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Medicare Services Provided by Cardiologists in the United States: 1999–2008
Bruce W. Andrus, MD; H. Gilbert Welch, MD, MPH

Background—Services provided by cardiologists represent a major portion of Medicare expenditures for specialist physicians. The absolute growth and distribution of these services over the past decade have not been well described.

Methods and Results—We analyzed fee-for-service Medicare Part B claims for each year from 1999–2008 and selected claims from physicians whose specialty code was cardiology. We then grouped approximately 1000 CPT-9 codes into 45 specific service groups that were then further aggregated into 3 broad service categories: evaluation and management, noninvasive procedures, and invasive procedures. Our main outcome measures were services and allowed charges per 1000 beneficiaries. Sample size ranged from 30.9 million beneficiaries in 1999 to 31.7 million in 2008. During this 10-year period, the number of claims from cardiologists increased 44% (from 2082–2997 per 1000 beneficiaries) while the allowed charges increased 28% after adjusting for inflation (in 2008 dollars, from $181 397–231 728 per 1000 beneficiaries). Evaluation and management services and invasive procedures contributed relatively little to this growth. Instead, most of the growth involved noninvasive procedures—with a 70% increase in claims. Although the most dramatic increases in noninvasive procedures involved emerging imaging technologies (cardiac CT, MRI, and PET scanning), the bulk of the growth occurred in two established technologies: resting echocardiograms and stress tests with nuclear imaging.

Conclusions—Most of the growth in services provided by cardiologists over the past decade is the result of increased noninvasive imaging.

Key Words: imaging ■ epidemiology ■ echocardiography

No other illness is responsible for a larger portion of health care expenditures than cardiovascular disease. Between 2004–2010, the direct health care cost of cardiovascular disease grew from an estimated $227–324 billion. The extent to which this growth is due to the provision of more cognitive services, increased utilization of well-established procedures, or diffusion of emerging technologies is uncertain. The latter group includes both new diagnostic imaging procedures (CT angiography, cardiac MRI, and PET scanning) and new therapeutic procedures (endocardial mapping of arrhythmias, implantable defibrillators, biventricular pacemakers, and coronary and peripheral endovascular interventions).

As the pressure to control costs rise, it is important to understand temporal trends and identify the cardiology services driving this growth. In this brief report, we examine the trends in services provided by cardiologists to Medicare beneficiaries over the past decade.

Methods
Our data are from the Medicare Physician/Supplier Procedure Summary File, which represents carrier-paid claims for 100% of beneficiaries enrolled in FFS Medicare Part B. We used this file to examine all claims submitted by physicians whose specialty code was cardiology in the 10-year interval from January 1, 1999, to December 31, 2008. Our data include all services payable under the Medicare physician fee schedule. This represents all professional services as well as the technical component of services provided in physician offices. It does not include the technical component of services performed on inpatients or outpatients in a hospital facility.

We grouped the approximately 1000 CPT-9 codes submitted by cardiologists into 45 specific service categories that we subsequently assigned to 3 broad service categories: evaluation and management (ie, nonprocedural care), noninvasive procedures, and invasive procedures. Full details of the categorization are available in the online-only Data Supplement Material.

A small percentage of physicians billed Medicare using a multispecialty group code instead of coding a specific specialty (eg, cardiology, internal medicine, family practice)—a percentage that declined over our 10-year study period (in exercise stress tests, for example, from 3.6–0.5%). Consequently, there were small increases in the use of specialty-specific codes, which would spuriously inflate measures of specialty-specific growth.

To correct for this bias, we allocated the services submitted by physicians using the multispecialty group code to specific specialties based on the distribution of providers of known specialty that year. For example, among ECG stress tests performed by a known specialty in 1999, 80% were performed by cardiologists, 14% by internists, and 6% by other specialties. Using this distribution, we allocated the 44 905 claims with unknown specialty in that year (3.6% of all stress tests) across the 3 specialty groups.

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WHAT IS KNOWN

- The rate of growth of health care spending is straining existing resources.
- Previous studies have documented increasing use of cardiovascular imaging and percutaneous intervention.
- Over the past decade, new technology has emerged for the diagnosis and management of cardiovascular disease.

WHAT THE STUDY ADDS

- As evaluated by claims per 1000 traditional Medicare beneficiaries, the intensity of health care services by cardiologists increased 44% from 1999–2008.
- The rates of noninvasive procedures grew much faster than that of bedside evaluation and management and invasive services; they accounted for 78% of the total growth.
- The rate of resting transthoracic echocardiography nearly doubled and nuclear stress testing tripled; these 2 well-established services accounted for much of the total growth.
- There was little growth in the rate of percutaneous coronary interventions.
- Emerging cardiovascular technologies grew rapidly but account for very little of the total services or charges of cardiologists.

We calculated utilization rates for each of the 45 categories in each of the 10 years in the analysis. The numerators were the counts of services during the year; the denominators were the average number of Medicare beneficiaries enrolled in fee-for-service Medicare Part B during that year. Rates were calculated per 1000 beneficiaries. Changes in volumes were calculated as ratios using 1999 as the base year. Increases <$2-fold are reported as percentage increases (eg, a ratio of 1.6 is expressed as a 60% increase); those >$2-fold are reported as multiples (eg, a ratio of 3.2 is labeled a 3.2-fold increase). Finally, we calculated the contribution of each service category to the overall growth in the number of services between 1999–2008. This calculation is simply a fraction: the numerator is the absolute change in the rate of service (eg, 50 additional invasive services per 1000 beneficiaries), the denominator is the absolute change in the rate of all services (eg, 1000 additional cardiology services per 1000 beneficiaries). In the prior example, the contribution of invasive procedures to overall growth would be 5% (50/1000). Because noninvasive imaging was the category with the greatest growth, we also calculated the contribution to its growth of its main components. The contribution to overall growth of allowed charges was calculated similarly, substituting allowed charges in place of number of services. We adjusted for inflation using the consumer price index.4 Claims level analysis was performed with SAS version 9.2. All subsequent analyses were performed in Microsoft EXCEL 2007.

Results

From 1999–2008, the number of claims from cardiologists increased 44% (from 2082–2997 per 1000 beneficiaries), whereas the allowed charges increased 28% after adjusting for inflation (in 2008 dollars, from $181 397–231 728 per 1000 beneficiaries). Figure 1 shows that noninvasive procedures grew much faster than either invasive procedures or evaluation and management services (70%, 25%, and 18%, respectively).

Evaluation and Management Services

The rate of inpatient visits by cardiologists remained nearly constant: initial hospital visits increased by 10%, whereas subsequent inpatient visit rates decreased by 4%. In contrast, initial and follow up outpatient visit rates increased by 51% and 41%, respectively.

Noninvasive Procedures

Table 1 shows the growth in the major subsets of noninvasive procedures. Within resting cardiac imaging, the emerging technologies of cardiac CT, MRI, and PET grew 6-fold. Peripheral vascular ultrasound increased 2.8-fold, and transcoronary and transesophageal echo grew 90% and 70%, respectively. Within monitoring, Holter rates increased 55%, ECGs 28%, and event monitoring 2.6-fold. Within stress testing, nuclear stress testing increased 3.2-fold, nonimaging stress 50%, and stress echocardiography only 11%.

Invasive Procedures

Table 1 also shows the growth in the major subsets of invasive procedures. Within coronary procedures, percutaneous coronary intervention and coronary angiography only grew moderately (23% and 9%, respectively)—and, in fact, have been declining in recent years as shown in Figure 2. In contrast, the emerging technology of intracoronary lesion assessment by intravascular ultrasound and pressure wire increased 18-fold. Within peripheral vascular procedures, angiography, angioplasty, and stenting all had similar growth (2.6-, 2.5-, and 3.1-fold, respectively), whereas atherectomy disseminated rapidly with a 48.0-fold increase. Within electrophysiological procedures, pacemaker and defibrillator implants increased 2.5-fold, ablations 2.3-fold, and invasive electrophysiological diagnostic evaluations grew by 87%.

Sensitivity Analysis

To address the uncertainty posed by services billed by multispecialty groups, we performed a sensitivity analysis by varying the assignment of multispecialty group to cardiologists across its entire possible range (ie, all physicians billing for cardiology services under “multispecialty group” were cardiologists versus all were not cardiologists). This did not have a meaningful impact on our findings. For example, consider a cardiology service particularly likely to be performed by noncardiologists: ECG stress tests. When all multispecialty group ECG stress tests were assigned to cardiology in both 1999 and 2008, we calculated an 89% increase in the cardiologist rate over the decade. Conversely, when we assigned no multispecialty group ECG stress tests to cardiology, we calculated a 97% increase. Our proportionally distributed approach outlined in the methods section above yielded a rate of 91%.

Contributions to Growth

Dramatic relative increases in procedures performed infrequently in 1999 (ie, emerging technologies) can exaggerate their importance to overall growth. To provide a broader
perspective, Figure 3 shows the contribution of various service categories to growth in terms of both services and allowed charges. Of the total increase in services, noninvasive procedures contributed 78% compared with 5% for invasive procedures and 17% for evaluation and management. The major components of noninvasive procedures were resting echocardiography and nuclear stress testing. These 2 services accounted for 32% and 16%, respectively, of the total growth in services and 18% and 27% of the total growth in charges.

Table 1. Invasive and Noninvasive Services Provided by Cardiologists per 1000 Beneficiaries by Year

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
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<th>2007</th>
<th>2008</th>
<th>RR (95% CI)</th>
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<td><strong>Coronary procedures</strong></td>
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<tr>
<td>Angiography</td>
<td>64.4</td>
<td>69.2</td>
<td>74.4</td>
<td>76.9</td>
<td>77.6</td>
<td>78.5</td>
<td>75.1</td>
<td>74.0</td>
<td>70.7</td>
<td>70.2</td>
<td>1.1 (1.09–1.09)</td>
</tr>
<tr>
<td>Interventions</td>
<td>10.0</td>
<td>10.9</td>
<td>11.8</td>
<td>12.5</td>
<td>13.0</td>
<td>13.5</td>
<td>13.3</td>
<td>13.5</td>
<td>12.1</td>
<td>12.3</td>
<td>1.2 (1.23–1.24)</td>
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<td>Stenosis assessment†</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
<td>16 (14.81–17.29)</td>
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<td><strong>Peripheral procedures</strong></td>
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<tr>
<td>Angiography</td>
<td>2.3</td>
<td>3.0</td>
<td>3.8</td>
<td>4.5</td>
<td>4.5</td>
<td>5.1</td>
<td>5.6</td>
<td>6.1</td>
<td>6.0</td>
<td>5.9</td>
<td>2.6 (2.55–2.60)</td>
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<td>Angioplasty</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
<td>1.0</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>1.5</td>
<td>1.6</td>
<td>1.6</td>
<td>2.5 (2.47–2.55)</td>
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<tr>
<td>Atherectomy</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
<td>0.5</td>
<td>0.6</td>
<td>341 (30.95–37.57)</td>
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<td>Stenting</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td>1.0</td>
<td>1.1</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>3.1 (3.09–3.21)</td>
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<td><strong>EP procedures</strong></td>
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<tr>
<td>EP studies</td>
<td>1.9</td>
<td>2.1</td>
<td>2.4</td>
<td>2.8</td>
<td>3.0</td>
<td>3.1</td>
<td>2.9</td>
<td>3.0</td>
<td>3.2</td>
<td>3.5</td>
<td>1.9 (1.85–1.89)</td>
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<td>Pacemakers/ICDs</td>
<td>5.2</td>
<td>6.0</td>
<td>6.8</td>
<td>8.0</td>
<td>9.5</td>
<td>10.2</td>
<td>11.8</td>
<td>11.4</td>
<td>12.3</td>
<td>13.1</td>
<td>2.5 (2.49–2.51)</td>
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<tr>
<td>Ablations</td>
<td>0.6</td>
<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0</td>
<td>1.1</td>
<td>1.3</td>
<td>2.3 (2.31–2.39)</td>
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<tr>
<td><strong>EP monitoring</strong></td>
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<tr>
<td>12-Lead ECGs</td>
<td>427.8</td>
<td>434.0</td>
<td>453.6</td>
<td>468.6</td>
<td>470.6</td>
<td>479.4</td>
<td>496.4</td>
<td>512.0</td>
<td>526.6</td>
<td>545.7</td>
<td>1.3 (1.27–1.28)</td>
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<td>Event monitors</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
<td>2.0</td>
<td>3.4</td>
<td>3.7</td>
<td>3.9</td>
<td>4.3</td>
<td>4.7</td>
<td>4.7</td>
<td>2.6 (2.56–2.61)</td>
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<td>Holter monitors</td>
<td>20.3</td>
<td>21.2</td>
<td>22.2</td>
<td>24.0</td>
<td>24.6</td>
<td>25.0</td>
<td>26.3</td>
<td>27.2</td>
<td>28.6</td>
<td>31.5</td>
<td>1.6 (1.55–1.56)</td>
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<tr>
<td><strong>Resting imaging</strong></td>
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<tr>
<td>CT/MRI/PET</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
<td>1.0</td>
<td>2.3</td>
<td>3.6</td>
<td>3.7</td>
<td>63.3 (60.43–66.32)</td>
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<tr>
<td>Vascular ultrasound</td>
<td>17.2</td>
<td>17.6</td>
<td>20.1</td>
<td>22.6</td>
<td>25.8</td>
<td>30.2</td>
<td>35.3</td>
<td>38.3</td>
<td>43.4</td>
<td>48.6</td>
<td>2.8 (2.82–2.84)</td>
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<tr>
<td>Transthoracic echo</td>
<td>319.6</td>
<td>355.3</td>
<td>390.7</td>
<td>426.9</td>
<td>457.9</td>
<td>486.4</td>
<td>522.2</td>
<td>546.7</td>
<td>581.3</td>
<td>609.8</td>
<td>1.9 (1.91–1.91)</td>
</tr>
<tr>
<td>TEE</td>
<td>3.3</td>
<td>3.7</td>
<td>4.1</td>
<td>4.6</td>
<td>4.7</td>
<td>4.8</td>
<td>4.8</td>
<td>5.1</td>
<td>5.2</td>
<td>5.5</td>
<td>1.7 (1.65–1.68)</td>
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<tr>
<td><strong>Stress testing</strong></td>
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<tr>
<td>Nonimaging stress</td>
<td>83.9</td>
<td>92.2</td>
<td>101.1</td>
<td>106.6</td>
<td>110.6</td>
<td>118.0</td>
<td>122.8</td>
<td>124.6</td>
<td>126.1</td>
<td>126.1</td>
<td>1.5 (1.50–1.51)</td>
</tr>
<tr>
<td>Nuclear stress</td>
<td>68.1</td>
<td>88.4</td>
<td>111.7</td>
<td>135.2</td>
<td>157.5</td>
<td>182.2</td>
<td>200.5</td>
<td>209.3</td>
<td>215.5</td>
<td>218.5</td>
<td>3.2 (3.21–3.22)</td>
</tr>
<tr>
<td>Echo stress</td>
<td>10.8</td>
<td>11.7</td>
<td>12.2</td>
<td>12.5</td>
<td>12.4</td>
<td>12.7</td>
<td>12.4</td>
<td>12.1</td>
<td>12.2</td>
<td>12.1</td>
<td>1.1 (1.11–1.12)</td>
</tr>
</tbody>
</table>

RR indicates relative rate 2008:1999; CI, confidence interval; EP, diagnostic intracardiac electrophysiologic studies; ICD, implantable cardioverter-defibrillator; and TEE, transesophageal echocardiography.

*Some services (eg, echocardiography and angiography) are billed as individual components of a comprehensive study.
†Stenosis assessment refers to intravascular ultrasound and pressure wire–derived fractional flow reserve.
Discussion

We found a dramatic increase in Medicare cardiologist services and allowed charges during the past decade. The new technologies of advanced cardiac imaging and intravascular coronary stenosis assessments are diffusing rapidly, but, because of their modest absolute volumes, their contribution to the overall growth of cardiology services is relatively small. Likewise, the relatively novel use of diagnostic peripheral ultrasound and peripheral interventions by cardiologists is a noteworthy shift from the heart to the periphery but also represents small numbers of absolute services. Instead, nearly half the growth in cardiology services is accounted for by 2 familiar services: nuclear stress testing and resting transthoracic echocardiography.

Earlier work established the growth of imaging stress tests during the 1990s both in the United States and Canada. Our analysis show this growth continued into the next century. Other investigators reported steady growth of echocardiography into the early part of this decade. Our work confirms that growth of this modality remains steady and contrasts strikingly with the stability of echocardiography rates in the relatively fixed budget VA health care system: from 2000—2007, the rate of echocardiography in the VA grew only 4%.

It is equally important to highlight that rates of some procedures, notably percutaneous coronary interventions (PCI), grew very modestly. From 1993–2001, PCI rates more than doubled in US Medicare beneficiaries and nearly tripled in Ontario from 1992–2001. In our study, the 10-year growth rate from 1999–2008 was only 23%. Table 1 reveals a decrease in the peak rate of this decade from 13.5 in 2006 to 12.1 in 2007. This reduced rate persisted at 12.3 in 2008. This decline in utilization of PCI may reflect the impact of the COURAGE trial presented at the American College of Cardiology annual meeting and simultaneously published online in March 2007 which showed that in chronic stable angina, an initial strategy of PCI did not reduce the risk of death or nonfatal myocardial infarction when added to optimal medical therapy. On this point, our data agree with a recent analysis of the Northern New England Cardiovascular Database which found a statistically significant and persistent decrease in PCI for the indication of chronic stable angina following publication of COURAGE.

Our study has limitations. First, as noted above, there was a trend away from the multispecialty group designation in Medicare claims. Though we adjusted for this shift, a small amount of residual misattribution may remain. Second, we do not know if these trends apply to Medicare managed care beneficiaries or the population younger than 65 years. Third, we cannot discern whether the growth in services reflects new patients (eg, having their first echocardiogram) or established patients (eg, having more frequently repeated studies). Fourth, our data include the count (number) of all services regardless of venue, but they do not include charges for the technical component of services provided in the inpatient or hospital outpatient setting. A shift from the hospital to the office during these 10 years would bias our results by exaggerating the growth in charges for these services. How-
ever, the opposite trend has occurred, and therefore our charge data probably underestimate growth in spending. Finally, our data set does include clinical indications nor allow patient level correlation of imaging rate and clinical outcomes.

There are many possible explanations for the growth in noninvasive imaging. They include demand by a technology-oriented, empowered patient population, waning patient and provider confidence in physical examination skills, new indications for defibrillators and cardiac resynchronization therapy based on ejection fraction, closer surveillance of patients with documented coronary lesions now being treated conservatively, an increasing role of midlevel practitioners in lieu of internists in primary care, a strong desire by clinicians to avoid litigation for missed or delayed diagnosis (ie, defensive medicine), and finally, an effort by some cardiology practices to compensate for stable or declining practice costs.

Regardless of the specific combination of contributing factors, we find it unlikely that cardiological imaging was underutilized in 1999 and doubt there is clinical justification for a 3-fold increase in nuclear stress testing and a nearly 2-fold increase in echocardiography. Inappropriate use of echocardiography has been examined from several perspectives. In light of echocardiography’s role in heart failure, Pearlman et al studied geographic variation and correlated echocardiography rates with heart failure prevalence and found that it explained only one-half of the variation in echocardiography. Clinical appropriateness has also been studied directly using criteria developed by professional specialty societies. The rate of nuclear stress studies done for inappropriate reasons has ranged from 7–14%, with an additional 15% classified as “uncertain.” As shown in Table 2, estimates of the rate of inappropriate use of echocardiography have ranged from 9–26%. Because investigators are likely to have a high threshold to explicitly label a test “inappropriate,” we believe that these studies may underestimate the true rate. Of note, the highest rate of inappropriate studies was in an exclusively outpatient population. Also of interest is the study by Willens et al who found the rate of inappropriate echocardiograms ordered by midlevels in the VA system was more than double that of physicians (16% versus 7%, P=0.024). This supports the hypothesis that some of the growth in imaging studies is both inappropriate and related to changes in the medical workforce.

Excessive testing poses a number of potential harms. These include an increased cancer risk related to radiation exposure, unnecessary anxiety related to false-positive results and over diagnosis, and the morbidity and mortality of complications of invasive procedures pursued in response to these abnormalities. These harms are arguably most relevant to patient with either trivial symptoms or no symptoms at all.

Although there are uncertainties regarding the impact of this growth in services on benefit, there is no uncertainty about its impact on cost. Increasing utilization of nuclear stress testing and echocardiography strains the sustainability of Medicare and drives declining reimbursement for these studies. Increasing expenditures, more broadly, hinder efforts to maintain current benefits, consider new services or expand access to health care. We applaud the development of appropriate use criteria by the cardiology community and support its continued evidence-based development and integration with electronic medical record systems as an alternative to simply reducing reimbursement across the board. Finally, we are concerned that increased expenditures on imaging puts undesirable downward pressure on reimbursement for bedside evaluation and management services—a careful history and examination, explaining the assessment, and reviewing options—services that we believe are underappreciated.

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We appreciate the assistance of Kevin Hayes and Ariel Winter of the Medicare Payment Advisory Commission (MedPAC) both in obtaining the data and assisting with the analysis.

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References

Table 2. Studies of Appropriateness

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Modality</th>
<th>Setting</th>
<th>Inappropriate, %</th>
<th>Uncertain, %</th>
</tr>
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<tbody>
<tr>
<td>Hendel (2010)</td>
<td>Nuclear stress</td>
<td>Six diverse community practices</td>
<td>14</td>
<td>15</td>
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<tr>
<td>Ward (2008)</td>
<td>Echo</td>
<td>One private practice–outpatients</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>Martin (2009)</td>
<td>Echo</td>
<td>Single academic center</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Willens (2009)</td>
<td>Echo</td>
<td>Single academic center and VA</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

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Ty
to
pel
ology
of Cardiology Services

Evaluation & Management

Outpatient

99201-99215
99241-99245
99354-99355

Inpatient

99217-99239
99251-99292
99356-99357

Other

all other 99201-99499 not included above

Noninvasive Procedures

ECG, rhythm strips

93000-93010, 93040-93042

Holter Monitors

93224-93237

Event Recorders

93012-93014, 93268-93272

Pacemaker Evaluation (remote)

93294-93298

Resting transthoracic echocardiography

93303-93308, 93320-93325
SUPPLEMENTAL MATERIAL

Resting CT scans
0144T-0151T, 71275

Resting MRI scans
75552-75564, 76375-76376, 73777

Resting PET scans
78459, 78491-78492

Peripheral vascular ultrasound studies
93875-93979

Exercise Stress Test without Imaging
93015-93018, 94620-94621

Exercise/Pharmacologic Stress with Echo Imaging
93350-93352

Exercise/Pharmacologic Stress with Nuclear Imaging
78460-78494

Transesophageal Echocardiography
93312-93314, 93318

Pacemaker/ICD Evaluation (in person)
93279-93292

Tilt Table Testing
93660

Direct Current Cardioversion
92960
SUPPLEMENTAL MATERIAL

Invasive Procedures

Cardiac

Cardiac Catheter Placement (access, hemodynamics, oximetry)
  93501-93533

Coronary Injection (coronary angiography)
  93539-93545

Coronary Angiographic Supervision and Interpretation
  93555-93556

Coronary Intravascular Ultrasound and Pressure Derived Flow Reserve
  93571-93572

Hemodynamic Support (intraortic balloon pump)
  33967

Coronary Intervention (PCI)
  92982, 92984
  92995, 92996
  92973
  92980-81

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Percutaneous Balloon Valvuloplasty
  92986-90

Balloon Atrial Septostomy
  92992-93
SUPPLEMENTAL MATERIAL

Peripheral Vascular

Aortic Catheter Placement

36200

Peripheral (noncardiac) angiography

36215-36248

Peripheral Angiographic Supervision and Interpretation

75600-75790

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35470-76 (angioplasty)
35490-95 (arhrectomy)
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Electrophysiologic

Focused Intracardiac EP Evaluation

93600-93612

Comprehensive Intracardiac EP Evaluation

93619-93622
93613 (3D mapping)

Catheter Based Arrhythmia Ablation

93650-52

Defibrillation Threshold Testing of ICDs

93640-93642