

Cardiovascular Imaging Payment and Reimbursement Systems

Understanding the Past and Present in Order to Guide the Future

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Uncertainty regarding the future of cardiovascular (CV) services and reimbursement systems in this era of rapid change in health care delivery may lead to further confusion among imagers. This article provides a brief history of national payment and reimbursement systems, and discusses potential changes that will impact CV imaging in the coming years. Data over the last decade are presented on payment and utilization of services to demonstrate the impact of reimbursement reforms and education on imaging use.

In this era of healthcare reform, the only certainty is uncertainty. For that reason, it is important to understand the current payment systems in order to appreciate the degree of re-engineering that will be required for the new proposals under consideration. Current reimbursement models are a result of many years of legislative and regulatory debate and healthcare reform, and understanding them will be necessary to adapt to future reimbursement. The Imaging Council developed this document as part of its overall mission to educate cardiovascular imagers and other interested parties about

various aspects of multimodality cardiovascular imaging. The data presented should help clarify the different payment systems and their evolution over the recent decade, which has resulted in tremendous change in Physician Fee Schedule (PFS) and hospital outpatient payments.

Medicare

Most Americans receive their health care through a private insurance product as opposed to a government product like Medicare (a government healthcare plan covering the elderly

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and disabled) or Medicaid. However, much of the modern payment system for imaging services is based on the development of the Medicare system, which was in turn based on the developing private insurance market in place at the time of its creation in 1965. Medicare rates currently serve as the standard to which other payment systems make adjustments. Medicare recognizes that imaging is provided predominantly in 2 settings: an outpatient physician practice/independent imaging facility or a hospital. Medicare further divides imaging into inpatient hospital services, outpatient hospital services, and outpatient physician practice/imaging centers paid under the PFS.

By its originating statute, Medicare covers medical services that are “reasonable and necessary for the diagnosis or treatment of illness or injury or to improve the functioning of a malformed body member” (1). In some cases, Medicare has chosen to further refine this statement by issuing a coverage policy that spells out appropriate indications for various services. For these services, the Centers for Medicare and Medicaid Services (CMS), the government agency charged with administering the Medicare and Medicaid programs, issue a national coverage determination that governs all Medicare patients. In other cases, coverage policy is determined by the local Medicare Administrative Contractors who process Medicare claims. If no national Medicare coverage determination exists for a service, the local contractors are permitted to make that determination (a local carrier determination) (2). A coverage determination may include explicit language for when a service is covered or when a service is not covered and often includes both (2).

Inpatient hospital services. Since 1982, Medicare has paid inpatient hospital services prospectively on the basis of the patient’s disease category and for any major invasive procedure services provided (3). This payment system is referred to as the Medicare Severity Diagnosis-

Related Groups (DRGs) (a global payment made to a hospital for a patient’s hospitalized episode, covering all services provided with the exception of professional physician services). Medicare requires hospitals to collect the costs of providing for patients and then sets payment rates for each DRG based on those costs. The cost of inpatient imaging studies are included in the DRG payment, and the payment for a particular DRG is the same whether or not an imaging study was performed during that hospitalization. Initially, these cost estimates were based on historical data or self-reports and were not very accurate. With the implementation of computerized systems, CMS is attempting to identify actual services provided and true costs. Because these services are provided in 50 states and in all types of hospital settings, the enormity of such a task is daunting. The DRG payment system used by Medicare for inpatient hospital care is also used by some private insurers, whereas others use per-diem rates or other methods (4). Payments are updated (i.e., increased) on an annual basis through a review of medical inflation and other adjustment factors.

Hospital Outpatient Prospective Payment System. The Hospital Outpatient Prospective Payment System (HOPPS) program (used to determine payments for services provided in the hospital in which a patient stays fewer than 2 midnights) was implemented as a result of the Balanced Budget Act of 1997. Hospitals had previously been paid on a cost basis for outpatient services, even though the prospective payment system described above had been used for inpatient hospital services since 1983 (5). The HOPPS pays for services on the basis of ambulatory payment classifications. The ambulatory payment classification system groups services as designated by the Healthcare Common Procedure Coding System (HCPCS) on the basis of clinical characteristics and costs.

Under the HOPPS, hospitals are paid on a fee-for-service basis based on HCPCS codes, and these codes

are bundled into ambulatory payment classifications. Payments are based on the median costs of particular service; however, CMS recently proposed to change this method to incorporate the geometric mean of costs (6). Costs are determined via hospitals recording charges for all services and items associated with a particular HCPCS code. Medicare/CMS then converts those charges into costs based on a department-specific cost to charge ratio, which is in turn based on required annual cost reporting (4). Payments are increased annually based on the inpatient hospital market basket percentage increase. A “market basket” is a measurement of the cost of purchasing a specific set of goods or services, in this case, the services associated with hospital services (7). The hospital market basket increase varies from year to year, but was consistently between 2.5% and 4% from 2000 to 2010 (8). This process is not done for individual hospitals and patient visits. Rather, levels are set nationally and applied to each institution regardless of the actual costs at the site.

Physician Fee Schedule. Since 1992, Medicare has paid physicians using a Resource-Based Relative Value Scale (RBRVS) (a system of assigning relative weights to physician services developed in the 1980s and commonly used to set payments based on a single monetary conversion factor). This payment mechanism compares the resources for all of the services covered under the Medicare PFS and establishes values for each service relative to others. The actual payment amount is calculated through a conversion factor based on a statutory formula. Services under the PFS may be paid as a professional component (the element of Relative Value Unit [RVU] related to the work the physician personally performs), a technical component (the element of an RVU that relates to the work that the physician does not perform), or a global component that combines the 2 components. These are best demonstrated by an example. For echocardiography (American Medical Association

Current Procedural Terminology [CPT] code 93306), there is a technical component of 3.75 RVUs to pay for staff time, disposables, and equipment depreciation necessary to perform the procedure. This is paid to the physician if the physician owns and operates the echocardiography machine; it goes to the hospital if the hospital owns and operates the equipment. In either case, the physician interpreting the echocardiogram receives a professional component payment that includes the physician work (1.30 RVUs) and additional practice expense of 0.48 RVUs to compensate for physician office expenses not directly related to technical performance of echocardiography. Separate professional component (the element of an RVU related to the work the physician personally performs) and technical component payments are typical for procedures (e.g., echocardiography and nuclear cardiology) in which the equipment is owned and operated by the physician in some cases and by the hospital in others.

The RBRVS used for physician payment by Medicare is also used as a basis for determining payment by >75% of private insurers, according to a 2006 American Medical Association (AMA) survey.

History of the PFS. CODING. Services provided in the physician office are paid using a fee-for-service system with a combination of HCPCS codes describing the procedure. Many of the HCPCS codes reported by physicians and hospitals for outpatient services are a product of the CPT system. CPT was first published in 1966 and was intended to identify certain surgical procedures. Beginning in 1983, CPT codes were used as part of Medicare payment systems (9). The 2000 final rule implementing the Health Insurance Portability and Accountability Act of 1996 required the use of standardized code sets and named CPT as the standardized code set for describing physician services, meaning that these codes must be used for transactions with private insurers in addition to Medicare (10).

New or revised CPT codes are approved by members of the CPT Editorial Panel (who are selected by the AMA Board of Trustees) based on proposals from specialty societies, industry, or the general public. CPT codes are created to describe services that are widely performed across the country and cannot be reported using another CPT code. CPT codes may be assigned in 3 possible categories: I, II, and III.

Category I status is given to services and procedures that are widely performed, have proven clinical efficacy, and have U.S. Food and Drug Administration approval for any devices used during the procedure. New category I codes are then sent to the AMA Relative Value Scale Update Committee (RUC) described below for assignment of values relative to the values of other procedures.

Category II codes are supplemental tracking codes used for performance measurement. These codes allow for quality data collection for performance measures contributing to good patient care.

Category III codes are temporary codes for data collection related to new and emerging technologies. These services are rarely performed, do not have U.S. Food and Drug Administration approval or proven clinical efficacy, and may be used in research. The codes help substantiate wider use and clinical efficacy, are not valued by the RUC, and may be billed although payment is discretionary by payer.

PAYMENT POLICY. Medicare physician payments were traditionally made based on a usual, customary, and reasonable rate based on local physician charges. Payments were made at the 75th percentile of the usual, customary, and reasonable rate in the early days of Medicare, with increasing payments for many services in subsequent years. The Omnibus Reconciliation Act of 1989 mandated that Medicare convert to the RBRVS starting in 1992. The RBRVS was created by William Hsaio and a multidisciplinary team of statisticians,

physicians, economists, and measurement specialists (11). They estimated physician time and effort involved in various services and assigned RVUs to each service. They assessed values for some services in detail and extrapolated from these to provide values for all other physician services.

After Hsaio's initial work with the RBRVS, the CMS needed a mechanism for valuing new CPT codes and valuing the codes for which Hsaio provided extrapolated values. In response, the medical profession created the AMA/Specialty Society RUC to value the physician work of services. The RUC serves in an unofficial advisory capacity to the CMS.

At present, after a new code is approved by the CPT Editorial Panel, the RUC recommends physician work values (in RVUs) and direct practice expenses to the CMS. The CMS can accept the RUC-recommended values or reject them and substitute its own estimations of value. The creation of a code by CPT does not ensure payment for the service. A review of the 2012 PFS shows that Medicare does not pay for many services with existing codes under any circumstances (12).

At present, payments to physicians by the CMS include 3 components: physician work, practice expense, and liability expense. For all 3, the RUC makes recommendations to the CMS, but the CMS makes the final decisions, and they may be quite different.

Hsaio et al. (11) originally recommended that practice expense be calculated based on the physician work associated with the service and the specialty-specific practice expense rates (11). When the RBRVS system was implemented in 1992, practice expense RVUs were calculated on the basis of historical charge information (13). The Social Security Acts Amendment of 1994 mandated the creation of practice expense RVUs that were not based on historical charge information. This effort was superseded by the Balanced Budget Act of 1997, which delayed the implementation until 1999 with a

4-year transition period (14). After this legislation, a method was finalized that combined 2 elements: 1) direct practice expenses (supplies, clinical staff, and equipment) that can be assigned to each service; and 2) indirect expense (estimates of overhead expense) specific to each specialty.

When the RUC evaluates the physician work for a service with a new CPT code, it also assesses the direct practice expenses associated with that code. Direct practice expenses attributable to an individual service include salary for clinical staff, disposable supplies, and durable equipment. Salary expense is the sum of the number of minutes to accomplish the service (estimated by the RUC) multiplied by the salary per minute (published by the CMS) summed for all medical professionals (e.g., licensed practical nurse, radiology technician) involved in providing the service. Disposable supplies for each service are identified by the RUC, and prices for each item of equipment are assigned by the CMS. Cost of durable equipment (e.g., a nuclear camera) is based on the amount of time that the equipment is used for the service (estimated by the RUC) with a price per minute based on capital cost of the equipment (determined by the CMS), amortization period for the equipment, and the percentage of time that the equipment is assumed to be in use (determined by the CMS). All of these assignments are made based on the typical patient. For example, if a service requires 1 needle 51% of the time, 2 needles 40% of the time, and 3 needles 9% of the time, the CMS prices the service with 1 needle.

Indirect practice expenses (i.e., overhead) are expenses that cannot be assigned to individual services provided to individual patients. Indirect practice expense is believed to vary from specialty to specialty. For example, an office-based internal medicine practice will have more indirect practice expense (e.g., office and administrative overhead) than a surgical practice that includes only a small office component.

Indirect practice expenses and the ratio of direct to indirect expenses are estimated on the basis of surveys. When the resource-based reimbursement was implemented, the CMS used the AMA Socioeconomic Monitoring Survey, which was conducted from 1981 through 1999, as a proxy for specialty-specific rates (15). In 2010, the CMS implemented data from a larger survey conducted by the AMA on behalf of many other specialty societies as a replacement for the AMA Socioeconomic Monitoring Survey. Data from this survey led the CMS to reduce practice expense payments to cardiologists by ~10%. The American College of Cardiology vigorously objected to the CMS that the survey methodology was flawed, but to no avail (16).

The practice expense formula requires a number of additional steps due to the payment mechanisms that govern the overall PFS (i.e., paying on a relative value system and limiting total anticipated spending based on a sustainable growth rate formula). This formula was instituted by the Balanced Budget Act of 1997 (17). Since 2002, this formula has resulted in legally mandated cuts in the overall Medicare conversion factor. However, since 2003, a series of legislative “patches” have been enacted that prevented the price cuts and instead resulted in yearly physician payment updates of 0.0% to 1.8% (18). Most recently, on January 2, 2013, Congress passed the American Taxpayer Relief Act, which prevented the 26.5% cut in CMS payments to physicians scheduled to occur on January 1, 2013. In the absence of further legislation, cuts deeper than 26.5% will be implemented on January 1, 2014.

Targeting Imaging

Starting in the early to mid-2000s, a rapid growth in imaging was recognized by Medicare and private payers, and both parties enacted specific and ongoing reductions in payment for these services. Because much of the growth took place through the PFS,

many of the payment reductions were focused on that area.

Deficit Reduction Act of 2005. The largest federal effort to regulate office-based medical imaging occurred as part of the Deficit Reduction Act (DRA) of 2005. The act mandated that as of 2007, reimbursement for the technical component of imaging services provided in the physician office setting could not be greater than the same service provided in the hospital outpatient setting. Cardiac computed tomography (CT) was significantly affected by the requirements of the DRA. The PFS payment was significantly higher than HOPPS payment for CT, so the HOPPS payment limited the reimbursement for in-office CT significantly. As an example, in 2012, the HOPPS cap for the technical component of cardiac CT was \$261.75, and the PFS rate was \$350.59, so the reimbursement was based on the HOPPS. Including a \$113.69 professional fee, global reimbursement was \$375.44 instead of \$464.27 as derived by the PFS. However, the impact on other cardiovascular imaging services, such as echocardiography and nuclear imaging, was relatively limited because the PFS payments were already below the HOPPS rate or would soon be based on other reductions in the PFS.

Creation of new codes through bundling. By law, the CMS is required to assess relative values of physician's services and procedures at least every 5 years. It has fulfilled that statutory requirement since 1997 by proposing codes for review by the RUC, and then considering the recommendations from the RUC's reviews at 5-year intervals. The RUC reviewed and made recommendations to the CMS regarding >1,000 codes in 1997, 870 codes in 2002, and 750 codes in 2007 (19).

Whereas it was the CMS's responsibility to identify codes to be reviewed at the 5-year reviews, most nominations for review came from the specialty societies, usually in an attempt to increase reimbursement for codes that they viewed as undervalued. Despite

Table 1. Relative Value Unit Valuation Pre- and Post-Bundling

Service	Pre-Bundling					Post-Bundling				Difference in Total RVU: Pre- and Post-Bundle, %
	Year Bundled	Physician Work RVUs	Practice Expense RVUs	PLI RVUs	Total	Physician Work RVUs	Practice Expense RVUs	PLI RVUs	Total	
Rest echo	2009	1.37	7.54	0.61	9.52	1.3	5.75	0.37	7.42	-22
Nuclear perfusion	2010	2.26	13.31	0.91	16.48	1.62	12.35	0.09	14.06	-15
Diagnostic cardiac cath	2011	6.505	27.61	0.7	34.82	5.85	23.87	1.33	31.05	-11

cath = catheterization; echo = echocardiography; PLI = Professional Liability Insurance; RVU = Relative Value Unit.

down-valuing of >400 codes in the 5-year review process, the CMS sustained criticism that the 5-year update process led to systematic increases in value and failed to identify codes that were overvalued. In response, in 2006, the CPT Editorial Panel and the RUC formed the Relativity Assessment Workgroup (RAW) to undertake a “rolling” 5-year review. Over the past 7 years, the RAW has developed 10 screens to identify potentially misvalued services and has sent >1,000 CPT codes to the RUC for review, leading in most cases to recommendations for lower values.

Even before pressuring the CPT Editorial Panel and the RUC to convene the RAW, the CMS attempted to identify potentially misvalued services. One of the CMS’s earliest strategies was to identify services frequently billed together, assume that they contained duplicative work when performed together, bundle them into 1 code, and then revalue that code with the assumption that this process would extract any overlapping or duplicative work.

The bundling initiative was launched by the CMS in 2009 when 2-dimensional Doppler and color Doppler echocardiography codes were bundled together into CPT code 93306. In 2010, CPT codes for nuclear myocardial perfusion imaging, wall motion, and ejection fraction (CPT codes 78465, 78478, and 78480, respectively) were bundled into CPT code 78452 and revalued. Other subspecialties of cardiology have been similarly targeted by an RAW screen (e.g., bundling of cardiac catheterization

codes in 2011 [devalued by 10%] and revaluing of coronary intervention codes in 2013 [devalued by an average of 18%]) (Table 1).

Multiple procedure payment reduction (MPPR). Medicare has had evolving policies that adjust payment when >1 service is provided to a patient based on the notion that efficiencies exist when furnishing multiple services in the same session due to duplication of work or resources, including patient preparation and post-procedure requirements as well as reporting. In 2006, the CMS began to reduce the payments if 2 imaging services in the same family were performed on contiguous body parts (e.g., CT of the abdomen and CT of the pelvis) (20). In subsequent years, through legislative and regulatory action, this multiple procedure payment reduction has been expanded in scope of reduction and number of services covered. By 2012, the multiple procedure reduction was 50% of the technical component and 25% for the professional component. This new policy did not distinguish services based on body part or imaging family. Although some cardiovascular imaging services such as magnetic resonance (MR) and CT were covered by this policy, most common cardiovascular imaging services such as echocardiography and single-photon emission computed tomography (SPECT) were not considered imaging in the initial implementation of the policy.

The 2013 Medicare PFS final rule included a provision to expand the MPPR for the technical component of

the second and subsequent cardiology service furnished by the same physician to the same patient on the same day. This resulted in a 25% reduction of the technical component of the lower-priced service. Although MR, MR angiography, CT, CT angiography, and noncardiac ultrasound service codes were already captured in this policy, the CMS proposed that the MPPR be applied to an expanded list of cardiovascular codes. The CMS used the example of SPECT and echocardiography performed on the same patient on the same day, where application of the MPPR would decrease by 25% the technical component of the echocardiography. The MPPR is applied only to office procedures, not those performed in the HOPPS setting or facility (hospital inpatient) setting.

Payment Trends and Comparisons Since 2002

The varying payment mechanisms, updates, and policy changes in the Medicare system over the past 10 years have greatly affected payment for a variety of cardiovascular imaging services (Figs. 1 and 2). As a result, the payment differential among these services varies widely. For rest echocardiography, physician office payments were relatively consistent between 2001 and 2007, but decreased each year from 2007 to 2012. The HOPPS payment for that same service moved dramatically up and down before settling into a slight upward trend on an annual basis between 2004 and 2010, followed

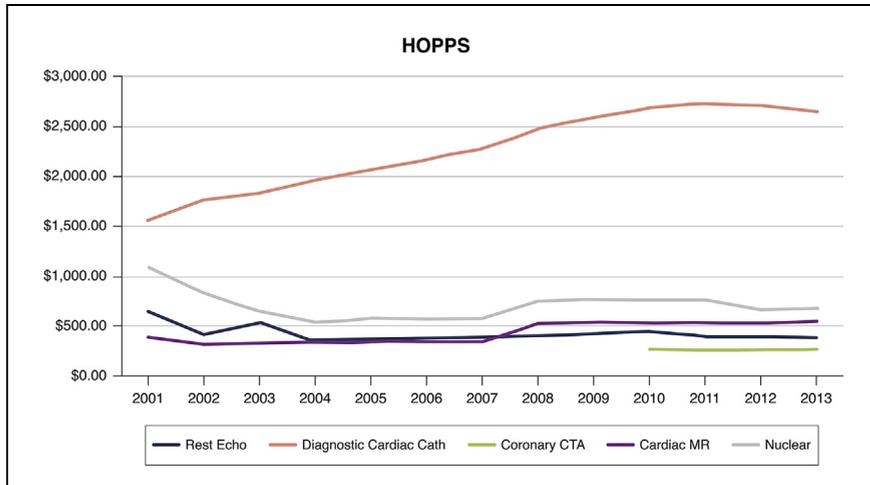


Figure 1. Payment by Year for Diagnostic Study Type Under the HOPPS Program: 2001 to 2013

Except for cardiac catheterization, HOPPS payments were reduced or relatively flat since 2001. Data are unavailable for coronary CTA pre-2010 due to lack of specific codes before 2008 and the inability to separate data from other chest computed tomography codes. Cath = cardiac catheterization; CTA = coronary computed tomography angiography; Echo = echocardiography; HOPPS = Hospital Outpatient Prospective Payment System; MR = magnetic resonance; Nuclear = cardiac single-photon emission computed tomography myocardial perfusion study.

a more limited history. However, coronary CT angiography payment levels remain nearly identical for HOPPS and PFS as a result of the DRA of 2005 provision limiting payment (as above). The actual calculated payment under the PFS would be greater were it not for that provision. In the case of diagnostic cardiac catheterization, the payment in the PFS was higher in 2001, but decreased dramatically by 2012. Payment increases in the chart reflect greater bundling of services in the hospital, but the overall difference resulted in the virtual elimination of this service outside the hospital by 2012.

Role of Imaging in Future Payment Models

Medical imaging growth has declined steadily since 2006 (Fig. 3) (21). A recent report by the Medical Imaging and Technology Alliance found that spending on imaging services per Medicare beneficiary has decreased by 16.7% from 2006 to 2011, whereas spending on nonimaging services has increased by 21.3% over the same period (22). This report also found that, since 2009, imaging services (based on a per-beneficiary use) have decreased by 5.1%, and advanced imaging services have decreased 6.6%. Furthermore, total spending on imaging services has decreased by 28.4% since 2006. Cardiovascular imaging has seen similar trends in overall medical imaging, with slowing of imaging use even before 2005. New advanced imaging modalities (cardiac CT and cardiac MR) continue to constitute a small fraction (0.1% to 1%) of conventional echocardiography and nuclear imaging volumes. Factors contributing to this decreased use of medical imaging include increased awareness of cost and use, pre-screening and required pre-authorization by radiology benefit manager companies and other entities, adoption of Appropriate Use Criteria by professional societies, and the recognition and emphasis in

by small decreases in each subsequent year. Other services such as nuclear SPECT imaging show similar patterns. It is important to note when comparing payment in the hospital and office settings that the payment and packaging rules are not identical. Notably, radio-nuclides used in SPECT imaging are

packaged in the HOPPS setting and not in the PFS setting, where they are instead paid at cost, and this difference is not reflected here. Services such as cardiac MR and CT have different packaging patterns. Because these services only began receiving national payments in 2008 and 2010, respectively, they have

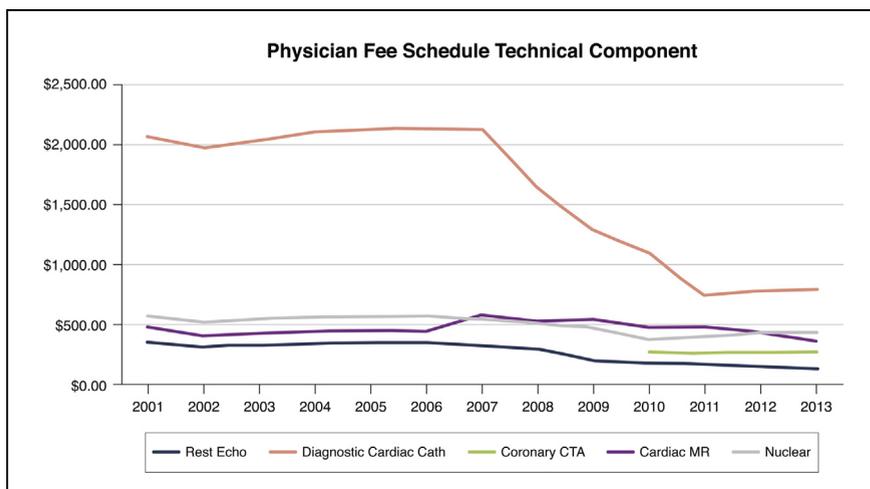


Figure 2. Payment by Year for Physician Fee Schedule Technical Component by Diagnostic Study Type: 2001 to 2013

Beginning in 2006 to 2007, Physician Fee Schedule payments were reduced for nearly all studies. Abbreviations as in Figure 1.

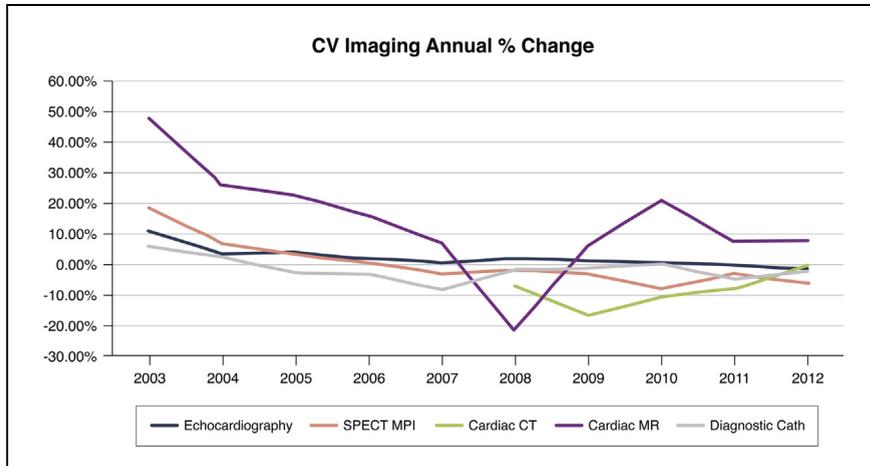


Figure 3. Annual Percentage of Change in Cardiovascular Imaging Procedure Volume: 2003 to 2013

Percentage of annual change in the use of cardiovascular imaging procedures in all studies performed for Medicare fee-for-service at all sites. (Procedures during 2012: Echo = 7.03 million; nuclear = 2.31 million; cardiac CT = 50,800; CMR = 16,400.) Data represent global and professional service billing for services in Medicare fee-for-service at all sites of service (e.g., inpatient hospital, physician office). Percentage of change calculation divides use of 1 year by that of the previous year. Percentage of changes to cardiac MR and cardiac CT are highly sensitive due to low use. CV = cardiovascular; SPECT MPI = single-photon emission computed tomography myocardial perfusion imaging study; other abbreviations as in Figure 1. Modified from Zoghbi (21).

expected to improve patient satisfaction, also requires spending more time with patients to alleviate concerns and explain procedures, radiation doses, and alternative imaging options versus conservative strategies. Outpatient imaging procedures are generally nonurgent, allowing ample time for patients to select from the multiple providers operating in regional markets and to explore alternative treatment options.

Capitated payment systems and bundled payment systems will pose another challenge to cardiac imaging procedures. Under capitated payment systems, a primary care physician or health system (e.g., an accountable care organization) is paid per patient per month to provide all care for the patient. Under bundled payment systems, a physician or health system is paid a fixed amount to provide care related to a procedure or episode of illness. In either case, the provider has an incentive to minimize cost, which may lead to parsimonious use or even underuse of cardiac imaging services.

In the future, reimbursement for medical imaging will continue to be challenging for several reasons. As mentioned above, insurers have identified imaging as a major cost, which, until 2007, was increasing rapidly. Some believe that there is overuse, which may be motivated by nonmedical reasons (23). Because much of imaging is elective, it is subject to pre-authorization and denial through insurer's black-box screening mechanisms, and merely the prospect of dealing with pre-authorization denials may inhibit ordering of tests. Newer imaging modalities (cardiac MR and cardiac CT) have been viewed with skepticism by insurers and undervalued relative to many other imaging procedures. Decreased reimbursements for in-office imaging have driven many cardiologists into hospital employment, which may decrease incentives for ordering imaging tests and increase the difficulty of obtaining imaging. Finally, it is anticipated that after increasing payments for HOPPS imaging

Appropriate Use Criteria for performing fewer serial studies in stable patients and avoidance of test layering.

Value-based purchasing, where cost and quality significantly affect payments for physician procedures and services, will be a large part of healthcare payment reform for specialists. For example, payment for imaging

procedures is increasingly contingent on certification of physicians to interpret imaging studies and accreditation of facilities that perform imaging procedures. Another part of the value equation that will be important in all healthcare reform payment models is patient satisfaction. A patient-centered approach to health care, which is

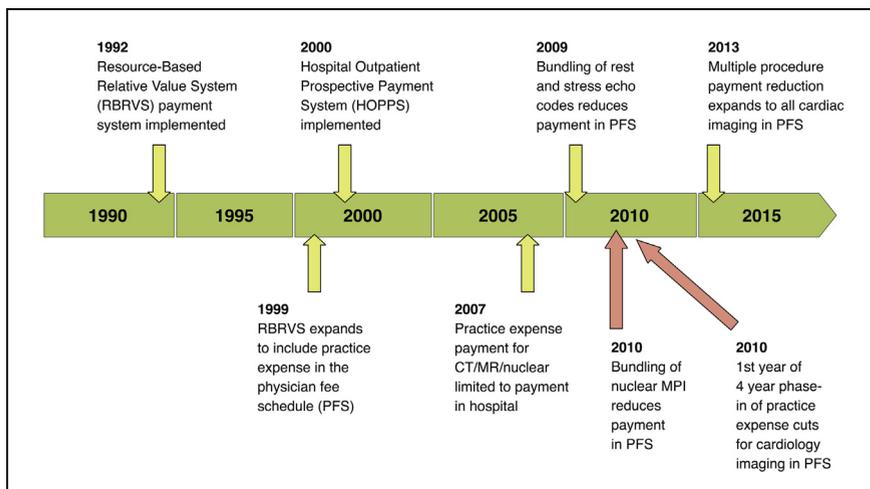


Figure 4. Major Events in Payment and Reimbursement Since 1990

The timeline depicts major events in imaging payment and reimbursement history over the past few decades, with emphasis on greater rates of change in recent years. As the healthcare reform environment becomes increasingly more complex, a more rapid pace of change is expected.

procedures recently, especially relative to in-office procedures, the CMS will likely reduce HOPPS payments as well.

A future challenge to cardiac imaging in the accountable care environment will be to provide evidence that it either decreases cost of care or improves hard outcomes for patients. Although cardiac imaging services are thought to be critical in many situations, there is a dearth of studies showing them to improve outcome, decrease adverse events, or save money.

The American College of Cardiology and its Cardiovascular Imaging Section Leadership Council champion high-quality multimodality cardiovascular imaging for optimal patient diagnosis and management. College leaders have acted as responsible stewards and supported physician certification, laboratory accreditation, development of imaging guidelines and Appropriate Use Criteria and implemented data registries in order to objectively review and assess the impact of imaging on quality of life

and long-term outcomes. We recognize that in order to provide quality imaging and support these measures and standards, hospitals and physicians must be reimbursed fairly for the services that they provide. To that end, the College has worked with government and private payers to assess the cost of providing services and optimizing efficiency, with the goal of avoiding duplication of testing and performing serial studies only when clinically indicated. Members of the American College of Cardiology and the imaging professional medical societies have served on the RUC and private insurance payer panels, provided testimony to federal and state legislative bodies, and advised the public in a responsible manner on all aspects of cardiovascular imaging. We are committed to supporting the value of high-quality cardiovascular imaging and fair compensation as healthcare and payment models in the United States continue to evolve at an ever-increasing rate (Fig. 4).

Conclusions

This brief history of our current payment and reimbursement system reveals the complex landscape that physicians and healthcare practices must negotiate in order to provide optimal patient care and to remain solvent in difficult economic times. The Imaging Council believed strongly, particularly in light of the panoply of changes and current challenges, that a review of the circumstances that led to our current models and a full understanding of the terms associated with reimbursement would be useful to the cardiovascular imaging community. Future discussions of this topic will follow as changes in policy and practice continue to evolve.

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REFERENCES

1. Social Security Act Title XVIII, Section 1862: Exclusions from Coverage and Medicare as a Secondary Payer. Available at: http://www.ssa.gov/OP_Home/ssact/title18/1862.htm. Accessed December 18, 2013.
2. Medicare National Coverage Determinations Manual: Chapter 1, Part 1. Available at: http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/ncd103c1_Part1.pdf. Accessed December 18, 2013.
3. MedPAC Payment Basics: Hospital Acute Inpatient Services Payment System. Available at: http://www.medpac.gov/documents/MedPAC_Payment_Basics_12_hospital.pdf. Accessed December 18, 2013.
4. Reinhardt U. The pricing of U.S. hospital services: chaos behind a veil of secrecy. *Health Aff* 2006;25:57-69.
5. Medicare program: prospective payment system for hospital outpatient services. Health Care Financing Administration (HCFA), HHS. Interim final rule with comment period. *Fed Regist* 2000;65:67798-8020.
6. 2013 Medicare Hospital Outpatient Prospective Payment System Proposed Rule: Details for Regulation No.: CMS-1589-FC. Available at: <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalOutpatientPPS/Hospital-Outpatient-Regulations-and-Notices-Items/CMS-1589-FC.html>. Accessed December 18, 2013.
7. Market Basket Definitions and General Information. Available at: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareProgramRatesStats/downloads/info.pdf>. Accessed December 18, 2013.
8. MedPAC Report to the Congress March 2012. Hospital Inpatient and Outpatient Services. Available at: http://www.medpac.gov/chapters/Mar12_Ch03.pdf. Accessed December 18, 2013.
9. AMA history of Current Procedural Technology Codes. Available at: <http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt/cpt-process-faq/code-becomes-cpt.page>. Accessed December 18, 2013.
10. Federal Register. Health Insurance Reform: Standards for Electronic Transactions (from the Health and Human Services Dept., 8/17/2000). Available at: <https://www.federalregister.gov/articles/2000/08/17/00-20820/health-insurance-reform-standards-for-electronic-transactions>. Accessed December 18, 2013.
11. Hsaio WC, Braun PO, Dunn D, Becker ER, DeNicola M, Ketcham TR. Results and policy implications of the resource-based relative-value study. *N Engl J Med* 1988; 319:881-8.
12. Medicare Program; Payment Policies Under the Physician Fee Schedule, Five-Year Review of Work Relative Value Units, Clinical Laboratory Fee Schedule: Signature on Requisition, and Other Revisions to Part B for CY 2012; Final Rule, Addendum B. *Fed Regist* 2011;76:73025-474.
13. Medicare program; physician fee schedule update for calendar year 1996 and physician volume performance standard rates of increase for federal fiscal year 1996-HCFA. Final notice. *Fed Regist* 1995;60:63358-66.
14. Medicare Program; Revisions to Payment Policies and Adjustments to the Relative Value Units Under the Physician Fee Schedule for Calendar Year 1999; Final Rule and Notice. *Fed Regist* 1998;63: 58814-9187.
15. Medicare Program; Payment Policies Under the Physician Fee Schedule and Other Revisions to Part B for CY 2011; Final Rule. *Fed. Regist* 2010;75:73170-860.
16. Nainggolan L. ACC aghast at proposed cuts to cardiology payments in Medicare physician fee schedule for 2010. [theheart.org](http://www.theheart.org). [Clinical Conditions > Clinical cardiology > Clinical cardiology]; Jul 3, 2009. Available at: <http://www.theheart.org/article/983741.do>. Accessed December 18, 2013.
17. Sustainable Growth Rate Formula of the Balanced Budget Act of 1997 (Sections

- 4502 and 4503). Available at: <http://www.gpo.gov/fdsys/pkg/PLAW-105publ33/pdf/PLAW-105publ33.pdf>. Accessed December 18, 2013.
18. Estimated Sustainable Growth Rate and Conversion Factor, for Medicare Payments to Physicians in 2013. Available at: <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SustainableGRatesConFact/Downloads/sgr2013p.pdf>. Accessed December 18, 2013.
19. History of the RBRVS. Available at: <http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/medicare/the-resource-based-relative-value-scale/history-of-rbrvs.page?> Accessed December 18, 2013.
20. Medicare Program: Revisions to Payment Policies Under the Physician Fee Schedule for Calendar Year 2006 and Certain Provisions Related to the Competitive Acquisition Program of Outpatient Drugs and Biologicals Under Part B. Available at: <https://www.federalregister.gov/articles/2005/11/21/05-22160/medicare-program-revisions-to-payment-policies-under-the-physician-fee-schedule-for-calendar-year>. Accessed December 18, 2013.
21. Zoghbi WA. President's page: cardiovascular imaging: a look to the past, present and future. *J Am Coll Cardiol* 2012;60:2331-4.
22. Imaging Today: Medical Imaging Trends in Medicare from the Medical Imaging and Technology Alliance, Arlington, VA; September 20, 2012. Available at: <http://www.medicalimaging.org/wp-content/uploads/2012/09/Medicare-2011-Data-MITA-Report-Final-9.20.2012.pdf>. Accessed December 18, 2013.
23. Shah BR, Cowper PA, O'Brien SM, et al. Association between physician billing and cardiac stress testing patterns following coronary revascularization. *JAMA* 2011;306:1993-2000.