ORIGINAL ARTICLE

Recent Trends in Imaging for Suspected Coronary Artery Disease: What Is the Best Approach?

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Abstract

Purpose: The aim of this study was to ascertain recent trends in noninvasive imaging utilization for suspected coronary artery disease.

Methods: The Medicare Part B databases for 2001 to 2013 were reviewed. Current Procedural Terminology primary codes for radionuclide myocardial perfusion imaging (MPI), stress echocardiography (SE), and coronary CT angiography (CCTA) were selected. Physician specialty codes were used to designate providers as radiologists, cardiologists, and all others as a group. Procedure volumes were tabulated, and utilization rates per 1,000 Medicare beneficiaries were calculated over the period of study.

Results: Total MPI utilization rates per 1,000 rose rapidly from 63.4 in 2001 to a peak of 88.0 in 2006 but declined every year thereafter, dropping to 61.9 in 2013. SE rates generally held steady around 12 to 13 from 2001 to 2010 but then began to decline, reaching 10.8 in 2013. Cardiologists predominate in both MPI and SE. CCTA rates were far lower. They peaked at 2.1 in 2007, but then dropped before leveling off at 1.07 in both 2012 and 2013. Radiologists and cardiologists have approximately equal roles in this procedure.

Conclusions: Both MPI and SE seem to be declining in use in recent years. This is likely due to unfavorable reimbursement trends caused by code bundling and resulting in the closure of many private cardiology offices. CCTA use is far lower than the two other types of imaging and has also declined in recent years. This is puzzling, as it is a new and promising procedure that has some advantages over MPI and SE. In 2013, 58 times as many MPI studies as CCTA studies were performed.

Key Words: Noninvasive cardiac imaging, coronary CT angiography, myocardial perfusion imaging, imaging utilization, radiology and radiologists, socioeconomic issues

J Am Coll Radiol 2015;■:■-■. Copyright © 2015 American College of Radiology

Cardiovascular disease is the leading cause of death worldwide [1-3]. In 2010 in the United States, 379,559 people died of coronary artery disease (CAD). It was also estimated that each year, 620,000 individuals would have new, nonfatal myocardial infarctions (MIs), another 295,000 would have recurrent MIs, and 150,000 would have new silent MIs [1]. Noninvasive imaging plays a crucial role in diagnosing this deadly disease. The imaging techniques most commonly used are radionuclide myocardial perfusion imaging (MPI), stress echocardiography (SE), and multidetector coronary CT angiography (CCTA). A previous study [4] suggested that after a period of very rapid growth in the early 2000s, the utilization rate of MPI was flattening by 2008 and that the utilization rate of CCTA was not growing as rapidly as anticipated. As will be discussed later, the use of the three tests in patients with suspected CAD is controversial, and some of the trends are puzzling. For example, MPI has significant shortcomings in evaluating patients with suspected CAD, yet in 2008 it was being used far more commonly than CCTA [4]. In this report, we present more recent utilization data for MPI, SE, and CCTA and discuss the implications of these data.

METHODS

Our data sources were the Medicare 2001 to 2013 Physician/Supplier Procedure Summary Master Files, which contain data on each code in the *Current Procedural*

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The authors have no conflicts of interest related to the material discussed in this article.

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1546-1440/15/$36.00 ■ http://dx.doi.org/10.1016/j.jacr.2015.11.015

Terminology, version 4 manual. The data include procedure volume, allowed payments, and other administrative information. The files cover all enrollees in traditional fee-for-service Part B Medicare (37.3 million in 2013) but not those in Medicare Advantage plans (15.1 million in 2013). We selected all primary codes for MPI, SE, and CCTA, as shown in Table 1. The primary MPI codes included those for single-photon emission computed tomographic (SPECT), planar, and PET studies, but did not include add-on codes for left ventricular wall motion or ejection fraction, which were commonly used before 2010. During the study period, code changes were made; these were carefully accounted for and are briefly summarized in Table 1. Global and professional component-only claims were tabulated, but technical component-only claims were excluded because that would have resulted in double counting. The numbers of fee-for-service Medicare enrollees each year were determined from the CMS Medicare Advantage State/County Penetration Reports, and these numbers were used to calculate the utilization rates of the procedures per 1,000 enrollees. Medicare's physician specialty codes were used to classify providers as radiologists, cardiologists, and all others as a group. The data for all MPI, SE, and CCTA codes were aggregated into those three categories, and trend lines from 2001 through 2013 were plotted. The trend lines show total procedure utilization rates per 1,000 enrollees, along with the rates for cardiologists and radiologists. The rates for the "other" category are not shown because they were quite small. Data analysis was performed using SAS version 9.3 for Windows (SAS Institute Inc, Cary, North Carolina).

RESULTS

The utilization rates for MPI are shown in Figure 1. The total Medicare fee-for-service rate per 1,000 rose from 63.4 in 2001 to a peak of 88.0 in 2006 (+39%). It then declined every year thereafter, slowly from 2007 to 2009 but then more rapidly thereafter. By 2013, the rate had dropped to 61.9, that is, slightly lower than it had been in 2001. The trend line for cardiologists generally paralleled that for total procedures. Cardiologists' rate rose from 35.3 in 2001 to 62.0 in 2006 (+76%), then remained generally stable for the next three years. It began a steady decline in 2010 and had dropped to 47.6 by 2013. The rate among radiologists was 20.3 in 2001, remained generally stable for the next four years, then began a slow but steady decline to reach 10.8 by 2013. PET MPI procedures were only a small fraction of the total. In 2013, total Medicare MPI procedure volume was 2,310,630, of which 91,200 (3.9%) were PET studies. The remainder used SPECT or planar technology (mostly the former).

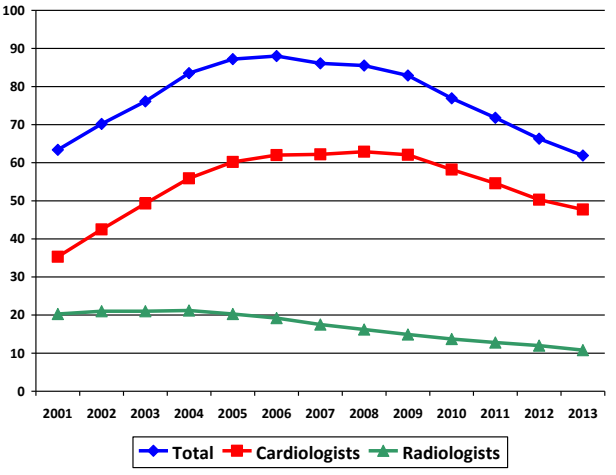

Fig 1. Utilization rates of radionuclide myocardial perfusion imaging (MPI) in the Medicare fee-for-service population, 2001 through 2013. Vertical axis shows examinations per 1000 beneficiaries. In addition to the total rates, data are shown for cardiologists and radiologists, who together provide the vast majority of MPI studies. The small proportions of examinations performed by other specialists are not shown.

Table 1. The CPT codes used in this analysis

Type of Study	Codes Used	Coding Notes
MPI	78460, 78461, 78464, 78465, 78451, 78452,78453, 78454, 78491, 78492	78451-78454 replaced 78460-78465 in 2010. 78491-78492 are PET MPI codes
SE	93350, 93351	93351 was a new code added in 2009
CCTA	0146T, 0147T, 0148T, 0149T, 75574	75574 replaced the T codes in 2010

Note: CCTA = coronary CT angiography; CPT = Current Procedural Terminology; MPI = myocardial perfusion imaging; SE = stress echocardiography.

Figure 2 shows the utilization rate trends for SE. Trend lines are shown for all procedures within this category and those by cardiologists. There is no line shown for radiologists because they have essentially no involvement in SE. The total SE utilization rate was 12.5 per 1,000 in 2001. Aside from minor fluctuations, there was little change over the ensuing nine years. In 2010, the rate was 12.6. During the next three years, however, there was a steady decline to 10.8 in 2013. The trend among cardiologists generally paralleled the total trend.

The CCTA trends are shown in Figure 3. Note that the scale on the vertical axis is far lower than for MPI and SE. The graph commences in 2006 because that

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