

Methodological Concerns  
with the Medicare RBRVS  
Payment System and  
Recommendations for  
Additional Study

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# **Methodological Concerns with the Medicare RBRVS Payment System and Recommendations for Additional Study**

**White Paper**

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# 1. METHODOLOGICAL CONCERNS WITH THE MEDICARE RBRVS PAYMENT SYSTEM

The purpose of this paper is to review the conceptual origin of the RBRVS, the research methods used to measure resource costs in the RBRVS, and to describe significant changes in sponsorship, transparency and critical review of relative values proposed for physician payment. We also pose specific questions with respect to the research work critical to recent recommendations forwarded by the RUC to CMS. We conclude with recommendations for conducting additional research to better understand the practical implications of the current updating methodology on the validity of the RBRVS.

## 1.1 A Review of the History of RBRVS Methodology

**Rationale for the RBRVS and Justification for Maintaining it.** Confidence by physicians, patients, and policymakers in relative values of services in the fee-for-service (FFS) system of physician payment is essential for the health, and possibly the continued survival of that system of payment. Further, the development of more aggregated systems of payment (for episodes of care, or for the allocation of incomes in accountable care organizations) will likely depend to some extent on the relative prices (in the FFS system) of the components making up those aggregates in some new system.

At root, the rationale for resource-based payment is that, when payments are based on the resource costs of alternative choices for care, medical decision-making is put on a level playing field, where the decisions of physicians and patients are based on the benefits and risks of alternative choices (as physicians are trained to act) and not perversely affected by the prices of those choices. In this way, an RBRVS serves to help steer physicians' individual decisions and the allocation of health care resources in a direction that best serves the health of patients and the use of the limited resources available for health. Prices are important signals, and it is important to get prices right for reasons that go beyond the financial well-being of one group of medical specialists or another. That proposition is the rationale for resource-based payment.

**Early History of the RBRVSs and Transparency.** Confidence in the relative values for physician services in the RBRVS—ultimately the basis of whatever level of trust physicians, policymakers, and the public hold in the fairness of system—rests on confidence that the process for arriving at those values is fair. There are, unfortunately, reasons for the confidence these parties hold in the system to be less than it was in the past. Some historical comparisons are useful in this regard.

It is useful to trace the history of the RBRVS and to contrast how RVUs were measured in the past with how they are currently being measured (to the extent we are able to

understand it). The concept of resource-based payment was articulated by Hsiao and Stason in the late 1970s that prices in a well-functioning competitive market approach the costs of the resource inputs and those inputs can be defined and measured (Hsiao and Stason, 1979). Further, there appeared to have been a market failure in the relative prices of physician services (abetted by presence of insurance and disproportionate power of physicians vis-a-vis that of patients in medical decision-making).

After Hsiao, Braun et al. 1985 performed a pilot study for the Medicaid Program in Massachusetts, Senator Robert Dole, then Chairman of the Senate Finance Committee's Health Subcommittee, sponsored legislation mandating the Health Care Financing Administration (HCFA) to fund a study of resource-based payment (the RBRVS study) for Medicare. Accordingly HCFA issued an RFP for the first phase of such a study. Because of concerns about the potential antitrust nature of a scale of relative values (which spelled the demise of the charge-based California Relative Value Scale) and the rulings of the relevant legal officers, the RFP specifically excluded medical professional organizations (including the American Medical Association (AMA), the American College of Surgeons (ACS) and their related research organizations) from submitting responses to the RFP. That is, the study was to be performed by an independent, i.e. disinterested, research organization.

When the project was awarded to Hsiao and Braun at the Harvard School of Public Health, the AMA negotiated a subcontract with Harvard to provide liaison services with the various medical specialty societies, which were to provide nominees for technical consulting groups (the American College of Surgeons chose not to participate) and gave the investigators access to its masterfile of all physicians (including non-AMA members) for use in drawing random samples for the study's surveys. The AMA specifically was not to take part in study design, performance of the study, analytic methods or the reporting of results. The AMA reserved judgment of its support of the methods and results of the RBRVS project. The Harvard team sponsored a national meeting on its proposed methodology, with participants in clinical medicine, health policy, social sciences, health economics and the health insurance industry during the first year of the project. It recruited an advisory committee of nationally recognized figures to provide expert advice and counsel (James Todd, MD Executive Vice President of the AMA, economist Eli Ginsberg of Columbia University, Walter McNerney, CEO of the Blue Cross Blue Shield Association, Samuel Thier, MD President of the IOM, and economist Frank Sloan of Vanderbilt University), with whom the investigators met periodically.

The work was conducted under high standards of transparency. The methods, including complete survey questionnaires and results of 33 specialty-specific surveys, statistical analyses and results, are available in separate reports of the three major phases of

Harvard's RBRVS studies performed between 1986 and 1992 submitted to HCFA<sup>1</sup>. This includes details of the method of cross-specialty alignment and the details of the 275 pairs of services judged to be of equal work (out of 486 proposed links) by practicing physicians representing the respective specialties in a face-to-face group process.

Details of the quantitative methods for constructing a common scale for all the specialties using the paired services from specialty-specific scales, and tests of the statistical validity of those methods, including sensitivity analyses, were published in JAMA in the fall of 1988 (Braun, Yntema, Dunn, et al. 1988). The study and its results were subjected to high levels of critical scrutiny that any scientific work deserves, but which is especially merited by work that was to have such important consequences when adopted as a tool for public policy. In addition to review by its sponsors at HCFA, this work was critically reviewed by the staff and commissioners of the Physician Payment Review Commission (PPRC), which commented extensively on these studies in a series of Annual Reports to Congress.

The AMA sponsored reviews by two separate consulting groups in 1988. The report on methodology, by Etheridge and Dobson (1988), concluded that the Harvard Group had (in its Phase I work) developed reliable methods for the development of relative value scales for eleven specialties, developed a valid method for constructing a common scale across specialties, and that these methods, when expanded and extended to the remaining specialties, would provide an appropriate basis for physician payment by Medicare. Provided with these reviews, the AMA House of Delegates unanimously gave its support. In August of 1989, the U.S. Congress made the Harvard RBRVS the basis of physician payment reform under OBRA 1989, with the study to be completed by Harvard and implementation of the reform to begin in January, 1992.

The full documentation of the Harvard group's work (including survey questionnaires, analytic methods, raw and aggregated data, statistical validation, and all cross-specialty linkages) is available in a series of Final Reports to HCFA (Two volumes under Hsiao, Braun, Becker et al make up the first of four major reports) and seventeen peer-reviewed papers, which appeared in the October 28, 1988 issue of JAMA, the September 29, 1988 issue of NEJM in 1988, and the November 1992 issue of Medical Care, plus additional reports and monographs.

**The Beginnings of Change in RBRVS Policy.** As part of the Notice of Proposed Rulemaking (NPRM) for Medicare Physician Payment Reform published in the Federal Register in late 1991, HCFA indicated that, in a letter from James Todd, MD, the AMA had

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<sup>1</sup> Physician surveys were performed by a university-based survey research organization contracted to obtain response rates of at least 55% (achieved rates of 56% for Ob-Gyn to 84% for Nuclear Medicine). Statistical tests for responder bias (frequency of performance and performers vs. non-performers of invasive services) were non-significant (Medical Care 30, NS40-NS49, November, 1992).



offered, at no charge to the Government, to assume a key role in the future of the RBRVS with respect to maintaining and updating the RBRVS. The AMA would provide recommendations to HCFA for relative values of new physicians' services (i.e. new CPT codes), services that had undergone change and services that were thought to have been misvalued (both undervalued and overvalued). This offer was accepted and the responsibilities were assumed by the AMA's new RBRVS Updating Committee (RUC). The AMA, which had been precluded from a role in creating a relative value scale for physician payment, had been granted a key role in the maintenance and updating of that scale.

**Changes in RBRVS Process and Methodology.** How have things changed in the nearly twenty years with respect to how policymakers determine something as consequential as the relative payments for physicians' services? Some things are clear and not subject to debate. For example, it became generally accepted, in the absence of a genuine competitive market, that resource costs form a suitable conceptual and operational basis for establishing prices of physicians' services. Magnitude estimation is widely recognized as a standard for measuring physician work. Refinements have been made in the measurement of practice expenses. What is less clear, as will be detailed below, are the processes by which relative work values, as presented to CMS by the RUC, have been determined since 1992.

Several important changes, which may not be trivial, concern the frame of reference for studies of relative values, financial sponsorship, and the possibility of increased bias on the part of physicians responding to surveys. The frame of reference of the original studies, sponsored by the agency responsible for all of Medicare, was all of CPT - the services and procedures of physicians in 33 specialties and important subspecialties. Studies performed for the RUC are sponsored and funded by specialty societies. In contrast, surveys of relative work for the original studies were carried out by stratified random samples of all physicians in the AMA masterfile who identified themselves within a specialty (i.e., not restricted to members of the AMA or particular specialty societies). The studies were performed at a time when most physicians were either not aware, or were skeptical of, the fact that these surveys of relative work (and not fees) would evolve directly into payment policy.

We know less about the processes and methods of relative value studies performed more recently under the RUC because these studies, under confidentiality agreements made between CMS and the RUC, are not publicly available. We believe, however, that studies performed under the aegis of the RUC are performed by specialty societies or by research organizations paid by the specialty society. It was apparent during the Harvard studies that some specialty societies were more affluent than others. Pediatricians, for example, had been excluded by HCFA from the RBRVS studies and had a difficult time obtaining private funds for a study of their services. Other specialties, when unhappy with the results of the Harvard studies, easily were able to fund studies by contract research organizations whose cost were said to be orders of magnitude greater than that Harvard performed for the

pediatricians. While the original investigators were answerable to HCFA and medicine at large, researchers in the current arena perform theirs for a particular specialty society, of whose interests they must certainly be aware. The process is very much changed in other ways. The studies are done at a time when the physicians being surveyed are increasingly aware (always a subject of concern) that their responses are likely to influence the fees they are paid.

We do not know the authors or their qualifications, commercial affiliations, or potential conflicts of interest, nor do we know how physician samples are drawn (e.g. from all specialists or members of a given specialty society). The survey instruments are confidential, as are the survey data. We do not have access to the preparatory materials that accompany surveys and whether they have the potential to influence respondents in some direction or what the response rates are. These studies, which form the basis of the RUC's recommendations to CMS, are not submitted to peer review for publication in professional journals, nor are they available (as were the extensive Final Reports of the RBRVS Study) for critical review by anyone outside the specialty societies that sponsor them or, possibly, members of the RUC. Therefore, independent observers are unable to critically review the processes or the data used to arrive, finally, at prospective RVUs for new services or services the society says to be misvalued. Yet those RVUs are forwarded to CMS as recommendations for relative values of new services or changes in the relative values of existing, assertedly misvalued services.

To be able to answer the many questions regarding the integrity of the process and the validity of the values that emerge from it one would want to be able to critically review the individual research studies underlying the recommendations of the various specialties. Even subtle differences in framing of questions, sampling of physicians, survey methodology, and analytic and statistical methods can bias results.

We do not at the present time have those studies to answer these questions. Alternatively, we have reviewed one publication, Mabry et al. (2005) that attempts to summarize methods used in a number of these studies and we have examined blank forms used by the RUC in obtaining recommendations from specialty societies for new or revised RVUs. See **Appendix A** for further discussion of the Mabry paper and issues raised within that paper.

## **1.2 Questions Regarding the Quantification of Intra-Service Work**

McCall et al have shown that operative times from surveys performed for the RUC are systematically higher than the times from a large nationwide, representative database of operating room logs (McCall, Cromwell, and Braun, 2006). The RUC's time values are also higher than the Harvard survey times for the same surgical procedures. If the intra-service work values described by Mabry et al are based on times obtained in surveys of surgeons, unlike the methodology used by the AANS in the first 5-year review, the method being used

involves a step backwards in terms of validity and poses the clear likelihood that intra-operative work will be overstated. This raises the question, first, of the source of the time values used. The research data on which recommendations for revaluation of these important relative work values (RWVs) are based were not provided to CMS by the RUC and cannot be examined by independent reviewers or by CMS itself. Indeed, CMS appears to have agreed that the products of research performed by contract research organizations and sponsored by specialty societies are confidential (<http://www.ama-assn.org/resources/doc/rbrvs/posesresponse.pdf>; <http://www.ama-assn.org/resources/doc/rbrvs/toptenthings.pdf>).

The methods used by the Harvard investigators for the measurement of the total work of both E&M services and surgical procedures rested on direct ratings of intra-service work (which is more discrete and amenable to being timed than total work) relative to a reference standard for the specialty (Hsiao et al, 1988). The common scale at the heart of the multispecialty RBRVS, in turn, rested on the ability of panelists in different specialties to judge whether those circumscribed services and procedures were equal or comparable in work (Braun et al, 1988). Intra-service time and similar categories of service were major criteria in these deliberations. One should note, in connection with our discussion of multiple points of comparison (section 1.4.3), that if the work value of a service in specialty A linked to other specialties is increased within specialty A and is still deemed to be equal in work to a service in specialty B that remains unchanged, it has the effect in the cross-specialty linkage process of lowering the values of all the other services in specialty A on the common scale.

We believe, however, that the studies conducted by specialty societies for the RUC do not follow these methods. In our review of a summary paper by Mabry et al (2005) and of materials distributed by the AMA regarding determinations of the work of major surgical services (AMA/Specialty Society RVS Update Process, 2010), and a presentation by the AMA (AMA RUC Presentation: <http://www.chestnet.org/downloads/practice/pm/amaRUCPresentation.pdf>), we have developed a picture of the methods as follows (see also **Appendix A**). The specialty society/applicant to the RUC:

- Asks surveyed physicians to value the total work (combining pre-intra- and post-service) of a given service, using the total work of a reference CPT for comparison.
- Asks physicians to:
  - estimate the intra-service time of the service, but not to value the intra-service work of the service compared to the intra-service work of a specialty standard,
  - estimate the times of such peri-operative tasks as pre-service evaluation, pre-service positioning, pre-service scrub, dress and wait time, and immediate post-operative services

- designate (using CPT codes) the levels of critical care visits, subsequent hospital visits, prolonged services, and of discharge day management for each day of the hospitalization
- designate the number and levels of office services during the remainder of the 90-day global period of service (or other applicable global period).
- Calculates total relative value of work by multiplying the times of the various pre-intra-and immediate post-operative segments by specified values of W/T for those segments (IWPUT) to convert them to RVUs and sums them. These are then added to the sum of the RVUs for the CPT codes of discrete services from the day of surgery through the rest of the global period to obtain total work.

The RUC and Mabry et al, have termed the process described above as the Building Block Method (BBM) for the calculation of surgical work; they have termed another logical form of the building block equation the “Reverse Building Block Method { Intra-service RWV = (Total RWV) - (pre-service RWV + post-service RWV)}. <sup>2</sup>

One must be concerned that this methodology provides a potential route for over-valuation of global surgical procedures via over-estimation of pre-, intra- and immediate post-operative times and numbers and coded levels of post-operative service. This should give us cause for concern. For here we are departing from the basic model of relative values applied across specialties, where increasing the value of one member of a set (measured at the intra-service level relative to an intra-specialty standard and linked to services in other specialties) implies lowering of the rest of the set (assuming a large number of the services are correctly aligned on a common scale with other specialties). Equity across specialties is maintained under those rules. We may have, instead, moved into a world of absolute values, where increasing the values of a large number of services in a specialty (by raising the values of total work, which are not linked) raises them all and equity across specialties is no longer maintained.

### **1.2.1 Anomalous Findings of Intra-service Work via the Building Block Method**

Hsiao, Couch, Causino et al reported that the intra-operative portion of surgical procedures accounts for roughly 50% to 65% of total work of most of the hospital-based procedures surveyed in eight surgical specialties (Hsiao et al., 1988), a finding that is consistent with higher W/T of the operative portion of these services than the non-operative portions. That finding met the tests of face validity with specialty society panelists in the Harvard studies and the scrutiny of peer reviewers. It is a fundamental finding of the RBRVS studies and a premise of the BBM approach. CMS has found that the Reverse Building Block results in anomalously low or even negative values for IWPUT and intra-service work when values for total RWV and for pre- and post-service RWVs from surveys (as opposed to objective

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<sup>2</sup> see third equation in Table 4 of Mabry et al., 2005 or panel 63 of AMA RUC Presentation: <http://www.chestnet.org/downloads/practice/pm/amaRUCPresentation.pdf>

sources of inputs), are used as inputs (CMS, 2010). The BBM approach, as currently being applied, appears to be seriously flawed. Either total work (obtained in the process of matching a service on the MPC list) has been grossly undervalued, which seems highly unlikely, or the pre- and post-operative RWVs have been overvalued. The latter is what we believe best explains the well-recognized anomalies. We note also, that, not having provisions for direct surveys of the intra-service work of global surgical procedures, the RUC no longer can provide measures of the work covered by modifier 54 (surgical care only) that seem credible.

It will be essential, if one is to critically evaluate the validity of widespread revisions of RWVs, as have occurred for global services, to critically review both the details of methodology and the raw data on which the recommendations are based. So as to better understand how intra-service work of global surgical services are determined under the BBM methodology, and better understanding how anomalous values could result, we recommend that MedPAC review the methods, including survey methods and analytic processes, under which specialty societies submit recommendations to the RUC for relative values of new services or services said to be misvalued.

### **1.3 Questions Regarding the Quantification of Pre- and Post-Service Work**

Researchers at RTI have described the dramatic trends that have taken place in the provision of global surgical services in the more than two decades since the global surgical package was defined by HCFA for purposes of payment policy (Cromwell, McCall, Dalton, et al., 2010). Efficiency improvements have included technologic innovations, personnel substitution, handoffs to intensivists, physician assistants and nurse practitioners and re-engineering (shifts to surgicenters and decreased lengths of stay).

These aforementioned trends all appear to work in the direction of reducing the time of post-operative (and possibly pre-operative) service by the principal surgeon. It is difficult to understand, therefore, how “using the techniques of IWPUT and BBM, the GSCRC (General Surgery Coding and Reimbursement Committee) increased the RWVs for 3,145 general surgery procedures, resulting in an annual increase to general surgeons’ Medicare-allowed charges of approximately \$76 million. A similar approach to revising RWVs for families of codes was used by vascular and cardiac surgery for codes submitted for the second MFS 5-year review. After the second MFS 5-year review, the RUC submitted revised RWV recommendations for 870 services to CMS, who agreed with 93% of those recommendations.” (Mabry et al., 2005). In addition, work earlier cited by Cromwell et al documents dramatic increases in billed handoffs to intensivists, physicians in other specialties, nurse practitioners and physician assistants (one assumes that NPS and PAs are providing postoperative care related to the surgery) during the period of the global surgical

package, apparently unaccompanied by significant decrease in billing under the global convention by surgeons.

As is the case for employing more objective sources of time for intra-service work, it would appear to be essential to examine the times and numbers of discrete pre- and post-operative services used to construct total work. MedPAC and CMS should turn to objective data, using reviews of medical records merged with billing data, to determine the numbers of postoperative services that are performed, who performs them, and how they are billed. Investigations of this kind could conceivably lead not only to changes in the total relative values for total work of global surgical procedures but to changes in payment policies for global surgery.

We would recommend that total work of surgical procedures be determined by conducting empirical studies of pre- and postoperative services provided by the principal surgeons in appropriate samples of patient records. Intra-service work values can be determined (preferably) by using magnitude estimation or, alternatively, as the product of verifiable, objective intra-service times and values for IWPUT consistent with values determined in the past and judged to have face validity. That would constitute a building block method based on inputs of increased objectivity.

#### **1.4 Toward Performing Critical Studies of the Questions Raised**

Examination of the documents described in **Appendix A** raise the issue of potential over-valuation of global surgical procedures via over-estimation of pre-and post-operative time and numbers of services. Such over-estimation is, in turn, consistent with the purported under-estimation of intra-service work when the sum of pre-and post-service work is subtracted from a value for total global work. Fortunately, data on numbers of pre-and post-surgical services, and identification of who performs them, can be obtained from reviews of medical records to cast some light on these issues.

##### ***1.4.1 Pre- and Post-Service Work: Obtaining Objective Measure of Post-Operative Services for Surgical Services through a Review of Medical Records***

We recommend empirically-based reviews of post-operative services after major surgery provided under the global convention and offer a proposed structure for such a study in section 2.1 below.

##### ***1.4.2 Estimation of Work per Unit Time of Invasive Procedures***

We recommend empirically-based studies of work per unit time using direct measurement of intra-service work by magnitude estimation and objective data on intra-service time for a subset of the more important CPT codes defined by inclusion on the RUC's MPC list, or used

to establish the initial Harvard study's cross-specialty linkage, or by dollars of Medicare expenditures. A proposed structure for such a study is in section 2.2 below.

### ***1.4.3 Questions Regarding the Implications of Changing Specialty-Specific Values and Relative Value Scales for Cross-Specialty Alignment and the Common Scale***

The issue here, which needs further exploration, is the extent to which changes in the RVUs of services within one specialty have been accounted for with respect to the common scale produced by alignment of the scales of all specialties. What are the implications of changing the RVUs of services that made up the original (n= ~275) pairs of services agreed by clinicians to be of equal work and (robustly) linked by a weighted least squares algorithm? If the work value of a service in specialty A linked to other specialties is increased within specialty A (because it was presumed to have been misvalued) and is still considered to be equal in work to a service in specialty B that remains unchanged, it should have the effect in a properly structured cross-specialty linkage process of lowering the values of the other services in specialty A on the common scale. Have the values of MPC services been raised (unilaterally) without accounting for their impact on the relationship of the specialty's RVUs to that of other specialties and to the integrity of the PFS as a whole? What are the implications of changes in services making up the RUC's MPCs? Properly accounting for these changes poses serious conceptual and computational issues. How have they been addressed? At this point, we do not offer a detailed study approach but would be willing to do so if of interest to MedPAC.

## **2. RECOMMENDATIONS FOR CONDUCTING ADDITIONAL RESEARCH TO BETTER UNDERSTAND THE PRACTICAL IMPLICATIONS OF THE CURRENT UPDATING METHODOLOGY ON THE VALIDITY OF THE RBRVS**

The issues examined above lead us to recommend a number of potential studies that could be conducted so that MedPAC could more fully understand the implications of the current updating methodology on the integrity of Medicare's RBRVS Physician Fee Schedule. We describe two potential studies. The first is related to validating frequency and content of post-operative visits made by the operating surgeon during the initial post-operative period versus other providers separately billing the Medicare program during the same time period. The second is related to validating the current estimates of intra-service work per unit time for the MPC CPT codes using direct measurement of intra-service work by magnitude estimation and objective data on intra-service time.

### **2.1 Pre- and Post-Service Work: Obtaining Objective Measure of Post-Operative Services for Surgical Services through a Review of Medical Records**

Physicians spend significant time and perform important work outside the part of the service for which their work is best documented – visits for evaluation and management (E&M) and surgical and other procedures. With respect to E&M services this work takes place at a variety of sites and in a number of forms. Physicians provide patient care outside the face-to-face encounter with patients, relatives, other physicians, laboratory personnel or other health care workers. Increasingly, these contacts may take place by phone, e-mail and online systems. The contacts may involve following the patient's progress, reviewing laboratory results or revising plans for management and coordination of care. They can take place in the office and after office hours, on the road, or at home. The fragmentary nature of such care has made it difficult to capture the extent of the work. Yet it involves a central part of medical care – making sound medical decisions and paying attention to the details of patient care. Because this aspect of the work of physicians is important, the payment system should compensate it accordingly. The approach to measuring pre- and post-service work up to this point has been to rely on physicians' estimates from surveys. RTI has explored other, more objective approaches, including direct observation of physicians in the office and hospital, use of information from electronic sources, such as the use of e-mails and other entries in electronic medical records, which may include time stamps. Nevertheless, these methods are likely to be incomplete, and the issue of measuring pre- and post-work for E&M services continues to be challenging. The findings from this additional work is contained in a companion paper entitled, *Improving the Accuracy of Time in the Medicare Physician Fee Schedule: Feasibility of Using Extant Data and of Collecting Primary Data* (Braun and McCall, 2011).



### **2.1.1 Measurement of Surgical Time vs. Estimates from Surveys of Physicians**

The situation with respect to major surgical procedures is more amenable to measurement. The units of pre-and post-operative care compensated in the payment system are discrete tasks – a pre-operative evaluation visit, postoperative care in intensive care units and conventional hospital rooms and office visits after discharge during the 10-day or 90-day global periods. Although the number and nature of these services are recorded in the patient record, where they could be measured, the physician payment system has relied on subjective data from surveys of physicians for the nearly twenty years since the payment reform. The Harvard investigators chose to rely on time estimates using physician surveys at that time, when good sources of objective data were lacking, for the several thousand invasive and diagnostic services that needed to be evaluated. Now, two decades later, the availability of objective data on time from operating room logs and the well-documented, systematic overestimates of physician survey data on surgical time argue strongly for replacing estimates with objective measures of surgeons' time (McCall *et al.*, 2006).

### **2.1.2 Issues Concerning Payment Policies and the Global Surgical Convention Instituted in 1992**

In the context of much variation for payment of major surgery prior to 1992, HCFA, in consultation with surgical groups, standardized policies for payment of major (90-day) and minor (10-day) procedures under Medicare's Physician Payment Reform of that time. Since then, however, many changes have taken place in patient care before and after major procedures: shifting of surgery from inpatient to outpatient site of surgery, shorter lengths of stay, increased post-operative handoffs to hospitalists and others, including intensivists, physician assistants and nurse practitioners. Peer-reviewed published studies have documented systematic increases in billings by providers other than the principal surgeon during the global period (Cromwell *et al.*, 2010). There has been, however, little or no reduction in the use by surgeons of CPT code modifiers reflecting the provision of only part of the global surgical package. This raises an important payment policy question: Are all the services being provided by surgeons for whom they are billing and being paid? Is the current system leading to duplicative payment – payment to surgeons under the global convention while postoperative services are being provided by and billed by others? It is time to take a careful look, using more reliable methods than surveys, of how pre- and especially post-operative care is provided, who performs these services and how they are billed. It is important to know whether the current conventions for paying for these services fit current realities of how they are provided and to make changes if changes are warranted.

### **2.1.3 Previous Experience Studying Units of Post-operative Care in Global Surgery**

A 2009 report by the Inspector General of HHS to the Administrator of CMS found that eye global surgery fees often did not reflect the number of E&M services that physicians provided to beneficiaries during the global surgical periods. Physicians provided fewer E&M services than were included in 201 global surgical fees and provided more E& M services than were included in 39 global fees. The fees reflected the number of E&M services provided during the global surgeries. Using the net results, the IG estimated that Medicare paid \$97.6 million for E&M services that were included in eye global surgery fees but not provided during the global surgery periods in CY 2005. The IG recommended that “CMS consider

- adjusting the estimated number of E&M services within eye global surgery fees to reflect the number of E&M services actually being provided to beneficiaries, and
- using the financial results of this audit, in conjunction with other information, during the annual update of the physician fee schedule” (Levinson, April 2009; Levinson, April 20, 2009).

### **2.1.4 Methods**

One potential method for obtaining objective information on the frequency and content of post-operative visits made by surgeons to their patients while hospitalized is through a review of the inpatient medical record. 11,000 imaged hospital records already “in-house” at RTI under the Comprehensive Error Rate Testing (CERT) program could potentially serve as a basis for such a study. Permission from CMS would need to be obtained prior to conducting any analysis of these records. These records are drawn from a sample of discharges that span all acute care hospitals in the United States. Episode-of-care files produced by RTI include admission diagnoses and all physician bills 60 days prior to admission and 90 days post discharge.

The investigators will select an appropriate subset of records documenting performance of inpatient major and minor surgical procedures and subsequent hospital care. By chart review, they will be able to relate the services documented in the clinical records to billing data. Of particular interest will be (1) whether the principal surgeon billed for the global service and, if so (2) whether other providers billed for services covered by the global convention for the surgical procedure. The researchers will identify other providers performing pre-and post-operative services (by specialty), the nature of the services performed (related or unrelated to the surgical procedure), the diagnoses given, who performed them and how these were billed. They would determine, by chart review, the services that the surgeon performed during the inpatient portion of the global period when he/she billed using the global payment convention. Appropriate CPT coding of E&M services will be applied according to documentation in the records.

The researchers will design the data collection protocol. Medical record abstraction would be performed by experienced professional coders. Abstracted data would be validated by appropriate studies of inter-rater reliability during a training period and with a 10% subset of records being abstracted. The outcome of the study will be an evaluation of how well the system of global payment for surgical procedures accords with current practices, the impact of efficiencies that may have been introduced, whether there is significant waste and overpayment under current arrangements, and if, so, what changes in payment rates and payment policies may be warranted.

## **2.2 Studies Using Work per Unit Time (W/T) of Invasive Procedures**

Work per unit time is an implicit measure of intensity. Using well developed subjective measures of both work and time, we have a robust body of peer-reviewed, published data that indicate relationships of the mean work per unit time (W/T) values across major categories and subcategories of physician services (E&M, intra-service portion of surgery, imaging, laboratory/pathology and other diagnostic tests). The values shown in Appendix Table 1 (based on Table 5 from Hsiao, Braun *et al*, 1992) result from surveys using magnitude estimation, involving more than 4,000 randomly sampled American physicians in 33 specialties on 4,795 services that they perform. These data show the relationship of W/T values among these categories of services.<sup>3</sup> These relationships are applicable for assessing the reasonableness of W/T values of newly introduced procedures, and procedures that have evolved with new technology. The major relationships of W/T across categories of service (the relation of invasive services to E&M services) are remarkably similar in both surgical specialties and medical specialties with invasive services (e.g. cardiology and gastroenterology), indicating a wide consensus of technical to cognitive services across the medical profession.

### **2.2.1 Objective of W/T Study of Invasive Procedures**

Rapidly rising work RVUs observed through the RUC updating process of the physician fee schedule coupled with the well documented over-estimation of intra-service time for major surgical procedures raises a serious concern about the reasonableness of current W/T values. These procedures can now be evaluated using objective sources of data on time by examining the W/T of services using direct measurement of intra-service work by magnitude estimation and objective data on intra-service time. The primary objective would

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<sup>3</sup> It should be stressed that the fundamental relationship between surgical and E&M services comes from surveys of surgeons. The quantitative relationship comes from within-specialty surveys of surgeons, using magnitude estimation, on E&M services and surgical procedures that they perform, and not from the cross-specialty alignment process or surveys of non-surgeons. Physicians in specialties that do not perform surgery were surveyed only on the services that they perform. Lastly, cross-specialty links of same or equivalent services were all made using services in the same category (E&M with E&M, surgery with surgery, endoscopy with endoscopy, etc.), so that within-specialty relationships determined the common scale across specialties.

be to identify possible changes in mean W/T of major categories and subcategories of services, using E&M services as the benchmark, that have occurred since the fundamental studies of this relationship were performed (Hsiao *et al.*, 1992).

### **2.2.2 Methods**

This type of study can be done for major invasive procedures (i.e. services using the 90-day or 10-day global convention) if, and only if, current intra-service work has been directly measured and if valid measures of time are available. The W/T of procedures not covered by the global convention (e.g. office-based procedures such as dermatologic procedures) can be evaluated in this fashion if objective values of time are available.

If direct measures of intra-service work (or established RVUs) and objective measures of intra-service time are available, one can calculate measures of W/T for surgical, E&M and other services and assess their reasonableness within categories of services, within specialties and across specialties, using reasonable bounds for these values. Services beyond these reasonable bounds would be flagged for further evaluation.

However, because of concerns raised above about the potential use by the RUC of the reverse building block method for identifying intra-service work, it is likely that de novo collection of intra-service work estimates will be necessary. Studies based on surveys of total work and not surveying the intra-service (i.e. operative) portion directly could not be evaluated using this method, due to fundamental differences in how intra-service work is measured in the two methods. The W/T of the global package (total work) is not relevant because it is a mixture of E&M and invasive work.

To collect current intra-service work estimates, we would recommend that the investigators use the original Harvard methods of performing surveys of the intra-service work of global surgical procedures, using the CPT descriptors for the procedures rather than vignettes. Surveys would be performed using small-group surveys of 10 to 15 physicians (Leape *et al.*, 1992). Benchmarks, as in the Harvard small-group studies, would be a ladder comprised of the intra-service work of surgical procedures. We recommend that investigators carefully choose physicians who have less of a direct stake in the outcome than practicing physicians paid directly by the Medicare FFS program and recommended by specialty societies. Physicians at organizations such as Kaiser Permanente and the Veterans Administration may be good candidates. The work values of such surveys would be suitable bases for payment when the surgeon performs surgical care only (modifier 54), for constructing more accurate values of total work by the building block method, for evaluations by policy-makers of work per unit time (imputed intensity) and for performing cross-specialty comparisons.

Objective time data are available for roughly 60 major surgical services from prior work conducted by *McCall et al.* (2006) and may be available for other surgical services from

other sources currently being investigated. Other primary data collection activities may be necessary depending upon the focus on this study. Once again focusing upon a subset of the most important CPT codes based on inclusion on the RUC MPC list or high total Medicare expenditures would seem prudent.

Once intra-service work estimates and objective time data are obtained, the investigators would examine the range and frequency distribution of calculated W/T values among services within major categories relative to the current W/T estimates to identify potential outliers for further investigation.

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## APPENDIX A: INQUIRY INTO METHODS USED

Research papers supporting recommendations to the RUC of new or changed relative values of surgical services are not available to outside observers. However, limited information on the methods used in some of these studies can be found in a paper by Mabry et al, The Use of Intra-service Work per Unit Time (IWPUT) and the Building Block Method (BBM) for the Calculation of Surgical Work (Mabry et al., 2005). A second source of information that may shed some light on the methods used by specialty societies are blank forms used by the RUC in obtaining data from specialty societies in support of the societies' recommendations for new or revised RVUs. We have reviewed these sources in an effort to understand, to the extent possible, methods that have been used (AMA/Specialty Society RVS Update Process, 2010).

### A1. Intra-service Work per Unit Time (IWPUT) and the Building Block Method (BBM)

Mabry et al describe the use of intra-service work per unit time (IWPUT) and the building block method (BBM) for the calculation of surgical work. While not a research paper itself, the Mabry article describes methods used whereby the

*"GSCRC increased the relative work values for 3,145 general surgical procedures .....a similar approach to revising RWVs for families of codes was used by vascular and cardiac surgery for the second MFS 5-year review."*

The paper first provides a summary of methods used by the Harvard investigators in the three phases of the original RBRVS studies. The building block method, patterned on the Harvard Group's methods, divides total work of global surgical services into pre- intra- and post- service portions. In preference to basing intra-service work on surveys using magnitude estimation, the BBM relies primarily on multiplying values of IWPUT of anchoring procedures within families of surgical procedures by time. Mabry et al state *that*

*"There are three established methods for estimating and assigning the IWPUT for intra-service work: (1) survey, (2) consensus panel, or (3) paired-comparison study. All three methods are based on magnitude estimation. In 2002, the mean IWPUT for 4,606 codes with a global period was calculated as 0.053, with a standard deviation of 0.032, which from a practical standpoint gives a range of IWPUT for most CPT codes of 0.021 to 0.085 (1 standard deviation)."*

For reference, the IWPUT for pre-service evaluation and same-day immediate post-service, as well as that of evaluation and management (E&M) services (including office visits, hospital visits and consultations) not related to surgery is given by



Mabry et al as 0.0224. Accordingly, the mean IWPUT of these 4,606 codes was 2.37 times that of most E&M services. That ratio exceeds by 10%, but approximates the ratio of 2.05 (SE 0.67) for all surgical services to all E&M services in the original Harvard studies (Hsiao, Braun, Becker, et al. 1992) and (right-most two columns) **Appendix Table 1** of this report.

Furthermore, Mabry et al cite an important application of these principles, as follows:

*“The RUC’s first major use of intensity as a mechanism to value work came with the first 5-year review. The American Association of Neurologic Surgeons (AANS) conducted two major surveys. The first was a survey of high-volume neurosurgical key references services to establish relative values for codes to be used as benchmarks or anchors within families of codes. The second was a survey of key misvalued codes scattered among the neurosurgery codes that were then compared with the anchor codes. **Operative log data** (emphasis ours) were used for the intra-service time of many of the procedures surveyed, and the values for IWPUT were calculated using an algorithm based on the actual survey responses for estimates of intensity for each category of service (pre-, intra-, and post-service). The RUC accepted the entire AANS proposal to correct the alignment of all neurologic services. CMS accepted the RUC recommendation and made the recommended increases and decreases to the Relative Work Values (RWVs) for neurosurgical services. Thus, the Medicare Fee Schedule (MFS) RWVs for the majority of neurosurgical services is based upon use of both intensity measures and operative log times.”*

Mabry et al state that the RUC extended the principle of using IWPUT in developing work values for anesthesia services:

*“The American Society of Anesthesiologists submitted a study that evaluated anesthesia work in relation to other services by partitioning an anesthesia service into 5 distinct components, assigning intensity values to these components based on the intensity values of benchmark procedures and multiplying anesthesia time per component by its corresponding intensity. The 5 defined components included pre-anesthesia, induction, procedure, emergence, and post-anesthesia. CMS reviewed and accepted the RUC recommendations and increased the work for anesthesia services by 22.76%. Similar to the neurosurgery codes discussed above, the entire anesthesia fee schedule is based upon assigned intensity values.”*

The Mabry paper makes no statement with respect to the source of the time values with which these five values for IWPUT must be multiplied. (How the times for these five phases of anesthesia are determined needs to be elucidated. However, it may be notable that the Society of Anesthesiologists has long advocated using time from patient-specific operative records as a basis for billings – arguing that operative times, even for the same surgery, are variable and that it is primarily the surgeon, and not the anesthesiologist, who determines the duration of surgery).

## **A2. Unanswered Questions regarding the Building Block Method as used by The American College of Surgery**

### ***A2.1 Sources of Data on Time***

The use of IWPUT and the BBM would appear to be a logical basis, at least in theory, for determining the work values of surgical services. Assuming, for the moment, that the values for IWPUTs used in the calculation of work values for global surgical services are reasonable and that work (for each phase of the global service) is the product of IWPUT for each and the times of each, one's confidence in the accuracy of work values hinges to a great extent on the accuracy of the data for time.

While Mabry et al cite the use of objective sources of time in the AANS' revision of intra-service work of neurosurgical services and while objective times are likely to have been used in the revision of anesthesia services, the Mabry paper is unclear on the source of intra-service time data employed by the ACS to increase the work values of 314 surgery procedures in the second CMS 5-year review. We have previously shown the systematic discrepancies between time from operative logs and the results of surveys of surgeons reported by the RUC and those cited in the original Harvard investigations (McCall et al, 2006).

### ***A2.2 Questions Regarding the Quantification of Intra-Service Work***

An entirely different question is raised by the text of the Mabry et al paper and Table 4 (p. 934), entitled The Standard IWPUT Formula Can Be Utilized for Codes that have a Global Period and Where Total Work (RWV), Intra-time, and Pre-/Post-time and Visits are Available. The third line of Table 4 states that "intra-service RWV = (total RWV) – (pre-service RWV + post-service RWV)." This would appear to propose a reverse of the building block method, by which intra-service work (placed as the dependent variable in this formulation) is calculated as the difference between total work and the sum of pre- and post-service work. Mabry et al do not explain how one gets a value for total surgical work, other than as the sum of pre-, intra-, and post-service work. Where do direct, primary values of total work for global procedures come from and what can be said about their validity?

The Harvard investigators, with the advice of the measurement psychologist on their team, rejected the notion of questioning physicians on the total work of global surgery (pre-, intra- and post-procedure) as a single step in magnitude estimation, since it was a mixture of tasks of different nature and varying times and since that task would be psychologically very much more complex than the tasks that they were posing on surveys to physicians (i.e., on discrete, as distinguished from global, services).

In the Harvard studies, the intra-operative portion accounted for roughly 50% to 65% of the work of most surgical procedures (Hsiao et al., 1988). Very low values of intra-operative work that seem to lack face validity raise the questions of (1) whether subtracting surveyed pre- and post-service values from a value of total work to calculate intra-service work is reasonable (2) what very low values for intra-service work so derived says about the validity of values for pre-and post-service work?

### ***A2.3 Questions Regarding AMA/Specialty RVS Update Process***

In an effort to better understand this relative work values for global surgery periods are developed, we also reviewed blank forms designed for obtaining data from specialty societies in support of the societies' recommendations the RUC for new or revised RVUs (AMA/Specialty Society RVS Update Process, 2010). Several aspects of these forms raise questions that are similar to those raised in connection with the paper by Mabry et al. The form provides a space marked "vignette used in survey" which carries the potential for describing something other than a typical patient. All surgical procedures in the Harvard studies were surveyed using the CPT descriptor for the procedure; the respondent was asked to consider the typical patient. In methodology that appears to differ from that of magnitude estimation used in the studies that established the RBRVS, the forms separately provides space for input of information on "intensity/complexity" of mental effort and judgment, technical skill/physical effort, psychological stress, as well as for pre-service, intra-service, and post-service "intensity/complexity." It is not clear how these inputs are used.

The page headed Survey Data provides for entries for times of pre-service evaluation, positioning, scrub, dress and wait time, intra-service time, immediate post-service time and gives codes and asks numbers of critical care visits, subsequent hospital visits, discharge day management, office visits and prolonged services (by code). One must be concerned that the format of these documents provides a potential route for over-valuation of global surgical procedures via over-estimation of pre-, intra and immediate post-operative time and numbers and coded levels of postoperative service. This should give us cause for concern. For here we are departing from the basic model of relative values, where increasing the value of one member of a set implies lowering of the rest of the set (assuming a large number of the services are correctly aligned on a common scale with other specialties); equity across specialties is maintained under those rules. We have, instead, moved into a world of absolute values, where the increasing the values of all the members of the set (if we have raised the values of pre-and post-service work, which are not linked) raises them all and equity across specialties is no longer maintained.

**Appendix Table 1 Intra-service Work, Time and Work per Unit Time, by Category of Service**

	Intra-service Work			Intra-service Time		Intra-service Work per Unit Time (W/T)		Mean W/T Normalized	SE normalized with
	N	Mean	SE	Mean	SE	Mean	SE	with E&M = 1.00	Mean W/T of E&M = 1.0
Evaluation and Management (All)	323	91	55	32	17	2.81	0.55	1.00	0.20
Office Visits	144	67	36	24	13	2.66	0.40	0.95	0.14
Consultations	53	130	59	42	14	3.11	0.67	1.11	0.24
Hospital Visits, Subsequent	44	59	24	21	9	3.02	0.48	1.07	0.17
Critical Care	10	161	73	44	18	3.57	0.23	1.27	0.08
Psychiatry	36	123	50	48	17	2.62	0.75	0.93	0.27
Invasive/Intra-service surgery (All)	4,276	535	491	90	73	5.76	1.89	2.05	0.67
Office	935	129	88	29	17	4.61	1.58	1.64	0.56
Ambulatory Surgical Center	1,058	341	191	56	29	6.19	2.17	2.20	0.77
Inpatient	2,283	791	529	130	76	6.02	1.67	2.14	0.59
Imaging	36	97	94	32	28	3.19	0.84	1.14	0.30
Pathology	46	107	161	35	55	2.75	0.70	0.98	0.25
Other Diagnostic Tests	114	68	46	23	46	3.07	1.00	1.09	0.36

Notes: Data in columns 1 through 7 are taken from Table 5 from Hsiao et al., 1992, pages NS61-NS79. Data in columns 8 and 9 are calculated by the authors of this report (by dividing each of the corresponding numbers in columns 8 and 9 by 2.81).