend.

We defined admission to include disposition to inpatient hospitalization, observation unit or status, or transfers to other hospitals. This definition would account for the rapidly rising use of ED observation units in the recent years [16,17].

Table 2
Demographic characteristics of ED patients presenting with syncope, 2002–2015.

Characteristic	2002–2007			2008–2015		
	Unweighted count	Weighted proportion		Unweighted count	Weighted proportion	
		%	95% CI		%	95% CI
Total	1817			2226		
Age (years)						
Under 15	116	6.2	(5.0, 7.7)	141	7.1	(5.6, 8.9)
15–24	219	11.9	(10.3, 13.8)	325	16.7	(14.7, 18.9)
25–44	340	20.5	(18.0, 23.2)	406	18.2	(15.7, 21.0)
45–64	390	22.1	(19.6, 24.8)	491	22.0	(19.3, 25.0)
65–74	243	12.5	(10.8, 14.4)	286	13.1	(11.3, 15.1)
75 and over	509	26.9	(24.2, 29.7)	577	22.9	(20.4, 25.6)
Gender						
Female	1033	57.7	(54.8, 60.5)	1286	58.7	(55.9, 61.4)
Male	784	42.4	(39.5, 45.2)	940	41.3	(38.6, 44.1)
Race						
White	1429	80.3	(77.1, 83.2)	1748	79.5	(76.2, 82.4)
Black	301	16.9	(14.3, 19.9)	371	17.0	(14.3, 20.1)
Other	87	2.8	(1.8, 4.2)	107	3.5	(2.2, 5.4)
Insurance status						
Private[a]	635	34.9	(32.2, 37.7)	754	34.5	(31.7, 37.5)
Medicare	659	35.4	(32.6, 38.3)	806	33.6	(30.7, 36.5)
Medicaid	210	11.2	(9.3, 13.3)	276	12.8	(10.8, 15.0)
Uninsured	187	10.8	(9.0, 13.0)	185	8.4	(6.7, 10.3)
Unknown	126	7.7	(5.8, 10.2)	205	10.8	(8.7, 13.3)
Region						
Northeast	465	21.7	(17.1, 27.1)	495	20.0	(16.5, 23.9)
Midwest	398	25.1	(19.7, 31.4)	547	22.0	(18.0, 26.7)
South	551	33.1	(27.0, 39.8)	710	35.8	(29.9, 42.1)
West	403	20.1	(15.4, 25.9)	474	22.3	(18.2, 27.0)

[a] Include worker's comp.

2.5. Statistical analysis

To construct adjusted time-series data from NHAMCS survey dataset, as outcomes were both dichotomous, we first estimated a survey weighted multivariable logistic regression model with an interaction between survey year indicators and study groups, adjusting for age, sex, race, insurance status, seen by resident, seen by physician assistants or nurse practitioners, geographic region, ECG, and ultrasound imaging. For admission rates, we additionally adjusted for any CT/MRI use.

We then estimated adjusted yearly outcome rates for each study group using marginal effects methods [18]. We plotted these adjusted points and applied aggregate-level segmented ordinary least squares regression, accounting for autocorrelation in time-series data [19]. The regression included a three-way interaction term between year, indicator for post-intervention period, and study group as well as lower-level two-way interaction and level-change terms, allowing the estimation of change in yearly trend in outcome rates after 2007 for each study group and the difference in the trend changes between the two groups. While we displayed 95% confidence intervals of coefficient estimates in accordance with conventional data reporting, as recommended in by NCHS for NHAMCS studies, we defined statistical significance at the level of $\alpha = 0.01$ [20]. All analyses were performed using STATA/MP 15 (College Station, TX) and procedure details are available in Appendix B.

3. Results

From 2002 to 2015, NHAMCS included 4043 visits with a principal ED diagnosis of syncope after evaluation. Overall, syncope visits account for 0.92% (95% CI 0.87, 0.96) of total ED visits, representing an average of approximately 1.1 million visits yearly. Syncope patients in 2002 to 2007, compared to those from 2008 to 2015, were slightly older and more likely to be uninsured (Table 2).

Table 3 shows the trends in adjusted annual rates of advanced imaging and hospitalization for syncope visits and the comparison visit groups. After excluding 372 visits with significant neurological diagnoses (8.5%; 95% CI 7.4, 9.7), from 2002 to 2007, the advanced imaging rate for syncope patients increased from 27.3% to 42.1% (adjusted annual trend: 2.9%; 95% CI 1.6, 4.1). Comparing before to after 2007, there was a downward trend change of −3.1% (95% CI −4.7, −1.6). The annual trend in advanced imaging rates among syncope visit were paralleled by trends in imaging rates among headache visits (Fig. 1), which had an adjusted upward annual trend of 2.2% (95% CI 0.8, 3.6)

Table 3
Results of interrupted time-series analysis for advanced imaging and admission rates.

Visit type	Adjusted outcome rate in 2002 (95% CI), %	Annual change in outcome rate (95% CI), %				
		Before guidelines	After guidelines	Trend change	Difference in trend change[a]	
Advanced imaging						p-Value
Syncope	26.7 (23.5, 29.9)	2.9 (1.6, 4.1)	−0.2 (−1.2, 0.7)	−3.1 (−4.7, −1.6)		
Headache	23.2 (21.7, 24.8)	2.2 (0.8, 3.6)	−0.3 (−1.0, 0.4)	−2.5 (−4.0, −1.0)	0.6 (−1.6, 2.8)	0.567
Hospitalization						
Syncope	37.1 (36.2, 38.0)	0.2 (0.0, 0.4)	−2.0 (−2.8, −1.2)	−2.2 (−3.0, −1.4)		
Chest pain	42.7 (37.9, 47.6)	0.4 (−1.2, 2.0)	−1.9 (−2.6, −1.2)	−2.3 (−4.0, −0.5)	−0.1 (−2.0, 1.8)	0.922
Dysrhythmia	39.7 (34.0, 45.4)	0.1 (−2.0, 2.1)	−1.2 (−1.6, −0.8)	−1.2 (−3.3, 0.8)	0.9 (−1.3, 3.1)	0.383
Pneumonia	52.7 (44.6, 60.8)	−0.5 (−4.4, 3.4)	−1.5 (−2.4, −0.5)	−1.0 (−5.0, 3.1)	1.2 (−2.9, 5.3)	0.535

[a] Trend change for syncope subtracted from trend change in the corresponding comparison group.

from 2002 to 2007 and a downward trend change of −2.5% (95% CI −4.0, −1.0) from before to after 2007. The trend changes in syncope and headache visits were not significantly different (difference in trend change: −0.6%; 95% CI −2.8, 1.6). Further exclusion of all visits with any traumatic diagnoses did not materially change our findings (Appendix C).

From 2002 to 2007, the adjusted hospitalization rate for syncope patients changed minimally from 37.1% to 37.0% with a minimally upward annual trend of 0.2% (95% CI 0.0, 0.4). From before to after 2007, there was a downward trend change of −2.2% (95% CI −3.0, −1.4). Annual trends in hospitalization rate among syncope visits were paralleled by trends in hospitalization rates of chest pain, dysrhythmia, and pneumonia visits (Fig. 2). Specifically, annual trends in hospitalization rates of syncope visits were not significantly different from each of the three comparison groups and difference in trend change from before to after 2007 were also not significantly different (Table 3).

4. Discussion

From 2002 to 2015, ED syncope care has changed substantially. In this interrupted time-series analysis of NHAMCS data, we found that advanced imaging utilization was rapidly increasing but plateaued after 2007. In contrast, while more than one-third of ED syncope patients were hospitalized each year before 2007 without notable trend, admission rates declined substantially after 2007. Although these changes coincided with the publication of the ACEP 2007 syncope clinical policy, they appear to follow changes in advanced imaging utilization and hospitalization among other diagnoses that had no substantial changes in clinical policy recommendations. Our findings, therefore, suggest that changes in low-value syncope care likely reflect broader shifts in the practice of emergency medicine rather than a direct effect by the 2007 ACEP syncope clinical policy.

Our findings about advanced imaging trends are particularly notable. Although the limited yield of brain imaging in syncope evaluation has been well established [3,7], prior studies have found increasing utilization of advanced imaging among ED syncope patients [1]. However, we found that, after 2007, advanced imaging rates stopped increasing, but still greater than 40% of syncope patients receive advanced imaging. The parallel between the trends in imaging utilization of headache and syncope visits suggest that these changes likely are broader secular changes. The negative trend change may have been influenced by the increasing recognition of rising healthcare cost due, in part, to the overuse of high-cost testing and adverse risks of radiation exposure from imaging [21-24]. Unfortunately, imaging rates continued to exceed 40% after 2007, which reflects limited adoption of the evidence that had led to the ACEP clinical policy recommendations against routine use of advanced imaging [3,7].

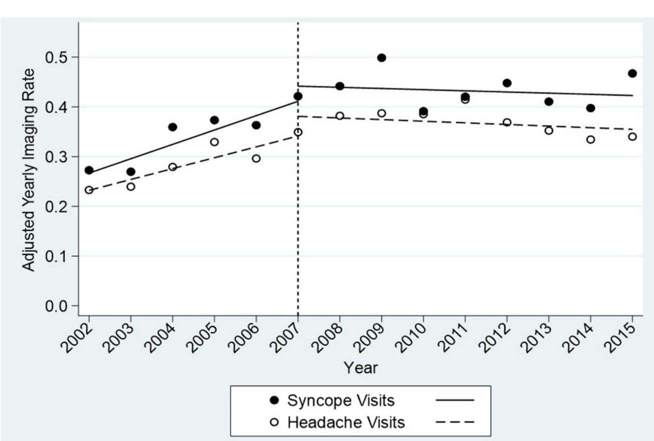

Fig. 1. Interrupted time series analysis of adjusted annual imaging rates for syncope visits compared with the control population (headache visits).

In contrast, admission rates, which include observation care in our analysis, have steadily decreased since 2007, which is paralleled by decreasing admission rates of other visit types. These trends may reflect the increasing shift towards outpatient management [25], particularly in an era of rising healthcare costs and ED crowding, of which one of the main contributors is hospital bed shortage [26]. The Recovery Audit Contractor program, initiated by the Center for Medicare and Medicaid Services in 2005, likely also contributed to this shift towards

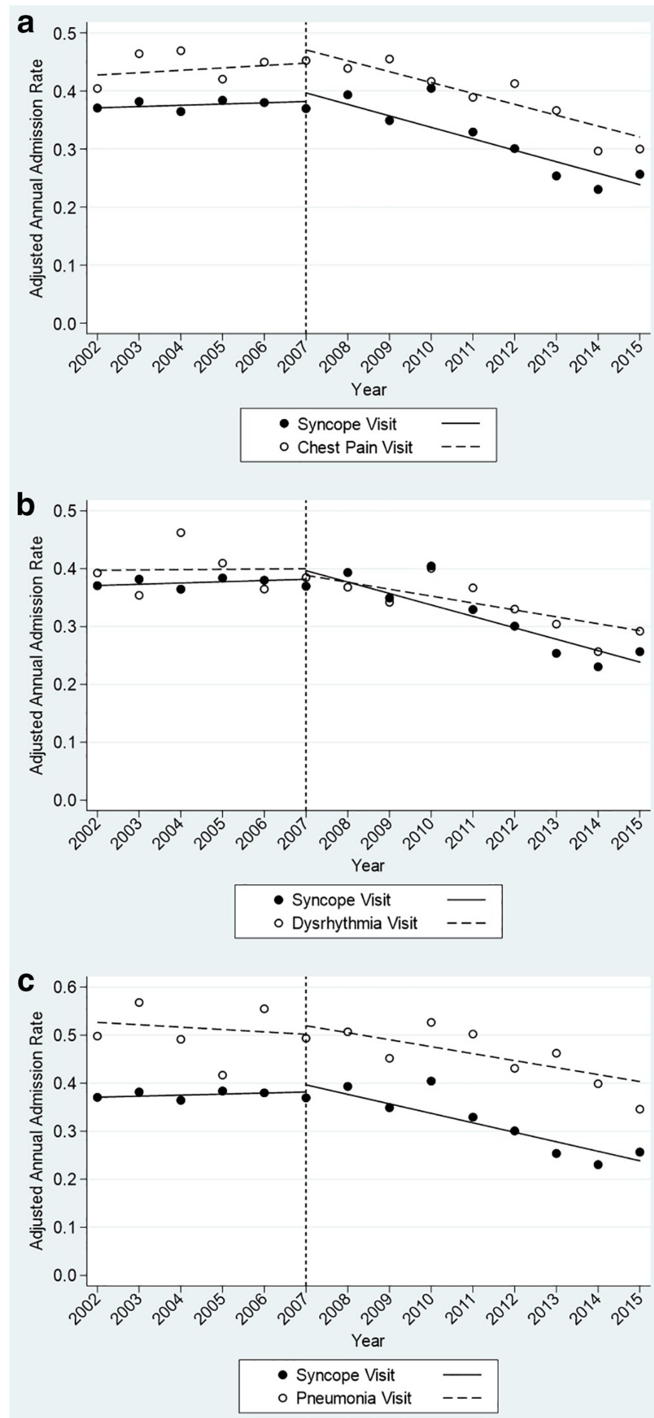

Fig. 2. Interrupted time series analysis of adjusted annual admission rates for syncope visits compared with the control population (a – chest pain, b – dysrhythmia, c – pneumonia).

outpatient care, in addition to inducing a substantial rise in observation stays [17,27]. While reduction in low-value syncope hospitalizations likely would reduce care cost without negatively impacting patient outcomes, the effect of a broader shift towards outpatient care is less clear. Further research should assess both the intended and unintended consequences of this trend.

Our findings underscore the limitations of society guidelines in reducing low-value care. While clinical policies are necessary to recognize and establish care standards, additional policy changes may be needed to reduce overutilization. Augmenting guideline recommendations with reportable quality measures is one way to further improve the value of care. Past success in improving emergency coronary care through implementation of reportable quality measures provides optimism that such approaches may be effective [28]. However, policymakers must be cognizant of the difference between advocating for implementation of appropriate care from discouraging the use of low-value care. Furthermore, the fear of legal liability that often motivates low-value care may be difficult to overcome without substantial tort reform [29]. In 2015, ACEP initiated a specialty-wide data registry of quality measures, which includes a quality measure targeting advanced imaging overuse in syncope [29]. Future studies should examine the effect of this clinical registry and implementation of quality measures in reducing low-value care.

5. Limitations

Our study has several limitations. In addition to limitations intrinsic to a national survey, such as errors in data entry or interpretation of medical records [30], NHAMCS lacks granular clinical information. As a result, we cannot estimate an "appropriate" benchmark of patients that should be expected to require imaging or hospitalization. We used the final ED diagnoses to define our study populations while the ideal study design would, for example, include all patients with concern for syncope after the initial clinician evaluation.

Our outcome measure of advanced imaging utilization encompasses any CT or MRI use due to the availability of NHAMCS variables, whereas the recommendation by the 2007 ACEP syncope clinical policy specifically targets head CT. However, most of advanced imaging in syncope visits was head CT. After 2007, NHAMCS began including an indicator specifically for head CT, which accounted for 84.8% (95% CI 82.1–87.2) of syncope visits with advanced imaging. Therefore, we do not believe our findings would have changed substantially.

6. Conclusions

In summary, although the increasing use of advanced imaging for patients with syncope plateaued after 2007, advanced imaging is still obtained in over 40% of ED visits for syncope. In contrast, since 2007, admission rates have declined. However, both trends were similar to changes in other conditions, suggesting that these trends may be related to overall emergency medicine practice changes, rather than a direct response to the 2007 ACEP syncope clinical policy. In an era of rising health care cost, policymakers should augment society guidelines with policy changes, such as reportable quality measures.

Appendix A. Cohort definitions by ICD9CM codes

Diagnosis for exclusion from advanced imaging rate analysis, adopted from

Diagnoses	ICD9CM codes
Intracranial bleeding and cerebral vascular disease	3466x, 431xx–435xx
Skull fracture, intracranial injury/bleeding, open head wound, head injury, crush injury to face, motor vehicle accident	800xx–804xx, 850xx–854xx, 870xx–873xx, 9590, 910xx, 918xx, 920, 921xx, 925xx, E81xx
Brain Cancer	191xx
CNS infection	320xx–324xx, 00321, 0360, 0361, 0462 047xx, 049xx, 0520, 0530, 0543, 05472, 0550,05601, 0582x, 062xx–064xx, 0662, 06641, 0721, 0722, 10,081, 11,283, 1142, 115 × 1, 1300
Seizure disorder	345xx, 78,039
Altered mental status	78,097
Muscular and nervous system symptoms	781xx, 7820, 7843, 7845

These comparison group definitions were based on diagnosis categories within the Agency of Healthcare Research and Quality Clinical Classification Software [11].

Definition for headache cohort

Diagnoses	ICD9CM codes
Headache syndromes	339xx
Migraine	3460x–3465x, 3467x–3469x
Headache symptom	7840

Definition for chest pain cohort.

Diagnoses	ICD9CM codes
Non-specific chest pain	78,650, 78,651, 78,659

Definition for dysrhythmia cohort.

Diagnoses	ICD9CM codes
Cardiac dysrhythmias	4270–4273x, 4276x, 4278x, 4279
Tachycardia	7850
Palpitations	7851

Definition for pneumonia cohort.

Diagnoses	ICD9CM codes
Pneumonia (zoonotic bacterial, fungal)	00322, 0203–0205, 0212, 0221, 0310, 0391, 0521, 0551, 0730, 0830, 1124, 1140, 1144, 1145, 11,505, 11,515, 11,595, 1304, 1363,
Viral pneumonia	480xx
Bacterial Pneumonia	481xx, 482xx, 483xx, 484xx
Bronchopneumonia	485
Pneumonia, organism unspecified	486
Abscess of lung	5130
Rheumatic pneumonia	5171

Appendix B. Detailed stata procedures

We created a visit-level advanced imaging analytic dataset comprising all syncope and headache visits (the comparison group) meeting inclusion criteria. We created an analogous hospitalization dataset with chest pain, dysrhythmia, and pneumonia visits as comparison groups. We then used marginal effects methods to calculate adjusted advanced imaging and hospitalization rates [18]. This involved first estimating a multivariable logistic regression which included indicator variables for each visit group, indicator for each study year, and the interaction of the two, adjusting for age, sex, race, insurance status, seen by resident, seen by physician assistants or nurse practitioners, geographic region, ECG, and ultrasound imaging. For admission rates, we additionally adjusted for any CT/MRI use as well as accounting for survey design using the *svy*: prefix. Using the "*margins*" post-estimation command, we then calculated the adjusted advanced imaging and hospitalization rates and their standard errors for each year under each condition. Using the annual adjusted outcome rates as data points and inverse of their variance as weights, we utilize the *itsa* command to estimate ordinary least squares regression accounting for autocorrelation in time-series data [19]. Specifically, the regression included a three-way interaction term between year, indicator for post-intervention period, and study group as well as lower-level two-way interaction and level-change terms, allowing the estimation of change in yearly trend in outcome rates after 2007 for each study group and the difference in the trend changes between the two groups.

Sample codes:

```
svy, subpop(exppop): logit anyscan i.yr##i.exp i.ager i.sex i.racer i.insurance ekg resint midlv i.region ultrasnd.
margins i.yr, over(exp) subpop(exppop) post.
tsset syncpop Year, yearly.
itsa anyscan [aweight = (1/(SE*SE))], trperiod(2007) treatid(1) figure.
```

Appendix C. Sensitivity analysis for imaging rate – excluding all injuries

Table C1
Interrupted time-series analysis for advanced imaging rates, additionally excluding visits with diagnosis for traumatic injuries

Visit type	Adjusted outcome rate in 2002 (95% CI), %	Annual change in outcome rate (95% CI), %				
		Before guidelines	After guidelines	Trend change	Difference in trend change[a]	
Advanced Imaging						p-Value
Syncope	27.0 (23.6, 30.5)	2.7 (1.4, 4.0)	−0.4 (−1.0, 0.7)	−2.8 (−4.4, −1.2)		
Headache	23.2 (21.6, 24.7)	2.2 (0.8, 3.6)	−0.3 (−1.2, 0.3)	−2.6 (−4.2, −1.1)	0.2 (−2.4, 2.1)	0.878

[a] Trend change for syncope subtracted from trend change in the corresponding comparison group.

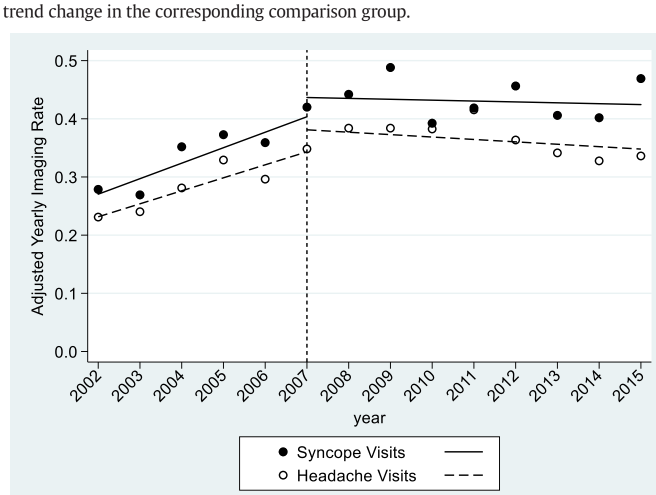

Fig. C1. Interrupted time series analysis of adjusted annual imaging rates for syncope visits compared with the control population (headache visits), additionally excluding visits with any diagnosis for traumatic injury.

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