National Trends in Visits to Physician Offices and Outpatient Clinics for Angina 1995 to 2010

Julie C. Will, PhD, MPH; Fleetwood Loustalot, PhD, FNP; Yuling Hong, MD, MSc, PhD, FAHA

Background—We asked whether visits to physician offices and hospital outpatient clinics for angina have changed over time and whether more frequent use of certain diagnostic techniques or referrals in this setting may account for such changes.

Methods and Results—We combined data from the National Ambulatory Medical Care Survey and the National Hospital Ambulatory Medical Care Survey to study visits to physician offices and outpatient departments. We calculated both crude and standardized rates for these visits using a modified version of technical specifications published by the Agency for Healthcare Research and Quality. In 1995 to 1998, there were on average 3.6 million office/clinic visits each year for angina among adults in the United States. By 2007 to 2010, this had declined to 2.3 million visits each year. Angina visit rates per 100,000 declined significantly (P<0.05), with the greatest decline from 1995 through 1998 to 2003 through 2007. Coronary atherosclerotic disease diagnoses also declined after 2002. Both stress testing and referring patients out for care doubled during some study periods.

Conclusions—Office and clinic visits for angina have declined over time. This trend parallels findings for both preventable hospitalization and emergency room visits for angina. Previous research’s decline in angina hospitalizations is not likely attributable to decreased referrals to hospital and emergency rooms for diagnosis and management. Although changes in International Classification of Diseases, Ninth Revision, Clinical Modification coding guidelines may explain some of the decline in angina and coronary atherosclerotic disease visits, it seems that other factors such as improved treatment or prevention may have played an additional role. (Circ Cardiovasc Qual Outcomes. 2014;7:110-117.)

Key Words: ambulatory care ■ epidemiology ■ health services research ■ office visits

Little is known about secular changes in angina visits in the outpatient setting. Most research on angina visits has focused on preventable hospitalizations and emergency room visits for angina, which are believed to capture the failure of the outpatient healthcare system to prevent and control cardiovascular disease risk factors.1 For example, an inability to access care or exposure to poor quality care can lead to a hospitalization that might have been prevented. The Agency for Healthcare Research and Quality (AHRQ) has developed a clear case definition for a preventable hospitalization (known by AHRQ as a prevention quality indicator).1 For patients with coronary and other atherosclerotic diseases, clinical guidelines suggest that aggressive, comprehensive risk factor management is likely to improve these patients’ lives by reducing the number of procedural interventions they require, possibly resulting in reduced hospitalizations.2

Secular declines in rates of preventable hospitalizations for angina have been reported by several researchers.1–3 Although 1 researcher suggested that this may partially be attributable to increased use of emergency departments, a recent research study4 shows that rates have also declined in emergency rooms. Based on observing increasing rates of hospitalization for coronary atherosclerosis and increased use of coronary angiography from 1992 to 1999, another researcher has suggested that these declines in rates reflect trends in more aggressive diagnosis of coronary atherosclerosis, which led to different discharge diagnoses.7

The purpose of this study is to fill a gap in the existing scientific literature by examining secular changes in angina visits in the outpatient setting. This will be done by examining rates of visits for angina, defined using a modified version of the AHRQ’s definition for prevention quality indicator No. 13,7 to determine whether they have declined in physician offices and hospital outpatient clinics. We also propose to shed additional light on previous research showing declines in rates of visits for angina in hospitals and emergency rooms by examining whether outpatient physicians are more likely to provide or order tests for the diagnosis and management of angina over time and whether they are more likely to refer patients to other physician offices, hospitals, or emergency rooms.

Methods

Data Source and Definitions
We obtained office-based physician visit data from the National Ambulatory Medical Care Survey (NAMCS) and combined those data with hospital outpatient clinic visit data from the National
WHAT IS KNOWN

- Hospitalizations and emergency department visits for angina as the primary diagnosis have declined substantially since the late 1980s.
- However, angina is often managed in the outpatient setting, and whether this decline in hospital visits is attributable to a lower overall incidence of angina, or if it extends to the outpatient setting as well, is unknown.

WHAT THE STUDY ADDS

- This research shows that angina visit rates has also declined in physician offices and hospital outpatient clinics in the United States.
- Although there is not a complete understanding of the reasons for these declines, one reason is likely due to coding guidelines developed in the early 1990s that have discouraged physicians from recording angina when a more specific cause is known.
- Although it is possible that aggressive treatment of risk factors for angina may have played a role in these declines, more research is needed to confirm this.

Because this study was conceived after questions were raised during our previous studies on preventable hospitalizations, we calculated angina visit rates using the same International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes we used previously, which are detailed in the technical specifications published by AHRQ for prevention quality indicator No. 13. The numerator consists of all nonmaternal visits for persons ≥18 years of age with the following diagnoses listed on the patient record form as being related to the sampled visit: intermediate coronary syndrome, including unstable angina (411.1), coronary occlusion without myocardial infarction (411.81), acute ischemic heart disease (411.89), angina decubitus (413.0), prinzmetal angina (413.1), and angina pectoris (413.9). Because there are only 3 places to record a diagnosis on the NAMCS and NHAMCS patient record forms, we used all 3 to flag a visit for angina. Pre-existing conditions were recorded in another section of the patient record form. In both databases, we excluded maternal visits using a method based on ICD-9 codes alone. Other exclusions required by the specifications include transfers from another institution and visits with selected cardiac procedure codes (eg, grafts, open heart surgery, valvotomies, pacemaker implants) in any field. We did not exclude these because transfers in an ambulatory care setting have a different meaning than transfers into a hospital, and cardiac procedures of this type (mainly complex surgical) are generally done only in the hospital. Although not a main focus of this study, we did compare rates of angina visits with rates of coronary atherosclerotic disease (CAD) visits to better explain the results of our analysis. We used ICD-9 codes of 414.0X to flag visits for CAD.

The denominators for the rates are from US Census Population Estimates published by NCHS as part of the documentation package for each year’s survey database. In describing the characteristics of visits for angina, we used 3 categories for race: white, black, or other. In calculating rates, we did not stratify by race because of sample size concerns. We used 4 census regions: Northeast, Midwest, South, and West (US Census Bureau 2000). For insurance, we used only the principal expected source of payment to derive 4 categories: Medicare, Medicaid, private insurance, and other. Other category included types such as other government insurance, self-pay, no charge or charity care, and worker’s compensation. We did not have a large enough sample size to study the other types of insurance individually. Source of payment was considered missing and excluded from the calculation of percentages if the patient record form had the unknown box checked.

To test whether physicians are more likely to provide or order tests for the diagnosis and management of angina over time or to refer them to another provider, we focused on 3 variables: (1) ECGs ordered or provided; (2) stress tests ordered or provided; and (3) referrals to another doctor, a hospital, an emergency room, or another facility. For ECG, in those years (1997–2010) where there was a checkbox on the patient record form indicating that an ECG had been ordered or provided, we simply counted the number of times that the box was checked. Because there was no checkbox for 1995 or 1996, we scanned all write-in information indicating that additional tests or procedures had been ordered for the ICD-9-CM code 8952. There were no checkboxes for stress testing in any of the years that we studied. We scanned all write-in information for the ICD-9-CM codes of 8941 to 8944. For referrals, we summed across the following: an NCHS constructed diagnostic code used to indicate transfer to another facility or having been sent to see a specialist (V992-), disposition codes that indicated a referral to a hospital or an emergency room, and a variable indicating referral to another physician.

Statistical Analysis

Angina Visit Rates and Trends Over Time

We estimated the total weighted number of outpatient visits for angina each year for persons ≥18 years of age in the United States by using the patient sampling weights in the database. Because angina as a primary reason for a visit is relatively rare, we looked at all 3 recorded diagnoses and then combined 4 years of data to obtain 4 time periods: 1995 to 1998, 1999 to 2002, 2003 to 2006, and 2007 to 2010. We summed the census population estimates over these same
### Table 1. Distribution of Office Visits for Angina, Weighted Number of Visits, and Crude Percent of Visits, by Selected Demographic Characteristics and Time Period: NHAMCS and NAMCS, 1995 to 2010

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<td>Age, y</td>
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<td>Total</td>
<td>18–64</td>
<td>65+</td>
<td>Total</td>
<td>18–64</td>
<td>65+</td>
<td>Total</td>
<td>18–64</td>
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<tr>
<td>No. (95% CI)</td>
<td>112,867</td>
<td>113,198</td>
<td>226,065</td>
<td>113,573</td>
<td>114,396</td>
<td>228,969</td>
<td>113,704</td>
<td>115,762</td>
<td>230,466</td>
<td>113,369</td>
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<tr>
<td>% (95% CI)</td>
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<td>100.0%</td>
<td>35.3%</td>
<td>64.7%</td>
<td>100.0%</td>
<td>35.7%</td>
<td>64.3%</td>
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<tr>
<td>No. (95% CI)</td>
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<td>46,859</td>
<td>115,942</td>
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<td>115,372</td>
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<td>% (95% CI)</td>
<td>47.7%</td>
<td>32.3%</td>
<td>100.0%</td>
<td>45.3%</td>
<td>54.7%</td>
<td>100.0%</td>
<td>45.7%</td>
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<td>Race</td>
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<td>No. (95% CI)</td>
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<td>276,247</td>
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<td>276,247</td>
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<td>% (95% CI)</td>
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<td>1.7%</td>
<td>90.2%</td>
<td>8.2%</td>
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<td>West</td>
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<td>South</td>
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<td>3,123,521</td>
<td>3,128,735</td>
<td>2,731,907</td>
<td>10,583,760</td>
<td>46,766,642</td>
<td>3,123,521</td>
<td>3,128,735</td>
<td>2,731,907</td>
<td>10,583,760</td>
<td>46,766,642</td>
</tr>
<tr>
<td>% (95% CI)</td>
<td>32.3%</td>
<td>22.4%</td>
<td>26.5%</td>
<td>18.9%</td>
<td>100.0%</td>
<td>32.3%</td>
<td>22.4%</td>
<td>26.5%</td>
<td>18.9%</td>
<td>100.0%</td>
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<td>Insurance status</td>
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<td>No. (% 95% CI)</td>
<td>No. (% 95% CI)</td>
<td>No. (% 95% CI)</td>
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<td>Medicare</td>
<td>8198 349 (6 436 336–9 960 362)</td>
<td>6882 972 (4 657 007–9 108 937)</td>
<td>4740 450 (3 284 028–6 196 872)</td>
<td>4 872 980 (2 774 519–6 971 441)</td>
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<td>56.9 (50.9–62.7)</td>
<td>58.1 (49.1–66.6)</td>
<td>61.5 (54.2–68.4)</td>
<td>55.7 (46.6–64.4)</td>
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<tr>
<td>Medicaid</td>
<td>1228 963 (7 247 798–1 733 128)</td>
<td>804 856 (2 252 152–1 384 560)</td>
<td>546 813 (2 529 880–8 406 464)</td>
<td>651 352 (1 658 806–11 368 986)</td>
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<td>8.5 (5.9–12.2)</td>
<td>6.8 (3.4–13.1)</td>
<td>7.1 (4.1–11.9)</td>
<td>7.5 (3.4–15.5)</td>
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<td>Private insurance</td>
<td>3238 985 (2 395 711–4 082 259)</td>
<td>3500 317 (2 423 352–4 577 282)</td>
<td>2 151 190 (1 503 128–2 807 252)</td>
<td>2 856 843 (1 630 187–4 083 499)</td>
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<td>22.5 (17.8–28.0)</td>
<td>25.9 (22.5–37.7)</td>
<td>28.0 (22.9–33.7)</td>
<td>32.7 (25.5–40.7)</td>
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<tr>
<td>Other†</td>
<td>1745 360 (1 164 198–2 326 522)</td>
<td>662 497 (2 967 20–1 028 274)</td>
<td>260 957 (1 375 532–5 081 161)</td>
<td>365 701 (159 966–7 517 735)</td>
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<td></td>
<td>12.1 (8.7–16.7)</td>
<td>5.6 (3.2–9.6)</td>
<td>3.4 (1.3–8.3)</td>
<td>4.2 (2.4–7.1)</td>
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<tr>
<td>Total‡</td>
<td>14 411 657 (13 389 675–15 433 639)</td>
<td>11 850 642 (10 828 660–12 872 624)</td>
<td>7 703 410 (6 681 428–8 725 392)</td>
<td>8 746 876 (7 724 894–9 768 858)</td>
</tr>
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CI indicates confidence interval; NAMCS, National Ambulatory Medical Care Survey; and NHAMCS, National Hospital Ambulatory Medical Care Survey.

*The estimates for this group are unreliable for the time periods 1995 to 1998, 2003 to 2006, and 2007 to 2010 attributable to sample sizes being <30.
†The estimate for this group is unreliable for the time period 2003 to 2006 attributable to the sample size being <30.
‡Totals here are less than totals for the other characteristics because of missing values; 79 383 (0.55%) in 1995 to 1998, 46 268 (0.39%) in 1999 to 2002, 62 667 (0.81%) in 2003 to 2006, and 241 102 (2.7%) in 2007 to 2010. Missing values were not included in the calculation of the percentages.
among women (6659/100000) and men (8533/100000) ≥65 years of age.

We first tested whether age- and sex-standardized visit rates for angina declined in a linear fashion across the 4 time periods (Figure). The linear trend was of borderline significance (P<0.10). Because the largest decline appeared to be from the first (1995–1998) to the third (2003–2006) time period, we then formally tested whether this decline was linear. We found that rates declined in a statistically significant linear fashion (β=−482/100; P=0.05) across these time periods. During those years, the actual rate declined by ~50%, from 1856.6/100000 to 982.8/100000. The rate then increased slightly to 982.8/100000 in the last period. CAD visit rates were much higher than angina visit rates, and the rate increased initially from the first to the second period (from 1856.6/100000 to 7708.1/100000), and then rates declined after that to a low of 5459.8/100000.

The crude percentage of angina visits where an ECG was either ordered or provided was relatively flat over time, ranging from 25% to 33% of visits (Table 3). Stress testing over the same period ranged from 7% to 13%. Referrals to another provider, a hospital, or an emergency room ranged from 8% to 15% of visits. Age- and sex-adjusted rates (Table 4) of these types of medical care showed that the likelihood of stress testing doubled during the second (odds ratio, 2.1; 95% CI, 1.2–3.6) and third (odds ratio, 2.1; 95% CI, 1.1–3.8) periods compared with 1995 to 1998, and the fourth period odds ratio was 1.3, which was not different from baseline. Also, the likelihood of visits being associated with a referral doubled (odds ratio, 2.1; 95% CI, 1.0–4.3) from 1999 through 2002 to 2007 through 2010.

### Discussion

We asked whether angina visits have declined over time in the outpatient setting. We found that physician office and hospital outpatient clinic visits for angina have declined from the mid-1990s through 2003 to 2006. This decline parallels the declines already noted in earlier studies of the inpatient and emergency room settings. We also asked whether physicians are diagnosing/managing angina more often in their offices. Although screening using a resting ECG is not recommended by the US Preventive Services Task Force, using an ECG to better understand angina symptoms is recommended. The percentage of ECGs ordered or provided to persons with angina did not change over time. On the contrary, we found that ordering or provision of stress tests during office visits for angina has increased from the mid-1990s through 2006 and that patient referrals have increased from the late 1990s through 2010. Thus, the reason for declining rates of angina in hospitals and emergency rooms is probably not that physicians fail to send patients to hospitals, emergency rooms, or other providers for diagnosis or management.

Possible explanations for this decline include a true declining prevalence of angina, based on improvements in heart disease risk factors over time; and a move to better understand the causes of angina, a better ability to do so, and ICD-9-CM coding guidelines designed to reflect these changing physician practices.

Unfortunately, it is extremely difficult to find published estimates of secular trends for angina prevalence in the United States. We found no studies that covered the period of our study, and we found only 1 study that covered an earlier time period.

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**Table 2. Age- and Sex-Stratified Rates of Office Visits for Angina per 100,000 Population and 95% CIs Among Adults, by Time Period: NHAMCS and NAMCS, 1995 to 2010, United States**

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<tr>
<td>18–64 y</td>
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</tr>
<tr>
<td>Men</td>
<td>942.8</td>
<td>661.6</td>
<td>457.2</td>
<td>625.7</td>
</tr>
<tr>
<td>Women</td>
<td>596.2</td>
<td>371.2</td>
<td>350.1</td>
<td>395.6</td>
</tr>
<tr>
<td>≥65 y*</td>
<td>8533.2</td>
<td>7586.5</td>
<td>3656.0</td>
<td>4001.1</td>
</tr>
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*For both men and women, and in every time period, rates were significantly higher (P<0.05) for those ≥65 years of age.
†Rates dropped in a linear fashion (P=0.03) from the first time period to the last time period.

**Figure. Age- and sex-standardized rates of office visits for angina in the United States across 4 time periods compared with changes in coronary atherosclerotic disease visit rates.** Data derived from National Hospital Ambulatory Medical Care Survey and National Ambulatory Medical Care Survey, 1995 to 2010. Although there is not a statistically significant decline at P=0.05 from the first to the last time period of the study, there is a statistically significant linear decline between the first (1995–1998) and third (1999–2002) time period (P<0.05). The 2000 US Census Population was used as the standard population.
period. Participants’ responses to questions from the Rose Questionnaire on angina symptoms were used to determine prevalence among adults 40 to 74 years of age from the early 1970s through the mid-1990s. During this period, rates were relatively flat. During the time frame of our study, however, several key risk factors for atherosclerosis have declined. There is clear evidence that high low-density lipoprotein cholesterol values for adults 40 to 74 years of age have decreased substantially from 59% to 27% during the late 1970s and through 2007 to 2010. Smoking prevalence and air pollution have also declined since the 1980s. Also, blood pressure control has increased to an estimated 50% of all patients with hypertension in National Health and Nutrition Examination Survey 2007 to 2008, with most of the improvement since 1988 occurring after 1999 to 2000. However, because other risk factors such as overweight, diabetes mellitus, and physical inactivity have increased over time, it is not known whether these setbacks would offset the gains expected in reducing atherosclerosis.

We found no studies of regional differences in trends of angina prevalence that might explain our puzzling finding that almost 50% of angina visits occurred in the Southern US region from 2007 to 2010. It seems that the prevalence in the South remained relatively flat because other regions experienced a decline in angina visits. Because few data are available to help us understand this, we can only speculate that this might be attributable to a lag in the aggressiveness of diagnosing CAD or a lag in the adoption of ICD-9 coding changes (see below) or an increase in the population with angina symptoms in the South, either through in-migration or a worsening of existing heart disease risk factors. Evidence suggests that the South has experienced disproportionate increases in both diabetes mellitus and obesity.

Since the early 1990s, ICD-9-CM coding guidelines for angina have changed by moving angina from a primary diagnosis to a secondary diagnosis (when the cause is known) or by dropping angina from the coding altogether (when it is
clear that a patient has had an acute myocardial infarction).22 Because these coding guidelines changes are adopted, one would expect that angina would be less frequently listed as a diagnostic code. This is especially true because the diagnostic technology used to distinguish angina, coronary atherosclerosis, and myocardial infarction has rapidly evolved. There is clear evidence that the use of imaging stress tests and cardiac catheterization increased from 1993 through 2001 in the Medicare population.23 Saver et al have provided evidence that the decline in preventable angina hospitalizations from 1992 to 1999, in part, stems from more aggressive diagnosis of coronary atherosclerosis. Bertoni et al conducted research on angina hospitalizations and showed that it is not just a matter of having moved angina from its position as a primary diagnosis to a nonprimary diagnosis. Angina recorded as any hospital diagnosis also declined during the period 1988 to 2001. Our findings from 1995 to 2002 support previous findings that angina rates declined while CAD rates increased. However, our data after 2002 show that both angina and CAD rates have declined. Although it is possible that the same coding changes that have occurred in the hospital setting have also occurred in the outpatient setting during the earlier time period; it also appears that angina visits may be declining attributable to other factors such as a declining prevalence of the symptoms of angina.

Both angina and CAD are conditions that are considered manageable, if not preventable, in outpatient and community settings. Highly recommended evidence-based management strategies in the outpatient setting include low-density lipoprotein cholesterol lowering to targets based on initial risk, aspirin therapy, and use of renin–angiotensin–aldosterone system blockers and β-blockers for selected at-risk patients.2 Other recommended strategies include smoking cessation, blood pressure control, participation in physical activity, improved nutrition, weight management, and diabetes mellitus management.2 Studies have shown that aggressive risk factor management and therapeutic lifestyle changes for patients with existing coronary and other atherosclerotic vascular disease improve survival, reduce recurrent events, and improve quality of life.24–27

Our study contributes newly to the literature in providing data on secular trends for angina visits, using data from a representative sample of physician offices and hospital OPDs, insights into previous research showing declines in angina hospitalizations and emergency room visits by refuting a hypothesis that physicians are more often managing angina in the outpatient setting, and providing more recent information on changes in outpatient physician practices over time.

Our study also has limitations. First, because we used ICD-9-CM coding to flag angina visits, it is important to realize that we do not provide estimates of the prevalence of angina. To derive such estimates, one would need to obtain data on individuals from a source such as the Rose questionnaire on angina. Having this would have provided us with a more complete picture of the causes behind the reduction in angina visits in the outpatient setting. Second, in an effort to inform previous research on preventable hospitalizations and emergency room visits for angina, we used a definition that closely resembles AHRQ’s technical definition of a prevention quality indicator. However, the match was not exact. We did not exclude transfers or cardiac procedures from outpatient visits, and we used all 3 diagnostic codes to flag an angina visit. This was done because we had small sample sizes if we only used the first diagnosis. Also, it was not clear that the use of first diagnosis in outpatient data has the same meaning as the principal diagnosis in hospitalization data. Third, some variables changed over the time frame of the study (eg, principal source of payment and referral patterns). Although we attempted to account for these by making appropriate coding changes, it is possible that the changes in the variables impacted our estimates over time. Fourth, we were unable to distinguish between whether services were provided in the office or were ordered to be provided in another setting. However, the aim of this part of the analysis was to simply examine whether physician behavior changed over time with regard to ordering/testing. Fifth, it was not clear whether referral to another physician was for care directly related to the management of angina. The patient record form asks for the final disposition of the visit, and 1 of the checkboxes reads referral to other physician. Finally, we were unable to conduct more in-depth analyses because of small sample sizes. We addressed some of the problems associated with this by combining data across years. However, despite the aggregation, we still were unable to conduct analyses that required further stratifications or additional multivariable adjustments.

Regardless of the reasons for the decline in angina outpatient visits, primary and secondary prevention strategies should continue to be a hallmark of care for patients with coronary artery disease. This does not remove the need for further research. To move beyond speculation, good studies of angina using standardized questionnaires such as the Rose Questionnaires are needed to understand whether angina symptomatology has changed over time in the United States. Also, more research is needed to understand the level of access and quality of care that is provided for patients with angina in the outpatient setting. With these types of studies, we could more easily determine whether, even with the complication of coding changes, the use of the prevention quality metric for angina without procedure still provides valuable insights on barriers to the outpatient system of quality care.

Disclosures

None.

References


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Julie C. Will, Fleetwood Loustalot and Yuling Hong

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